Methods: A retrospective commercial claims database review was performed of the Truven MarketScan (MS) database. In a 10 year MS sample, 23,262 patients with burn injuries were identified and were matched to a control population in a 1:1 ratio based on age, sex, and total time in the MS database. For the burn patient population in the study, pre-burn and post-burn utilization of therapy, emergency department, nutritional support, psychiatry/psychology, home health, skilled nursing facility, inpatient, and outpatient visits were recorded. For controls, we defined their pre-burn and post-burn periods using the burn event date of the matched base. In a 10 year MS sample, 23,262 patients with burn injuries were matched to a control population in a 1:1 ratio based on age, sex, and total time in the MS database. For the burn patient population in the study, pre-burn and post-burn utilization of therapy, emergency department, nutritional support, psychiatry/psychology, home health, skilled nursing facility, inpatient, and outpatient visits were recorded. For controls, we defined their pre-burn and post-burn periods using the burn event date of the matched case adjusted by the pair’s relative difference in initial enrollment into the MS database, and then recorded the same utilization metrics. A series of negative binomial regressions were completed to evaluate the data.

Results: At the conclusion of the study, for every outcome, except skilled nursing facility, healthcare utilization was greater in the pre-injury burn group relative to controls. Healthcare utilization for the burn cohort post-injury was greater for every outcome compared to controls. Relative to controls, healthcare utilization remains higher for at least 25 months post-injury in the burn patients and does not return to pre-injury levels during this time frame.

Conclusions: In a commercial claims database study, the healthcare utilization of the burn patients is higher both before and after burn injury than matched controls. Utilization does not return to preburn levels in the 25-month follow-up period. Additionally, burn patients have higher healthcare utilization prior to injury compared to matched controls, which may indicate an important difference in baseline health of these patients, and an opportunity for injury prevention.
Introduction: Management of critically ill patients requires simultaneous administration of many medications. These patients may have co-morbidities and drug-drug interactions which may result in decreased drug efficacy or increased risk of adverse reactions. Children are of particular concern as they may be even more sensitive to adverse drug reactions. Current practices rely on a one-size-fits-all approach for most medication dosing. Alternatively, precision medicine evaluates an individual’s genetic profile and adjusts individual therapeutic dosing. Pharmacogenetic testing is not generally implemented but is reserved for addressing an established problem rather than being used proactively to optimize clinical care. A greater understanding of the frequency of clinically significant genetic variants in drug pathways and identification of the drugs most commonly impacted by genetic makeup is needed to incorporate pharmacogenetics into medical care. We hypothesize several patients will have one or more genetic variants in drug metabolizing pathways used by one or more medications administered during hospitalization. The aims of this study are to determine the frequency of abnormal genetic variants in the primary drug pathways and assess what medications may be impacted.

Methods: Genetic data from 30 pediatric burn and surgery patients was collected to identify genetic variants in drug metabolizing pathways. We also evaluated drugs potentially impacted by these variants that were administered during the hospitalization. 19 whole exome and 11 whole genome sequencing datasets were analyzed using Aldy allelic decomposition software to identify haplotypes in cytochrome P450 (CYP) metabolizing enzyme genes.

Results: 17 patients were identified with predicted altered function in 1 or more of the following CYP genes: 2C9, 2C19, 2D6, 3A4 and 3A5. The majority had decreased function, except for several patients with CYP2C19 variants with rapid or ultrarapid phenotypes. Drugs administered during hospitalization that rely on these pathways for primary metabolism include hydrocodone, oxycodone, methadone, ibuprofen, ketorolac, celebrex, diazepam, famotidine, diphenhydramine and glycopyrrolate.

Conclusions: This research demonstrates that approximately 1/4 to 1/3 of patients have functionally impactful haplotypes in the primary drug metabolizing pathways. There is great need for future clinical research to further evaluate the clinical relevance of these haplotypes and the additional impact of drug-drug interactions and other clinical confounders that additionally impact drug efficacy.
Validation of the Burn Survivor Fear-avoidance Questionnaire

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Introduction: According to the Fear-Avoidance (FA) Model, FA beliefs can lead to disability due to avoidance of activities expected to result in pain or further injury. Extensive research on the relationship of FA, pain, catastrophizing, and disability has been generated with patients suffering from chronic neck and back pain, but little research has been conducted with burn survivors. To address the need for a valid evaluation of FA in burn survivors, Langlois and colleagues developed, but did not validate, the Burn Survivor Fear-Avoidance Questionnaire (BSFAQ). Thus, the primary objective of this study was to investigate the construct validity of the BSFAQ among burn survivors. The secondary objective was to examine the relationship between FA and (i) pain intensity and (ii) catastrophizing at baseline (admission to rehab), 3 months and 6 months post-burn, and (iii) disability among burn survivors at 6 months post-burn.

Methods: A prospective mixed methods approach was used to examine the construct validity by comparing the quantitative scores of the BSFAQ to independently performed qualitative interviews of burn survivors (n=31) that explored their lived-experiences, to determine if the BSFAQ discriminated those who had, from those who did not have FA beliefs and behaviors. Data for the secondary objective, scores of burn survivors (n=51) pain intensity (measured by the Numeric Rating Scale), catastrophizing (measured by the Pain Catastrophizing Scale), and disability (measured by the Burn Specific Health Scale-brief), were collected through a retrospective chart review.

Results: For the primary objective, Wilcoxon Rank Sum Test results showed a statistically significant difference (p=0.015) between the BSFAQ scores of participants who were identified from the qualitative interviews as fear-avoidant compared to those who were identified as non-fear-avoidant. For the secondary objective, the Spearman correlation test results showed a moderate correlation between FA and (i) pain at baseline (r=0.466, p=0.002), a moderate correlation with (ii) catastrophizing thoughts over time (r=0.557, p=0.000; r=0.470, p=0.00; r=0.559, p=0.002 respectively at each time point), and a moderate correlation with (iii) disability at 6 months post-burn (r=-0.639, p=0.000).

Conclusions: These results support that the BSFAQ is able to discriminate which BS are experiencing fear-avoidant beliefs and behaviors. As has been reported in other patient populations, burn survivors who express FA are more likely to report higher levels of pain early during their recovery that correlates with elevated catastrophizing thoughts, which are maintained across time and ultimately results in higher self-reported disability, which is consistent with the FA model.
Introduction: Urine output (UOP) still remains the primary endpoint utilized as a surrogate for cardiac output (CO) and adequacy of perfusion during burn resuscitation. The role of arterial blood pressure (BP) waveform as a guiding tool for burn resuscitation has not been rigorously explored. As we move toward developing and validating novel endpoints to complement UOP, we compared the potential of pulse wave analysis (PWA) of arterial BP waveforms for estimating cardiac output (CO) and stroke volume (SV) in a large animal model of 40% total body surface area (TBSA) burns with varying resuscitation paradigms.

Methods: Anesthetized swine were instrumented and hemorrhaged 15% of their blood volume, and sustained a 40% TBSA full-thickness contact burn with aluminum billets. Animals were kept in a surgical ICU setting overnight, during which anesthesia was maintained with a combination of propofol, ketamine, and fentanyl. Animals were randomized to 3 different intravenous fluid (lactated Ringer’s, LR) levels: under resuscitation with no IV fluids, adequate resuscitation protocolized with a clinical decision support tool, or over resuscitation with a starting rate of 500mL/hour. We computed 20 surrogate measures of CO and SV (10 each) via PWA of arterial BP, and calibrated them to reference CO and SV on a subject-by-subject basis. Surrogate performance was quantified in terms of correlation coefficient and root-mean-squared error (RMSE) relative to reference CO and SV.

Results: Animals received 0±0, 4.4±1.6, and 9.1±1.3 mL/kg/% TBSA in the under, adequate, and over resuscitation groups (p=0.0036), respectively. Among the ten surrogate measures of CO and SV, 4 surrogates had positive proportionality to reference CO and SV consistently. The best surrogate measure of CO and SV was \([\text{mean BP-diasstolic BP}] / [\text{heart period}]\) and \([\text{mean BP-diasstolic BP}]\), respectively, which yielded \(r\) value of 0.82±0.19 and RMSE of 0.23+/−0.14 lpm for CO and \(r\) value of 0.85+/−0.17 and RMSE of 2.7+/−2.0 ml for SV (Fig. 1).

Conclusions: The initial results suggest that PWA-based surrogates of CO and SV have the potential to track reference CO and SV in extremes of resuscitation post-burn. The current model produces under-resuscitated, adequately resuscitated, and over-resuscitated animals, making it possible to rigorously examine the efficacy of PWA-based tracking of CO and SV in a wide spectrum of burn resuscitation scenarios. Hence, PWA may provide metrics useful for developing surrogates of CO and SV as novel treatment endpoints of burn resuscitation that indicate perfusion and volume status of burn injury patients.
Introduction: The goal of burn resuscitation is to provide the least amount of fluid necessary to maintain end-organ perfusion and prevent burn shock. The objective of this analysis was to examine how the Burn Navigator (BN), a clinical decision support tool in burn resuscitation, was utilized across 5 major burn centers in the United States.

Methods: A non-interventional, observational trial of 300 adult patients with embedded prospective and retrospective components was undertaken to examine the effectiveness of the BN in burn resuscitation. 5 ABA-verified burn centers enrolled patients. Data examining patient demographics, burn characteristics, fluid volumes, and resuscitation-related complications were examined. Statistical analysis compared the 5 sites in terms of these variables.

Results: A total of 285 patients were eligible for analysis. There was no difference among the centers in terms of average age (45.5 + 16.8 years), BMI (29.2 + 6.9), ISS (21.2 + 12.8), or median TBSA (34 [25.8, 47]). Primary crystalloid infusion volumes at 24 hours differed significantly when measured in ml/kg/TBSA (median 3.7 [2.9, 8.8], range 1.3 to 12.3). Similarly, total fluids, which includes colloid adjuncts, drip medications and enteral fluids, differed between groups when measured in both ml/kg (median 149.8 [106.5, 224.1], range 38.4 to 536.2) and ml/kg/TBSA (4.2 [3.3, 5.5], 1.7 to 15.3) at 24 hours. Post-hoc adjustment for pairwise comparisons resulted in a loss of significance between most of the sites. There was a total of 156 resuscitation-related complications reported across the 5 sites with an average incidence of 44.4% incidence.

Conclusions: The Burn Navigator appeared to standardize fluid resuscitations across 5 major US burn centers. With primary fluid volumes near the Parkland formula, the device can be utilized effectively in burn centers, and further study should examine the utility of this device in facilities that do not commonly treat burn injuries, as well as the battlefield.

Introduction: Burn care continues to focus on providing enough fluid resuscitation to perfuse end organs with the least amount of fluid necessary in order to prevent complications related to excess fluid. In this observational trial of 5 ABA-verified burn centers that utilized the Burn Navigator (BN), a clinical decision support tool, we sought to examine resuscitation-related complications that occurred in the first 48 hours after burn injury. Since minimal literature exists regarding the incidence of resuscitation-related complications in the acute phase after burn injury, we aimed to present our data for future comparison.

Methods: An observational study of adult patients undergoing burn resuscitation utilizing the BN was conducted. Data were gathered hourly for the first 48 hours for patients on fluid infusion rates, laboratory data, critical care elements to include ventilator settings and clinically relevant outcomes. Morbidities were classified based on each burn center’s definition as related to over or under-resuscitation and variables associated with these outcomes were extracted from the data set.

Results: Three hundred patients were enrolled into the study, and 156 resuscitation-related complications were documented in 92 patients in the first 48 hours after admission. Compartment syndromes (abdominal, extremity, ocular) accounted for 62 (40%) of the complications. ARDS occurred in 9 patients. ARDS patients were the most severely injured, reflected by highest Baux score. None of the ARDS patients had an inhalation injury. The under-resuscitation morbidities of shock and acute kidney injury accounted for 81 (52%) of the complications. Patients experiencing shock received greater than the Parkland formula in the first 24 hours after injury. Most patients with AKI continued to make adequate urine during their resuscitation period, with 59% making an average of >30 ml/hr over the first 24 hours. Nearly half of patients with AKI were placed on renal replacement therapy in the first 48 hours. Seventeen patients (18.5%) experienced both a compartment syndrome and either AKI or shock.

Conclusions: This large observational study demonstrates variables associated with different complications across 5 major burn centers and shows that complications associated with over- and under-resuscitation can occur within the same patient during resuscitation after burn injury. Additional comparative studies are needed to better understand the cause of these complications, to determine the incidence of these complications in a larger population and criteria used to define each complication.
Continuous Renal Replacement Therapy for the Treatment of Burn Shock: A Post Hoc Analysis

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Introduction: Burn shock is a consequence of burns that cover ≥20% TBSA and may be complicated by acute kidney injury, which is commonly treated with continuous renal replacement therapy (CRRT). However, early initiation of CRRT has not been clinically evaluated for the treatment of burn shock.

Methods: Data were obtained from the Renal Replacement Therapy in Severe Burns: A Multicenter Observational Study. In that study, baseline (t0) measurements were taken at the time of CRRT initiation and ~24 (t1) and ~48 (t2) hours thereafter. Patients were included in this analysis if they had ≥20% TBSA and began CRRT within 2 days of injury. Patients were categorized as Group A (began CRRT on same day as injury), Group B (began CRRT on day 1 postburn), and Group C (began CRRT on day 2 postburn). Outcomes measured at t0, t1, and t2 and hospital and ICU length of stay (LOS) were analyzed using generalized linear mixed models. Cox proportional hazards models were used to assess survival to hospital discharge (HD). All models were adjusted, e.g. for age, % full thickness, etc. Burn center was included as a random effect.

Results: More than half of the 48 patients included were treated at just 2 burn centers. Timing of CRRT initiation varied by center, with all patients at one center starting CRRT on either the day of injury or the day after injury. Nearly 96% of patients had AKI at CRRT start and, of those, 22 were at stage 1 or 2. Patients generally had severe burns; Group A had more inhalation injuries and higher %TBSA, % full thickness, and Baux scores than Groups B and C. Shock index (SI) was persistently elevated across all 3 time points and did not vary by timing of CRRT initiation (p=0.37). Vasopressor dependency index (VDI) was also not associated with timing of CRRT initiation (p >0.99), although mean VDI for Groups B and C declined over time. For all 3 groups, fluid balance decreased from t0, but there were no differences among the groups (all p >0.30). Survival to HD was better for patients with lower TBSA (i.e. 20-49%) compared to those with TBSA ≥50% (hazard ratio=0.37; 95% CI=0.15-0.91). In contrast, timing of CRRT initiation was not associated with survival (p=0.73). Among patients that survived to HD, the mean hospital LOS was shorter for Groups A (13 days; p=0.01) and B (52 days; p=0.03) than for Group C (168 days).

Conclusions: In this analysis, earlier initiation of CRRT did not improve survival to hospital discharge. Nonetheless, starting patients on CRRT early may be advantageous for reducing ICU and hospital LOS for those patients that do survive.
4 Risk Association Between Race and Complications Following Burn

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**Introduction:** Racial minorities have been recognized to experience worse health outcomes for many medical conditions. However, it is not clear if these outcomes are associated with pre-existing conditions or the quality of care those patients receive. In burns, little information on the relationship between race and burn comorbidities is available. This study examines the risk association between race and burn complications, such as pneumonia, sepsis, and ARDS while controlling for common comorbidities that affect burn recovery such as diabetes and hypertension.

**Methods:** Burn patient cohorts were identified by ICD10 codes for burn injury using TriNetX, a federated network of real-world data. The cohorts were stratified by race and balanced in terms of age at index, gender, BMI, and pre-existing comorbidities such as diabetes and hypertension. The following post burn outcomes were selected for analysis: renal failure, cardiovascular disease, sepsis, ARDS, graft complication, pneumonia, ICU admit, respiratory failure, hypertrophic scarring (HTS), hyperglycemia, and mortality. A measure of association analysis was performed to compare risk outcomes in black vs. white burn patients. Statistical significance was set at p < 0.05. The same cohorts were analyzed for treatment pathways to compare critical care billing CPT codes for the amount of time seen by a physician: Critical Care and Evaluation, first 30-74 minutes, and Critical Care and Evaluation, each additional 30 minutes.

**Results:** The balanced patient cohorts comprised 78,974 patients per cohort. Black patients experience a positive relative risk ratio (RR) to renal failure (p < 0.0001, RR = 1.372, 95% CI: 1.314-1.435), cardiovascular disease (p < 0.0001, RR = 1.115, CI: 1.08-1.15), sepsis (p < 0.0071 RR = 1.081, CI: 1.021-1.144), and ARDS (p < 0.0010, RR = 1.287 CI: 1.107-1.496) following burn injury. However, black patients experience a negative risk ratio to mortality (p < 0.0006, RR = 0.935, CI: 0.89-0.982) and pneumonia (p < 0.0014, RR = 0.937, CI: 0.901-0.975). The risk ratio was not significant for outcomes between black and white burn patients for respiratory failure, HTS, hyperglycemia, and ICU admit.

**Conclusions:** Black burn patients are more likely to experience renal failure, cardiovascular disease, sepsis, and ARDS compared to white burn patients despite controlling for common comorbidities. They are less likely to experience pneumonia and mortality.
5 Admission Frailty Is Associated with Acute Respiratory Failure and Mortality in Burn Patients > 50

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Introduction: Pre-injury frailty has been shown to predict mortality of older burn patients. Herein, we assessed the utility of the Canadian Study of Health and Aging Clinical Frailty Scale (CSHA-CFS) to predict burn-specific outcomes. We hypothesize that frail patients are at greater risk for complications such as graft loss, acute respiratory failure, and acute kidney injury and will require increased healthcare support at discharge.

Methods: This is a retrospective cohort study. Patients 50 years and older admitted to our Institution for burn injuries between July 2009 and June 2019 were included. Patients with inhalation injury only, no data on total burn surface area, or for whom medical history was incomplete were excluded. Demographics; comorbidities; pre-injury functional status; admission, injury, and hospitalization information; complications (graft loss, acute respiratory failure, and acute kidney disease (AKI)); mortality, and discharge disposition were collected. Patients were scored on the CSHA-CFS based on pre-admission health and functional status. The frail and non-frail groups were compared. Multivariate analyses were performed to assess the association between admission frailty and outcomes. P < 0.05 was considered significant.

Results: We included 851 patients, 697 were not frail and 154 were frail. Frail patients were significantly older (66.1 ± 10.8 vs. 63.5 ± 10.9, p = 0.002), more likely Caucasian (98.1% vs. 91%, p = 0.027) and to have suffered flame burn injuries (68.8% vs. 59.8%, p < 0.001). Frail patients had a lower %TBSA (4.4 ± 8.1% vs. 10.1 ± 13.1, p < 0.001) but were more likely to stay longer in hospital relative to %TBSA (3.6 ± 6.7 vs. 1.9 ± 3.1, p < 0.001). Frail patients were less likely to have had skin graft procedures (27.3% vs. 57.4, p < 0.001). On multivariate analysis, controlling for age, sex, race, mechanism of injury, %TBSA, 2nd degree and 3rd degree burn surface, inhalation injury, frailty was associated with acute respiratory failure (OR = 2.599 [1.460-4.628], p = 0.001). Frailty was also associated with mortality (OR = 6.915 [2.455-19.980]; p < 0.001) when controlling for the same variables as well as acute respiratory failure and AKI. Frailty was also associated with discharge to home with healthcare services (OR = 2.678 [1.491-4.809], p = 0.001), to SNF, rehabilitation, or long-term acute care facilities (OR = 3.572 [1.933-6.602], p < 0.001), and to hospice (OR = 5.759 [1.519-21.827], p = 0.010) when compared to home without healthcare services.

Conclusions: Frailty is associated with increased risk of acute respiratory failure, mortality, and requiring increased healthcare support post-discharge. Our data suggest frailty as a tool to predict morbidity and mortality as well as for goals of care discussions for the burn patient.

6 Risk Factors and Comorbidities Associated with Post-burn Hypertension

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Introduction: Hypertension (HTN) is a prevalent condition in the United States and leads to an increased risk of developing other comorbidities. However, the impact of hypertension following severe burns on patient outcomes is not known. We hypothesize that post-burn hypertension is associated with an increased risk of other comorbidities and mortality.

Methods: This study used data from TriNetX, a global federated health research network. Burned patients who were diagnosed with essential hypertension at least 1 day after injury were identified in the TriNetX database using specific ICD codes and were compared to those who did not develop essential hypertension; neither cohort was diagnosed with hypertension prior to injury. Each cohort was balanced for age, gender, race, and ethnicity. Occurrence of the following within 3 days of burn was compared between the two cohorts: acute kidney injury (AKI), hyperglycemia, heart failure, coronary artery disease, and death. These patient cohorts were then stratified by gender, percent total body surface area (TBSA) burned, and age. Statistical analysis for the measures of association used an odds ratio with a 95% confidence interval and a risk ratio with a z-test. Significance for the z-test was set at a p-value of < 0.05.

Results: The search identified 460,977 burn patients of whom 87,808 were diagnosed with hypertension at least 1 day after burn injury. Those diagnosed with hypertension were 7.25 times as likely to develop AKI, 5.45 times as likely to develop hyperglycemia, 7 times as likely to develop heart failure, 7.17 times as likely to develop coronary artery disease, and 1.78 times as likely to die. Men were at greater risk of experiencing AKI, heart failure, coronary artery disease, and death, however, women were 1.51 times as likely to develop hyperglycemia. Stratification based on % TBSA burned indicated an increased risk for all outcomes for patients with a high percentage of total body surface area burned (60% to > 90% TBSA burned was higher than < 10% to 50-59% groups). Subgroup analysis based on age indicated elevated risk of developing AKI, heart failure, coronary artery disease,
or death with age. However, we found a spike in risk for all outcomes in the 0-9 age group. All data was significant at p < .0001.

**Conclusions:** A new hypertension diagnosis in severely burned patients is highly associated with other comorbidities including acute kidney injury, heart failure, coronary artery disease, and death. Overall, males, older patients, and those with a higher percent TBSA burned are at a higher risk of developing these comorbidities.

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### Impact of Chronic Alcohol Use on Fluid Resuscitation in Burn Patients

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**Introduction:** Acute alcohol intoxication in burn patients has been associated with increased mortality, renal dysfunction and difficulty with adequate fluid resuscitation. It is less clear how chronic alcohol use, regardless of intoxication status on admission, impacts patient outcomes. In this study, we examine chronic alcohol use and both short- and long-term outcomes in burn patients.

**Methods:** Patients were identified using an institutional burn center registry and linked to clinical data. Adults admitted from 2017 to 2020 with a total body surface area (TBSA) % above 10% and a hospital stay greater than 2 days were eligible for inclusion. A total of 298 patients were enrolled and chart review completed for admission labs and fluid administration. Alcohol use was also examined and patients were staged based on severity and chronicity of alcohol use: none/minimal, early/moderate use, and problem/severe abuse. Renal dysfunction was defined based on Acute Kidney Injury Network criteria. Linear regression was used to assess the association between alcohol use and fluid resuscitation. Multiple logistic regression was used to assess alcohol use and renal dysfunction with adjustment for confounders.

**Results:** Compared to patients with none/minimal (NM) alcohol use and early/moderate (EM) alcohol use, patients in the problem/severe (PS) alcohol use category were older (NM 45.4 years, EM 44.1 years, PS 52.2 years; p=0.02), had larger mean TBSA burns (NM 18%, EM 14.9%, PS 23.1%; p=0.03), were more likely to have third degree burns (NM 53.8%, EM 36%, PS 72.4%; p=0.02), and more likely to have inhalation injury (NM 7.2%, EM 0%, PS 24.1%; p< 0.001). Patients in the PS category also had a significantly longer hospital length of stay (LOS) (p< 0.001), ICU LOS (p< 0.001), and ventilator days (p=0.005). Mortality was higher for the PS group (21.7%) compared to the NM (6.6%) and EM (0%) groups; p=0.001. These correlated to higher mean hospital costs for patients in the PS category compared to those in the NM category ($394,964 versus $868,126, p< 0.001). After adjusting for TBSA, patients in the PS category required more fluid resuscitation within 48 hours of admission compared to the NM category (p=0.0138), despite a lower mean admission BMI (27.1 vs 30.03, p=0.03). Although there was a trend toward increased rates of acute renal injury within 48 hours of admission in the PS group (32.7%) vs the NM group (21%), this did not reach statistical significance.

**Conclusions:** Chronic alcohol use was associated with more severe burn injury, increased morbidity and mortality, and greater resource use. Even after adjustment for comorbidities and TBSA, chronic alcohol use resulted in a need for increased initial fluid resuscitation.
Introduction: Significant morbidity and mortality is seen with high volume burn resuscitations. Surpassing the Ivy Index, defined as 250 milliliters/kilogram (ml/kg), has been correlated with increased incidence of complications such as abdominal compartment syndrome. Cognizance of factors contributing to over-resuscitation can help optimize fluid administration strategies to minimize associated morbidity.

Methods: A single-center Quality Improvement review was performed of all adult (age ≥ 18 years) burn-injured patients presenting to a major metropolitan burn center with burns ≥ 20% total body surface area (TBSA) between 12/2020-8/2021. Those not surviving the first 24 hours were excluded. Patient demographics and injury characteristics were collected, and resuscitation volumes and timing were recorded prospectively. Patients were categorized by whether their initial 24-hour intake exceeded their Ivy Index, defined as 250 milliliters/kilogram (ml/kg), has been correlated with increased incidence of complications such as abdominal compartment syndrome. Observed mortality rate was 30.0%. Patients resuscitating beyond their Ivy Index in the first 24 hours. These patients had a significantly higher third degree component (41.4±15.8% v. 15.4±15.2%, p = 0.029). None had diagnosis of hospital acquired infections, some of which may originate from environmental surfaces. Enhanced cleaning practices likewise be beneficial. Protocol for the use of HHP fogging for treatment spaces will result in >5,700 ACC.

Results: No statistically significant difference between SC and C+UV was seen (mean ACC 7.16 and 6.35 respectively; p=0.186). ACC levels were reduced following HHP fogging demonstrating a 98% improvement over SC and C+UV (mean ACC 0.14; < 0.0001). ATP demonstrated an 88% reduction after HHP fog without manual cleaning. Biological indicators confirmed a 1x10⁶ reduction of bacterial spores, and CIs verified a thorough migration of HHP fog throughout the patient room. Baseline sampling of the treatment spaces following SC and C+UV resulted in a range of 0-70 ACC. Swabbed locations consistent with ACC levels measured in patient rooms (range 0-153). An industry-known location for high bioburden, one sink backsplash swabbed on two separate occasions resulted in >5,700 ACC.

Conclusions: In patient rooms, HHP fogging resulted in a significant reduction in ACC compared to current protocols of SC and C+UV. Baseline sampling of the treatment spaces resulted in ACC levels similar or greater in range to those seen in the patient room, indicating a similar reduction in bioburden levels could be achieved through implementation of HHP fogging. The efficacy and feasibility of HHP fogging in a patient room setting within a burn unit suggests that a protocol for the use of HHP fogging for treatment spaces will likewise be beneficial.
Results:

(i.e., age, gender, race/ethnicity) and burn injury severity.

Conclusions:

Having Medicaid and Medicare insurance was significantly associated with a lower health-related quality of life at long-term follow up, even after adjusting for demographics and burn injury severity. Further studies need to focus on analyzing the reasons for these disparities and developing strategies to improve the quality of life of this subpopulation.

Introduction:

Access to healthcare and insurance coverage are associated with quality of life, morbidity, and mortality outcomes. However, most studies have only focused on same-admission and short-term outcomes due to the lack of national longitudinal data and there is limited data on this topic in the burn literature. Our aim was to determine the effect of insurance status on long-term outcomes in a national sample of burn patients.

Methods:

This is a retrospective study using the longitudinal Burn Model System National Database from January 2015 to April 2021. The inclusion criteria were all adult patients admitted for burn injury from participating sites. Main outcomes were the physical (PCS) and mental (MCS) health component summary scores of the Veterans RAND 12 (VR-12) score at 6, 12, and 24 months after injury. Multivariable regression was used to examine the association between insurance status and the outcomes, adjusting for demographics and burn injury severity. Further studies need to focus on analyzing the reasons for these disparities and developing strategies to improve the quality of life of this subpopulation.

Results:

A total of 3,698 burn patients were included. Mean age was 43.39 (SD 15.84) years, 72% were male and 76% were white. Most patients had private/commercial insurance (56.37%), followed by Medicare (14.42%) and Medicaid (13.18%). The remaining 16% were uninsured patients (self-pay or philanthropy). Mean PCS scores were 43.64 (SD 10.87), 45.31 (SD 11.04) and 46.45 (SD 10.65) and Mean MCS scores were 47.80 (SD 12.35), 48.18 (SD 12.30) and 48.44 (SD 12.18) at 6, 12 and 24 months, respectively. In adjusted analyses, Medicaid insurance was associated with worse MCS at 6 months (Coefficient -3.90, p=0.001), and worse PCS at 12 and 24 months (Coefficient -3.09, p=0.004 and Coefficient -4.18, p< 0.001, respectively), compared to uninsured status. Medicare insurance was associated with worse PCS scores at 24 months (Coefficient -3.07, p=0.013).

Conclusions:

Having Medicaid and Medicare insurance was significantly associated with a lower health-related quality of life at long-term follow up, even after adjusting for demographics and burn injury severity. Further studies need to focus on analyzing the reasons for these disparities and developing strategies to improve the quality of life of this subpopulation.
The Influence of Female Sex Hormones on Outcomes After Burn Injury

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Introduction: The pathophysiological response to major trauma has gender dimorphism in outcomes associated with sex hormones levels. However, little is known of the effects of female hormones on outcomes in burn patients. Previous studies demonstrated exogenous estrogen alleviates hyper-inflammation after burn. We thus posit that female patients have fewer comorbidities depending on female hormone levels. We had two objectives: to investigate the role of female hormones on outcomes after burn and to investigate potential protective properties of exogenous hormone treatment on burned post-menopausal women.

Methods: This study obtained data from the TriNetX research network with electronic medical records of de-identified patients. Both male and female patients who suffered burns were included from 2002-2020. The population was stratified to only include women over 45 on estrogen or progestin hormones taken within 6 months prior to injury and 1 month after injury to assure a menopausal state which occurs at age 45-55. Outcomes for mortality, sepsis, acute myocardial infarction, and acute kidney injury were measured within one day of injury to one month following injury. Odds ratios, risk difference, and risk ratios were calculated for outcome analysis after propensity-matched for race and ethnicity. A z-test for risk difference was performed. Statistical significance was defined at p < 0.05.

Results: Compared to males, females grossly had a 28% risk reduction of 30-day mortality and a relative risk reduction for sepsis (26%), acute kidney failure (30), and myocardial infarction (29%) (p< .05). Additionally, female burns younger than the age 45 had risk reductions for mortality 5.4-fold within 3 months, 2.9-fold lower for sepsis, 17.5-fold lower for myocardial infarction, and 7.7-fold lower for acute kidney injury (p< .001). TriNetX identified 169,566 female burn patients, of which 2,683 were on estrogen and progestin and above 45 years old. Women over 45 on exogenous hormones had a 37% significant risk reduction in acute kidney failure when compared to the women over 45 not prescribed estrogen or progestin (p< .05).

Conclusions: Female burn patients had better outcomes, while women over 45 had worse outcomes indicating the role of female sex hormone correlated to burn patient progress. The administration of estrogen and progestins for females above age 45 resulted in reduced risks for acute kidney failure after burn injury.
13 Statewide Prehospital Routing of Burn Injuries Reduces Patient Length of Stay
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Introduction: In the U.S., traumatic injuries are the leading cause of death before age 45 and have a significantly lower mortality if routed to a verified trauma center. Burn injuries are included in trauma statistics and represent 1.1 million injured people annually seeking medical assistance. Routing of burn injuries to ABA-recognized burn centers has yet to be assessed as it has in trauma injury. Our goal was to examine the impact of prehospital routing of burn injuries on hospital length of stay, mortality, and potential costs of care through a statewide care coordination center, the Louisiana Emergency Response Network.

Methods: Our study is a retrospective statewide analysis of burn injuries from 01/01/2017 thru 12/31/2019 using the Louisiana Hospital Inpatient Discharge Database. Routing of burn patients was implemented in 2018 using the ABA burn referral criteria. Data included: total admissions with primary burn diagnosis, region, discharge status, length of stay, and raw mortality by region and state. Descriptive and comparative statistics were performed to assess the impact of routing of burn injured patients. Cost analysis was performed using Louisiana Medicaid per diem rates from 2021 at $1,907.92/day.

Results: 1,288 patients were treated in Louisiana during the study period with 855 post-routing and 433 pre-routing. The mean length of stay was reduced from 11.84 days in 2017 to 8.82 days in 2018 (p-value=0.0988) with a potential savings of 761 inpatient care days or $2.17 million. Overall mortality across the state was unchanged except in the highest volume region where it dropped from 7.9% in 2017 to 3.6% in 2019 (54%).

Conclusions: Burn injuries meeting ABA referral criteria are a form of time-sensitive trauma. This study marks the first analysis pre and post implementation of routing for burn injuries by a statewide care coordination center. Our study demonstrates improvement in length of stay and mortality but a continued need to examine other contributing factors such as severity of injury and concomitant trauma.

14 Prognostic Factors for In-hospital Mortality of Geriatric Burns from the US National Inpatient Sample 2016-2018
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Introduction: Older adults experience a disproportionately higher rate of hospitalization and mortality due to burns. However, national estimates of in-hospital mortality in geriatric patients with acute burns outside of the recognized burn centers are lacking. The purpose of this study is to characterize such national estimates and identify the prognostic factors associated with in-hospital mortality in elderly patients with acute burn injuries.

Methods: Patients ≥50 years with an acute burn diagnosis in the United States National Inpatient Sample from 2016 to 2018 were identified by using International Classification of Diseases, Tenth Revision, Clinical Modification codes (T20.0-T31; initial encounters only). Trend weights were used from the Agency for Healthcare Research and Quality to generate national estimates. Factors associated with in-hospital mortality were evaluated by multivariable logistic regression.

Results: A total of 60,515 weighted discharges met inclusion criteria. For age groups 50-64 (reference category), 65-74, 75-84, and ≥85, the numbers of discharges were 33,100, 15,295, 7,880, and 4,240, respectively; the in-hospital mortality rates were 3.3%, 5.3%, 6.6%, and 9.9%, respectively. The full list of significant variables of the multivariable regression can be seen in Table 1. Specifically, variables associated with increased in-hospital mortality include age 75-84 (odds ratio [OR], 3.91; p<0.001), age ≥85 years (OR, 11.94; p<0.001), total body surface area (%TBSA) 10-19% (OR, 2.93; p=0.017), and %TBSA ≥20% (OR, 27.78; p<0.001). Intentional burns were associated with an increased risk of mortality (OR, 7.86; p=0.005), whereas hot liquids and vapor burns were associated with a decreased risk of mortality (OR, 0.33; p=0.043). Respiratory distress/failure (OR, 5.78; p<0.001), aspiration pneumonia/pneumonitis (OR, 5.01; p=0.004), shock (OR, 4.58; p=0.004), and acute renal failure (OR, 2.85; p=0.005) were associated with an increased risk of mortality. One or more surgical excisions were associated with a reduced risk of mortality (OR, 0.26; p<0.001).

Conclusions: Age ≥75 years, %TBSA ≥10%, intentional burn as the mechanism of injury, and certain comorbidities and complications were significant risk factors for in-hospital mortality in geriatric burn patients.
Introduction: Previous work has demonstrated that frailty predicts mortality and patient disposition in burn patients >50 years old. It is unknown to what extent poverty contributes to these outcomes. There has been no work demonstrating the interplay of these two variables on patients with burn injuries. The purpose of this study was to determine the relationship of frailty and poverty in burn patients over the age of 50, and their association with patient outcomes.

Methods: A 9-year retrospective chart review from 2009-2018 of patients >50 years old admitted to an ABA verified burn center with acute burn injuries was completed. Patient demographics, burn characteristics, frailty scores and poverty levels were collected. Frailty scores were assigned using the Canadian Study of Health and Aging Clinical Frailty Scale (scored 1-7). Frailty was dichotomized with scores >5 being frail. Poverty data were obtained using zip code and US census data. Poverty level was categorized according to whether a patient came from a zip code that had >20% of people living in poverty. Descriptive statistics, univariate analysis, and multivariate analysis were completed to examine the relationship between frailty and poverty, as well as each variable independently on mortality and length of stay (LOS).

Results: A total of 953 patients were included. Mean age was 63.5 ± 10.4 years and 675 (70.8%) were male. Mean %TBSA was 11.4%±14.2% and mean frailty score was 3.8 ± 1.2. Upon admission, mean poverty score was 17.3 ± 8.7. The overall mortality rate was 8.8%. Univariate analysis demonstrated that non-survivors had significantly higher chances of living in poverty (p=0.02). Similarly, univariate analysis showed that non-survivors were more likely to have frailty scores of 5 or greater compared to survivors. Multivariate logistic regression confirmed relationship between poverty and mortality (c20% vs >20%, OR 0.47 95% CI 0.25-0.89) and frailty and mortality (c5 vs 1-4, OR 2.9 95%CI 1.4-5.8). It also demonstrated that the combined variable of frailty and poverty was not significantly associated with mortality (Wald x2 2.0, p=0.15). Neither poverty (c20% vs >20%, p=0.26) nor frailty (1-4 vs >5, p=0.52) were associated with LOS. Both poverty and frailty were associated with a patient's disposition destination (p=0.03; p= 0.0001). Univariate analysis did not show a significant correlation between poverty and frailty (p=0.08), though there was a trend towards significance.

Conclusions: Poverty and frailty each independently predict mortality and discharge destination in burn patients >50, but they are not associated with LOS, and do not show a significant association with each other, nor a combined effect on mortality.
Correlative III: Translational Sciences: Wounds & Scars

17 A Tissue-engineered Bi-layer Skin Substitute Polarizes Macrophages Towards an M2 Phenotype
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Introduction: Cellular and/or Tissue Product made of stratified keratinocyte-containing epidermis and fibroblast-embedded collagen dermis, has been shown to promote healing in patients with deep partial-thickness burns. The biological mechanisms behind these effects are poorly understood. Macrophages, the primary cell type of the innate immune system, are major regulators of all stages of tissue repair. They accomplish these diverse functions by shifting phenotype throughout the healing process from a pro-inflammatory population to a diverse population of phenotypes that orchestrate resolution of inflammation and healing. In burn injuries this transition is impaired. We hypothesized that skin substitutes promote this healthy transition in macrophage phenotype. The aim of this study was to analyze the crosstalk between skin substitutes and macrophages and to determine the influence of direct contact, secreted factors, and the substrate used in fabrication of the skin substitutes.

Methods: Primary human macrophages (N=4 donors) were co-cultured either directly or indirectly with a skin substitute via separation by transwell inserts. Macrophages were also cultured directly on the collagen scaffolds used in the skin substitute fabrication process or on low-activation plastic as an unactivated control. After 1 and 3 days, the macrophages were stained with a 10-marker flow cytometry panel to characterize macrophage phenotype: general marker (CD45), M1-related markers (CCR7, CD80, CD38 and PD-L1) and M2-related markers (CD206, CD209, CD163 and CXCR4). For a more thorough evaluation, multidimensional analysis was used to identify unique populations of macrophages. Large-scale Dimensionality reduction using triplets and clustering analysis with using FlowSOM algorithms were performed. Statistical analysis of individual marker expression or cell composition within clusters was performed with one-way ANOVA.

Results: In response to both direct and indirect interaction with skin substitutes, macrophages generally decreased M1 marker expression after 1 day in culture and increased M2 marker expression after 3 days. The suppression of M1 markers occurred when macrophages were co-cultured with skin substitutes, and in response to acellular collagen. The upregulation of M2 markers occurred only in response to direct or indirect interaction with cellular skin substitutes. Furthermore, multidimensional single cell analysis showed that contact with the skin substitutes also promoted unique populations of phenotypes that do not fit into the classical M1/M2 paradigm.

Conclusions: These results suggest that a potential mechanism by which skin substitutes promote healing is by promoting a transition of macrophages towards reparative phenotypes.

18 Comparison of Topical Agents for Eschar Removal in Porcine Model: Bromelain-enriched vs. Traditional Collagenase Agents
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Introduction: Surgical excision and grafting of deep partial thickness (DPT) and full thickness (FT) burns is a cornerstone of modern burn wound care. Use of commercially available topical enzymatic agents has been limited due to slower and less complete eschar removal than surgical excision. Using a porcine model of DPT and FT burns, we compared the eschar removal efficacy of a bromelain-enriched enzymatic agent derived from the stems of pineapple plants and a commercially available collagenase.

Methods: Under an approved animal welfare committee protocol, we created 10 DPT and 10 FT burns measuring 2.5 by 2.5 cm on each of four anesthetized Yorkshire pigs weighing 30 kg using a preheated aluminum bar applied to the dorsum and flanks of the animals. For DPT burns, the bar was preheated to 80°C and applied for 20 seconds with a pressure of 2 kg. For FT burns, the bar was preheated to 100°C and applied for 30 seconds. Eschar removal was initiated 24-hours later. Two pigs each were randomly assigned to collagenase or the bromelain-enriched agent. The bromelain-enriched agent was applied topically once on day 1 for a period of 4 hours followed by a 2-hour soaking period with normal saline. The collagenase was applied topically daily as per manufacturer instructions until complete removal of the eschar or for up to 14 days. The primary outcome was the percentage of burns with complete eschar removal assessed by a masked observer at 1, 10 and 14 days after application.

Results: A total of 40 FT and 40 DPT burns were created on the four pigs. Regarding FT burns, all bromelain treated burns experienced complete removal of eschar on day 1 after the single 4-hour application. In contrast, none of the collagenase treated FT burns experienced complete removal of eschar after 14 days of treatment. At 10 days, 30% of collagenase treated burns had < 50% removed eschar; by day 14, 40% had >50% removed eschar and 15% had < 50% eschar removed. Regarding DPT burns, all bromelain treated burns had complete eschar removal after the single 4-hour application. In contrast, none of the collagenase treated burns experienced complete removal of eschar after 10 days by day 14, 35% had complete eschar removal. At day 10, 10% of collagenase treated burns had >50% eschar removed and 75% had < 50% eschar removed; by day 14, 30% had > 50% eschar removed and 35% had < 50% eschar removed. There were no wound infections or any other adverse events noted.

Conclusions: Topical treatment of DPT and FT porcine burns with a single 4-hour application of a bromelain-enriched enzyme resulted in complete eschar removal of all burns. In contrast, after 14 daily topical applications of the collagenase, none of the FT burns experienced complete removal of the eschar and in 35% of the DPT burns, eschar removal was complete.
Minced Skin Grafts Can Be Expanded up to 500 Times to Re-epithelialize Full-thickness Burns

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Introduction: Deep and large burns require hospitalization and, without exception, surgical treatment. Skin graft expansion in major burns currently is restricted to a 1:6 expansion ratio (possibly 1:9) by current methods. For this reason, skin transplants are limited by donor site availability.

Methods: Deep partial-thickness burns were created on the dorsum of Yorkshire pigs. Three days post injury the burns were debrided and grafted with epidermal/dermal and dermal pixel grafts using expansion ratios from 1:2 to 1:500. The pixel grafts were prepared by harvesting 0.3 mm thick skin grafts from the same donor site going down in depth (Layer 1: STSG; Layer 2: dermal graft). Subsequently, the grafts were minced to 0.3 x 0.3 x 0.3 mm pixel grafts, suspended in a small volume of hydrogel and transplanted onto debrided porcine burn wounds. Healing was monitored up to 28 days and biopsies were collected on days 6, 10 and 14. The wounds were excised and fixed in formalin for histologic analysis. In addition, to measure wound area reduction and wound depth, wound images were taken. Multiple wound healing parameters were used to assess the quality of healing and the results were compared to STSG (standard of care treatment).

Results: Histology demonstrated that when both STSG pixel grafts and dermal grafts were transplanted onto porcine full-thickness wounds in a 1:2 ratio they were able to fully re-epithelialize the wounds in 14 days. At day 14, re-epithelialization-% using other expansion ratios varied from 46 % (1:500) to 64 % (1:10) and by day 28 all the wounds were fully re-epithelialized. Wound images obtained at different time points showed that by day 28 all the pixel grafts were reduced in area efficiently, from 70 % (dermal pixel grafts 1:50) to 81 % (STSG 1:100). No statistically significant differences were observed between the pixel graft study groups and STSG (standard of care).

Conclusions: This study concluded that both epidermal/dermal and dermal pixel grafts can be suspended in a hydrogel and transplanted onto wounds regardless of orientation (dermal side up or down), making the transplantation greatly simplified.

Autologous Meshed Split Thickness Graft Healing in Interstice versus Grafted Sites: A Histological Characterization

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Introduction: Autologous skin grafting is a common technique used in the treatment of full thickness (FT) wounds to aid in healing, wound closure, and reducing the likelihood of developing hypertrophic scarring. Meshed split thickness skin grafts (mSTSG) which contain portions of the dermis and epidermis are the gold standard for the treatment of FT wounds because they allow for expansion of skin taken from a relatively small donor site. It has largely been hypothesized that in mSTSG skin progenitor cells migrate from the edges of healthy donor tissue to aid in healing the interstices created by meshing. For this reason, meshed wound healing is not homogenous as interstice and meshed sites display distinct healing characteristics. This study aims to characterize the differences between interstice and grafted site healing.

Methods: Wound healing was evaluated in vivo using Duroc pigs. In this model, 4 animals had 10.16 cm by 10.16 cm full-thickness burns created on bilateral flanks for a total of 12 wounds. On day 2, the burns were excised down to subcutaneous tissue, mSTSG was harvested, meshed 4:1, and applied to the prepared wound beds. Wounds were photographed and sampled on days 5 and, 15. Punch biopsies from either the grafted area or interstice area were taken at each time point, processed, and imaged. Images were used to quantify epidermal and dermal thickness, cellularity, and rete ridges.

Results: Epidermal thickness at day 5 in interstices was significantly thinner than in graft (1.73±4.33µm, p < 0.05). By day 9, interstice epidermal thickness was comparable to graft thickness (194.9±157.7µm). On the other hand, dermal thickness was elevated in the interstice at days 9 (1850.4±642.0µm, p < 0.05) and 15 (2469.9±626.1µm, p < 0.01) to a significant degree. Cellularity was greater at all time points in the interstice compared to the grafted sites. Similarly, rete ridge ratios (RRR) were significantly greater in the grafted areas at day 5 (0.0±0.0µm v.s. 1.0±0.7µm, p < 0.01) and day 9 (1.3±1.2µm vs. 1.9±0.45µm, p < 0.05).

Conclusions: These data show that within a grafted burn wound, healing is a dynamic and heterogenous process when looking at interstice and graft sites, respectively. Grafted sites were thinner throughout, showed decreased inflammatory cell infiltrate, and exhibited higher RRR. Thicker tissue layers and upregulated cellularity in interstices point to a wound healing trajectory that is slower than grafted sites, even by the time wounds are fully re-epithelialized.
Isolation of cells using ACHD required 8-fold results:

assessed using flow cytometry. Pheno-

typing of the cell suspension isolated using ACHD was

Ki67, ColIV, ColVII, keratin 15, and involucrin. Advanced

Fontana-Masson's, and via immunohistochemistry for

Cell suspensions were seeded on the dermal allografts and

tissue and cells were isolated using ACHD or via standard

Split-thickness skin (0.008") was harvested from the discard

surgical discard tissue was collected with IRB approval.

Dermal allografts were made by seeding collagen scaffolds

fibroblasts. Both cell suspensions were capable of epidermal

subpopulations of keratinocytes including epidermal stem

cells, activated keratinocytes, and proliferating keratinocytes.

Advanced phenotyping indicates

dominantly of keratinocytes (60-75%), fibroblasts (25-40%),

and melanocytes (1-3%). Advanced phenotyping indicates

subpopulations of keratinocytes including epidermal stem
cells, activated keratinocytes, and proliferating keratinocytes.
The standard laboratory protocol resulted in a keratino-
cyte suspension (96-99%) with melanocytes (1-3%) and no

fibroblasts. Both cell suspensions were capable of epidermal

regeneration with greater pigment and slightly higher numbers

of proliferative cells and epidermal stem cells with the

ACHD.

Conclusions: The results suggest non-cultured cell sprays

have the potential to regenerate bioengineered dermal

allografts in the absence of a split-thickness skin graft.

Additionally, ACHD offers a significant time advantage to

laboratory-based procedures in the preparation of cell-spray.

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Additionally, ACHD offers a significant time advantage to

laboratory-based procedures in the preparation of cell-spray.
Introduction: Adipose-derived stem cells (ADSCs) possess high regenerative potential and therefore are postulated to enhance re-epithelialization via recruitment of keratinocytes into the wound bed, and thusly improve healing of severe burns. Although ADSCs are enriched in the stromal vascular fraction (SVF) of fat grafts, the ADSC frequency in these samples is very low (1%) which has hindered their further characterization. So far, the CD34\(^+\) subset of SVF cells has shown to contain up to 75% of all the ADSCs present in SVF samples but their ADSC frequency remains low (2.5%). Unfortunately, while the ADSC frequency increases in passaged SVF cells, the expression of CD34 is lost in these cells. Therefore, there is a pressing need to identify new ADSC biomarkers to study ADSC mechanisms that accelerate wound closure. In this study, we aim to identify new ADSC biomarkers and to examine the impact of ADSC-enriched cells on skin wound closure.

Methods: Single cells from SVFs were obtained from disassociated fat tissue, collected from excess lipoaspirates used in patients undergoing mastectomies. Native cells (P0), and passaged cells (P3) were placed in cell cultures and the ADSC numbers were obtained using the colony forming unit-fibroblast assays. The expression of 244 cell surface receptors was examined in P0 (low ADSCs) and P3 (high ADSCs) SVF cells to obtain new ADSC biomarkers. In another experiment, the impact of ADSC-enriched CD34\(^+\) SVF cells on wound closure was assessed. Using transwell inserts containing adult human epidermal keratinocyte (HEKa) cells in the bottom and the bulk SVF or CD34\(^+\) SVF cells in the top chamber, a scratch was induced in the HEKa cell layer and the scratch area was examined at 0h and 12h.

Results: Our cell surface antibody array experiments revealed 10 potentially new ADSC biomarkers that will be used to examine their ability to enrich for ADSCs. Both the bulk SVF and the CD34\(^+\) SVF cells showed a 2-fold increase in wound closure. It is noteworthy that ADSCs frequency in the CD34\(^+\) SVF cells is still very low, and these experiments need to be conducted using the new SVF subsets with potentially higher ADSC frequencies based on our cell surface array.

Conclusions: The ADSC-enriched CD34\(^+\) SVF enhance keratinocyte wound closure, a function that is important to healing of severe burns. Further studies are needed to validate our findings using more purified SVF subsets to identify ADSC-regulated keratinocyte wound closure mechanisms.

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Correlative IV: Pain & Pruritis

C-154

The Association Between Pain and Sleep Post-burn Injury: A Preschool LIBRE1-5 Study

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Introduction: Quality sleep is an essential part of post-injury recovery. Sleep deprivation, including that due to pain, may hinder and slow recovery progression. Therefore, it is vital to assess long-term sleep outcomes post-burn injury. This study examined the association of sleep items with the severity of pain in pediatric burn survivors one to five years of age, using Preschool LIBRE1-5 (Life Impact Burn Recovery Evaluation) parent-reported data.

Methods: The Preschool LIBRE1-5 was administered to 426 parents of burn survivors during field-testing. Three sleep-specific items within the psychological domain were assessed: “My child had frightening dreams or nightmares,” “My child had trouble staying asleep,” and “My child had trouble falling asleep at night.” Each item was scored on a 5-point Likert scale from 0 = never to 4 = always. Pain was assessed on a 4-point severity scale, from 0 = not severe to 3 = very severe and dichotomized (1= not severe and 0 = mild, moderate, and very severe). For sleep items, higher scores denote better functioning. Odds ratios for each of the three items were calculated using logistic regression to measure the association between pain severity with sleep. Lower odds ratios denote that greater pain severity is associated with more sleep problems. The multiple logistic and linear regression analysis included covariates for age at time of survey, gender, race, total body surface area burned (TBSA), Hispanic (yes/no), wound dressings, and burns to critical areas (hands, face, foot). Multiple imputations were used for missing values.
**Results:** The sample characteristics included: mean age of 3.1 + 1.4 years, mean time since burn injury of 1.2 + 1.3 years, mean TBSA of 4.2 + 7.9, 55.2% male, and 74.2% white. In the multiple logistic regression analyses, burn survivors with severe pain had significant trouble falling asleep (OR = 0.44, 95% CI [0.24, 0.81]) and staying asleep at night (OR = 0.45, 95% CI [0.24, 0.83]). No association was found with pain severity and frightening dreams or nightmares (OR = 0.8, 95% CI (0.37, 1.75). The multiple linear regression analysis showed that higher scores on pain scales were associated with poor sleep outcomes (R²= 9.5%, \( p = 0.0016 \)). As pain scores increased, the sleep summed score decreased by 0.46 standard deviation.

**Conclusions:** There are important associations between pain severity and sleep outcomes. Pain management and interventions for sleep improvement may lead to better outcomes in the pediatric burn population.

**Introduction:** The use of opioids in the medical field has contributed to the growing opioid epidemic. Nonetheless, opioids remain imperative in the treatment for pain management in burns. While some studies have addressed the use of opioids in surgery, a comprehensive analysis of the pattern of opioids use in burns has not been investigated. This study aims to identify trends of opioid use and investigate the risk of opioid related disorders in burn patients.

**Methods:** Data was obtained from TriNetX, a national research database that provides medical records of de-identified patients. The study population includes patients that were prescribed an opioid, ICD-10 code CN101, on or after any instance of burn between January 1st, 1990 and September 19th, 2021. Patient population was further stratified by the decade in which patients received opioids for pain following burn injury: 1990-1999, 2000-2009, 2010-2019, and 2020-September 19th, 2021. Five outcomes were investigated: opioid related disorders, opioid dependence, opioid abuse, intentional self-harm, and mental and behavioral disorders due to psychoactive substance use. Cohorts were matched for age at index, sex, and race. Statistical analysis used risk ratios with a 95% confidence interval, and \( p < 0.05 \) was considered significant.

**Results:** We identified 8,421 patients that were prescribed an opioid between 1990-1999, 30,846 patients from 2000-2009, 169,991 patients from 2010-2019, and 30,966 patients from 2020-present. When compared to the 2000s cohorts, the 1990s patients had a 47% decrease in risk of opioid related disorders, with a 53% decrease in risk of opioid dependence, 45% decrease in risk in opioid abuse, 11% decrease in risk of mental and behavioral disorders due to psychoactive substance use, and 63% reduced risk of intentional self-harm. Comparison of the 2000-2009 to 2010-2019 cohorts showed increased risk of opioid related disorders (RR= 1.912), opioid dependence (RR=1.569), opioid abuse (RR=1.677), mental and behavioral disorders (RR =1.733), and intentional
self-harm (RR=2.027). When compared to 2020-present, the 2010-2019 patient cohort had 10 times the risk of developing opioid-related disorders, with 3 times the risk for opioid dependence and behavioral disorders, and 5 times the risk for opioid abuse and intentional self-harm.

Conclusions: The risk of opioid related disorders in the 1990s was lower compared to the 2000s. Since 2000, the risk of opioid related disorders has significantly increased. Recognizing the risks of opioid prescriptions in burn patients is imperative when addressing the role of physicians in controlling the constantly growing opioid epidemic.

Introduction: Use of prescription pain medication after burn injury is commonly required. However, little is known about long-term pain medication use and its association with outcomes. Therefore, the purpose of this study is to assess patterns of prescription pain medication use after discharge and the association between these medications and quality of life outcomes.

Methods: Data from the Burn Model System National Longitudinal Database (2015-2021) were analyzed. Pain medication use was assessed at pre-injury (recall at discharge), discharge (medical record) and follow-up (self-report at 6, 12, and 24 months after injury). Outcome measures included: VR-12 Physical and Mental Component Summary scores (PCS and MCS), Community Integration Questionnaire (CIQ), Posttraumatic Stress Disorder Checklist (PCL), Satisfaction with Life Scale (SWLS), and NeuroQOL Stigma. The population was divided into two groups, those taking and not taking prescription pain medications at one year. Regression analyses examined associations between prescription pain medication use and outcomes at 12 months, controlling for age, gender, race, ethnicity and burn size.

Results: Of the 645 participants, 15% reported prescription pain medication use prior to their burn. At discharge, 81% reported use of an opioid and 46% reported use of a neuropathic pain medication. At 12 months, 32% of individuals indicated prescription pain medication use. The pain medication group exhibited larger burn size (24.0% vs 15.2%) and longer hospital stays (40.4 vs 25.0 days) than the non-pain medication group (p< 0.0001 for all). Additionally, 25% of individuals who reported pre-injury pain medication use also reported use at 12 months. Regression analyses demonstrated that pain medication use was associated with worse physical health (PCS: coefficient 8.69, p< 0.0001) mental health (MCS: 6.31, p< 0.0001), stigma (NeuroQOL Stigma: 3.91, p< 0.0001), and satisfaction with life (SWLS: -3.66, p< 0.0001) at one year. Additionally, pain medication use was associated with 45% decreased odds of being employed (coefficient 0.55, p=0.029) and approximately 3 times greater odds of having post-traumatic stress disorder at 12 months (coefficient 3.25, p< 0.0001).

Conclusions: There are significant associations between prescription pain medication use and worse physical, mental and employment outcomes at twelve months. This information may be used to trigger screening and manage long-term recovery outcomes.
Introduction: Patients with severe burns often have a prolonged recovery course and frequently opioid pain medications. Several studies showed patients who receive frequent and high doses of opioid medications are at elevated risk of developing opioid dependence. Risk factors for opioid dependence have been established in several fields, including in trauma patients, however opioid dependence within the burn population has not been well studied. In this study we identify risk factors and outcomes for burned patients with opioid dependence.

Methods: We performed a review of a deidentified database that covers our institution comprising over 1.9 million patients. ICD-10 codes were used to identify those with burns. We identified 9150 patients who received treatment for a burn injury between January 1, 2010 and December 31, 2020. From this cohort 130 patients (1.4%) developed for a burn injury. We identified 9150 patients who received treatment for a burn injury between January 1, 2010 and December 31, 2020. From this cohort 130 patients (1.4%) developed documented opioid dependence. Patients from each cohort were balanced by propensity score matching. The database was then examined to determine treatment type and concomitant diagnoses.

Results: Prior to matching we found a significant increase in mortality, chronic pain, non-opioid substance abuse, depression, and use of opioid and non-opioid medication (p < 0.05) for those with opioid dependence. After propensity score matching, we found no significant increase in mortality or depression (p > 0.05). Chronic pain and non-opioid substance abuse remained elevated (OR 2.7, CI 1.6, 4.4; OR 2.4, CI 1.3, 4.5, p < 0.05, respectively). Those who developed opioid dependence were more likely to receive opioid and non-opioid pain medication (p < 0.05), but these were not more likely to receive IV opioid pain medication (p > 0.05). However, they were more likely to receive IV opioid pain medication more frequently (p < 0.05). Interestingly, patients who developed opioid dependence were more likely to follow up post-operatively and to receive anti-depressant and anti-epileptic (gabapentin and pregabalin) medications (p < 0.05).

Conclusions: Here we presented data on patients who developed opioid dependence following burn injury. These patients appear to receive more pain medication and receive it more frequently. We did not find a correlation of opioid dependence to depression or patient compliance. Characterizing the patient who develops opioid dependence will better help clinicians to identify patients at risk and direct their care accordingly. Further investigation is indicated to determine the impact these factors have and how these might be mitigated.
Introduction: Burn injuries and their associated treatments are exquisitely painful and often require hospitalization to achieve adequate pain control. Hospitalized patients have their pain managed aggressively, with rigorous monitoring. However, once patients are discharged from the hospital, the assessment of ongoing pain management becomes more difficult. The purpose of this study was to examine our current practices in the outpatient setting regarding pain management.

Methods: This was a retrospective review of patients treated in the outpatient burn clinic following discharge home from the burn center over a one-year period. Patients with a significant history of premorbid pain and those discharged initially to a post-acute facility were excluded. Patients were stratified into those requiring opioids ≤ 4 weeks/ > 4 weeks, autografting/no autografting, opioids required following initial to a post-acute facility were excluded. Patients with a significant history of premorbid pain and those discharged initially to a post-acute facility were excluded. Patients were stratified into those requiring opioids ≤ 4 weeks/ > 4 weeks, autografting/no autografting, opioids required following wound closure/not required and those with and without a history of significant substance abuse.

Results: There were 206 evaluable patients in this study. The median number of days to healing was 19.5 days. The mean percent total body surface area injured was 5% yielding a percent of days to healing per percent total body surface area burn of 4. Overall, narcotic pain medications were discontinued 8 days prior to wound closure. The majority of patients, 83% (n=170) had their narcotic pain medications discontinued before 95% wound closure was achieved; 17% (n=36) number of patients had their narcotic pain medications continued beyond wound healing. Subgroup analysis revealed the following findings. Patients who were on narcotic pain medication > four weeks following the time of injury (n=37) had a mean duration of narcotic pain therapy of 57 days compared to 11 days in patients who received ≤ four weeks (n=169, p < .0001). Likewise, patients who were grafted had a longer narcotic pain duration, 28 days vs 12 days in patients who were not grafted (p < .0001). Finally, the presence of previous or current substance abuse appeared to have no impact on the duration of narcotic therapy 19.8 days vs 19.3 days.

Conclusions: Most patients followed in the burn outpatient clinic demonstrated cessation of narcotic analgesic use around the same time as burn wound closure. Factors tending to extend the duration of narcotic use included longer inpatient narcotic use, and the necessity of skin grafting for burn wound management. Interestingly, previous substance abuse history did not influence length of post-hospital narcotic use.

Introduction: Split thickness skin grafting is ubiquitous in the management of acute burns and burn reconstruction. Patients describe the resulting partial-thickness donor site wound as one of the most painful aspects of burn care. Managing donor site pain is challenging and frequently involves potent opioid regimens. Rapid reepithelialization of the donor site makes long-acting local and regional anesthesia an attractive option for reducing opioid use. This study aims to determine the efficacy of graft donor site regional anesthesia at reducing postoperative opioid consumption in burn patients.

Methods: A retrospective review of burn patients undergoing split-thickness skin grafting at our institution was performed. Patient demographics, burn mechanism, and percent burned total body surface area were collected. The type of regional anesthesia, when it was performed, and the anesthetic agents used were also determined. Milligram morphine equivalents (MME) were calculated for three 24-hour periods postoperatively to quantify opioid usage. The total MME in 72h postoperatively was also determined and used to calculate per day MME requirements. Mean, and peak pain scores in the first 24h postoperatively were collected. Univariate and multivariate analyses were performed to determine the efficacy of regional anesthesia.

Results: Twenty-five patients were identified, 14 who received donor site regional anesthesia and 11 who did not. The two groups did not differ significantly in age, gender, race, BMI, or burn mechanism. The regional anesthesia group had a significantly lower percent burned TBSA (5.3 vs 21.6, p < 0.001). Still, donor site dimensions did not differ significantly between groups (363 cm² vs 411 cm², p = 0.247). The use of regional anesthesia was associated with significantly lower MME requirements in the first 24h postoperatively (22.5 vs 84.9, p = 0.023), lower total requirements after 72h (47.3 vs 147.8, p = 0.016), and lower per day requirements (17.6 vs., 51, p = 0.014). The regional anesthesia group was discharged on average one week sooner (5.1 days vs. 12.4 days, p = 0.031). Multivariate analysis demonstrated the use of regional anesthesia independently predicted decreasing MME requirements in the first 24h after surgery, decreasing MME requirements in total, and decreasing per day MME requirements. No patients experienced anesthesia-related complications.

Conclusions: In a cohort of burn patients undergoing split-thickness skin grafting, the use of regional anesthesia was highly effective at reducing opioid requirements in the immediate postoperative period. We believe regional anesthetic blockades should be considered to provide long-lasting donor site analgesia. More investigation is warranted into ideal anesthetic agents, the maximum donor site dimensions, and the extent of cost savings.
Effect of Oral Ketamine on Analgesia During Burn Wound Care

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Introduction: Pain and anxiety can be difficult to control in the burn patient. Ketamine, a NMDA receptor antagonist can be utilized, however intravenous (IV) dosing requires increased monitoring. In contrast, oral ketamine (O.K.) is reported to have fewer side effects, and can be administered without a higher level of care. Little is known about dosing and efficacy of O.K. in the treatment of burn patients. We sought to examine the use of O.K. in our burn population.

Methods: This was a cross-sectional comparative quality improvement study conducted at our ABA verified burn center from January 2021 through September 2021. Inclusion criteria were in patients experiencing refractory pain and anxiety after receiving fentanyl and midazolam during wound therapy one day prior to first O.K. administration, along with completion of pre-post patient assessment surveys. Patients were administered 50mg-150mg of ketamine in an oral suspension mixed with 30mL-120mL juice. Effectiveness of the O.K. was measured using pre-post patient surveys, pre-post IV pain medication usage, and subjective staff evaluation of pre-post tolerance of debridement. Baseline demographics were recorded, along with adverse events. O.K. was deemed effective by improved survey scores, improved tolerance to debridement, and reduction in IV medication requirements. Students T-test was performed to determine significance.

Results: A total of 71 patients were given O.K. and 32 met inclusion criteria. Baseline demographics included: 19 male (59%), median age 36 years (range 14-66), median TBSA 9.9% (range 1.6%-33.2%). O.K. reduced mean fentanyl use by 33% (pre 199.2mcg- post 123.5mcg, p < 0.01) and mean midazolam use by 39% (pre 1.4mg - post 0.7mg, p < 0.01). On a scale of 1-10 (1 best, 10 worst) mean pain scores improved 38.8% (pre 8 - post 4.6, p < 0.01), anxiety by 36.6% (pre 6.5 - post 3.5, p < 0.01), and overall experience by 37.5% (pre 5.9 - post 3, p < 0.01). Mean O.K. effective dose was 50mg. Staff noted O.K. improved the patient’s ability to tolerate debridement; uncooperative and inconsolable patients participated in their own wound care, and reported to prefer tube time with O.K. One patient experienced psychotomimetic effects, while one patient requested discontinuation due to increased anxiety 4 hours after O.K. administration.

Conclusions: O.K. appears to be efficacious in improving pain and anxiety during wound care while being well tolerated by patients. It also subjectively improved the wound care therapy experience.

Setting the Standard: Using a National Burn Registry to Benchmark Risk Adjusted Mortality

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Introduction: Reports of single center experience and studies of larger databases have identified several predictors of burn center mortality, including age, burn size, and inhalation injury. None of these analyses has been broad enough to allow benchmarking across burn centers. The purpose of this study was to derive a reliable risk-adjusted, statistical model of mortality based on real-life experience at many of the burn centers in the United States.

Methods: We used a national burn registry to identify 128,252 initial admissions from July 2015 through June 2020 across 103 unique burn centers. We selected 23 predictor variables, from over 50 recorded in the dataset based on completeness (at least 75% complete required) and clinical significance. Missing data were multiply imputed with a Bayesian Ridge Regression estimator. All data analysis was performed in Python using Numpy and Scikit-Learn libraries. We used Gradient boosted regression (CatBoost), a form of machine learning, to predict mortality and compared this to traditional logistic regression. Model performance was evaluated with AUC and PR curves. Using the CatBoost predictions, observe to expected mortality was calculated for each center. Confidence intervals for O/E analysis in the case of mortality prediction were calculated using a custom implementation of the Clopper-Pearson method. Analyses were run on three cohorts: All patients; Patients with 10-20% TBSA; and >20% TBSA.

Results: The CatBoost model achieved a test AUC of 0.982 with an average precision of 0.801. The logistic regression, by comparison, produced an AUC of 0.974 with an average precision of 0.726. While accuracy, the measure most reported in the literature, is near ceiling for both models, the CatBoost model is markedly more sensitive, leading to a substantial improvement in average precision. Because of the superiority of the CatBoost model with respect to outcome prediction, we only used CatBoost models for calculation of O/E ratio (Fig. 1).

Conclusions: Gradient boosted regression models provided greater model performance than traditional, multivariate, logistic regression. Using data from a national burn registry, we can predict burn mortality across contributing centers allowing for meaningful O/E ratios. Further, this allows for comparison of mortality across centers contributing data to the registry.
**Introduction:** Length of stay (LOS) is a frequently reported outcome after a burn injury. Previous estimates of LOS at 1 day per % total burn surface area (TBSA) but this varies considerably across patients & centers. LOS benchmarking will benefit individual burn centers as a way to measure their performance & set expectations for patients. We sought to create a nationwide, risk-adjusted model to allow for LOS benchmarking based on data from a national burn registry.

**Methods:** Using data from a national burn registry, we queried admissions from 7/2015-6/2020 & identified 126,129 records with LOS data reported by 103 centers. We selected 23 predictor variables on the basis of completeness (min. 75% required) & clinical significance. Missing data were multiply imputed with a Bayesian Ridge Regression estimator. All statistics were calculated in Python using Numpy & Scikit-Learn libraries. Comparisons of unpenalized linear regression & Gradient boosted (CatBoost) regressor models were performed by measuring the R2 & concordance correlation coefficient (CCC) on the application of the model to the test dataset. The CatBoost model applied to bootstrapped versions of the entire dataset was then used to calculate O/E ratios for individual burn centers. Confidence intervals (CI) for O/E ratios were calculated using a normal distribution parametric model. Analyses were run on 3 cohorts: all patients, 10-20% TBSA, >20% TBSA. Results: The CatBoost model outperformed the linear regression model with a test R2 of 0.68 & CCC of 0.81 compared to the regression model with R2=0.52, CCC=0.70. The CatBoost was also less biased for higher & lower LOS durations. Due to the CatBoost model’s superiority in predicting the outcome, this model alone was used for O/E ratio calculations. The O/E ratio data from the model for all 3 cohorts are shown in Figure 1.

**Conclusions:** Gradient boosted regression models provided greater model performance than traditional regression analysis. Using national burn data, we can predict LOS across contributing burn centers while accounting for patient & center characteristics, producing more meaningful O/E ratios. These models provide a risk-adjusted LOS benchmarking using a robust data source, the first of its kind, for burn centers.

**Introduction:** The burn care community has demonstrated a long-standing commitment to quality of care, improved outcomes, and research by collecting and sharing clinical data through burn registries. The key to optimizing the value creation from these registries is data quality. In 2019 a new registry platform incorporating the latest, standardized, data definitions and sophisticated audit controls was piloted with 12 burn centers. The following year it was introduced to the broader burn care community along with a robust registrar education and training program. We sought to evaluate the effect of this new system on quality of data collection.

**Methods:** We compared data from 27 centers that collected data on the new system against their data collected on prior registry systems. We analyzed 26 data elements, across four different variable categories (Admissions (n=6), Demographics (n=5), Injury (n=10), and Outcomes(n=5)) that have been consistently collected over time, for data completeness. A two-proportion z test was used to assess statistical significance of differences in data completeness rates. Results: The 27-center cohort entered data on 4,524 inpatient burn admissions between January 1, 2020 and June 30th, 2021 and 7,259 admissions between July 1st, 2019 and June 30th, 2020 in their legacy system. The data elements were harmonized to maximize longitudinal comparability. When comparing data from the same centers but using different registry software (graphic 1) 16 of 26 variables profiled had a higher percentage of completeness in the new registry system (all statistically significant), 5 variables were statistically significantly lower, and 5 variables were not significantly different. Overall, this subset of data elements showed a 14% improvement in data completeness between the new and legacy systems (90% vs 75%).

**Conclusions:** The development of a clinical registry requires significant commitment and leadership from the healthcare association and broader clinical community. The resources and effort that the burn community has expended to improve data quality has produced important gains in data quality with the introduction of a new, high-quality registry. The burn care community should continue to emphasize education, innovation, and collaboration to collect the highest quality data at the lowest burden from all burn centers.
Results: Information was obtained from randomly selected patient charts from 2014-2019. Thirty-three CDEs were investigated. Two hundred four patient charts were randomly selected for review. We presented extracted CDEs as frequencies and percentages. Information was obtained from the history and physical notes, progress notes, and discharge summaries.

Methods: This was a single-center retrospective review of patient charts from 2014-2019. Thirty-three CDEs were investigated. Two hundred four patient charts were randomly selected for review. We presented extracted CDEs as frequencies and percentages. Information was obtained from database or studies, can also assist in improving data collection. Currently, burn care does not have an existing set of CDEs despite their potential to be a reproducible and reliable system for data collection which leads to improved burn care. Our institution performed a retrospective review of patient charts to identify the consistency of our burn care documentation and highlight deficits that could be remedied by the implementation of CDEs.

Introduction: Thorough documentation is an important component of delivering quality patient care. Documentation of common data elements (CDE), defined as a precise question with a specified set of responses used across multiple databases or studies, can also assist in improving data collection. Currently, burn care does not have an existing set of CDEs despite their potential to be a reproducible and reliable system for data collection which leads to improved burn care. Our institution performed a retrospective review of patient charts to identify the consistency of our burn care documentation and highlight deficits that could be remedied by the implementation of CDEs.

Methods: This was a single-center retrospective review of patient charts from 2014-2019. Thirty-three CDEs were investigated. Two hundred four patient charts were randomly selected for review. We presented extracted CDEs as frequencies and percentages. Information was obtained from the history and physical notes, progress notes, and discharge summaries.

Results: Our review yielded 204 patient records. The note/record of some data points could not be identified and were excluded from the qualitative calculation. Of the data points that included more than 200 records, 86% percent specified the date of injury, 88% recorded the admission date, 99% reported burn etiology, 94% included total body surface area (TBSA) burned, 94% included burn thickness, 99% specified anatomic injury location, 97% included information about wound care agents/dressings, and 24% recorded the patient’s pain scores. Thirty percent (49/164) reported the presence or absence of inhalation injury. Twenty-six percent (38/148) listed reported presence or absence of non-burn related injuries. Sixty-four percent (127/200) reported presence or absence of comorbid conditions. Other data points were found with varying frequencies (Table 1).

Conclusions: Consistent documentation of burn care remains challenging and many variables are collected inconsistently. Our results highlight the need for CDEs in burn care to standardize documentation.

Introduction: This quality improvement project (QI) focused on reducing procedural pain. Phase I of this project demonstrated a need to improve our patients’ and nurses’ satisfaction with pain control management during hydrotherapy. In this phase (Phase II), we educated the nursing staff on 1) appropriate dosing and timing of opioid administration (oral and IV) and 2) need for more frequent midazolam administration before hydrotherapy. We also assessed the safety and potential benefits of ketamine for procedural pain control.

Methods: Patients undergoing wound cleaning procedures were surveyed for up to three hydrotherapy encounters. Nurses were educated on procedural pain control prior to this current phase. A convenience sample of patients underwent ketamine administration. Ketamine was administered per protocol starting at 0.3 or 0.4 mg/kg with intermittent boluses of 0.25 mg/kg as needed. Demographics, opioid (oral morphine equivalents, OME), midazolam, and ketamine doses and time of administration, and adverse events were collected. Patient pain scores (1-10) before and after hydrotherapy and patient and nurse satisfaction scores (1-10) after hydrotherapy were collected. Paired t-tests and one-way ANOVA were performed. P < 0.05 was considered significant.

Results: During Phase II, 9 patients and 19 encounters were analyzed; of which ketamine was administered for 10 events. Compared to Phase I (28 Patients and 50 encounters), education of the nursing staff resulted in a significant improvement in giving midazolam prior to hydrotherapy (78.9% vs. 10%; p < 0.001) and opioid administration (27.4 OME vs. 20.2 OME, p = 0.043). Timing of opioid administration did not improve when compared to Phase I (Outside the window of efficacy: 42.1% vs. 43.8%, p = 0.903). Both patient (8.7 ± 2.4 vs. 7.7 ± 2.1; p = 0.011) and nurse (8.2 ± 2.1 vs. 7.3 ± 1.9; p = 0.021) satisfaction scores regarding pain control improved. None of the patients who received ketamine experienced adverse effects. Notably, the use of ketamine improved nurse satisfaction scores with patient pain control (9.2 ± 0.8 vs. 7.1 ± 2.6; p = 0.035). While patients on ketamine were more satisfied with pain control, significance was not reached (9.4 ± 1.1 vs. 7.9 ± 3.2; p = 0.315).

Conclusions: Our data demonstrate that nurse education regarding medication administration was effective, but further education is needed to improve the timing of opioid administration. Ketamine offers additional benefits that deserve additional study.
Utilizing an Implementation Science Framework to Design a Burn Resuscitation Bundle in a Resource-limited Setting

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Introduction: Protocolized burn resuscitation algorithms with hourly, closed loop feedback, have reduced instances of over- and under-resuscitation and improved outcomes in high income countries. However, a “know-do” gap exists as this practice has yet to be adopted in many low- and middle-income countries (LMIC). We aimed to describe the change management process of the development and implementation of a contextually driven protocolized burn resuscitation bundle at a tertiary burn center in an LMIC using an implementation science framework.

Methods: We applied strategies from the Expert Recommendations for Implementing Change (ERIC) for the design and implementation of a burn resuscitation bundle at a major burn center in an LMIC, over a 9-month period. Semi-structured focus group discussions (FGD) were conducted with stakeholders to understand facilitators and barriers to developing and using the protocol, with iterative feedback used to inform and adjust the protocol and documentation tools. Responses were analyzed using content analysis and particularly unique and useful responses were highlighted.

Results: Stakeholders identified resource constraint-related concerns about the feasibility of an hourly IV resuscitation protocol and reached consensus on performing 2-hourly assessments and fluid adjustments. Corresponding documentation tools were developed and iteratively adjusted. Several initial barriers to adoption and institutionalization were encountered. ERIC strategies used to promote intervention uptake included simplification and visualization of the protocol, identification of a project champion, development of educational materials for multiple cadres (e.g., nurses, physicians, health assistants), use of chain of command to enable change and accountability, utilizing institutional branding and ultimately obtaining endorsement by the center’s leadership (Table 1). Post-implementation FGD with stakeholders revealed high levels of acceptance, utilization and adherence of the protocol bundle, with occasional opportunities for improvement identified in protocol completeness and accuracy.

Conclusions: Adoption of change in clinical resuscitation practice in a resource-constrained setting required a contextually driven, multi-faceted approach led by a team of change champions and leaders. The ERIC framework allowed for an iterative approach to prioritize stakeholder engagement and feedback, in order to implement a protocolized IV resuscitation bundle in a LMIC.
Implementation of a Screening Tool for Wellbeing in the Burn Clinic for Patients < 5 Years

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Introduction: Pediatric burn survivors and their parents experience higher rates of psychological disorders compared to their uninjured peers. In the early years, children experience rapidly changing development, which can impact responses to psychological outcomes. Early identification of developmental delays is vital to recovery and coping with burn injury. As a quality improvement project, a survey tool was implemented in the burn clinic to screen for issues impacting pediatric burn survivors and their family’s coping, who may benefit from additional referrals.

Methods: A free comprehensive tool, which screens for behavior, development and family stressors was chosen based on its high reliability, validity, and usability including being available in multiple languages. Prior to implementation and following the trial phase, staff completed qualitative and quantitative surveys regarding their input on the importance of screening and ease of execution. The Child Life Specialist (CLS) screened and scored children ages 12 to 65 months upon their initial visit and were rescreened two to four months later if they scored “Needs Review” in any category, indicating additional assessment was needed. Those who scored 50% of expected score for their age on initial assessment or a repeat “Needs Review” on the second assessment, were referred to additional resources by the CLS, social worker or physician team.

Results: Of the 43 children whose parents completed the survey (3 in Spanish), there were 25 males and 18 females. The median age was 2.6 years (IQR: 2.0-3.52). The score of the survey determined that 42% (n=18) of children evaluated as “Needs Review” or ≤50% expected in one or more category, indicating additional assessment was needed. Those who scored 50% of expected score for their age on initial assessment or a repeat “Needs Review” on the second assessment, were referred to additional resources by the CLS, social worker or physician team.

Conclusions: The tool was effectively integrated into the burn clinic and identified children who needed referral for support services. Screening in the burn clinic provides an opportunity to identify critical factors related to children's development and behavior, which can compound psychological responses to burn injury and addresses parental concerns for development.

Evaluation of a Multidisciplinary Approach to Pressure Injury Prevention Among Patients in a Burn Center

Stacey Richerbach, MSN, RN, Tiffany Hockenberry, MSN, RN, Karen Richey, BSN, RN, Kevin N. Foster, MD, MBA, FACS
Arizona Burn Center, Phoenix, Arizona; Arizona Burn Center Valleywise Health, Phoenix, Arizona; Arizona Burn Center Valleywise Health, Phoenix, Arizona; The Arizona Burn Center Valleywise Health, Phoenix, Arizona

Introduction: Compromised skin integrity in tandem with the prolonged length of stay necessitated by patients in a burn center has the capacity to result in an increased incidence of hospital acquired pressure ulcers (HAPUs). A HAPU increases the cost of a hospital stay by approximately $43,000. Many interventions exist to reduce their occurrence; however, interventions have been largely compartmentalized by discipline. One burn center’s dramatic increase in HAPUs from 2018 to 2019 led to further evaluation of prevention efforts. Upon detecting a 117% increase of HAPUs and a threefold increase in cost for specialty bed rental, a multidisciplinary approach to pressure injury prevention was employed. The frequency of multidisciplinary patient rounds was increased from once to twice daily, and involved discussions regarding functional status, mobility, and nutrition. The practice of ordering specialty beds was modified to require three-part approval by the Medical Director of Burn Services, Nursing Director, and a burn therapy supervisor. The purpose of this QI project was to examine the implementation of the multidisciplinary approach to pressure injury prevention among patients in a burn center and to identify trends in HAPUs and specialty bed expenses.

Methods: This was a retrospective review of patients admitted to a Burn Center between January 1, 2018 and June 30, 2021. Preexisting pressure ulcers were identified upon admission and were not regarded as HAPUs. Patients were grouped by year of their admission date.

Results: A total of 941 patients were admitted for inpatient care in 2020, six HAPUs (1.35%) were identified for this population. As compared to the prior year, this revealed a 53% decrease in incidence of HAPUs. The specialty bed rental cost from 2019 to 2020 was reduced by $110,181.76 (68%).

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Admissions</td>
<td>945</td>
<td>943</td>
<td>941</td>
<td>571</td>
</tr>
<tr>
<td>Incidence</td>
<td>6.02%</td>
<td>1.35%</td>
<td>0.64%</td>
<td>0.10%</td>
</tr>
<tr>
<td>HAPU change in incidence from prior year (%)</td>
<td>117%</td>
<td>-52%</td>
<td>-73%</td>
<td></td>
</tr>
<tr>
<td>Specialty Bed Pts</td>
<td>25</td>
<td>43</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Specialty Bed Costs</td>
<td>$50,767.27</td>
<td>$161,193.76</td>
<td>$1,012.00</td>
<td>$2,223.16</td>
</tr>
<tr>
<td>Spec Bed Cost change from prior year (%)</td>
<td>-218%</td>
<td>-40%</td>
<td>-76%</td>
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</tr>
</tbody>
</table>

*Data provided for 2021 is from 01/01/2021 to 06/30/2021*
Conclusions: Following implementation of a multidisciplinary approach to pressure injury prevention, we were able to reduce the incidence of HAPUs and dramatically reduce the expense associated with specialty bed rental. This supports an effort to identify additional practices which may increase quality while decreasing cost.

Introduction: In the burned patient, clinical outcomes are inextricably linked with immune function. Patients are subject to an early pro-inflammatory response and a subsequent compensatory anti-inflammatory response syndrome. This dysregulation can lead to infection, multiple organ dysfunction syndrome, and death. Despite continuing efforts, a profile of immune gene expression from burn patients that can be transformed into an “immune suppression index”, which accurately reflects the underlying degree of immune insult and significantly correlates with the degree compromise, has yet to be developed. The development of such an approach that can predict graft failure, susceptibility to infection, length-of-stay in the hospital, and/or that can inform a provider on how to better manage the timing of surgical interventions would be transformative.

Objective: To determine a set of peripheral biomarkers that correlates with clinical outcomes of burn patients.

Methods: This observational study enrolled two participant cohorts within a single burn center. Initial unbiased analysis compared 23 burn patients and 6 healthy controls. Confirmatory outcomes analysis was performed in 109 burn patients and 19 healthy controls. We employed multiplex gene expression analysis to identify differential peripheral blood mononuclear cells (PBMC) immune gene expression. qPCR was used to validate these findings, identify, and model associations with outcomes.

Results: We identified 149 genes with a significant difference in expression within PBMCs from burn patients compared to controls (Figure 1a). Pathway analysis identified pathways related to IL-10 and inducible nitric oxide synthase (iNOS) signaling (Figure 1b). qPCR analysis of IL-10, IL-12, arginase-1 (ARG1), and iNOS demonstrated that burn injury was associated with increased expression of ARG1 and IL-10, and decreased expression of NOS2 and IL-12. Burn severity, acute lung injury (ALI), development of infection, failure of skin autograft, and mortality significantly correlated with expression of one or more of these genes. Ratios of IL-10/IL-12, ARG1/NOS2 and (ARG1+IL-10)/(NOS2+IL-12) transcript levels further improved the correlation with outcomes. A multivariate regression model, adjusting for confounders, demonstrated that (ARG1+IL-10)/(NOS2+IL-12)
significantly correlated with burn severity and development of ALI (Table 1).

Conclusions: We present a robust model to predict patient outcomes early after burn injury using non-invasive methods, allowing early identification of underlying immune dysfunction.

<table>
<thead>
<tr>
<th>Covariate</th>
<th>AR1</th>
<th>IL-10</th>
<th>NOSE1</th>
<th>AR1</th>
<th>NOSE1</th>
<th>AR1+IL-10</th>
<th>AR1+IL-10</th>
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</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.48</td>
<td>0.0074***</td>
<td>0.032**</td>
<td>0.44</td>
<td>0.63</td>
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<tr>
<td>Age</td>
<td>0.84</td>
<td>0.35</td>
<td>0.93</td>
<td>0.84</td>
<td>0.67</td>
<td></td>
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<tr>
<td>Sex (Male)</td>
<td>0.35</td>
<td>0.88</td>
<td>0.70</td>
<td>0.54</td>
<td>0.55</td>
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<tr>
<td>Race (Non-Black/African American)</td>
<td>0.52</td>
<td>0.96</td>
<td>0.0087***</td>
<td>0.048*</td>
<td>0.34</td>
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<tr>
<td>BMI</td>
<td>0.31</td>
<td>0.36</td>
<td>0.61</td>
<td>0.12</td>
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<tr>
<td>% TBSA</td>
<td>0.073</td>
<td>0.53</td>
<td>0.021*</td>
<td>0.012*</td>
<td>0.043*</td>
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<tr>
<td>Inhalation</td>
<td>0.030**</td>
<td>0.32</td>
<td>0.33</td>
<td>0.13</td>
<td>0.35</td>
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<tr>
<td>Length of Stay</td>
<td>0.77</td>
<td>0.45</td>
<td>0.78</td>
<td>0.93</td>
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<td>Expiratory</td>
<td>0.45</td>
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<td>0.81</td>
<td>0.46</td>
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<tr>
<td>Acute Lung Injury</td>
<td>0.058</td>
<td>0.48</td>
<td>0.10</td>
<td>0.034*</td>
<td>0.038*</td>
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<tr>
<td>Graft Failure</td>
<td>0.95</td>
<td>0.007</td>
<td>0.13</td>
<td>0.45</td>
<td>0.42</td>
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<tr>
<td>Positive Blood or BAL Culture</td>
<td>0.28</td>
<td>0.97</td>
<td>0.051</td>
<td>0.98</td>
<td>0.67</td>
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<tr>
<td>Total Days on Ventilator</td>
<td>0.94</td>
<td>0.67</td>
<td>0.83</td>
<td>0.87</td>
<td>0.18</td>
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</table>

Introduction: Severe burn injury can lead to local and systemic activation of the innate immune system which can cause a dysfunctional and overt pro-inflammatory response, resulting in inflammatory complications and organ dysfunction. If there is an inhalation injury concomitant with burn, patients have a 3.6 times higher mortality rate and greater than 70% chance of developing secondary respiratory complications. Previous work has shown that the Mechanistic/ Mammalian Target of Rapamycin (mTOR) pathway is involved in signaling neutrophil activity in burn patients. Antagonists of mTOR stimulation represent possible immunomodulatory therapies. However, it is unclear if mTOR plays a role in the pulmonary distress seen after combined burn and smoke inhalation (B+I) injury. The goals of this study were to 1) characterize a novel mouse model of combined B+I injury and 2) investigate the role of mTOR in the pro-inflammatory response after B+I injury.

Methods: We built upon our pre-established 20% total body surface area cutaneous burn mouse model by adding smoke inhalation injury and treating mice with rapamycin, an mTOR-specific inhibitor. In brief, mice were anesthetized before receiving controlled B+I, burn only, or sham injury. After resuscitation, they were given morphined water for 24 hours before euthanization and tissue collection. RNA and whole cells were extracted from lung and spleen tissue for analysis by Nanostring and Flow Cytometry, respectively. Fluid within the lung (bronchoalveolar lavage, BAL) and peripheral blood plasma were collected for pro-inflammatory cytokine quantification via magnetic bead multiplex assays.

Results: Wildtype female C57BL/6 mice that underwent B+I injury exhibited elevated levels of protein, macrophages, and neutrophils in the lung cavity compared to burn alone. In addition, 29 genes were significantly differentially expressed in the lung tissue after B+I, suggesting that inhalation elicits a unique response when compared to burn alone. In the peripheral blood, B+I mice have a >4 fold increase in IL6 and 3 fold increase in MCP-1 pro-inflammatory cytokine levels. When we examined the role of mTOR in B+I injury, we found that pre-emptive rapamycin treatment leads to a reduction in peripheral blood pro-inflammatory cytokine levels, namely MCP1, TNFa, IL10, and IL2, and an increase in pro-inflammatory cytokine IL2 in the lung cavity. Rapamycin significantly affected expression levels of 46 genes in the lung and 36 genes in the spleen, indicating an mTOR-dependent response to inhalation injury.

Conclusions: In conclusion, these data describe a valuable mouse model of B+I with inhalation-specific immune phenotypes and implicate mTOR in the inhalation-induced hyper pro-inflammatory response.
While Gdf15 expression may not accurately reflect catabolism in the adipose tissues of burn patients, Ucp1 gene expression may be used as a marker indicating a peak hypermetabolic period after ten days post-burn. This may also be reflected by circulating concentrations of VEGF. Moreover, IL-6, IL-10 and MCP-1 may be used as early determinants before the onset of hypermetabolism.

**Introduction:** Hypermetabolism, characterized by drastic increases in whole-body catabolism and resting energy expenditure (REE), is a hallmark response to a severe burn injury. This is believed to be driven in part by alterations in adipose tissue metabolism. We proposed to define the hypermetabolic response in adipose tissue from burn patients and create a roadmap of markers indicative of hypermetabolism to improve prognosis. We hypothesized that catabolic markers, such as uncoupling protein-1 (Ucp1) and growth differentiation factor-15 (Gdf15), would positively correlate with increasing days post-burn and REE.

**Methods:** Adult burn patients (n=65) admitted to our burn center between 2011—2019 were included in this study. Subcutaneous white adipose tissues (sWAT) from the site of injury (n=85) and plasma were collected from severely burned patients (> 20% total body surface area). Gene expression and circulating cytokine levels were measured by RT-qPCR and multiplex assays, respectively.

**Results:** We found a significant correlation between increasing Ucp1 gene expression and days post-burn (p< 0.0001). Moreover, when samples were stratified into acute (1-3 days post-burn), moderate (4-9 days post-burn), and long-term (>10 days post-burn) timepoints, a significant increase in Ucp1 gene expression was detected only in adipose tissues from long-term time points in comparison to non-burned control tissues (p< 0.01). However, we found that REE remained stagnant throughout hospital stay after a burn injury in our patient cohort. Thus, we did not detect a significant correlation between Ucp1 gene expression and REE. Further, while Gdf15 expression was most pronounced, albeit statistically insignificant, during the moderate timepoints, we did not detect any significant differences when correlated with days post-burn. Additionally, we determined that circulating levels of IL-6, IL-10, and monocyte chemoattractant protein-1 (MCP-1) were greatly elevated within the first seven days post-burn and gradually decreased over time, while vascular endothelial growth factor (VEGF) concentrations followed a similar pattern to Ucp1 gene expression.

**Conclusions:** While Gdf15 expression may not accurately reflect catabolism in the adipose tissues of burn patients, Ucp1 gene expression may be used as a marker indicating a peak hypermetabolic period after ten days post-burn. This may also be reflected by circulating concentrations of VEGF. Moreover, IL-6, IL-10 and MCP-1 may be used as early determinants before the onset of hypermetabolism.
Introduction: Inhalation injury is a significant cause of morbidity and mortality in the burn patient population. However, the pathogenesis of inhalation injury and its potential involvement in burn shock is not well understood. Pre-clinical studies have shown endothelial injury, as measured by syndecan-1 levels, to be involved in the increased vascular permeability seen in shock states. Furthermore, the lung has been identified as a site of significant syndecan-1 shedding. Here we aim to characterize the contribution of endotheliopathy caused by inhalation alone in a swine model.

Methods: Eight female Yorkshire pigs were used in this experiment. A custom-made smoke box was employed to deliver smoke via endotracheal tube directly into the swine lungs. Carboxyhemoglobin levels were then titrated to a level of 50-75%. Blood was collected at induction of anesthesia, prior to injury, 30 minutes, and at hours 1, 2, 4, 6, and 12 post-injury, and was stored for future analysis. Pigs were necropsied immediately after completion of the experiment and lung samples were placed in all-protect and flash frozen. Histology was performed on lung sections and a validated, published scoring system composed of 5 parameters (neutrophils in the alveolar space, neutrophils in the interstitial space, hyaline membrane formation, protein deposition, and retraction) was used to assess lung injury severity (between 0 and 1). Plasma Syndecan-1 (SDC-1) was quantified by ELISA. All data was compared to Syndecan-1 levels measured at induction. Conditions were analyzed with one-way ANOVA with multiple comparisons and Dunnett’s correction for multiple comparisons.

Results: Syndecan-1 levels at induction were 13.74 ± 2.03 ng/ml. Pre-injury and 30 minutes post-injury levels remained similar. Syndecan-1 levels at hour 2 post-injury increased 37% from induction (18.36 ± 1.28 ng/ml, p<0.0057). This trend continued with a 47% percent increase from induction at hour 4 post-injury (19.62 ± 2.15 ng/ml, p=0.0033) and a 49% increase from induction at hour 6 post-injury (20.42 ± 2.43 ng/ml, p=0.0011). Histological sections showed higher lung injury severity compared to control pigs (0.1-0.3 vs. 0.5-0.74, p<.05).

Conclusions: Significant increases in syndecan-1 levels in this animal model provide evidence for a connection between smoke inhalation injury and endothelial injury. Furthermore, the endotheliopathy that leads to burn shock could be exacerbated by inhalation injury, leading to the poor clinical outcomes that are often seen in patients with combined burn and inhalation injuries. Future research should focus on the mechanisms underlying inhalation injury and its contribution to shock physiology.
Successful Prevention of Secondary Burn Progressions Using Topical Tacrolimus and Infliximab Hydrogel

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Vanderbilt University Medical Center, Nashville, Tennessee; Department of Biomedical Engineering, Vanderbilt University, Nashville, TN, USA, Nashville, Tennessee; Vanderbilt University Medical Center, Nashville, Tennessee; Meharry Medical College, Nashville, Tennessee; Vanderbilt University Medical Center, Nashville, Tennessee; Vanderbilt University Medical Center, Nashville, Tennessee; Vanderbilt University Medical Center, Nashville, Tennessee; Vanderbilt University Medical Center, Nashville, Tennessee

Introduction: The pathophysiology of partial- to full-thickness burn wound conversion remains poorly understood. Recent studies have demonstrated that an altered inflammatory response may play a role in this secondary conversion to deeper wounds. Therefore, reduction in early inflammation may decrease burn severity and morbidity. Specifically, TNF-α has been shown to have detrimental effects on the healing process after injury through a variety of mechanisms. We hypothesized that microcapillary alginate hydrogel loaded with immunosuppressive medications applied to partial-thickness burns would reduce inflammation and prevent further progression to full-thickness burns.

The purpose of this study was to determine whether topical application of infliximab or tacrolimus could decrease burn wound depth.

Methods: Assembly of the microfluidic hydrogels was achieved by embedding microfibers within a hydrogel scaffold composed of an alginate blend. The treatment cohorts received either (1) infliximab loaded hydrogel or (2) tacrolimus skin ointment covered by hydrogel. The control cohort only received an occlusive dressing.

There were 12 young (2-4 months) and 12 old (>16 months) mice, which were separated into treatment and control cohorts. All mice were anesthetized and given partial thickness burns by a validated scalding protocol. Mice were euthanized on post-burn day 3, and skin samples were taken. Burn depth was evaluated using Vimentin immunostaining.

Results: In young mice, infliximab hydrogel (p=.002) and tacrolimus hydrogel (p=.002) significantly decreased burn depth compared to controls. In old mice, infliximab hydrogel (p=.005) and tacrolimus hydrogel (p=.001) significantly decreased burn depth compared to controls.

In young mice, infliximab and tacrolimus were similarly efficacious (p > .05). In old mice, tacrolimus significantly decreased burn depth compared to infliximab (p=.002).

In controls, old mice had deeper burn wound progression than young mice (p<.001). Similarly, in those treated with infliximab, old mice had deeper burn wound progression than young mice (p=.002). Interestingly, tacrolimus was able to decrease burn wound depth in old mice such that their burn wound thickness was similar to young mice (p >.05).

Conclusions: Application of a novel microcapillary alginate hydrogel infused with infliximab or topical tacrolimus reduced partial- to full-thickness burn wound conversion in mice. Application of immunosuppressive dressings may be a promising avenue for further clinical investigation to reduce morbidity and mortality associated with burn injuries.
Results: Post-burn metformin treatment restores the thermogenic activation of WAT in elderly patients and mice, reflected by the increased expression of key browning markers, UCP-1 and PGC-1α (p< 0.05). This was accompanied by higher mitochondrial respiration, improved lipolysis (p< 0.05) and increased fat wasting (p< 0.01) relative to control counterparts. The anti-aging effects of metformin appeared to be mediated by AMPK, which consequently increased [NAD+] (p< 0.01), thereby promoting activation of the longevity-specific enzyme Sirt-1 (p< 0.05).

Conclusions: Here, we show that post-burn metformin treatment effectively rejuvenates adaptive metabolic responses in elderly WAT by targeting key longevity pathways which rescue the age-dependent loss of being back to youthful levels. Our findings support the potential of anti-aging modalities to improve care and outcomes in elderly burned patients.
eschar removal was according to routine methods, at the investigators’ discretion. Patients are currently in stages of long term follow-up, planned for a duration of >2 years. This abstract reports the top line results of the study including the first year of follow-up.

Results: Baseline characteristics were similar between the arms. The median age was 3.4 years in the BBD arm and 3.9 years in the SOC arm. The average burn area was 7.0±4.9 %TBSA in the BBD arm and 6.2±4.8 %TBSA in the SOC arm. The study met all 3 primary endpoints: Median time to complete eschar removal was 1 day for BBD and 6 days for SOC (p< 0.001), the percent wound area excised in order to complete eschar removal was 1.5% for BBD and 48% for SOC (p< 0.0001), and the MVSS scores at 12 months were 3.83 for BBD and 4.86 for SOC (non-inferiority endpoint). Secondary endpoints demonstrated 8.3% incidence of surgical excision to complete eschar removal for BBD and 64.4% for SOC (p< 0.0001), mean eschar removal associated blood loss of 32±284ml for BBD and 202±409 for SOC (NS), a 25.9% incidence of autografting in deep partial thickness wounds for BBD and 37.7% for SOC (p=0.054), and a mean percent area of deep partial thickness wound autografting of 15.9±38.6 for BBD and 22.8±43.7 for SOC (NS). Safety endpoints demonstrated a non-inferior time to complete wound closure (median 32 days for BBD, 34 days for SOC) and no significant safety issues were demonstrated during the study.

Conclusions: BBD was shown to be a safe and effective debridement agent in pediatric burns.

50 Rise of the (Learning) Machines: Artificial Intelligence for the Assessment of Adult Thermal Burns
Jeffrey E. Carter, MD, Herb A. Phelan, III, MD, MScS, William L. Hickerson, MD, J. Michael DiMaio, MD, Jeffrey W. Shupp, MD, James H. Holmes, IV, MD, FACS
University Medical Center- New Orleans, New Orleans, Louisiana; LSUHSC-New Orleans Department of Surgery, New Orleans, Louisiana; Spectral MD, Avita Medical, AccessPro Med, Memphis, Tennessee; Baylor Scott and White, Dallas, Texas; MedStar Washington Hospital Center, Washington DC, District of Columbia; Atrium Health Wake Forest Baptist, Winston-Salem, North Carolina

Introduction: Burn depth assessment (BDA) is an essential component of the physical exam used in the treatment and triage of burn injured patients. And while many specialties incorporate labs and imaging to determine diagnoses, burn professionals must rely on a physical exam that is accurate in only 70-80% of cases. Our goal was to assess the accuracy of a new imaging technology called Multispectral imaging (MSI) combined with a machine learning algorithm to aid in rapid BDA. We present the results of the first multi-center study using this technology in adult burn injuries.

Methods: In a multi-center IRB-approved study, an MSI device was used to image subjects >18 years of age with thermal burn injuries. The imaging device captured a set of images measuring the reflectance of visible and near-IR light. Subjects were enrolled and imaged within 72 hours of injury with serial imaging as permitted. The images were used to develop a type of machine learning algorithm called a convolutional neural network (CNN) that could identify the regions of non-healing burn within an image. Non-healing burn areas were determined by a panel of three burn surgeons using two standards: a) images confirming 21-day spontaneous healing; or b) pathology reports detailing histologic changes from multiple punch biopsies taken prior to burn excision. From this data, an ensemble of eight separate CNN algorithms was used to automatically identify non-healing burn tissue. Training and test accuracies of the ensemble CNN were calculated using cross-validation at the level of the subject.

Results: One hundred (100) adults were enrolled and imaged. The population had a mean age 45.6 ± 16.7; mean TBSA 13.0 ± 9.3; and was 31% female. From these adults, 210 burn regions were serially imaged. The estimated performance result from the ensemble CNN for identification of non-healing burn regions was AUC of 0.96. Based on the ROC curve, an ideal threshold showed an accuracy of 92.0%, sensitivity 91.9%, and specificity 92.0%.

Conclusions: Our study demonstrates a non-invasive technology that rapidly determines an accurate DBA relative to traditional bedside exam. More accurate burn wound assessment could lead to avoiding unnecessary surgeries or delays in treatment and dramatic cost savings. Use of such a device in a disaster has additional value to better align a patient’s burn care needs and available resources.
Wireless Electroceutical Dressing for the Treatment of Biofilm Infected Burn Wounds

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U.S. Army Institute of Surgical Research, San Antonio, Texas; US Army Institute of Surgical Research, San Antonio, Texas; US Army Institute of Surgical Research, San Antonio, Texas; Indiana University, Indianapolis, Indiana; University of Indiana, Indianapolis, Indiana; The Metis Foundation, San Antonio, Texas; US Army Institute of Surgical Research, San Antonio, Texas; University of Indiana, Indianapolis, Indiana

Introduction: Burn injuries are common to all military conflicts. In combat, eradication and prevention of burn wound infection is complicated by high rates of soft tissue contamination and prolonged delays to definitive stateside care. Furthermore, in the battlefield setting the salvage rate for infected burned extremities is low. Therefore, a simple, easy, non-invasive and rapid method to protect the wound, while also inhibiting infection, would represent a significant advance in the treatment of combat burn wounds. The purpose of this clinical trial was to investigate the efficacy of an FDA approved disposable and easily portable, wireless electroceutical dressing (WED) in the treatment of burn wounds. The hypothesis was that a low electric field generated by the moisture-activated WED will reduce infection load, improve graft survival and take, enhance wound healing and restore skin barrier function of biofilm infected wounds.

Methods: A phase I, prospective, randomized, controlled clinical trial was performed to evaluate the efficacy of the WED dressing as compared to the standard of care (SoC) dressing to prevent and disrupt biofilms. Subjects were screened from inpatient admissions for traumatic burns >300cm² in size. In total 38 subjects were enrolled to the study. Subject burn wounds were divided into two parts and randomized to receive either the SoC dressing or the WED dressing. Dressings were changed on day 4, removed on day 7 and the burns were followed for 30 days. Small biopsies were collected on days 4 and 7 for histology, SEM examination of biofilm and for quantitative bacteriological analysis. In addition, non-invasive wound imaging techniques were utilized to study wound healing. Furthermore, Vancouver scar scale and patient observer scar assessment were used to evaluate quality of healing.

Results: The results showed that at the time of dressing removal, non-grafted burns that were treated with the WED dressing presented statistically significantly less biofilm in comparison to the SoC treated burns (p < 0.05). The results also demonstrated that the WED dressing was more efficient at eradicating biofilm than the SoC dressing. At the time of the dressing removal, biofilm score [0-3] had decreased in 48% of the WED dressing treated burns in comparison to 28% in the SoC treated burns. In terms of wound healing and quality of healing no significant differences were observed between the WED and the SoC dressings.

Conclusions: This trial demonstrated that the WED dressing was more efficient against biofilm infection than the SoC dressing. In addition, the study concluded that the WED dressing performed equally well as the SoC in terms of burn wound healing.

Refinement of a Histologic Algorithm for Burn Depth Categorization Using 1142 Consecutive Burn Wound Biopsies

Herb A. Phelan, III, MD, MSCS, James H. Holmes, IV, MD, FACS, William L. Hickerson, MD, Clay J. Cockerell, Board certified dermatopathologist, Jeffrey W. Shupp, MD, J. Michael DiMaio, MD, Jeffrey E. Carter, MD

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Introduction: Our group previously reported a theoretical burn biopsy algorithm (BBA-V1) for the categorization of burn wound depth based on histologic analysis, and informed it with the largest series of burn wound biopsies in the literature. That iteration of the BBA resulted in clinical misclassification rates consistent with past literature. Since our last report of that process, we have refined the algorithm with new criteria and a larger repository of burn wound biopsies. Here, we sought to promulgate this newer, simpler version of the BBA (BBA-V2).

Methods: This was an IRB-approved, prospective, multicenter study. Patients with burn wounds assessed by burn experts as requiring excision and autograft underwent 4mm biopsies procured every 25cm². Serial still photos were obtained at enrollment and at excision intraoperatively. Using H&E with whole slide scanning, a board-certified dermatopathologist assessed each burn biopsy. The criteria used for categorization of burn wound depth in BBA-V1 were: 1) proportion of necrotic adnexal structures, and 2) presence/absence of each of epidermis, papillary dermis, and reticular dermis. The criteria used for BBA-V2 were: 1) magnitude of reticular dermal degeneration, 2) proportion of necrotic adnexal structures, and 3) magnitude of vessel thrombosis. Biopsy pathology results were correlated with still photos by 3 burn experts for consensus of final burn depth diagnosis. Superficial partial thickness (SPT) wounds were considered to be burn wounds likely to have healed without surgery, while deep partial thickness (DPT) and full thickness (FT) were considered unlikely to heal by 21 days.

Results: The development of BBA-V1 was previously informed by 66 subjects with 117 wounds and 816 biopsies, and resulted in wound categorizations as follows: SPT (20%), DPT (43%), and FT (37%). Therefore, according to BBA-V1, 20% of burn wounds were incorrectly judged as needing excision and grafting by the clinical team. The overall cohort was enlarged to 162 subjects with 294 wounds and 1142 biopsies. The most recent 838 burn wound biopsies were then re-reviewed and re-categorized according to the new BBA-V2 criteria and algorithm. Under BBA-V2, 3% of all burn wound biopsies were categorized as superficial partial thickness, 69% were categorized as deep partial thickness, and 29% were categorized as full thickness.

Conclusions: Our study demonstrates that by adding dermal degeneration severity and vessel thrombosis to our previous criterion of adnexal structure necrosis, BBA-V2 had...
a much higher rate of concordance with visual clinical assessment for burn wounds clinically judged as needing surgical excision. This study serves as the largest analysis of burn biopsies by modern day burn experts.

53 Use of Polylactic-acid-membrane in Split-thickness Skin Graft Donor Sites: A Prospective, Comparative, Randomized Study
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Introduction: Polyurethane film (PU) dressings are commonly applied for coverage of split-thickness skin graft (SSG) donor sites, while previous studies have suggested reduced morbidity using a polylactic acid membrane (PLM). To further investigate the optimal treatment approach, the presented study compared outcome of donor sites in patients receiving either PLM or PU.

Methods: This randomized clinical trial allocated patients requiring SSG to receive either PLM or PU at the donor-site. Primary endpoint was difference in donor site scar appearance between groups 3 months postoperatively (Vancouver Scar Scale – VSS). Secondary endpoints included pain, the number of and time required for wound dressing changes, and costs related to the wound dressing.

Results: 30 patients were allocated to each group. The median VSS scored lower for patients receiving PLM (PU: 3 (Q1: 2; Q3: 4) vs. PLM: 2 (Q1: 1; Q3: 3); p=0.049). Pain during change of wound dressing (PU: 2.0 ± 0.2 vs. PLM: 0.5 ± 0.2; p< 0.001) and mobilization (PU: 0.8 ± 0.2 vs. PLM: 0.3 ± 0.1; p=0.032) was reduced in the PLM group. Patients with PLM required less dressing changes per day of hospital stay (PU: 0.44 ± 0.06 vs. PLM: 0.28 ± 0.02; p=0.015). Mean time for wound dressing changes per patient was higher in the PU group (PU: 74.50 ± 5.72 vs. PLM: 21.43 ± 2.61 min; p< 0.001). Costs were higher in the PLM group (PU: 67.83 ± 5.56 vs. PLM: 162.79 ± 21.76 €; p< 0.001).

Conclusions: PLM improves outcome of SSG donor sites, however, higher treatment costs must be taken into consideration.
Cost of Dakin’s Solution vs. Mafenide Soaks in Acute Burn Care

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Introduction: The cost of health care in the United States is extremely high, with burn care being no exception to this rule. A 2016 study found that burn care costs are twice as much as the cost of non-burn related inpatient admissions, necessitating the need for cost savings. As one such measure, the authors no longer routinely use mafenide solution for burn care, and now use 0.0125% Dakin’s as a default topical irrigant, due to lower cost and less cytotoxicity. The aim of this analysis is to investigate the cost savings from using Dakin’s Solution (0.125%, 0.25%, and 0.50% strengths) versus the theoretical cost of using an equivalent amount of 5% mafenide.

Methods: This study was a retrospective review that characterized a single cohort of burn patients treated with Dakin’s solution in the pre and post operative setting. Graft loss was recorded and defined as >25% loss. As a default, 0.125% Dakin’s was used, and concentration was potentially escalated based on attending judgement of wound characteristics. We qualitatively compared length of stay (LOS) index to expected for length of stay index using 1.1 hospital days per %TBSA and using 2019 NBR statistics of 3 days per %TBSA for survivors. Using costs of $37.29 (0.0125%), $40.69 (0.25%), and $38.11 (0.5%) per liter of Dakin’s versus $165.05 per liter for 5% mafenide, we looked at potential savings per patient and for the entire cohort. Average cost, median cost, and total cost of both Dakin’s solution and Mafenide were calculated. Mann Whitney Test was used to compare costs of Dakin’s versus theoretical cost of mafenide.

Results: The total number of cases analyzed was 39 (n=39). The median burn size was 4% TBSA (IQR:1.6) and the median LOS was 3 days (IQR:2.8) The average cost for Dakins per patient was $721.61 versus $3172.98 had mafenide been used, p< 0.001. When all of the Dakins use was amalgamated, this represents a potential cost savings of $2451.37 per patient and $95603.43 for the entire cohort. LOS index was 0.68 with the conservative measure and 0.25 using 2019 NBR data. Only 2 patients had unplanned readmissions within 30 days. None of the patients suffered graft loss.

Conclusions: Use of Dakin’s solution as an alternative to mafenide results in a significant potential cost savings compared to 5% mafenide. The patients treated with Dakins in this study spent less time in the hospital than expected compared to national averages. In addition to lower strength Dakin’s dilutions being well established as less cytotoxic, this study suggests it can save money for the burn center. Future studies should directly compare the two topicals to determine if true differences in infection, healing, or length of stay that might offset or augment cost savings emerge.
**Initial Experience Using Artificial Intelligence for the Assessment of Pediatric Burn Depth**

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**Methods:** The MSI device was used to image subjects < 18y of age with thermal burns < 50% TBSA. It captured a set of images measuring the reflectance of visible and near-IR light, within a 23x23 cm field-of-view. Images were collected from up to 2 separate burned regions within 72 hours of injury that were then serially imaged for up to 7d post-injury. Burns that the investigator believed would heal spontaneously (superficial or superficial partial-thickness) were managed per institutional standard of care (SOC) and assessed at 21d post-injury for complete healing. Burns that the investigator felt would not heal by 21d post-injury (deep partial-thickness or full-thickness) were excised and grafted per institutional SOC, with multiple biopsies being taken prior to excision. Regions of non-healing burn within every MSI image were identified by a panel of 3 burn surgeons. To accurately identify these non-healing regions, the panel of surgeons was given access to 1 of 2 clinical reference standards: a) the 21-day healing assessments for burns allowed to heal spontaneously; or b) pathology reports detailing histologic analyses from the biopsies. This information was then used to develop a type of MLA called a convolutional neural network (CNN) that could automatically identify the regions of non-healing burn within an image. From these data, an ensemble of 8 separate CNN algorithms was used to automatically identify non-healing burn tissue. Training and test accuracies of the ensemble CNN were calculated using cross-validation at the level of the subject.

**Results:** Twenty-four (24) pediatric burn patients were enrolled, with 26 burned areas being serially imaged. The age range of the subjects was 7 months - 17y, with a mean age of 5.7y. Subjects had a mean burn size of 8.0 ± 4.2% TBSA, and 70% of the subjects were male. The AI performance results showed an accuracy of 88.2 ± 3.7%, sensitivity of 88.0% ± 3.7%, and an area under the curve (AUC) of 0.92.

**Conclusions:** Our study demonstrates an improvement in the accuracy of burn depth assessment over the traditional exam, which could lead to improved burn care.

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**Evaluation of a Smartphone Application as a Method for Calculating Total Body Surface Area Burned**

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**Methods:** The smartphone application was compared to 3 established methods of burn size estimation (Lund-Browder Chart, Rule of Nines, Rule of Palms). Twenty-four healthcare providers used each method to estimate burn sizes on moulaged manikins. The manikins represented different ages (infant, child, adult) with different total body surface area burns (small < 20%, medium 20-49%, large >49%). We calculated the accuracy of each method as the difference between the user-estimated and actual total body surface area. We used multivariable modeling to control for manikin size and method.

**Results:** Among all age groups and burn sizes, the smartphone application had the greatest accuracy for burn size estimation (-0.01%, SD 3.59%) followed by the Rule of Palms (3.92%, SD 10.71%), the Lund-Browder Chart (4.42%, SD 5.52%), and the Rule of Nines (5.05%, SD 6.87%).

**Conclusions:** The smartphone application may improve the estimation of total body surface area burned compared to existing methods.
Understanding the Burden of Burn Injury in Latin America & the Caribbean

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Introduction: Burn injuries are a global health problem disproportionately affecting low- and middle-income countries, especially in Latin America and Caribbean (LAC) where cooking methods, dangerous work conditions, and minimal housing regulations place people at increased risk of burn injury. Until recently, there was limited global epidemiological data on burn injuries. Following publication of the 2017 Global Burden of Disease (GBD17) database, we obtained objective and comparable data on burn injuries while specifically focusing on LAC countries.

Methods: Data from all 35 LAC countries were collected from GBD17 for fire, heat, and hot substance-related injuries to calculate burn incidence, deaths, and Disability-Adjusted Life Years (DALYs) with respect to country, age, and gender from 1990 to 2017. Incidence and deaths were reported as rates per 100,000 persons. Mortality rate was reported as a percentage of deaths-to-incidence. DALYs were reported in years per 100,000 persons. Incidence, death, DALY, and mortality rate trends were assessed using age-standardized, age-stratified, and gender-specific cohorts. All statistical analyses were performed using Excel.

Results: Over 27 years, LAC’s rates for burn incidence (-19%), deaths (-63%), DALYs (-62%), and mortality (-54%) all decreased with the greatest improvements seen in Brazil and Paraguay. All indicators improved around 15% more than the global averages during the same period with LAC’s rates 30-40% below global rates by 2017. The highest burn incidence (227 cases/100,000) was in Southern Latin America (Argentina, Chile, Uruguay). The Caribbean had the worst DALYs (124 years/100,000). In 2017, LAC accounted for 7% of global burns, 5.5% of deaths, and 5.1% of DALYs with Central America contributing the greatest numbers. For 27 years, Chile had the highest burn incidence but Haiti had the greatest death, DALY, and mortality rates of all LAC. Children under 14 years of age and males were disproportionately affected compared to other regional and global cohorts.

Conclusions: Despite a relatively greater reduction in burn severity and lifelong disability within LAC compared to the world, certain regions and countries exhibited significantly higher rates of burn injury, morbidity, and mortality. Central America (e.g. Costa Rica, Belize, Mexico) and the Caribbean (e.g. Haiti, Cuba) were particularly affected, comprising the majority of cases, deaths, and DALYs. This study provides essential analyses for developing regional and country-specific strategies to reduce the burden of burns through targeted interventions for prevention, workforce, and capacity building efforts.
**Introduction:** Burn injuries disproportionately affect low- and middle-income countries. Work conditions, rapid industrialization, social conditions, cultural activities, political conflict, and lack of access to safe and affordable surgery are key barriers to effective burn care in Asia. This study aimed to better define the burn burden in Asia, its sub-regions, and related sex and age disparities to elucidate populations where targeted burn care interventions are most needed.

**Methods:** The 2019 Global Burden of Disease (GBD19) of the Global Health Data Exchange was used to acquire 151,741 sources of epidemiological data on fire, heat, and hot substance-related injuries for 53 countries in Asia from 1990 to 2019. Measures used to derive summative statistics included incidence, deaths, disability-adjusted life years (DALYs), and mortality ratio (deaths: incidence) by year, sex, age, and location. Spatial mapping was performed to geographically delineate burn indicators.

**Results:** From 1990 to 2019, an estimated 117 million burns occurred in Asia. The relative proportion of global burns, deaths, and DALYs from Asia increased during that time. By 2019, 46% of global burn cases, 47% of deaths, and 46% of DALYs were from Asia. The two most burdened regions were South and Southeast Asia, accounting for 30-40% of all global cases, deaths, and DALYs. Compared to global averages, the incidence, death, and DALY rates for Asia were 32%, 22%, and 23% higher. Central Asia had the worst rates, averaging 2.9, 2.3, and 2.6 times the global averages. Throughout Asia, men were 32%, 63%, and 47% more likely to be burned, die, and suffer DALYs than women versus the global disparities of 7%, 26%, and 10%. Only South Asia’s trend was reversed with women suffering 15%, 20%, and 27% more burns, deaths, and DALYs than men. In Asia, those under 5 years were most impacted by DALYs (314 years/100,000 people), 5-14 year olds had the highest burn rate (219 cases/100,000), and 70+ year olds had the highest death rate (8.4 deaths/100,000) and mortality ratio (54%).

**Conclusions:** In 2019, Asia had an estimated 3.8 million burns comprising nearly half of all the world’s burn cases, deaths, and DALYs. While Asia’s burn indicators have declined since 1990, global improvements have surpassed Asia’s. South and Southeast Asia accounted for the greatest burden of burn morbidity and mortality, but Central Asia consistently had the highest rates relative to overall population. Men were more affected than women, except in South Asia, and the extremes of age (< 5 and 70+ years) suffered the greatest rates of disability and death.
**Introduction:** Low- and middle-income countries (LMICs) account for 70% of all global burns. Due to this significantly disproportionate burden, it’s critical we identify barriers to burn care and prevention in LMICs. As a result, this study aimed to elucidate trends in LMIC-related burn research to create focused strategies for burn care training, research, and innovation. Accomplishing meaningful change from the study’s findings will be guided by the first 4 steps of Dr. John Kotter’s “8-Step Process for Leading Change” – 1) create urgency for change, 2) build a guiding team, 3) develop a vision and plan, 4) communicate with key stakeholders to obtain buy-in.

**Methods:** Web of Science’s 7 citation databases were searched through March 2, 2021 using synonyms of “burns” and “low- and middle-income countries.” After screening articles, metadata were uploaded to VOSviewer (Leiden, Netherlands) where citation and network metrics were generated. The Kruskal-Wallis test and linear regression were used for bivariable and multivariable analysis of factors influencing publications, citations, and total link strength (TLS) – the strength of association between a given research article, other articles, and additional institutions.

**Results:** Bibliometric analysis identified 2,027 articles by 8,602 authors in 692 journals. Two-thirds of journals published a single article (n=453, 65.5%) whereas only 3.6% published ≥10 articles. One-quarter of LMIC burn research was published in ISBI’s Burns (n=417 articles, 20.6%) and ABA’s Journal of Burn Care & Research (n=89 articles, 4.4%). Most authors published < 5 articles (n=8521, 99.1%) but 19 (0.2%) had published ≥10. Authors were affiliated with 2,519 organizations in 132 countries. There was a strong positive correlation between total publications and citations (R=0.87, P<0.001). In addition, there was a significant difference in the number of publications (P=0.003, 0.07), citations (P=0.005, 0.03), and TLS (P=0.009, 0.008) by geographic and economic categories - North America had the highest while Latin American and the Caribbean had the lowest. The USA (n = 563), India (n = 161), and China (n = 154) published the most articles.

**Conclusions:** Given the disproportionate representation of high-income countries and authors in the current LMIC burn research landscape, there must be a sense of urgency to develop pathways for facilitating change. Local and regional candidates for mentors and leaders were identified using bibliometric findings. Assembling teams with these individuals and prolific authors using a well-defined vision for change will facilitate sustainable communication and collaboration within LMIC research.
**Introduction:** Scalds are the most common mechanism of burn in children, and a significant proportion of these injuries are associated with bathing. Burns sustained while bathing present a unique opportunity for injury prevention; previous studies have examined lowering water heater temperatures, however reputable infant bathing educational resources do not explicitly recommend avoiding running water and the risks that it could pose. In an effort to inform prevention programs, this study seeks to determine the incidence and circumstances of running water in bathing scald burns at our institution.

**Methods:** A retrospective review was performed of records from an American Burn Association verified center over a ten year period (1/1/2010 to 12/31/2019). This center treats both children and adults and is affiliated with an academic hospital in a major urban center. The burn database was queried for scald injuries in children less than three years involving bathing. The Child Advocacy and Protective Services team provides inpatient consultation for all children less than three years old with burn injuries allowing us to analyze the specific events surrounding the bathing scald burns in this cohort.

**Results:** A total of 123 patients met inclusion criteria. Three bathing safety risk factors were specifically noted in the chart review: (1) running water, (2) lack of caregiver presence for duration of bathing, and (3) failure of caregiver to check water temperature before bathing. Of the cases identified, 107 (87%) had clear documentation of running water as part of the history of injury, 66 (54%) cases involved failure of caregiver to check the water temperature before bathing and 53 (43%) cases did not have a caretaker present for the duration of the bath. In cases with only one risk factor, running water was identified in 34 (94%) out of 36 cases, and in cases with one or two risk factors, running water remained the primary risk factor with 38 (90%) out of 42 cases. When looking at the combination of risk factors, only three (2%) cases had no risk factors while 77 (63%) involved two or more risk factors.

**Conclusions:** The vast majority of bathing burn injuries in this series involved running water. In addition, a significant number of scald burns occurred from running water alone, even without the other identified risk factors. Conversely, only 2% of scald burns associated with bathing featured none of these three risk factors, suggesting that these injuries could be greatly impacted by safe bathing education.
The Impact of ICD10 on the Incidence of Abuse in the National Burn Repository

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Introduction: Previously, cases of abuse may only have been coded as such when the investigation was complete, thus skewing the data available in the National Burn Repository (NBR) toward more severe or obvious cases of abuse. The introduction of the ICD10 coding system in 2015 brought with it the concept of “confirmed” and “suspected” cases of abuse. We hypothesized that the creation of these two categories might shift our understanding of non-accidental pediatric burn injuries.

Methods: We queried the NBR, a retrospective database maintained by the American Burn Association (ABA) which contains data submitted by all ABA-verified burn centers as well as some non-verified centers, for all children under the age of 18. Data were cleaned using e-codes where appropriate. To create equal samples, we created two cohorts: the ICD-9 sample comprises all children treated from 2012-2014, and the ICD-10 sample includes all children treated from 2016 to 2018. Data from 2015 were omitted as the ICD-10 coding system was introduced part way through the year.

Results: A total of 34,456 patients are included in the sample, including 18,783 (54.5%) in the ICD-9 group and 15,673 in the ICD-10 group. The most common causes of injury in both eras was scald (48.7% in ICD-9 and 55.2% in ICD-10), followed by fire/flame (20.3% in ICD-9 and 20.9% in ICD-10). The overall rate of abuse (including both suspected and confirmed abuse in the ICD-10 group) was higher in the ICD-9 era than the ICD-10 era (4.2 vs 3.2%, p<0.001). As seen in previous studies, children with injuries due to abuse were younger (median age 2.0 vs 3.0 years, p<0.001), had a larger median burn size (3.0 vs 5.0%, p<0.001), a longer hospital length of stay (2.0 vs 4.0 days, p<0.001), and a higher rate of mortality (0.8 vs 0.5%, p<0.001). In the ICD-10 cohort, only 17 cases were coded as “confirmed” abuse (0.1%) and 478 were coded as “suspected” (3.0%). In contrast, in the ICD-9 group, 789 patients (4.2%) were coded as being victims of abuse.

Conclusions: We expected that adoption of ICD-10, with its ability to yield increased data granularity, would yield a higher overall incidence of injury. Specifically, we expected more patients with smaller injuries to be included in the new “suspected” category, given the lower threshold to apply that diagnosis. However, this was not demonstrated in the NBR dataset, and in fact the overall incidence of abuse decreased. Given the added layers of complexity within the ICD-10 system, it is possible that the differences reflect challenges in coding cases of abuse rather than actual epidemiological changes.

Left out in the Cold: The Impact of Psychosocial Comorbidities on Victims of Frostbite

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Introduction: Patients with psychiatric or substance use disorders (SUD) and those experiencing homelessness have been identified as populations likely disproportionally affected by frostbite injury. However, the literature is sparse in regards to morbidity and mortality in these patients. As such, we sought to examine and characterize factors associated with worse outcomes and increased resource utilization in this patient population.

Methods: Adult patients admitted to a single ABA-accredited burn center for frostbite between 2013-2021 were identified using an institution-specific data registry. A retrospective chart review was conducted on patients meeting inclusion criteria, as identified by ICD-10 and ICD-9 codes. The primary outcome was morbidity and mortality associated with frostbite, including hospital length of stay, number of operations, and readmission. Chi-square and t-tests were utilized to compare patients with and without SUD (alcohol, drug, or positive urine drug screen), psychiatric disorders, or homelessness.

Results: In total, 54 patients were identified (70% male), 19% had documented non-alcoholic SUD, 50% had alcohol use disorder, and 14% were homeless. No significant differences were found between these patients and others in terms of the number of operations or amputations required. However, patients with positive SUD screen (32.0% vs 8.0%, p=0.03), positive UDS (46.7% vs. 0%, p=0.015), psychiatric disorders (27% vs. 0%, p=0.034), active drug use (50% vs 14.3%, p=0.01), or homelessness (50% vs 15%, p=0.026) were more likely to be readmitted with wound infections or progression of gangrene. Finally, patients with psychiatric disorders were more likely to require additional operations (1.8 vs 0.6, p=0.02) and longer length of hospital stay (16.0 +/- 2.9 vs 7.7 +/- 2.8, p=0.046).

Conclusions: Our results suggest significant differences in resource utilization and morbidity between those with and without a history of SUD, psychiatric disorder, or homelessness. Subsequent allocation of resources should target outpatient needs of at-risk patients to avoid similar outcomes. Future research should be focused on elucidating reasons for these differences which may include issues accessing follow-up care, inability to adhere to wound care, and more.
Community Level Disadvantage Negatively Impacts Return to Work After Burn Injury

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Introduction: The loss of income from injury, additional health care expenses, and inability to return work can lead to unsatisfactory outcomes. Community level disadvantage (e.g., low high school completion, low home ownership, low income) are more common among minority groups. We hypothesized community level disadvantage would negatively impact the ability to return to work after burn injury. This could serve to identify patients who need focused social, vocational, and financial support during rehabilitation.

Methods: Data from adult participants in a large multicenter database from 1998-2021 were linked by zip-code to three multi-domain community-level-indices: i) Distressed Communities Index, ii) Social Vulnerabilities Index (SVI), iii) Social Deprivation Index (SDI). Cohort characteristics, the distribution of each index within cohort, and days to return to work were described. Fit and strength of association between the indices and return to work was assessed with multi-level logistic regression models. A non-responder analysis examining demographic and clinical differences between was performed using Chi-square tests and Wilcoxon rank sum tests to understand potential bias in the findings.

Results: A total of 1960 participants provided both zip code and employment data 6 months after injury. 75% of participants were male. Mean age was 39. Race/Ethnicity Data: 81.4% identified as White, 11% Black, and 7% as “other” race; 84% of the participants as non-Hispanic or Latino. Median burn size was 20% TBSA (IQR 0.1-95.0), and length of hospitalization was 30 days (IQR 0-79). Of the community indices tested, both DCI and SVI were associated with return to work with DCI having the strongest association with return to work after injury, irrespective of indices. However, when DCI and SVI were included in the model to represent community disadvantage, the impact of race on return to work was less. Participants who did not provide employment information were younger, sustained larger burn sizes, and had longer LOS compared to those who did.

Conclusions: DCI and SVI are associated with return to work after burn injury and can be used to focus limited social, vocational, and financial services. Minoritized participants were less likely to return to work but they live in communities with greater disadvantage (e.g. fewer employment opportunities), which highlights the public health impacts of structural racism.

Therapist Confidence Utilizing Virtual Range of Motion Methods

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Introduction: Since the SARS-CoV-2 virus (COVID-19) was officially declared a pandemic, there has been a marked increase in virtual clinical care. Between 2019 and 2020, telehealth (TH) visits, including tele-rehabilitation (TR), increased from 11% to 46%. While many therapy interventions can be performed with verbal guidance or demonstration, objective tool-based outcomes such as goniometry, a valuable tool to determine burn survivor progress, have proved more challenging. The purpose of this study was to evaluate the level of confidence of therapists using three different remote methods of measuring finger range of motion (ROM).

Methods: Therapists evaluated finger ROM position of a mannequin model via a simulated TH visit using three different methods: Goniometry (GON), Visual Estimation (VE), and Electronic Protractor (EP). Pre and post-questionnaires were used to assess the participant’s experiences and comfort with each method of measurement. Descriptive statistics are used to report clinician opinions. A linear mixed effect model was used to determine the interaction of bias as a function of clinician characteristics (i.e., experience, familiarity, etc.).

Results: A total of 30 therapists and one hand surgeon participated. All reported some (30%) or a lot (70%) of familiarity with standard GON, and most reported some (30%) or a lot (40%) of familiarity with finger-specific goniometry. Post-testing, clinicians reported VE (80%) as the most difficult method and EP (73%) as the easiest. Only 7% reported feeling more confident with TR compared to in-person measurements, 27% felt equally confident, and 67% felt less confident. The average time to conduct the remote assessment measurement was 11:45 minutes using GON, 4:27 minutes using VE and 9:47 minutes using EP. There was not a significant relationship between performance bias and years of experience (p=0.587), familiarity with GON (p=0.406), familiarity with finger GON (p=0.709) or profession (p=0.281).

Conclusions: Despite the transition to virtual care, the mandate for valid and accurate documentation of functional outcome measures, including ROM, remains. Our study showed that the tools used for TR may not be the same as for in-person and clinicians need to adapt their approaches and skillsets. In addition, training with these new tools is essential for clinician confidence. In addition, there was not a relationship between experience and performance, suggesting that TR joint measurement is accessible to clinicians of all experience levels with proper training.
The Association of Burn Size and Global Functioning: A Preschool LIBRE1-5 Study

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Introduction: Between the ages of one and five, children gain increased mobility and begin to explore their surroundings. This makes them a particularly vulnerable age group for burn-related injuries, which can influence a child's physical and psychosocial development. Previous research in adult burn survivors associated larger burn size with poorer functional outcomes for social activities. Currently, there are limited data on the association in preschool aged survivors between burn size and functioning. The aim of this study is to understand how demographic characteristics, particularly burn size, correlate with the global functioning items using data from the Preschool-LIBRE1,5 study.

Methods: The Preschool-LIBRE1,5 was field-tested with 426 parents of burn survivors. Eight global items assessed change in functioning in four domains (physical, psychological, communication & language, and social) compared to pre-burn functioning. Demographic variables included gender, race, age at survey completion, total body surface area burned (TBSA), ethnicity, and pain severity. Post-burn abilities were assessed with “Following the burn injury, my child lost abilities he/she had before the burn injury in…”, measured with a yes or no response and compared to other children without burns with, “Compared to other children in the same age, in general, how would you rate your child’s…”, measured with a 5-point Likert scale ranging from much worse to much better. Multivariate logistic regression with multiple imputation for missing values were used to measure the association between demographic characteristics and global items.

Results: The population had a mean age at time of burn injury of 1.9 ± 1.1 years and mean TBSA% of 4.2 ± 8.0. Of the 426 participants, 305 have a TBSA < 5%, 45 have a TBSA between 5%-15% and 45 have a TBSA >15%. Larger TBSA was associated with lower odds of abilities in functional status for all four global functioning items. Adjusted odd ratios with 95% CI’s included communication and language 0.57(0.35,0.93), physical function 0.55(0.37,0.83), social function 0.33(0.2,0.52), and psychological/behavioral function 0.49(0.31,0.75). There was also a negative correlation of larger TBSA with weaker social abilities of the child compared to other children without burns.

Conclusions: The findings of this study show a negative association between a child's burn size and parent-reported functioning in the four domains post-burn injury. These findings may help clinicians improve pediatric recovery and rehabilitation.
67 Transient Dysphagia After Burn Injury in Children: An Under-identified Problem

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Introduction: Severely burn injured pediatric patients are at risk of dysphagia (difficulty swallowing) due to prolonged intubation or tracheostomy placement. To improve the early identification and treatment of dysphagia, we implemented a swallowing assessment protocol. We hypothesized that the swallowing assessment protocol is effective for identifying and treating dysphagia after prolonged intubation.

Methods: Between October 2016 and December 2020, pediatric burn patients with facial burn injuries, prolonged mechanical ventilation, tracheostomy, inhalation injury and/or anoxic events were placed on the swallowing protocol. The protocol included a Transitional Swallow Screen (TSS) performed within 24 hours after extubation or decannulation by an advanced practice swallow occupational therapist. If signs of dysphagia were noted, recommendations on diet consistency and treatment for positioning and feeding were implemented. Regular reassessments continued until the patient was determined to have regained premorbid swallowing function. Data on patient demographics, burn characteristics, dysphagia, treatment and outcome were collected. Descriptive statistics were used to describe the population, treatments and outcome.

Results: A total of 33 pediatric burn patients were included. Mean age was 8.1±5.9 years and TBSA was 48.1±26.8%. Median time from injury to swallow assessment was 45 (21-81) days. The majority of patients suffered from flame burns (70%). Almost all of the patients were intubated (97%) and 85% underwent a tracheostomy. Patients had a facial burn (73%), inhalation injury (24%) or anoxic injury (15%). Transient dysphagia was diagnosed in 79% of patients. Subsequent therapeutic procedures as a result of the TSS included: neurologic re-education (30%), swallow therapy exercises (55%), desensitization (42%), and patient/family training and supervision (79%). All patients eventually returned to normal swallow and regular diet. This occurred at an average of 72.5±46.7 days post injury and 8.2±18.0 days post swallow assessment.

Conclusions: Pediatric patients with substantial burn injury may not only be at risk for aspiration but also have other forms of dysphagia that require intervention. Implementation of a swallowing protocol can identify patients who required further therapeutic intervention and can guide the recovery of safe swallowing and functional oral intake.

68 The Association Between Body Mass Index and Physical Function in Adult Burn Survivors

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Introduction: An area of rehabilitation research in burns is the impact of co-morbidities. Obesity is one of these, is an increasing public health concern, and its role remains controversial regarding burn injury and physical recovery. Our aim was to evaluate associations between body mass index (BMI) as a measure of obesity, at discharge and self-reported physical function (PF) during recovery of adult burn survivors.

Methods: This study included data that was collected by four American Burn Association–verified burn centers, which contribute to the Burn Model System National Database project. The data included BMI obtained at hospital discharge and self-reported Patient-Reported Outcomes Measurement Information System (PROMIS)-29 PF-mobility and upper extremity scores assessed at 6-, 12-, and 24-months after burn. Mixed linear models for repeated measures and regression models were used to assess associations between BMI and PROMIS-29 PF scores over time. Values are expressed as means ± SD. Significance was set at p < 0.05.

Results: A total of 502 adult patients aged 47 ± 16 years were included, with mean total body surface area burned (TBSA) of 17 ± 18 % (range; 1.0-88%) and mean BMI of 23.1 ± 5.4 kg·m⁻² (range: 14.0-64.7 kg·m⁻²). We found no significant effect at 6 months (beta=-0.045, p= 0.54) nor at 12 months after injury (beta=-0.063, p= 0.44) when adjusted for age, burn size, and sex, however, BMI at discharge had a significant negative effect on self-reported mobility scores 24 months after injury (beta=0.218, p< 0.05).

Conclusions: Increased weight (i.e. BMI) at discharge was negatively associated with PF during recovery. Benefiting from a large sample size, our analysis suggests that long term recovery and restoration of PF in adult burn survivors is compromised by excess body weight.
Early Post-operative Mobilization After Treatment of Burn Wounds with Autologous Skin Cell Suspension

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Introduction: Early mobilization has become popular in the literature and the benefits in critically ill patients are well-documented. However, early mobilization in burn care is undefined. Clinical practice guidelines regarding post-operative mobilization (POM) of patients with burn injury, especially after autografting, are limited, resulting in significant practice variance among burn centers. Furthermore, data on mobilization after treatment with autologous skin cell suspension (ASCS), is even more limited, and wider practice variation exists. We hypothesize early POM is safe and does not compromise healing or lead to graft loss.

Methods: A retrospective chart review was performed to examine mobility interventions utilized for patients, with mixed partial and full thickness burns, who received ASCS with polylactic acid sheet, with or without meshed split-thickness skin grafting (STSG), over 6 months. Data included demographics, operative procedure, dressing, post-operative restrictions, POM date by burn therapy, and presence of graft loss (>25% of grafted area with need for regrafting). The data was analyzed to correlate POM day and graft success. Initially, the authors utilized manufacturer splinting guidelines before becoming more judicious with aggressive early mobilization. Patients at risk of noncompliance and graft sheer were splinted.

Results: Fifteen patients were included in the study. In those patients, 25 body areas were grafted with 17 areas receiving ASCS with polylactic acid sheet and 8 areas additionally receiving STSG, over 6 months. Data included demographics, operative procedure, dressing, post-operative restrictions, POM date by burn therapy, and presence of graft loss (>25% of grafted area with need for regrafting). The data was analyzed to correlate POM day and graft success. Initially, the authors utilized manufacturer splinting guidelines before becoming more judicious with aggressive early mobilization. Patients at risk of noncompliance and graft sheer were splinted.

Conclusions: While the sample size is limited, this study suggests early POM of ASCS is safe and does not lead to graft loss. Considerations for mobilization techniques, such as ROM and functional mobility, should include joint involvement, presence of STSG with ASCS overspray, and other patient factors such as health literacy and compliance. Additional prospective studies should be dedicated to the examination of POM to develop clinical practice guidelines which can be widely utilized across burn therapy.

Effect of Virtual Reality on Pain Reduction in Robot Training in Burn Patients

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Introduction: Burn injuries and their treatment are extremely painful. This study aimed to determine whether virtual reality (VR) can reduce pain during robot-assisted gait training (RAGT) in burn patients, by analyzing the cerebral blood flow (CBF) in the prefrontal cortex over time, using functional near-infrared spectroscopy (fNIRS).

Methods: The patients included in this study complained of a pain score≥5 on a visual analog scale (VAS) during RAGT, which was performed 10 times for 2 weeks. Each session consisted of 15 min of VR application, a 2 min break, and 15 min without VR. The average values of oxy-hemoglobin and deoxy-hemoglobin in the prefrontal cortex using fNIRS were calculated at four stages: temporal delay time with only RAGT, RAGT without VR, temporal delay time with RAGT and VR, and RAGT with VR. The pain scores and CBF were evaluated in sessions 1, 5, and 10 of the RAGT.

Results: The mean VAS pain scores were significantly lower (P< 0.05) in the experimental condition than in the control condition. Oxy-hemoglobin in the prefrontal lobe increased significantly when RAGT was performed with VR.

Conclusions: Therefore, VR may be a strong non-pharmacological pain reduction technique for burn patients during physical therapy.
**Introduction:** Competencies in healthcare are used to teach practice standards, to establish expectations for professional growth, and to evaluate and improve the effectiveness of educational programs. Benefits of early mobilization of Burn Intensive Care Unit (BICU) patients include improved ICU related weakness and delirium, range of motion, and decreased length of stay while promoting functional independence. A rehabilitation competency was developed for early mobility with the patient in the BICU using nationally agreed-upon standards for competence. By design this competency for BICU early mobility is part of a tiered training structure, with the burn rehabilitation and pediatric competencies serving as additional tiers of burn therapist training at our organization. The goal of this competency is to provide direct therapist training, including alignment with the inter-professional team involved with this intervention.

**Methods:** A pretest was issued regarding BICU early mobility competency. The pretest asked the therapist to indicate their perceived level of competence in the areas of functional mobility, indications and contraindications of BICU early mobility, Respiratory Care Provider (RCP) protocols and documentation of BICU early mobility. Based on the results of this pretest, it was identified that BICU early mobility would be prioritized as the next training tier. The BICU Early Mobility Competency was created in Competency Based Orientation (CBO) format, including nationally agreed-upon standards for burn therapist competence. The method of this training is designed to occur with an ongoing patient case study for validation, with the CBO as the teaching tool.

**Results:** Creation of this competency as part of a tiered training allows our burn center to have an educational program which aligns with the nationally agreed-upon standards for burn therapist competence. Creation of this competency resulted in direct communication channels between rehabilitation, RCP, nursing and physician teams.

**Conclusions:** This tiered system allows for time management of the validator signing off on competencies, and encourages use of current resources and literature in the areas of burn therapist competence and professional development.
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73 Associations Between Pre-burn Occupation Type and Employment Outcomes at One Year
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Introduction: Reintegration into the workforce after burn injury is an important issue for survivors. In a 2012 systematic review, 28% of burn survivors never returned to any form of employment. Although pre-burn employment status is strongly associated with post-burn employment, there are little data on the role of pre-injury occupation type on workplace reintegration. The aim of this project was to assess the impact of occupation type on employment outcomes after burn injury.

Methods: Data from the National Institute on Disability, Independent Living, and Rehabilitation Research Burn Model System National Longitudinal Database from 2015 to 2021 were used to investigate the association between occupation type and employment outcomes. Occupation type was classified into two groups, Labor and Non-labor, using the U.S. Bureau of Labor Statistics Standard Occupational Classification System. Demographic and clinical data were compared between groups. Mixed regression analyses examined associations between pre-burn occupation type and post-burn employment outcomes (employment at 1 year, days to return to work), controlling for age, gender, race, ethnicity, pre-injury employment, and burn size.

Results: Of the 600 patients who were employed pre-injury, 247 (41%) identified with a non-labor occupation and 353 (59%) with labor occupations. The Labor group was more male (82% vs. 61%) and Hispanic (23% vs. 6%), younger (mean age 42.1 vs. 48.3 years), less educated (high school or less, 25% vs. 11%) and more likely to have been injured at work (28% vs. 14%) compared to the Non-labor group (p < 0.001 for all comparisons). Changes in occupation were seen from pre-injury to post-injury; 16% of working survivors changed from Non-labor to Labor and 13% from Labor to Non-labor occupation types. For those who did return to work after injury, the average time to return to work was greater for Labor compared to the Non-labor group (150 vs 100 days; p=0.003). Additionally, those in the pre-injury Labor group were less likely to be employed at 12 months compared to the Non-labor group (odds ratio = 0.41; p=0.009).

Conclusions: Pre-injury occupation type is associated with employment outcomes after injury. Therefore, occupation type can be used to inform vocational reintegration resources, such as vocational rehabilitation programs, to optimize survivor outcomes.

74 The Association Between Burn Injury and Peer Relations: A preschool-libre1-5 Study
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Introduction: Children ages one to five years old are naturally curious and build their personality and social skills through interactions with others. Positive peer relations are especially important after a burn injury as bullying and peer rejection can delay development of social skills. This study assessed the association between burn injuries and burn survivors’ ability to connect with and maintain peer relations in this age group using the Preschool-LIBRE 1-5 (Life Impact Burn Recovery Evaluation).

Methods: The Preschool-LIBRE 1-5 was field-tested with 426 parents of burn survivors. Each item was scored on a 5-point Likert scale ranging from 0 (never) to 4 (always). Data was recoded for selected items such that higher scores denote better functioning. Classic test theory methods were used to assess the peer relation items from a social functioning domain. Individual items and mean scores in the domain were examined. Multiple linear regression analyses (controlling for gender, race and ethnicity, pain severity, burn injury to critical area, burn size, and age at survey completion) measured the association between demographic and clinical characteristics and calculated a peer relation score based on multiple imputation samples.

Results: The mean age was 3.06 + 1.41 years, mean time since injury of 1.16 + 1.34 years, mean total body surface area (TBSA%) of 4.21 + 7.92, and 55.16% male and 74.18% white. Items from peer relations item pool (n=15) were identified as a unidimensional scale (α=0.92, item-total correlations for all 15 items >0.4, ratio of the 1st and 2nd eigenvalues (8.729/1.287=6.78) > 4). The mean peer relation score was 2.86 + 0.76. The two items with the lowest and highest score were “My child would ask for things nicely when playing with other children” (SEX = 2.09) and “My child liked to play near and be with family members and friends” (SEX = 3.47).
(\bar{x} = 3.59) respectively. Results indicated that age was a significant predictor, such that older age at survey completion was significantly associated with higher peer relation score (\( \beta = 0.16, p < 0.0001 \)). With each year of age increase, peer relationship score increased by 0.16 + 0.21 points.

**Conclusions:** Preschool-aged burn survivors, as reported by parents, often had the ability to connect with peers through imitation and participating in play activities, and maintained peer relationships well. These findings emphasize the importance of promoting early interventions that build social skills, allowing for positive interactions with peers and improving social functioning in the long-term.

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**Patient Reported Outcome Measures Associated with Burn Severity**

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**Introduction:** Burns continue to be a leading cause of unintentional injury sustained by children. The lasting effects of burn treatment on pediatric patients’ quality of life are still poorly understood. Patient-Reported Outcomes Measurement Information System (PROMIS) is a reliable tool that evaluates a patient’s physical, mental, and social health. To measure the impact of burn injuries on quality of life, we integrated the use of PROMIS into our outpatient clinic. Our aim for this study is to determine the effects of patient demographics, burn treatment, and burn characteristics on PROMIS scores.

**Methods:** A retrospective review of patient and PROMIS data collected at our institution from June 2016 to August 2019 was conducted. Patient demographics, burn injury characteristics, PROMIS Pediatric Mobility, Upper Extremity, Pain Interference, and Peer Relationships scores were collected. Statistical analysis was conducted using Wilcoxon Two-Sample Test, Chi-Square, and Pearson’s Correlation Coefficient.

**Results:** 163 pediatric burn patients completed PROMIS questionnaires. The median injury age was 5.94 years (interquartile range (IQR)= 6.9) and had a median total body surface area of 15% (IQR= 25.5). Individual burn characteristics did not impact Peer Relationships scores; however, they did have a significant effect on Upper Extremity, Mobility, and to a lesser extent, Pain Interference scores. Older injury age (-0.24, p = 0.02), longer length of stay (-0.25, p = 0.02), larger total body surface area (-0.27, p = 0.009), and more operating room visits (-0.28, p = 0.006), were associated with worse Upper Extremity scores. Similarly, older injury age (-0.2, p = 0.04), longer length of stay (-0.25, p = 0.01), more days in the intensive care unit (-0.24, p = 0.01), and more operating room visits (-0.26, p = 0.01) impacted Mobility scores. Worse Pain Interference scores were correlated with longer length of stay (0.24, p=0.01), and larger total body surface area (0.19, p=0.05). Upper Extremity scores correlated with Mobility scores (0.60, p < 0.0001); Pain Interference (-0.23, p < 0.02) and Upper Extremity (0.3, p < 0.003) scores correlated with Peer Relationships scores; and Upper Extremity (-0.48, p < 0.0001) and Mobility (-0.42, p < 0.0001) scores correlated with Pain Interference scores.

**Conclusions:** Peer Relationships scores are not influenced by patient demographics or burn characteristics. This is in contrast with Upper Extremity, Mobility, and Pain Interference scores which are all directly affected by burn characteristics. The patients’ impression of their upper extremity function has the greatest impact on their perceived pain, peer relationships, and mobility.
Methods: A retrospective chart review of patients aged > 5 years, with TBSA > 10%, requiring hospitalization for > 7 days in a two-year span (2018-2019) was performed. Patients who did not report employment during admission and those who expired during hospitalization were excluded. IRB approval was obtained to contact patients via telephone who did not report a return to work or school date during their outpatient follow-up.

Results: There were a total of 1579 burn admissions from 2018-2019, 93 of those patients met final protocol criteria. Seventy-four of those patients returned to work/school (RTW), and nineteen did not return to work/school (N-RTW) as of chart review date. The average total body surface area (% TBSA) for RTW was 18.30 vs. 33.08 for NRTW (p=0.0002). The average length of stay (LOS) for RTW was 23.55 vs. N-RTW 51.15 (p=0.0102). Exact return to work/school dates were obtained from 67 patients. The average length of days to return to work/school (n=67) was 102.19 post discharge, the minimum was 2 days, and the maximum was 785 days. There were 9 patients in the N-RTW group who filed for disability.

Conclusions: Results suggest the average days per %TBSA it takes for burn patients to return to work or school is 5 days. Additionally, larger %TBSA burned and longer hospital LOS also adversely affected return to work. Additional studies are needed to identify additional factors influencing return to work and to identify methods to hopefully improve the ability to return to work.

Introduction: Financial toxicity negatively impacts recovery after injury. Financial assistance (FA; e.g., disability income, food stamps, low-income housing voucher) may mitigate the impacts of financial toxicity. We aimed to describe FA after burn injury and its association with health-related quality of life (HRQL) and return to work.

Methods: Data from adult participants participating in a multicenter longitudinal database from 2015 to 2021 were used for complete-case analysis. Participants were separated into two groups: those who received any form of financial assistance due to their burn injury, and those who did not. The cohort and FA were described. Multi-level, mixed-effects, linear regression was performed to assess the associations of FA with VR-12 Physical and Mental Health Component Summary scores (PCS, MCS) and return to work. Lastly, a propensity score analysis matched 3:1 on age, gender, pre-injury PCS and MCS, burn size, length of hospital stay, and the number of operations as a result of burn injury was used to maximally reduce potential confounding.

Results: The analysis included 1,237 participants [725 who received FA, 512 who did not receive FA (NFA)]. Participants who received FA due to their burn injury were more likely to be younger (median 42 FA vs 48 NFA, p-value < 0.001), racially minoritized (19.2% FA vs 14.3% NFA, p-value < 0.001), have larger injuries (21% FA vs. 10% TBSA NFA, p-value < 0.001), longer hospital stays (median 29.5 days FA vs. 17 days NFA, p-value < 0.001), more days before returning to work (median 220 days FA vs 79 days NFA, p-value < 0.001), and have a workers compensation insurance payer (23.6% FA vs. 9.38% NFA, p-value < 0.001) compared to peers who did not receive FA. The number of participants who received new FA decreased after the 6-month time point: 11% at discharge, 33% at 6 months, and 15% at 12 months. Propensity score analysis demonstrated that receiving FA was associated with lower PCS and MCS scores at all time points and longer time to return to work (Table 1).

Conclusions: Given that financial toxicity is associated with unsatisfactory recovery after injury, efforts to reduce financial stressors are needed. FA seems somewhat matched to patients with greater recovery challenges (e.g., larger injuries, more complex hospitalizations). Additionally, most patients do not receive FA for a prolonged period (e.g., >6 months). While FA is associated with lower HRQL and longer return to work, these data may represent improvement compared to what people living with burn injury might have experienced without FA and represent unmeasured confounding.
Multiple covariables contributed to the SWL score.

Greater than 24 hours after index hospital admission.

Response to injury. Lab values were those closest to but not within 24 hours of index hospital admission were analyzed from five institutions. Two hundred and fourteen participants were identified from a multicenter national longitudinal data and merged with clinical data from a single institution’s trauma registry. Patients were randomized into a training base and merged with clinical data from a single institution’s trauma registry. Patients were randomized into a training dataset (80%) and a testing dataset (20%). A CART algorithm was used to examine the relative contributions of individual predictor variables in classifying low SWL at six-month follow up (SWL ≤ 20). Seventeen covariables obtained within 24 hours of index hospital admission were analyzed from five domains: demographics, comorbidities, injury, care, and host response to injury. Lab values were those closest to but not greater than 24 hours after index hospital admission.

Results: Multiple covariables contributed to the SWL score. CART analysis selected a pre-injury SWL score < 31 as the first node and strongest indicator of low SWL. CART then selected the following subgroups at risk for SWL ≤ 20 at 6 months: (1) hematocrit >55%; (2) lactate >4 mmol/L, age > 59; (3) total body surface area burned (TBSA) burned >30%, presence of a hand, neck, and/or face burn. The cross-validated predictive accuracy of the CART model was 69.4% with a cross-validated relative error of 0.379. In the validation data set, sensitivity and specificity were 62.5% and 72.0%, respectively.

Conclusions: The findings demonstrate the potential feasibility of creating a model that can predict a clinically meaningful quality of life outcome using covariables gathered within hours of hospital admission after burn injury. Predictive measures suggest that while some of the included covariables may be associated with SWL, they are not consistently and reliably predictive of low SWL alone. With more data and additional refined inputs, a similar model could be used to identify those in need of more intensive services earlier on in the hospitalization.

Introduction: Current early burn care prognostication models predict in-hospital mortality (e.g., revised Baux Score). However, patients, families and clinicians need more holistic tools in the hours and days after injury to identify specific factors that might affect their quality of life and indicate a need for more intensive services. This project aims to predict Satisfaction with Life (SWL) in survivors of burn injury using patient, injury, and care factors available within 24 hours of admission.

Methods: Two hundred and fourteen participants were identified from a multicenter national longitudinal database and merged with clinical data from a single institution’s trauma registry. Patients were randomized into a training dataset (80%) and a testing dataset (20%). A CART algorithm was used to examine the relative contributions of individual predictor variables in classifying low SWL at six-month follow up (SWL ≤ 20). Seventeen covariables obtained within 24 hours of index hospital admission were analyzed from five domains: demographics, comorbidities, injury, care, and host response to injury. Lab values were those closest to but not greater than 24 hours after index hospital admission.

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Validation of PROMIS-25 Among Children Living with Burn Injuries
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Introduction: Patient-reported outcomes are important for burn injury research and clinical practice. The NIH-funded Patient Reported Outcomes Measurement System (PROMIS)-25 profile has been validated for use in diverse populations of children with many conditions, though not among children living with burn injuries. The purpose of this study was to examine the reliability and validity of PROMIS-25 scores in children living with burn injury.

Methods: Data were provided by children who were participating in a multi-center longitudinal study of outcomes after burn injury. The PROMIS-25 Profile, which includes 4 items for each domain of physical function mobility, anxiety, depression, fatigue, peer relationships, and pain interference, was evaluated for reliability and validity. Floor and ceiling effects, unidimensionality, internal consistency, and reliability were examined. Correlations with other measures (Post-Traumatic Growth Inventory-Child (PTGI-C), Child PTSD Symptom Scale (CPSS) and Burn Outcome Questionnaire Body Image Scale (BOQBI)) were calculated to assess concurrent validity.

Results: 256 children living with burn injury who sustained a moderate to severe injury provided responses on PROMIS-25 domains 6 months-10 years post burn. Participants’ age ranged from 8-18 years at time of assessment; mean years since injury was 4.3 (SD 4.1). All PROMIS-25 domains showed high internal consistency (Cronbach’s α=0.90–0.95). Substantial portions of the sample reported no symptoms (anxiety [58.2%], depressive symptoms [54.6%], fatigue [50.8%], pain [60.1%]). There was a large ceiling effect on peer relationships (46.8%) and physical function mobility (57.5%). One-factor confirmatory factor analyses supported unidimensionality for all domains (all CFI >0.98). Reliability was credible for group mean comparisons ( >0.8) across at least some trait levels for all domains except fatigue and anxiety which had low reliability (< 0.8) across the entire trait range. The magnitude and direction of correlations were as anticipated (0.32 for peer relationships and body image; 0.51 for depressive symptoms and PTSD) with the exception of weak negative correlations between PTGI-C and the anxiety and depression domains.

Conclusions: The results provide some evidence of reliability and validity of PROMIS-25 scores among children living with burn injury. Reliability of all domains was low to moderate and would likely be improved, and ceiling effects reduced, by administering the PROMIS-37, which includes 6 items per domain.

Correlative XI: Surgical Care, Acute Non-reconstructive

Post-operative Self-adherent Compression Wrapping of the Hand and Its Impact on Skin-graft Viability
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Introduction: Potential complications of autografting for burn wound coverage of the hand include edema, hematoma formation, and bleeding; all of which can lead to graft failure. Self-adherent elastic wraps are commonly used by burn rehabilitation clinicians to minimize complications by providing graft protection and decreasing edema post-operatively; however, there is a lack of evidence on its impact on graft healing. The purpose of this study was to determine if the application of self-adherent elastic wraps to the hand in the operating room after autografting improves the percentage of graft viability.

Methods: A retrospective chart review was performed for 37 patients with burned hands who underwent autografting from January 2017 to July 2021. Grafted hands were categorized into 2 groups: post-operative dressings with and without self-adherent elastic wraps. Post-operative day 4 pictures for both groups were collected from the medical record and a blinded digital photograph analysis of graft viability was performed by 5 expert raters including 3 Burn Surgery Fellows, 1 Burn Attending Surgeon and 1 Hand Attending Surgeon. A rating system was developed based on percentage of graft take as seen in Table 1 and presence of hematomas were assessed.

Results: Patients who received self-adherent elastic wraps suffered burns with significantly larger TBSA (p=0.007) and were admitted for a longer duration (p=0.009) than patients who did not. Patients with elastic wrap had a higher percentage of grafts with >95% take (64.0% vs 41.7%, p=0.227) and a lower rate of hematoma formation (24.0% vs. 41.7%, p=0.443). Intra-class correlation coefficient across raters was 0.90 for graft take and 0.87 for determining presence of hematomas, indicating excellent interrater reliability.

Conclusions: Despite suffering larger burns requiring longer hospitalizations, patients who received elastic wrap had a higher rate of >95% graft take than those without. This
study is limited by a relatively small sample size, however these findings warrant continued research in the use of self-adherent elastic wrap to maximize graft take in hand burns.

**Figure 1. Self-adherent elastic wrapping of the hand**

82 Early Skin Excision Decreased the Risk of Skin Infection, Sepsis and Mortality Among Burn Patients

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**Introduction:** In lieu of outdated and limited patient studies on excision for severe burns, a more comprehensive analysis is indicated to determine the effects of early skin excision following burn. This study aims to address the outcomes of early excision.

**Methods:** Data collection and analysis was performed using TriNetX, a national research database. The study population included patients ranging from 0 to 90 years old who underwent excision for burns. Groups were stratified by the number of days after injury in which they received a skin excision treatment. Five outcomes were analyzed: death, cardiac stress, wound infection, blood transfusion, and sepsis. Risk and incidence of various health outcomes were compared between groups after matching for age, gender and race, using a z-test with p< 0.05 considered significant.

**Results:** We identified 2,522 patients who underwent excision between 0-3 days, 825 between 4-7 days, and 419 between 8-14 days following burn. We found a significant decrease in risk of skin infection and sepsis for skin excision 0-3 days after burn compared to 4-7 days (p< 0.05). Additionally, the frequency of blood transfusion significantly increased for those with excision 0-3 days after burn when compared to 4-7 days (p< 0.05). There was a significant increase in the risk of mortality for patients who received skin excision 8-14 days after injury as compared to both 0-3 days (p< 0.05) and 4-7 days (p< 0.05). However, we found no statistical difference in cardiac stress, skin infection, blood transfusion or sepsis between 0-3 and 8-14 days nor 4-7 and 8-14 days.
Conclusions: Skin excision 0-3 days after burn injury results in a significantly lowered risk of skin infection and sepsis as compared to skin excision 4-7 days and 8-14 days after burn. Skin excision within the first 7 days after burn decreased the risk of mortality as compared to excision 8-14 days after burn. The risk of blood transfusion increased with early excision, which may be explained by the severity of the injury.

83 The Impact of Tracheostomy on Long-term Patient Outcomes: A Burn Model System National Database Study

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Introduction: Management of the upper airway is crucial to burn care, especially in the setting of inhalation injury or burns to the face or neck. Endotracheal intubation is often performed to secure the airway; however, tracheostomy may be necessary in patients requiring prolonged ventilatory support. This study compares long-term outcomes of burn patients with and without tracheostomy.

Methods: Data from the Burn Model System National Database, collected from 2013 to 2020, were analyzed. Demographic and clinical data were compared between those with and without tracheostomy. The following patient-reported outcome measures, collected at 6-, 12-, and 24-months, were analyzed: Veterans Rand 12 Physical Component Summary Score (VR-12 PCS), Veterans Rand 12 Mental Component Summary Score (VR-12 MCS), Satisfaction with Life (SWL), Community Integration Questionnaire (CIQ), Patient-Reported Outcomes Measurement Information System (PROMIS-29), employment status, and number of days to return to work. Regression models were used to assess the impact of tracheostomy status on long-term outcome measures, controlling for demographic and clinical variables.

Results: Of the 714 patients included in this study, 39 (5.46%) received a tracheostomy and 675 (94.54%) did not. The two groups were similar across all demographic data collected. Tracheostomy patients were more likely to have flame injury, inhalation injury, larger burn size, more trips to the operating room, longer hospital stay, and greater number of days on a ventilator (p< 0.001). Regression model analyses demonstrated that tracheostomy was associated with worse VR-12 PCS scores at 6-, 12-, and 24-months (6.6 [95% CI 1.5, 11.8], p=0.012; 11.5 [6.2, 16.8], p< 0.001; 10.8 [4.2, 17.5], p=0.001). Tracheostomy was also associated with worse scores in two PROMIS-29 domains, physical function and pain interference. For physical function, the association was seen at 6-, 12-, and 24-months (7.4 [3.0, 11.8], p=0.001; 9.6 [5.2, 14.0], p< 0.001; 11.3 [5.8, 16.9], p< 0.001). For pain interference, the association was only seen at 12-months (-5.3 [-10.0, -0.55], p=0.029).

Conclusions: After burn injury, patient-reported outcome measures of physical function and pain interference were significantly worse with tracheostomy.
Introduction: Reported advantages of early excision for larger burn injuries include reduced morbidity, mortality, and hospital length of stay for adult burn patients. However, a paucity of evidence supports the best option for paediatric burns and the advantages of non-excisional (mechanical) debridement. This study aims to evaluate the association between early (<24 hours post-injury) non-excisional debridement under general anaesthesia with burn wound re-epithelialisation time and skin graft requirements.

Methods: A cohort study of children (<17 years) presenting with burns >5% total body surface area, using prospectively collected state-wide pediatric burns' registry between January 2013 to December 2019. Primary outcomes were: time to reepithelialization (tested using survival analysis) and skin graft requirements, tested using binary logistic regression for odds ratios). Using depth and size, we performed a propensity matched dataset to analyse effects of early non-excisional debridement in the operating theatre.

Results: Overall, 392 children met eligibility (males 58.2%). When propensity matched, early non-excisional debridement under general anaesthesia in the operating theatre, significantly reduced the time to re-epithelialisation (15.0 (CI: 11.00-20.00) versus 20.0 (CI:13.5 – 31.00) days) and the odds of requiring a skin graft (OR:0.319 (0.125 – 0.812).

Conclusions: This study is the first to demonstrate that early non-excisional debridement under general anaesthesia in the operating theatre significantly reduces wound re-epithelialisation time and subsequent need for a skin graft in paediatric burn patients. Analysis suggests that ketamine procedural sedation and analgesia in the emergency department used for burn wound debridement is not an effective substitute for debridement in the operating theatre.
Introduction: Due to COVID-19, hospitals have had to undergo drastic changes to operating room (OR) policy to mitigate the spread of the disease. Elective surgeries were cancelled, and some ORs were repurposed to help withstand a surge of COVID-19 patients. Given these unprecedented measures, we aim to look at the changes in operative volume and metrics of the burn surgery service at our institution.

Methods: An IRB-approved single-institution retrospective review was conducted by querying our institutional OR database. We obtained case lists and OR metrics for the burn surgery service at our institution. These cases were then divided into the following groups: elective cases, and late COVID (period with resumed elective review was conducted by querying our institutional OR database). We obtained case lists and OR metrics for the burn surgery service at our institution. These cases were then divided into the following groups: elective cases, and late COVID (period with resumed elective cases). However, there was no significant decline in the number of burn specific cases performed. The elective cases were largely replaced with excision and grafting cases and this shift has persisted even after elective cases have resumed. This change is also reflected in increased operative times.

Results: The total number of cases performed by the entire hospital during 2019, 2020, and 2021 was 2375, 1184, and 2265 respectively. During those times, the burn surgery service performed 174, 124, and 212 total cases (138, 103, and 114 burn related cases) respectively. Compared to the hospital, the burn service had a smaller decrease in volume during early COVID (28.7% vs. 50.1%) and exceeded prepandemic volumes during late COVID (+21.8% vs. -4.6%). There was a significant increase in excision and grafting cases in early and late COVID periods (41, 84, 74 respectively; p < .0001 and p < .002). There was a significant decrease in laser scar procedures, secondary reconstruction without grafting or flaps, secondary reconstruction with grafting, and secondary reconstruction with flaps. Types of cases and operative metrics were compared amongst the three time periods.

Conclusions: COVID-19 related OR closures lead to an expected decrease in the number of overall cases and elective cases. However, there was no significant decline in the number of burn specific cases performed. The elective cases were largely replaced with excision and grafting cases and this shift has persisted even after elective cases have resumed. This change is also reflected in increased operative times.
Comparing the Efficiency of Tumescent Infiltration Techniques in Burn Surgery
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Introduction: Tangential excision and grafting of burn wounds results in significant intra-operative blood loss. Infiltration of a dilute epinephrine solution is routinely performed to reduce bleeding from both the eschar and donor sites. Tumescent infiltration has been described using both a manual technique or a pump device. The purpose of this study is to compare the efficiency of these two methods in terms of time and economy of motion.

Methods: Consecutive adult burn patients who required excision and grafting were enrolled in the study. Manual infiltration consisted of an aspirating syringe (10 mL), spinal needle (18 gauge), and three-way stopcock connected to sterile tubing. Pump infiltration consisted of a blunt cannula and infiltration pump (300 mL/minute). Prior to each case, patients were randomized into either the manual or pump tumescent technique. Excisions of < 2% TBSA were excluded, along with specific anatomic regions (head and neck, genitalia, hands and forearms, feet, and legs below the knee). Infiltration with epinephrine-saline solution (1:500,000) was performed to the endpoint of tissue tumescence by a single surgeon for consistency. ImageJ software was used to calculate the surface area to be infiltrated. The infiltration was filmed and later coded for duration, number of maneuvers, and total volume of tumescence injected. Any complications related to the infiltration of tumescence were collected.

Results: A total of 14 patients were enrolled, and 16 cases were randomized to either manual (N=8) or pump infiltration (N=8). Participants were 71% male, with a mean age of 41.8 years, and mean burn size of 16.9% TBSA. The pump method required less time (2.0 cm²/s vs 1.1 cm²/s, p< 0.001) and fewer maneuvers (37.8 cm²/move vs 1.1 cm²/move, p< 0.001). Use of the infiltration pump also resulted in a reduced volume of fluid required to reach the endpoint of tumescence (1.7 mL/cm² vs 2.4 mL/cm², p=0.01). No complications were reported related to the process of tumescence in either group.

Conclusions: Compared to the manual technique, use an infiltration pump was significantly more efficacious in terms of both time and economy of motion. Additionally, less fluid volume was required to achieve the endpoint of tumescence.

Pediatric Postburn Ear Reconstruction of Significant Cartilage Defects
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Introduction: The ear is a protruding appendage with multiple functional and aesthetic implications. Literature indicates that up to 40-60% of facial burns involve the ear. Ear burns with considerable tissue loss and sensory deficits can negatively impact quality of life, psychosocial functioning, and physical health. Successful ear reconstruction mitigates these undesirable outcomes. The complex architecture of the external ear presents a formidable surgical challenge after burn injury, when scar tissue, impaired blood supply, and trauma to cartilage all influence reconstructive options. A lack of materials that truly replicate the characteristics of uninjured elastic cartilage also presents a longstanding surgical dilemma. In this retrospective study, the authors highlight the utility of reconstructive techniques to address significant cartilage deficits, including conchal transposition flap, composite graft, costal cartilage graft, and porous polyethylene implant.

Methods: A retrospective review was conducted on patients aged 0 to 21 years who underwent cartilage framework reconstruction between January 2004 to January 2021 at a specialized pediatric burn center. Medical records from the hospital’s patient database were screened, and 52 patients (60 ears) who met study criteria were identified. Patient demographics, procedural characteristics, and patient outcomes were analyzed.

Results: For helical rim cartilage defects, 20 patients (23 ears) with an average age of 15 ± 4 years underwent a conchal transposition flap, which was associated with no major complications. In cases involving repair of small to medium cartilage deficits, 9 patients (9 ears) with an average age of 13 ± 5 years underwent a composite graft, which was associated with one case of infection. A total of 20 patients (23 ears) with an average age of 13 ± 6 years underwent porous polyethylene implantation, which was associated with two cases of exposure and one case of infection. Of these porous polyethylene cases, 20 ears involved helical rim reconstruction and 3 involved total ear reconstruction. Costal cartilage grafting was performed in 4 patients (5 ears) with an average age of 13 ± 5 years and was associated with one case of infection. Costal cartilage grafting was utilized to reconstruct 2 helical rims and 3 total ears.

Conclusions: In cases of focal cartilage defects or medium-sized helical rim cartilage loss, highly aesthetic results and minimal complication rates can be achieved with composite graft or conchal transposition flap. When presented with large to total helical rim loss or total ear loss, either costal cartilage graft or porous polyethylene implantation is typically necessary.
Introduction: Autograft (AG) is the standard of care treatment for deep burns but requires creation of a donor site wound prone to pain and scarring. Treatment with a bioengineered allogeneic cellularized construct (BACC) is an alternative approach that can reduce or eliminate the need for autografting. The BACC is a bilayer construct that was recently approved in the US for the treatment of adult deep partial-thickness (DPT) burns. Here, we report the analysis of pooled safety data from two open-label, randomized, controlled trials (STRATA2011 [NCT01437852] and STRATA2016 [NCT03005106]) that evaluated efficacy and safety of BACC versus autografting in patients with DPT burns.

Methods: The trials enrolled 101 patients aged ≥18 years with 3–49% total body surface area (TBSA) thermal burns. In each patient, two DPT areas on the torso or extremities were randomized to receive BACC or AG, where the mean total BACC dosage was 234.8 cm$^2$ (range: 12.0–960.0 cm$^2$). The safety endpoints assessed at each visit included: 1) treatment-emergent adverse events (TEAEs), treatment-related AEs (TRAEs), and serious AEs (SAEs); 2) changes in immunologic responses (panel reactive antibodies [PRA], anti-bovine serum albumin [BSA] antibody response [STRATA2016 only]); 3) persistence of allogeneic DNA; and 4) laboratory exam and vital signs.

Results: Eighty-seven patients (86.1%) experienced TEAEs, 30 patients (29.7%) experienced TRAEs, and 16 patients (15.8%) experienced SAEs. The most frequent TEAEs reported by ≥10% of patients in the pooled analysis were pruritus (n=31, 30.7%) and blister, hypertension, and hypertrophic scar (n=11, 10.9% each). The most frequent TRAEs (≥5% of patients) were pruritus (n=13, 12.9%) and blister (n=5, 5%). The most common SAEs were transplant (BACC or AG) failure, pneumonia, and deep vein thrombosis (n=2, 2% each), where only one SAE (impaired healing of moderate severity) was possibly related to BACC. One patient (1%) discontinued the trial due to a TEAE (traumatic brain injury). Two patients (2%) experienced SAEs that led to death, neither related to BACC. The number of patients with positive PRA values that were negative at baseline were 36 (38.7%) at Day 28 and 20 (22%) at Month 3. The number of patients with reactivity to HLA I class alleles found in the BACC increased from 4 (4%) at baseline to 39 (40.9%) at Day 28, then decreased to 22 (24.2%) at Month 3. No persistence of allogeneic DNA from the BACC was detected.

Conclusions: BACC is well tolerated and is not associated with any unexpected SAEs or TEAEs. The safety profile at BACC treatment sites is similar to that at AG treatment sites. Thus, BACC may offer a safe alternative to autografting for the treatment of DPT burns.
Introduction: Human cadaver allograft (HCA) is the current standard of care for temporary wound closure of large burns, but a critical need for high-quality alternatives exists. Porcine skin shares many similarities with human skin, and hyperacute rejection is prevented via a single genetic modification. Like human skin, non-terminally sterilized porcine skin contains viable dermal and epidermal cells and intact vasculature that enables restoration of barrier function. These characteristics are distinct from those of traditional, terminally sterilized “xenografts” and may offer greater therapeutic capability. We report here key efficacy outcomes specific to severe burn care from a first-in-human clinical trial to assess the capability of genetically engineered porcine skin xenotransplants to provide temporary wound closure for severe and extensive deep-partial and full-thickness burn wounds, compared to HCA.

Methods: Split-thickness skin containing epidermal and dermal layers was harvested from Designated Pathogen Free, GalT-KO, porcine donors, cGMP processed to achieve USP< 71 > sterility and cryopreserved to retain >70% cell viability. These were transplanted side by side with HCA on debrided full-thickness burn wounds in six human subjects. Temporary wound closure, incidence of complete wound closure following autografting, and quality of healing, including scarring, contour, and feel of healed skin, normalization of skin markings or pigmentation, were independently assessed.

Results: Across all patients and assessment time points, adherence, vascularity, and overall appearance were indistinguishable between porcine skin xenotransplants and HCA control. After surgical removal, wound beds treated with each type of dressing were perfused and otherwise appeared equivalent and clinically suitable for autografting. Long-term outcomes were comparable between wound sites treated with porcine skin or HCA with no discernable differences in scarring or cosmesis.

Conclusions: Skin xenotransplants effectively provided temporary wound closure and restoration of barrier function via intact native vasculature, active cells, decreased antigenicity, and high-quality tissue architecture unimpacted by cryopreservation and thawing. These results show clinical promise as an interchangeable alternative to HCA in the treatment of severe burns. Expanded clinical evaluation is ongoing.
Comparison of a Polylactic Acid Skin Substitute to Porcine Xenograft for Pediatric Partial Thickness Burns
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Introduction: In August of 2020, our institution transitioned from porcine xenograft to a polylactic acid skin substitute for the management of pediatric partial thickness burns. This change in treatment was due to the discontinuation of porcine xenograft by the primary supplier to the United States. We sought to make a length of stay (LOS), postoperative pain score, postoperative dressing change, and cost analysis of the polylactic acid skin substitute as compared to porcine xenograft for the treatment of pediatric burns.

Methods: Patients were identified using an institutional Burn Center registry and linked to clinical and administrative data. All pediatric patients admitted between January 1st, 2019 and March 31st, 2021 who sustained partial thickness burns were eligible for inclusion. LOS, burn etiology, total burn surface area (TBSA), postoperative pain scores, postoperative dressing changes, complications, infections, and hospital cost were evaluated.

Results: A total of 259 patients were identified, 47 of whom received the polylactic acid skin substitute and 212 of whom received xenograft. Average age for polylactic acid skin substitute patients was 5.4 years with 51.1% male, average age for xenograft patients was 4.6 years with 58.5% male. Average LOS for polylactic acid skin substitute patients was 3.4 days and 3.2 days for xenograft patients (p = 0.45). Etiology of burns was 83.0% scald and 16.0% flame for polylactic acid skin substitute patients and 80.2% scald and 9.4% flame for xenograft patients (p = 0.66 and p = 0.71, respectively). Polylactic acid skin substitute patients had an average TBSA of 5.3% and xenograft patients an average TBSA of 4.3% (p = 0.11). Postoperative pain scores on postoperative day (POD) 1 were 1.1 for polylactic acid skin substitute and 1.2 for xenograft (p = 0.13). Average number of inpatient postoperative dressing changes was equivalent between the polylactic acid skin substitute and xenograft (p = 0.62), while average day of first postoperative dressing change was POD 10.9 for the polylactic acid skin substitute and POD 9.9 for xenograft (p = 0.15). Neither group had postoperative infections, though xenograft had a complication rate of 1% with 2 patients while the polylactic acid skin substitute had 0%. Polylactic acid skin substitute patients had an average hospital cost of $28,415 and xenograft patients an average of $27,935 (p = 0.80).

Conclusions: A polylactic acid skin substitute is equivalent to porcine xenograft in LOS, postoperative pain, postoperative dressing changes, and cost in the setting of similar age, burn etiology, and %TBSA. More analysis with wound healing indices and safety profiles could determine the clinically superior choice.

ASCS Treatment Impact on Length of Stay Data and Costs for Patients with Small Burns
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Introduction: Small burns with a total body surface area (TBSA) of < 20% account for the large majority (92%) of burn injury hospital admissions. Autologous skin cell suspension (ASCS) is a novel treatment for acute thermal burn injuries – including small burns – that is associated with significantly lower donor skin requirements than split-thickness skin grafts, the traditional standard of care (SOC). The ASCS treatment indication was recently expanded from adult patients to include pediatric patients. Previously modeled analyses suggested that ASCS use is associated with a lower hospital length of stay (LOS) and costs savings versus SOC. This study evaluated whether real-world data (RWD) corroborate these findings in small burns and in both adult and pediatric populations.

Methods: Data were collected from January 2019 through August 2020 from 500 facilities in the United States. Adult patients (age ≥ 21) and pediatric patients (< age 21) receiving inpatient burn treatment with ASCS were identified and matched to patients receiving SOC based on sex, age, TBSA < 20%, and comorbidities. Based on typical BEACON model outcomes, LOS was assumed to account for 70% of total costs and was used as a proxy to assess the data. LOS was assumed to cost $7,554 per day. Mean LOS and costs were calculated for the ASCS and SOC adult and pediatric cohorts. The incremental revenue associated with changes in inpatient capacity was also analyzed.

Results: A total of 151 ASCS and 2,243 SOC adult cases and 19 ASCS and 341 SOC pediatric cases were identified. In adults, the SOC cohort had a higher percentage of patients with TBSA < 20% than the ASCS cohort (82.9% vs. 55.0%). For small burns, sixty-three matches were made for each adult cohort, and seven matches were made for each pediatric cohort. For adults, LOS was 18.5 days with ASCS use and 20.6 days with SOC use (difference: 2.1 days [10.2%]). For pediatrics, the ASCS LOS was 18.6 days, and the SOC LOS was 20.6 days (difference: 2.1 days [10.2%]). This difference led to cost savings of $15,587.62 per adult ASCS patient. Total cost savings with ASCS adult patients were $22,268.03 per patient. The reduced LOS with ASCS adult patients resulted in an increased capacity of 2.0 inpatients per bed per year, which was estimated to increase hospital revenue by $83,894 per burn unit bed annually. Pediatric cost results and savings were similar.

Conclusions: Conclusion: This RWD analysis shows that small burn treatment with ASCS is associated with reduced LOS and substantial cost savings compared with SOC in both adult and pediatric populations, supporting the validity of previous model projections. ASCS use may also significantly increase hospital revenue related to increased inpatient capacity.
Introduction: Diabetes Mellitus (DM) is an epidemic in the US that complicates the treatment of burn injuries. Lower extremity burns in diabetic patients, particularly the feet, are challenging problems with predictably unfavorable outcomes, as demonstrated by single-institution studies. National evaluations are absent, especially with regard to limb salvage. We aim to characterize lower extremity burns in persons with DM and evaluate the likelihood of amputation. We hypothesize that the incidence of DM associated foot burns is increasing in the US, and these patients are more likely to undergo lower extremity amputation than those without DM.

Methods: The National Trauma Data Bank (NTDB) was queried from 2007-2015 extracting encounters with primary burn injuries of the feet using International Classification of Diseases (ICD) 9th Edition codes. DM is a predefined comorbidity within the NTDB, allowing for cohort comparisons. Logistic regression modeled predictors of lower extremity amputation. Patient covariates included age, sex, race/ethnicity, and comorbidities. Burn covariates included % burn total body surface area (TBSA), mechanism, and region of burn center. Poisson regression evaluated for significance in temporal changes in DM foot burns.

Results: There were 116,796 adult burn encounters of which 7,963 (7%) had foot burns. Of this group, 1,308 (16%) had DM. DM foot burn encounters were older, more likely to be male, and had more comorbidities than non-DM foot burn encounters (all p< 0.001). DM foot burn encounters were more likely to sustain a scald injury (compared to flame) and had smaller %TBSA (all p< 0.001). Additionally, 5.6% of encounters with DM foot burns underwent amputation compared to 1.5% of non-DM encounters (p< 0.001). Independent predictors of lower extremity amputation included DM (OR 3.70, 95% CI 2.98 – 4.59), alcohol use, smoking, chronic kidney disease, burn size >20%, African American/Black race, male sex, and age >40 years (all p< 0.01). The incidence of DM foot burns increased over the study period with an incidence rate ratio (IRR) of 1.09 (95% CI 1.07 – 1.12, p< 0.001).

Conclusions: In the largest cohort study to date, DM was associated with nearly a 4-fold increase in amputation after adjusting for available confounders. Furthermore, the incidence of DM foot burns is increasing. Strategies for optimizing care in persons with DM foot burns are need to improve limb salvage.

Introduction: Despite advancements in burn care, the optimal treatment to prevent or treat hypertrophic scars is still elusive. Therefore, the objective of this study is to compare the efficacy of five glucocorticoid medications commonly used in the treatment of hypertrophic scarring in burned patients using a large patient database.

Methods: Patients diagnosed with hypertrophic scarring, hypertrophic disorders of the skin, or scar conditions and fibrosis of skin at least one day after burn injury were identified in the TriNetX database. Hydrocortisone, methylprednisolone, dexamethasone, triamcinolone, and prednisone were the glucocorticoids investigated. Those who received a glucocorticoid on the same day or any time after the incidence of burn injury were compared to those who did not take glucocorticoids in the previous five years. Patients were stratified into four groups based on percent total body surface area (TBSA) burned: 0-9%, 10-19%, 20-39%, and 40-100%. A total of 165,041 burned patients were found who did not receive glucocorticoids, and 66,652 burn patients who received glucocorticoids after injury. Statistical analysis for comparison included a risk ratio with a significance defined as a p-value < 0.05.

Results: In all burn patients identified, the risk of hypertrophic scar diagnosis was reduced with methylprednisolone (RR=0.60, p< 0.001) and prednisone (RR=0.37, p< 0.001), while it was increased with dexamethasone (RR=2.48, p< 0.001). Stratification based on %TBSA burned showed that diagnosis of hypertrophic scarring was reduced in the < 10% TBSA group with methylprednisolone (RR=0.49, p< 0.001) and prednisone (RR=0.33, p< 0.001), while it was increased with dexamethasone (RR=3.6, p< 0.001). Similarly, in the 10-19% TBSA group, the risk was reduced with prednisone (RR=0.57, p=0.024) while increased with dexamethasone (RR=2.2, p< 0.001). No significant effect was observed with hydrocortisone or triamcinolone with any of the %TBSA groups examined. Patients treated with dexamethasone continued to show increased risk for hypertrophic scar diagnosis.
Conclusions: While methylprednisolone and prednisone decreased the risk of hypertrophic scarring diagnosis among all burn patients identified, dexamethasone showed an increased risk of hypertrophic scarring diagnosis in all burn patients and in each %TBSA stratified group.

Introduction: In burn surgical care, wound coverage and the corresponding dressing are paired to maximize the ability to promote re-epithelization, minimize pain and patient discomfort, dressing change frequency and overall cost. This dressing, a copolymer material based on DL lactic acid, has been described as a reliable alternative dressing for partial thickness burns as well as skin graft donor sites with comparable wound-healing quality and duration. Our aim is to assess outcomes results of this copolymer dressing at our institution, as applied to partial thickness burn wounds and graft donor sites.

Methods: We performed a retrospective analysis of 55 adult patients admitted between January 1, 2020 to August 25, 2021 for the treatment of partial thickness burns that were managed with a poly-DL-lactide copolymer skin substitute at the burn wound and/or autograft donor site. Three study groups were established based on application site: wound only (group 1), donor site only (group 2), and both (group 3). We assessed operative times, infections rates, complications, length of stay, readmission rates, and mortality.

Results: Preliminary data of 40 patients shows clinically similar results for analgesic requirements, operative length, and hospital LOS between group 1 and group 3. Group 2 showed higher analgesic requirements, lower operative times, a lower LOS, and lower readmission rates. Group 3 shows higher pain levels and longer operative times, when compared with groups 1 and 2, but lower readmission rates than group 1.

Conclusions: The poly-DL-lactide copolymer skin substitute offers reliable wound coverage for a partial thickness burns while also reducing frequency of dressing changes and associated pain correlating to reduced length of hospital stay and wound healing interval.
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97 Arterial Waveform Variations as Measures of Resuscitation Adequacy in a Porcine Model of Burn Injury

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Introduction: Optimized fluid resuscitation of burn patients is a clinical care challenge as both under- and over- resuscitation have deleterious consequences. The gold-standard endpoint guiding burn resuscitation is urinary output (UO), which is known to have limited efficacy. We investigated the potential of the dynamic indices of fluid responsiveness derived from arterial blood pressure (BP) waveforms in conveying information about burn resuscitation. In particular, we investigated pulse pressure variation (PPV) and systolic pressure variation (SPV), which have been shown to be valuable in a number of other indications.

Methods: We conducted a retrospective analysis of arterial BP waveform data acquired from six anesthetized and mechanically-ventilated pigs (33±5 kg weight and 40% total burn surface area) which were instrumented for hemodynamic monitoring for 24 hours. The animals were either under-, over-, or adequately-resuscitated (guided by a burn resuscitation decision support system), with two animals in each group. PPV and SPV were calculated on an hourly basis. Fluid responsiveness thresholds of 15% and 6% were used respectively for PPV and SPV, as per literature.

Results: All of the animals experienced an immediate rise in PPV and SPV following the injury (PPV and SPV start from large values as seen in Fig. 1 and Fig. 2). In the under-resuscitated group, PPV and SPV increased above the threshold, reaching maximum values in the last eight hours (PPV: 49.8±20%, SPV: 24.7±3.6%), indicating severe hypovolemia. In the over-resuscitated group, PPV and SPV decreased below the threshold, reaching their minimum in the last eight hours (PPV: 8.7±3.6%, SPV: 4.1±1.9%), indicating major hypervolemia. In the adequately-resuscitated group,
PPV and SPV maintained closer to the threshold throughout the duration of the experiment, and at the end, PPV was 15.6±4.2% and SPV was 6.2±2.6%.

Conclusions: Our initial results suggest that PPV and SPV may help distinguish under-, adequately-, and over-resuscitated burn patients, and potentially complement UO in the hemodynamic assessment of the burn injury patients.

Introduction: Extracellular microvesicles (MVs) have emerged as key regulators of immune function across multiple diseases and potential biomarkers. Severe burn injury is a devastating trauma with significant immune dysfunction that results in an ~12% mortality rate due to sepsis-induced organ failure, pneumonia, and other infections. Severe burn causes a biphasic immune response: an early (0-72 hrs) hyper-inflammatory state, with release of pro-inflammatory damage-associated molecular pattern molecules (DAMPs), such as HMGB1, and cytokines (e.g. IL-1b), followed by an immunosuppressive state (1-2 weeks post injury), associated with increased susceptibility to life-threatening infections. We have reported that early after severe burn injury HMGB1 and IL-1b are enriched in plasma microvesicles (MVs), suggesting a role for MVs in post-burn immune activation. Here we tested the impact of MVs isolated after burn injury on phenotypic and functional consequences in vivo and in vitro using adoptive MV transfers.

Methods: We then assessed if the cargo of MVs following burn injury in humans could predict length of hospital stay. MVs isolated early from mice that underwent a 20% total body surface area (TBSA) burn injury (burn MVs) caused similar cytokine responses in naïve mice to those seen in burned mice early after injury. Burn MVs transferred to RAW264.7 macrophages caused similar functional (i.e. cytokine secretion) and genetic changes (measured by NanoString™) seen with their associated phase of post-burn immune dysfunction.

Results: Burn MVs isolated early (24h) induced MCP-1, IL-12p70 and IFNg, while MVs isolated later (1 and 2 weeks) blunted RAW pro inflammatory responses to bacterial endotoxin (LPS). Unbiased LC-MS / MS proteomic analysis of early EVS (< 72 h post-injury) showed similarities in human and mice.

Conclusions: In our sample of large burn injury, EV SAA1 and CRP correlated with TBSA injury in both sexes and were correlated with length of hospital stay in women.
**Introduction:** Patients with major burn injury (BI) often develop muscle wasting (MW) and mitochondrial dysfunctions (MD), which affect their prognosis. We have recently shown that auto/mitophagy response is defective in BI model and can be mitigated by trehalose treatment. Though auto/mitophagy is widely accepted as the quality control (QC) system of cellular components including mitochondria, the relationship among MD, auto/mitophagy response defect, and MW was unclear. Furthermore, to evaluate MW precisely by morphometric analyses was difficult, due to the heavy workload of counting the size of muscle cross sectional area manually and analyzing the data. Thus, we have set up a streamline of whole section image capturing, analyzing with cutting edge deep learning-based method, processing it via image J-based program. Using this system, we have tested the efficacy of trehalose on mitigating MW in BI-treated mice.

**Methods:** First, the effect of auto/mitophagy modulator on normalizing defective auto/mitophagy maturation was confirmed by in vivo microscopy of tIFC3-expressing mice with BI (30% BSA) or sham-burn (SB) control. A mitophagy inducer, CCCP was injected to induce mitophagy, and the auto/mitophagosome maturation was monitored with or without trehalose treatment. In a separate experiment, tibialis muscles were harvested at post-burn day (PBD)-7, with or without trehalose treatment (2g/kg/day, i.p.), cryosectioned, and stained by anti-laminin antibody. The entire tissue cross-sectional microscopic images were captured, fed into a cellpose, and processed in ImageJ and Prizm for automatic calculation of the cross sectional area (CSA).

**Results:** In vivo microscopic monitoring of auto/mitophagosome maturation revealed BI-induced maturation defect when treated by CCCP, which was rescued by trehalose treatment. Next, with MW analysis experiment, cross-sectional morphometric analysis of tibialis anterior myofibers showed a typical bi-phasic pattern of CSA distribution (large size population and small size population) in the control group. BI treatment showed a significant CSA decrease in both populations, which was effectively treated by trehalose. The average CSA was as follows (1843.0, 1245.3, 1683.9 for SB control, BI, BI+trehalose, respectively, in micron^2), and in accordance with manual counting measurement.

**Conclusions:** Normalizing defective auto/mitophagy response was shown an effective therapeutic approach to mitigate BI-induced MW. Deep learning-based size counting method is a feasible technique for a systematic MW analysis. Note that in our data, trehalose does not function in increasing the basal level of autophagy, but it mitigates the defective response of auto/mitophagy to the auto/mitophagic stimulation, by normalizing the maturation process.

**Introduction:** Major burn injury (BI) is associated with excessive inflammation. We have reported autophagy/mitophagy response defect in skeletal muscles in BI, leading to diminished homeostasis capability of cells and mitochondria. Macrophages play central roles in the process of wound healing, from causing inflammation, clearing cell debris, to coordinating tissue repair. Classically, M1 macrophages are considered as pro-inflammatory phenotype, and M2 as anti-inflammatory/pro-regeneration phenotype, though complexity of constituent of macrophage subpopulations, being increasingly recognized. The relationship between BI-induced autophagy/mitophagy defect and the regulation of macrophage polarity in BI has not been studied so far.

**Methods:** Body trunk BI covering 30% of body surface area or sham-burn (SB) treatment was administered to wild type mice. At post burn day (PBD) 5, mechanical injury was created in sternomastoid muscles (STM) by pressure injection of saline into the tissue (>3x fracture toughness) to study effect of BI on the wound healing process in muscles. STMs were harvested at post surgical day (PSD)1, 3, 7 and 14, and cryosectioned for immunohistochemistry against satellite cells (pax7), and macrophages (CD86 for M1, CD206 for M2, and F4/80 for general). As a therapeutic approach, we tested the effect of auto/mitophagy modulating drug, trehalose, whose pro-auto/mitophagy effect has been attributed to mitigation of the blocked flux of auto/mitophagy (due to BI) in our separate studies.

**Results:** SB control group showed both total and M1 macrophage numbers chronologically decreasing from PSD1 towards PSD14. BI caused delay in the subsiding of the macrophage infiltration. The greater majority of the macrophage in BI was CD86 (+) M1 phenotype, confirming the pro-inflammatory traits in BI (+46.4% of SB at PSD7). Contrarily, CD206 (+) M2 macrophage started from low numbers at PSD1 and increased towards PSD7 and 14 in SB. In BI, however, M1/M2 conversion was markedly delayed (~59% of SB at PSD7), which was mitigated by trehalose (~134% of BI at PSD7). Pax7 (+) muscle satellite cells increased from PSD1 towards PSD14 in SB, but the response was prominently defective in BI, and was normalized by trehalose.

**Conclusions:** M1 to M2 conversion observed in SB was defective in BI with concomitant defect in satellite cell proliferation. Autophagy/mitophagy treatment drug, trehalose mitigated the phenotype conversion defect in macrophage.
101 Adrenergic Receptor Expression Is Increased in Carotid Smooth Muscle from Severely Burned Rats

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Introduction: Severe burn disrupts cardiovascular function which can lead to critical shock. To counteract cardiovascular collapse, there is a systemic increase of catecholamines released in response to severe burn. Previous studies showed that β-adrenergic receptor (AR) protein expression was significantly increased in the cardiac right ventricles (RV) following burn injury, which is correlated with compromised cardiac dysfunction. Vascular smooth muscle contraction served to modulate blood pressure and improve circulatory perfusion. We hypothesize that ARs expression in major arteries are modified to initiate vascular functional changes following severe burn. In the current study, we report temporal ARs expression in murine carotid artery smooth muscle following severe burn.

Methods: Thirty-four adult Sprague-Dawley male rats received a 40% total body surface area (TBSA) scald burn followed by fluid resuscitation using the Parkland formula. Control animals received a sham burn procedure. Animals were serially euthanized between 6 hours and 14 days after burn and endothelium-intact common carotid arteries were harvested for histological analysis.

Results: Immunohistochemical staining data demonstrated expression of adrenergic receptors (AR) (α1, α2, β1, and β2) were differentially changed in response to injury over time. α1a-AR expression significantly increased within the carotid artery tunica media 7-days after burn (p< 0.05). As a negative feedback of inhibitory of norepinephrine signaling, AR-α2a expression did not significantly change. AR-β1 expression also had no change over time after burn. Interestingly, functioning to relax vascular smooth muscle, a significant elevation of β2-AR expression within the carotid artery tunica media was observed only at 1-day after burn (p< 0.05).

Conclusions: In summary, immunohistochemistry showed that carotid arterial adrenergic receptor expressions of α1a-AR and β2-AR are significantly altered in response to severe burn, which may contribute to vascular contractility in burn rats.

102 Vaping of Vitamin E Acetate Causes Acute Lung Injury in a Dose-dependent Manner in Sheep

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Introduction: The Centers for Disease Control and Prevention and the Food and Drug Administration have reported an increasing number of clinical cases of pulmonary injury following the use of e-cigarette/vaping products. Although the causative factors for the national outbreak of electronic-cigarette, or vaping product use-associated lung injury (EVALI) has not been established, CDC reported that vitamin E acetate (VEA) is strongly linked to the EVALI outbreak. In this study, we tested the hypothesis that VEA vaping causes acute lung injury in a dose-dependent manner in a sheep model.

Methods: Sheep were surgically prepared under anesthesia and analgesia with multiple vascular catheters (pulmonary arterial, left atrial, and femoral arterial). To assess pulmonary edema, the mediastinal lymph node vessel draining the lung was cannulated. After a 5-day surgical recovery, a tracheostomy tube and urinary catheter were placed. Then, the sheep were placed on a mechanical ventilator and VEA vaping was immediately started in the following groups: (1) vaped with glycerol (n=1); (2) vaped with 0.4mg of VEA (n=2); (3) vaped with 0.6mg of VEA (n=1); (4) vaped with 0.8mg of VEA (n=7); and (5) not injured, not treated (Sham, n=6). Sheep were resuscitated with lactated Ringer’s solution (4mL/kg/hr). Sheep in a conscious state was monitored with 4 hrs intervals for cardiopulmonary variables for 48 hrs.

Results: Pulmonary gas exchange, represented by the PaO2/FiO2 ratio, was unchanged in sham, glycerol, and 0.4 mg VEA groups. In the 0.6 VEA group, the PaO2/FiO2 ratio was decreased from 42 to 48 hrs, while in the 0.8 mg VEA group, it was strongly decreased starting at 24 hrs and remained low throughout the remaining period. Lung lymph flow, an index of pulmonary microvascular permeability, was increased more than 2-fold in 0.6 and 0.8 mg VEA groups. Lung compliance also tended to decrease in all VEA groups.

Conclusions: VEA vaping causes acute lung injury in a dose-dependent manner in sheep. Further studies should investigate underlying mechanistic aspects that cause increased microvascular permeability.
**Differences in Estradiol Levels Following Burn Injury**

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**Introduction:** The American Burn Association estimates over one million people with burn injuries in the US need medical care, with around 4,500 cases ending in mortality each year. Mortality is due to bacterial infection as a consequence of severe cytokine dysregulation and impaired wound healing. Previous research has shown females have worse outcomes than males following burn injury, but the reasoning is unknown. Estradiol is involved in the regulation of local and systemic interleukin-6 (IL-6) levels, which has been demonstrated by others to positively correlate with poor outcomes following burn. We hypothesize that concentrations of estrogen can create a pro-inflammatory effect in epithelial cells, which is controlled in a negative feedback loop.

**Methods:** We utilized plasma from 1) human burn patients and 2) our murine model of burn injury, in which C57BL/6 mice are exposed to a 20% total body surface area burn injury and 3) an *in vitro* cell model using human Oral Epithelial Cells (OECs) and human Airway Epithelial Cells (AECs).

**Results:** We measured human estradiol levels 1-3 days after burn injury and murine estradiol levels 3 and 7 days after injury by ELISA. In humans there were differences in levels at these timepoints (*p* < 0.05). In mice we observed a difference in the change in murine estradiol levels between males and females 7 days after injury (*p* < 0.01). We stimulated a wound by removing the cell insert and treating cells with concentrations of estradiol (0.1 nM, 1.0 nM & 250 nM). Images were taken at 0, 6 & 24 H and analyzed using Fiji to observe wound closure. Supernatant was removed from cells at 24 H and analyzed for IL-6 levels (a key pro-inflammatory cytokine linked to poor wound healing after burn) via ELISA. mRNA was isolated from cells and analyzed for IL-6, TNFα & VEGF (important regulators of wound healing) via PCR. We observed an increase in percent wound closure in the AECs, and no difference in OECs. We observed an increase in IL-6 production following stimulation with Estradiol and LPS at different rates for each cell type and corresponding reduction in TNFα and VEGF expression. We also described different Estradiol Receptors in the two cell types.

**Conclusions:** Taken together, these data suggest burn injury upregulates estradiol in both humans and mice following burn injury whereby this is more robust in females at later stages of burn injury and thus contributing to female-associated poor clinical outcomes.

**Parkin-independent Pathway of Mitophagy as a Potential Target Mitochondrial Dysfunctions in Burns**

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**Introduction:** In many critical illnesses including burn injury (BI), muscle wasting (MW) with mitochondrial dysfunction (MD) leads to poor prognosis. Disturbed mitochondria can normally be turned over by autophagic degradation of mitochondria (mitophagy). We have previously observed that BI causes disturbed mitophagy response in skeletal muscles both in vivo and in the cultured myocytes, a potential mechanism for BI-induced MD. These previous findings have lead to the expectation that augmenting mitophagy will rescue mitochondrial functions and can help treating the BI-induced MW and MD. There have been, however, limited research tools to specifically intervene (or augment) mitophagy. In the current study, we have established mitophagy-compromised cell strains by CRISPR/Cas9-mediated knocking out of BNIP3L, a pivotal molecule mediating parkin-independent mitophagy induction. Deferiprone (DFP), a recently established mitophagy inducer, had previously been known to exert cellular and organ protective functions, but the mechanisms of its beneficial effects were not investigated in detail. Nor has its efficacy been tested on BI-induced MD.

**Methods:** First, whether DFP stimulated mitophagy induction causes translocation of mitophagy markers into mitochondrial fraction, was tested by Western Blotting on the WT C2C12 cells against Parkin/PINK1- and BNIP3L-pathway molecules. Next we established BNIP3L knockout C2C12 myoblast cell line by CRISPR/Cas9-mediated gene deletion. Using both WT and BNIP3L knockout (KO) cell lines incubated in the BI or SB serum (from 30% rat burn at 3PBD) with or without DFP treatment, we tested whether DFP can rescue BI-induced upregulation of mitochondrial-derived superoxide (SO) using MitoSOX staining.

**Results:** In WT C2C12 cells, mitophagy stimulation by DFP caused robust increase of the protein amount of BNIP3L in the mitochondrial fraction, but Parkin/PINK1 did not. KO completely abolished both basal and stimulated increase of BNIP3L. BI serum caused significant elevation of mitochondrial SO in WT myocytes (>20 fold of SB), which was ameliorated by DFP-stimulated mitophagy augmentation (95% reduction). In KO C2C12 cells, however, DFP-induced SO reduction in BI serum was completely abolished, suggesting that DFP-mediated mitochondrial protection against BI was through augmenting mitophagy via BNIP3L pathway.

**Conclusions:** By using BNIP3L KO C2C12 myocytes, mitochondrial protective role of BNIP3L-mediated mitophagy against BI-induced stress was demonstrated for the first time. Previously reported cellular and organ protective functions of DFP is likely through activation of this pathway. Augmentation of mitophagy will be a promising therapeutic approach in protecting BI-induced MW and MD.
Results: NGRNs arriving at our unit in early 2020 were 5) Nurse Extern program 4) On-going preceptor education 3) Task trainers 2) Burn specific High-fidelity simulation scenario utilizing critical reasoning skills

Burn Specific Education includes: Competency based staged orientation program for new staff didactics/simulation/skills/unit orientation one on one with a preceptor

StaRN program: Burn Specific Education includes: Competency based staged orientation program for new staff didactics/simulation/skills/unit orientation one on one with a preceptor

Introduction: Recruitment efforts just after the recent COVID crises brought in several new graduate nurses. They had limited clinical exposure during COVID-19 resulting in difficulty transitioning into practice providing safe patient care. As a result, these nurses lacked the fundamental knowledge needed to care for acutely ill burn and wound patients resulting in the new graduate registered nurses (NGRNs) feeling overwhelmed at the bedside. These findings coincide with assessments noted in Kavanagh and Sharpnack’s (2021), article identifying only 9% of NGRNs were practice ready, with 7% failing to recognize urgency or a change in a patient’s condition.

Methods: In order to achieve the designated American Burn Association (ABA) competencies, our center designed a program based on Patricia Benner’s Novice to Expert nursing theory. Additionally, we divided the competencies into achievable goals and domains using the Donna Wright’s nursing competency model.

StaRN program: didactics/simulation/skills/unit orientation one on one with a preceptor

Competency based staged orientation program for new staff Burn Specific Education includes: 1) Burn and complex wound care didactic 2) Burn specific High-fidelity simulation scenario utilizing critical care equipment promoting critical thinking and critical reasoning skills 3) Task trainers 4) On-going preceptor education 5) Nurse Extern program

Results: NGRNs arriving at our unit in early 2020 were found to be incapable of performing clinical tasks in the burn ICU (BICU) setting at the level of competency recommended by the ABA. We immediately placed this cohort into the revised training program incorporating Benners Novice to Expert Theory and Wright’s Competency Model. Of the 25, 17 were able to be placed in the BICU (68%), and 8 were able to transfer to a lower level of care (progressive care/med-surg). All 25 were given extended orientation (12 weeks instead of the normal 8, as recommended by our facility). We will follow this group to determine retention rates.

Conclusions: Current levels of competencies by the ABA creates gaps in care for graduate nurses entering the workforce with deficits. Applying Benner’s Novice to Expert Theory and Wright’s Competency Model to modify approaches to training helps identify gaps in care, addresses areas that are weak for the nurse, and help guide the graduate nurse through stages of expertise to arrive more confidently at the level of competency expected by the ABA.
Conclusions: When comparing the data between the EMR to BN, it was observed that pre-hospital fluids tended not to be documented in the EMR, causing a statistically significant difference in total fluids administered in one burn center. Overall, the nursing documentation variability was minimal across all sites even though the nurses had to document the data in two different systems, while simultaneously caring for critically ill patients with large burn injuries. Close monitoring of the nursing documentation during burn fluid resuscitation should always be a priority.

107 Nursing Interventions in the Temperature Management of Acute Burn Patients in the Burn Operating Room

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Introduction: The development of hypothermia in the operating room is a known risk that has been well documented in the literature. The typical surgical patient undergoing general anesthesia experiences a temperature loss of approximately 4°F without warming interventions. Burn patients are at a higher risk for hypothermia due to the greater body surface area exposure and evaporative losses related to their burn injury and length of their operative interventions. The purpose of this review is to determine the average loss of body temperature of the burn surgical patient as it pertains to total body surface area (TBSA) injury and the use of warming interventions.

Methods: A two year retrospective review was performed on acute burn surgical cases in our two dedicated burn operating rooms within our burn center. Data obtained included TBSA of each case, pre and post-procedure patient temperatures, maximum OR room temperature, and use of adjunctive warming interventions. The surgical procedures were categorized by percent TBSA burn of < 10%, 10-20%, 21-40%, and >40%.

Results: We identified 415 cases that were included in this review from 2019 and 2020. As expected, patients with larger TBSA involvement led to a greater temperature decline. As seen in Table 1, forced warm air devices were utilized in 67.2% of cases. In our large Burn OR suite, we utilize a heat panel that is integrated in the ceiling above the OR table. Utilization of these devices is determined by the Burn OR nurse. They are either initiated prior to the start of the case or intra-operatively if the patient’s temperature is declining and intervention is required. Mean operating room temperatures were 80.1°F in all cases with cooler room temperatures in the smallest TBSA group. Our average patient temperature decline was 1.25°F in all cases. However, in the largest TBSA group, the mean temperature loss was 2.68°F which is significantly less than the 4°F loss in general anesthesia procedures without warming interventions.

Conclusions: The use of elevated ambient operative room temperatures along with other warming interventions aid in the maintenance of core body temperature in the burn surgical patient. Having dedicated burn operative nurses with investment in the outcome of the burn surgical patient contributes to the overall safety and the maintenance of temperature homeostatic state.
108 Development and Implementation of a Burn Nurse Educator

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Introduction: Prior to the introduction of the Burn Nurse Educator (BNE), at a growing and newly established burn center, the education of the Burn Trauma ICU staff was completed by the Burn Director and Burn Supervisor. In this burn center, large amounts of education became difficult to create and distribute by the current Burn Director and Burn Supervisor due to the demand of their respective job roles. The role of the BNE was to create initial and ongoing education for the Burn Trauma ICU Staff, Ortho-Trauma staff, ED staff, local EMS agencies, and the community.

Methods: The Burn Nurse Educator reviewed previous education that was provided to the staff, compared it to the Burn Nurse Competencies established by the American Burn Association, and was able to formulate a new education plan. The Burn Nurse Educator created several burn-based courses. These classes included: Floating into Burn Care, Burn Boot Camp, and Burns in the Pediatric Population. There was also the introduction of mock codes focused on the pediatric burn population. In addition to the formulation of these educational opportunities, the Burn Nurse Educator worked directly with the Quality Improvement Committee to find gaps in care. These gaps were then turned into project improvement plans and additional education was provided to the bedside staff. The Burn Nurse Educator formed relationships with local EMS agencies and was able to provide burn lectures and continuing education.

Results: Each class offered had a pre and post test administered, all with improved scores. A sample size of 30 nurses who enrolled in Burns in the Pediatric Population had a score increase from 46% to 94%. A sample size of 14 nurses had a score increase of 55% to 80% after enrolling in Floating into Burn Care. A sample size of 30 nurses who enrolled in Burn Boot Camp had a score increase of 71% to 95%. More importantly, the staff expressed a higher level of confidence when caring for a burn patient after these classes. The outreach with local EMS agencies also increased our EMS admits to the hospital, improved knowledge for caring for burn victims, and created a relationship with our local cities EMS.

Conclusions: It is anticipated that as the program continues to expand, the role of the Burn Nurse Educator will continue to grow and encompass new responsibilities. To ensure each nurse remains competent in their skill set, additional knowledge testing will be completed one year after a nurse has completed a class.

109 The Impact of Distance to Treatment Center on Long-term Outcomes of Burn Patients

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Introduction: Geospatial access to American Burn Association (ABA)-verified burn centers or self-designated burn care facilities varies across the country. It is often necessary to transport patients hundreds of miles to provide definitive burn care and rehabilitation services. This study evaluates the impact of distance to treatment center on long-term outcomes of burn patients.

Methods: Data from the National Institute on Disability, Independent Living, and Rehabilitation Research Burn Model System (BMS) National Database, collected from 2015 to 2019, were analyzed to investigate the impact of distance to BMS center on long-term, patient-reported outcomes. Distance was calculated as driving distance between home zip code centroid and BMS center. Demographic and clinical data were compared between groups by distance from BMS center (< 20, 20-49.9, >50 miles). The following patient-reported outcome measures, collected 12 months after injury, were examined: Veterans Rand 12 Physical Component Summary Score (VR-12 PCS), Veterans Rand 12 Mental Component Summary Score (VR-12 MCS), Satisfaction with Life (SWL), employment status, and days to return to work. Mixed regression model analyses were used to examine the associations between distance to BMS center and each outcome measure, controlling for demographic and clinical variables.

Results: Of the 726 participants included in this study, 191 (26.3%) and 204 (28.1%) were < 20 and between 20-49.9 miles from a BMS center, respectively; 331 (46.6%) were >50 miles from a BMS center. Greater distance to BMS center was associated with white race/ethnicity (p < 0.001) and employment at time of injury (p = 0.001). Greater distance to BMS center was also associated with flame injury (p < 0.001) and larger burn size (p < 0.001). There were no significant differences in length of stay or number of operations between groups. Regression analyses did not identify significant associations between distance to BMS center and VR-12 PCS, VR-12 MCS, SWL, employment at 12 months, or days to return to work.

Conclusions: After burn injury, patient-reported outcome measures of physical and psychosocial function, as well as employment, do not differ based on distance to BMS center.
Introduction: The care of burn injuries requiring hospitalization is complex and highly specialized. In-hospital treatment results in discharging patients with stabilized, but unhealed wounds with the need for ongoing care. The expectation is that wounds continue to heal without complication. For patients who are unable to be discharged home, disposition is frequently dictated by finance and payor source. Post-acute facilities such as Skilled Nursing facilities (SNF), Acute Rehabilitation Centers (ARC) and Long-term Acute Care facilities (LTAC) are utilized. The purpose of this study was to evaluate the wound healing in patients being sent to SNF and ARC.

Methods: A retrospective chart review of patients discharged to a SNF or ARC over a one-year period was performed. Photographic review was done comparing photos from the first clinic visit to those from hospital discharge. Wounds were designated as “Improved” (IM) or “Worsened/No Change” (W/NC) by a single burn surgeon.

Results: Of the 963 charts reviewed, 719 patients suffered burn injuries, and of these 127 were discharged to post-acute facilities, 54 were either discharged to a LTAC or did not have photos available for review at their first clinic visit. Thus 73 were evaluable. The majority, 51% (n=37) worsened or showed no change (W/NC) and 49% (n=36) improved (IM). All patients returned to clinic within the first 2 weeks of discharge. There were no significant differences for age, gender, BMI, comorbidities, substance abuse, living situation, ICU days, ventilator days, length of stay, number of surgeries, payor source or facility type (SNF vs ARC). Mean TBSA was greater in IM 13.99% vs W/NC 8.31% (p=0.018). There were no significant differences between groups for mechanism, although IM was more likely to have suffered a flame/flash injury (n=20) and W/NC contact burns (n=21). A total of 30 different facilities were utilized for discharge.

Conclusions: Despite having smaller burn injuries, the majority of patients worsened if discharged to a post-acute facility. No patient factors were identified that were associated with worsening/no change in wound status at the first clinic visit post discharge. Given the number of discharge facilities utilized, we were unable to analyze the relationship between specific facilities and outcomes. The magnitude of the problem warrants further investigation. A Quality Improvement project is being developed to further identify areas for intervention.
112 Developing Outpatient Registry to Capture Data Post Hospitalization

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Introduction: Per the 2019 ABA re-verification requirements, a burn center must see ≥75% of all inpatients (IP) who require an outpatient (OP) follow-up after discharge. In prior years, we utilized the inpatient registry and built a report to track patient follow-up. With the report, we were able to compare the number of Burn Clinic return patients against admissions to get the percentage. This process required hours of focused effort. We sought to optimize the process for determining IP follow-up at our ABA verified burn center. In addition, we hoped to better quantify the efficacy of our OP clinic.

Methods: An OP registry was developed in December 2019 utilizing an automated report from our electronic medical record (EMR) and imported into a custom built, secure, web-based software platform designed to support data capture for research studies. Employing various automation techniques, we were able to eliminate the need for manual abstraction by our burn registry team. Metrics tracked in the OP registry included: type of patient visit (New Patient, Return Patient, and Telehealth), diagnoses, zip-codes of patient residence, payer methods, and total number of clinic encounters per year. We collected data from January 2020 through the present, with 2020 being the first full year in the OP registry. The initial effort required to design, automate, and import data was approximately 18 hours. The report import takes approximately 5 minutes.

Results: The OP registry has given us the ability to create a multitude of graphs from the OP clinic data, like the one shown. During the review period our OP clinic saw patients from 19 different US states, encompassing 2,710 total OP visits. The median number of monthly OP clinic visits was 235 [IQR 210-246], see graph 1. The median number of clinic visits per patient was 2 [IQR 1-4]. The majority of clinic visits were return patients (55%, n = 1595), new patients (31%, n = 914), and telehealth visits (14%, n = 399). Finally, our analysis of the OP Clinic Registry demonstrated that we saw 82% (309/374) of inpatients that required follow-up care, exceeding the expected 75% by the ABA.

Conclusions: The creation of an automated OP registry can assist the tracking of discharged patients and reduce the amount of effort needed to track ABA required metrics. In addition, this OP registry can be expanded to track both IP and OP outcomes. This is crucial for quality improvement for the burn program as a whole.

Correlative XV: Medical Care Non-Critical

114 Long Term Impact of Hospital Acquired Multi-drug Resistant Organisms on Health-related Quality of Life

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Introduction: MDROs colonize wounds and cause infections for hospitalized burn patients, which may lead to increased infection risk, wound complications, longer (LOS) and more cost. Little is known about the long-term impacts of MDRO colonization and infection on burn survivors. We aimed to describe the impacts of colonization on long-term health-related quality of life (HRQoL), itch, and pain.

Methods: Data from adult participants in a multicenter longitudinal outcome study were used. Data was described and χ² and Kruskal-Wallis testing was applied to determine differences between the two groups. Outcomes included Veterans RAND 12 (VR-12) physical component summary score (PCS), and PROMIS 29 domains for pain intensity, fatigue, pain interference, physical function, and sleep disturbance. Pruritus was assessed using the 4-D Itch scale for total itch. Multilevel, multiple linear regressions were used for outcome measures at 6 months post-injury. Random effects regression with robust standard errors (SE) were used to evaluate the impacts over time.

Results: The study included 704 individuals and 92 were MDRO colonized (13%). Colonized patients had larger burns (25% TBSA, IQR 9.45 - 8.8% TBSA, IQR 3 - 20; p < .001), more operations (4, IQR 2.7 vs. 1, IQR 1 - 3; p < .001), more grafting (17% TBSA, IQR 3.46 vs. 3% TBSA, IQR 1 - 9; p < .001), more ventilator days (2, IQR 0 - 8 vs. 0, IQR 0 - 0; p < .001), and longer LOS (34 days, IQR 17 - 64 vs. 16, IQR 9 - 27; p < .001). Adjusting for confounding covariables, such as demographics, colonization was associated with a lower PCS score (OR -0.33, 95% CI -0.68, -0.06; p = .018); a higher fatigue score (OR 0.46, 95% CI 0.13, 0.79; p = .007) and worse itch (OR 0.4, 95% CI -0.01, 0.75; p = .036). There was no association with pain intensity, pain interference, or sleep disturbance. Random effects regression indicated that colonization was associated with lower PCS (OR -5.0, 95% CI -8.60, -1.39; p = .007).

Conclusions: Impact of colonization extends beyond the immediate hospitalization and likely has long-term effects on HRQoL. Given our observation of lower physical function after MDRO, more granular research on taxa-specific effects, timing of colonization, and interventions are indicated to elucidate the impact on HRQoL.
Analyzing Temporal Trends and Outcomes Associated with High Prevalence Bacterial Infections in Burn Patients

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Introduction: Bacterial infections are a leading cause of complications in burn patients. However, ambiguity remains around the most common infectious etiologies and their resulting complications. Our study identifies which bacterial infections will lead to specific complications and tracks infection rates of these bacteria over time.

Methods: Burn patients diagnosed with a bacterial infection within 6 months of burn were identified in the TriNetX database using ICD-10 codes; those with bacterial infections prior to injury were excluded. Occurrence of the following outcomes within 12 months of injury were compared for those with bacterial infections and those without, including acute kidney injury (AKI), congestive heart failure (CHF), hypertrophic scarring, sepsis, and death. The top 4 bacterial infections, by incidence, were then identified and analyzed for the outcomes. Lastly, infection rates were stratified by year from 2010-2020. Data was analyzed using chi-square with p < .05 considered significant, and regressions.

Results: We identified 457,383 burn patients, of whom 4,688 (1.0%) were diagnosed with a bacterial infection within 6 months of injury. The bacteria that constituted the highest proportion of infected patients were *Staph aureus* (51.1%), *E. Coli* (20.2%), *Pseudomonas* (17.6%), and *Enterococcus* (9.6%). When outcomes were stratified by bacteria, *Enterococcus* infection was associated with the highest incidence of AKI (23.1%), sepsis (25.2%), and mortality (16.03%). *E. Coli* was associated with the highest incidence of CHF (17.7%) and *Pseudomonas* was associated with the highest incidence of hypertrophic scarring (13.3%). All data was found to be statistically significant (p< .05). Time trend data from 2010 to 2020 stratified by bacterial infection is displayed in Figure 1. Of note, *Pseudomonas* infection rates increased by 33% (r² = 0.7223). In contrast, *Staph Aureus* infection rates have decreased since 2013. Lastly, *Enterococcus* infection rates displayed a fluctuating pattern with an increasing trend since 2017.

Conclusions: Species identification of a post-burn bacterial infection is an important step in outcome management. Despite its low incidence, *Enterococcus* infection was associated with the highest incidence of AKI, sepsis, and mortality, and has displayed recent increases in infection rates. *Pseudomonas* has shown a similar increasing trend and is notable for hypertrophic scar formation.
Introduction: Burn patients often experience a tremendous amount of pain and anxiety during dressing changes and other procedures, frequently requiring a moderate sedation (MS) or deep sedation (DS) for successful completion. We previously reported our primarily Nurse Practitioner-based model for procedural sedation but recently transitioned to a primarily hospitalist-based sedation service. We evaluated the clinical and financial impact of this transition.

Methods: Retrospective chart review of patients undergoing MS or DS from June 2019 to June 2020 (burn provider-based [BPB]) and August 2020 to August 2021 (hospitalist-based [HB]). Data included demographics, number and types of sedation, provider type, American Society of Anesthesiology Physical Status Classification (ASA score), complications and relative value units (RVU)/anesthesia units generated. Our hospitalist completed a combined Internal Medicine-Pediatrics residency and is credentialed by the institution for procedural sedation.

Results: During the BPB sedation timeframe, 263 patients were admitted to the burn center, of which 55 patients (21%) underwent 203 sedations (average: 3.6 sedations/patient). Twenty-one (10%) were DS. The most common medications used for DS were a combination of Midazolam, Fentanyl, Glycopyrrolate and Ondansetron (81%); and for MS, a combination of Fentanyl and Midazolam (77.5%). Ten percent of patients had an ASA of 3 or greater. During the HB sedation timeframe, 203 patients were admitted, of which 73 patients (36%) underwent 353 sedations for an average of 4.8 sedations/patient. Ninety-one (26%) were DS. Medication combinations were similar as above for DS (90%) and MS (93%). Nineteen percent of patients had an ASA of 3 or greater.

Our hospitalist performed 16% of the sedations in the BPB timeframe and 72% in the HB timeframe. In the BPB group there were 4 desaturation events (0.02%) among all sedations, compared to 8 desaturation and 1 hemodynamic change events (0.025%) in the HB group. Total work relative value units (wRVUs) and anesthesia units of service (for the DS) generated were 599.6 and 133 respectively in the BPB group compared to 1104.2 (84% increase) and 784 (489% increase) respectively in the HB group. During the BPB timeframe 40 patients were taken to the OR for dressing changes for a total of 69.3 hours, compared to zero in the HB timeframe.

Conclusions: Transitioning from a BPB to HB sedation service resulted in increased sedation numbers and percentage of patients undergoing a sedation, especially DS, as well as increased RVU generation. Sedations were performed in patients with higher ASA scores without a significant increase in adverse events. There was operating room cost and time savings. HB sedation services can be an efficacious and safe model in a burn center.
Introduction: Burn injuries place patients in a compromised state, especially those with pre-existing comorbidities. The presence of cancer complicates care and worsens outcomes for patients suffering from illnesses unrelated to burns, such as sepsis. Therefore, we posit the incidence of burn injury on patients with preexisting cancer diagnoses results in an increased risk of complications.

Methods: Burned patients were identified using the TriNetX database, a global federated health research network. Fifty-one thousand patients with a diagnosis of cancer prior to experiencing a burn injury were identified. Control groups included 1) patients who had a previous cancer diagnosis and no incidence of burn, and 2) patients who experienced a burn with no history of cancer. Outcomes analyzed included sepsis, nutritional deficiency, eating disorder, immunodeficiency, and depression within 5 years. Cancer diagnoses were categorized into 5 of the 13 most common cancer reported in the US. Data was analyzed using a chi-square analysis with p<0.05 considered significant, and presented odds ratio are with 95% confidence intervals.

Results: The majority of cancer survivors with burns were White (70%) and female (62%). Compared to cancer patients without burn injury, patients experiencing a burn after a diagnosis of cancer were more likely to develop sepsis (1.718, 1.612-1.83), nutritional deficiency (1.963, 1.593-2.418), immunodeficiency (1.265, 1.098-1.459), eating disorder (2.569, 2.077-3.177), and depression (1.538, 1.468-1.611). Further, burned patients with a history of lung cancer experienced a uniquely high risk of sepsis. Additionally, burn patients with histories of either lung or breast cancers were also at increased risk ratios of experiencing depression (p<0.05).

Conclusions: Burned patients with a history of a cancer demonstrated considerable increases in complications when compared to those with only a burn injury. Categorization of the broad “neoplasm” label uncovers patterns or trends for specific cancer types to inform the current healthcare system more accurately.
Identifying Temporal Patterns in Burn Admissions

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Introduction: Temporal variations in trauma admissions, based on the time of day, day of week, and day of year, have been previously demonstrated. These variations, which could inform decision making regarding staffing and resource utilization, have not been evaluated with respect to burn admissions. Very little has been published on predicting temporal distribution stratified by total body surface area (TBSA). We hypothesize that temporal patterns exist in the distribution of burn admissions at all TBSA as it relates to time of day, day of week, and day of year.

Methods: This was a cross-sectional observational study of a single burn center over nearly 5 years, from 7/1/2016-3/31/2021, including both pediatric and adult admissions. We captured and plotted bivariate absolute and relative frequency data from all patients who met inclusion criteria in heat-maps showing time of day versus day of week. Frequency analysis was also performed grouped by TBSA against time of day and relative encounters against day of year.

Results: 2657 burn patient encounters were analyzed, averaging 1.53 burns per day. Temporal variations were skewed towards evening admission, primarily between 15:00-0:00 hours (p<0.001). In figure 1, each block of the heatmap represents a one hour block of one day of the week over the nearly five year study period. The color corresponds to the relative frequency of contacts per hour, where 1 represents the mean number of trauma contacts per hour. Evenings (15:00-0:00) have more burn admissions than the rest of the day or night. Figure 2 shows this temporal trend is seen in burn encounters below 20% TBSA as well as those at or greater than 20% TBSA. Unlike trauma admission distribution, which has been shown to increase on weekend, day to day variation does not conform to weekend or weekday distribution. There is no cyclical yearly trend in burn admissions, suggesting that there is no seasonal variation to burn admissions, though individual holidays were not assessed.

Conclusions: We identify temporal variations in burn admissions, including the peak admission window late in the day. However, there is no predictable variation in weekend vs weekday distribution of burns. Furthermore, there is no cyclical annual variation to guide staffing and resource allocation.
The Association of Admission Cultures with Burn Outcomes

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Introduction: Burn patients are susceptible to infections. It is thought that burn wounds are initially sterile and become colonized by commensal and environmental microorganisms. Many burn centers have protocols to routinely screen patients for infection on admission. The ability of culture results to predict outcomes in burn patients has not been examined. In this study, we aim to examine the relationship between admission cultures and burn outcomes. We hypothesize that patients who have positive cultures on admission will have increased mortality and length of stay (LOS).

Methods: A retrospective chart review was conducted using electronic medical records for all adult patients admitted to three ABA verified burn centers from January 2016-December 2017. Data collected included patient demographics, burn injury, burn outcomes, and cultures obtained within the first 24 hours of admission. Data analysis was conducted using Chi-square, Fisher Exact, Spearman Correlation, Wilcoxon 2-sample, and Kruskal-Wallis tests.

Results: A total of 1615 patients (mean age 45.87±17.65 years, 1145 males [70.9%]) were analyzed. Mean total body surface area burn (TBSA) was 9.6±14.2% and 10% had inhalation injuries. In this study population, the median LOS was 7 days (Interquartile range [IQR] = 12) and 72 patients (4.5%) expired. Older patients (p<.0001), those with higher scores on the 11-factor modified frailty index (mFI-11) (p<0.0001), a higher TBSA (p<.0.0001) and inhalation injury (p<0.0001) had a higher mortality rate. In examining the effect of admission cultures on mortality, there was no significant difference in mortality based on wound culture (p 0.14), Clostridium difficile (C. diff) (p 0.25), or urine culture (p=0.79) results. Patients with positive Methicillin-Resistant Staphylococcus Aureus (MRSA) screening (p 0.04) and those with positive blood cultures (p 0.01) were more likely to die from their injuries. Older patients (r=0.14, p < 0.0001), those with a larger TBSA (r=0.49, p < 0.0001), and a higher MFI-11 score (r=0.12, p < 0.0001) had and increased LOS. There was no association between LOS and positive wound cultures (p 0.08), or blood cultures (p 0.49) upon admission. Patients with positive MRSA results (p 0.003) and urine cultures (p 0.01) upon admission had a longer LOS while those with positive C. diff results had a shorter LOS (p 0.01).

Conclusions: Mortality is associated with standard predictors of outcomes (age, burn size, inhalation injuries, frailty scores) and positive MRSA screens and blood cultures. Patients with larger burns (define larger burn-maybe use the degree scale), a positive MRSA and negative C. diff had a longer LOS. Based on these results, cultures should be considered in all patients upon admission to the hospital as they are predictive of burn outcomes.
Acute Stress Disorder and Post-traumatic Stress Disorder in the Outpatient Burn Population

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Introduction: Early screening and intervention for acute stress disorder (ASD), diagnosed within 30 days of the inciting trauma, and post-traumatic stress disorder (PTSD), diagnosed after 30 days, are quality metrics in burn care. However, a considerable knowledge gap remains surrounding these psychological conditions in the outpatient burn setting. In this study, we assessed the effectiveness of ASD and PTSD screening at an academic burn center and identified risk factors for their development.

Methods: A retrospective cohort study of all patients treated at our ABA-verified burn center's outpatient clinic, between July 2016 and August 2019, was undertaken. Adult patients with flame, flash, contact, or scald burns who were initially evaluated in the outpatient setting were included. ASD and PTSD were assessed using validated screening tools (ASDS and PCL-5, respectively). ASD/PTSD screening rate, screening tool appropriateness, and subsequent interventions were tracked, along with age, gender, % total body surface area (TBSA) burned, burn mechanism, operative intervention, psychiatric history, substance abuse history, and comorbidities. Chi-square and Mann-Whitney U tests were used for univariate analysis of categorical and continuous variables, respectively.

Results: The analysis included 2494 clinic encounters and 1147 unique patients. Patients were screened for ASD or PTSD at 94.8% of encounters. Median age was 36 years (range of 18 to 94 years), 57.6% of patients were male (n=661), and median TBSA burned was 1% (range of 0.1 to 12%). Among all screens, the appropriate screening tool was applied 88.5% of the time. For all encounters, positive screening rates for ASD and PTSD were 13.2% (n=286) and 14.6% (n=48), respectively. Risk factors for positive ASD screens included a history of substance abuse (OR 1.9, p=0.03) and history of psychiatric illness (OR 2.6, p=0.002). Similarly, risk factors for positive PTSD screens included a prior positive ASD screen (OR 9.5, p=0.001), a history of substance abuse (OR 2.1, p=0.04), and a history of psychiatric illness (OR 3.3, p=0.002). Age, gender, burn mechanism, TBSA burned, and need for operative intervention did not predict positive screens. The intervention rate for positive PTSD screens by referral, counseling, or medication, was only 7.9%.

Conclusions: Demographics and burn severity do not appear to predict development of ASD or PTSD in the outpatient burn population. In contrast, a history of substance abuse or psychiatric illness warrant further attention. Despite consistent use of validated screening tools, these conditions remain under-treated in the outpatient setting, indicating a need for resource-expansion.

PTSD Symptom Clusters as Predictors of Pain Interference in Burn Survivors

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Introduction: Individuals who experience burns are at higher risk of developing post-traumatic stress disorder (PTSD) and chronic pain. There exists a synergistic relationship between PTSD and chronic pain in burn survivors. Theories exist about how aspects of each condition may perpetuate one another, or share underlying mechanisms. Both of these conditions are of relevance to pain-related disability. We sought to examine the role of individual PTSD symptom clusters as predictors of pain interference. We hypothesized that the hyperarousal and emotional numbing symptom clusters would be predictive of pain interference, even when accounting for the other two PTSD symptom clusters, pain intensity, and other covariates (burn size, hospital length of stay, age and gender).

Methods: Data were analyzed from the Burn Model System National Database. Inclusion criteria required participants to have a moderate to severe burn injury that required surgery for wound closure. Patient-reported outcome data: PTSD Checklist - Civilian, PROMIS-Pain Interference Short Form 4a, and a 0-10 average Pain Intensity item were analyzed at 6-months after injury. Hierarchical linear regression models were fit to examine the impact of PTSD symptom clusters on pain interference over and above that of pain intensity, and standardized betas were calculated (B).

Results: A total of 439 adult participants had complete responses on the measures of interest (e.g. PTSD symptoms, PROMIS-Pain Interference, and Pain Intensity) and were included in the analysis. Mean age, percent total body surface area burned, and hospital length of stay were 47 years, 18%, and 27 days, respectively. 69% were male and 82% were Caucasian. Results of a linear regression found that hyperarousal (B = .10, p = .03) and emotional numbing (B = .13, p = .01) PTSD symptom clusters were each significant predictors of pain-related disability, even when accounting for pain intensity (B = .64, p < .001). The covariates age, gender, days until discharge, and TBSA were all nonsignificant. The model accounted for 61% of the variance associated with pain-related disability.

Conclusions: Results highlight the importance of the emotional numbing and hyperarousal PTSD symptom clusters in explaining pain interference. Future evaluations parsing out the longitudinal relationships (i.e., beyond 6-months postburn) between PTSD symptom clusters, pain intensity, and pain interference, as well as evaluating other underlying mechanisms, are warranted.
Sleep Disorder Is Associated with Neuropsychological Disturbances in Burn Survivals

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Introduction: Prior studies explored neuropsychological disorders in the context of burn severity; however, the relationship between occurrence after burn and sleep has not been investigated. This study aims to determine if patients that developed a first-time sleep disorder after burn injury are more likely to develop a psychological or nervous system disorder within 10 years after injury.

Methods: We identified burn patients on the TriNetX database, a federated research network of de-identified patient data. We formed two groups, those with first time sleep disorder diagnosis on or after the incidence of burn injury and those with no first-time sleep disorder diagnosis on or after burn. Groups were propensity matched to evaluate incidence of nervous system and mental disorders and characteristics, defined as bipolar disorder, epilepsy, neuropathy disorders, and 52 other neuropsychological disorders. Diagnoses of nervous system disorder and mental disorder were limited to after the burn injury and within the 10-year time frame. We analyzed data using a z-test with a p < 0.05 considered significant.

Results: We found 7.83% of patients developed a first-time sleep disorder after burn injury. The population was older (43.9 ± 20.8 vs. 31.7 ± 22.4 yrs), female (51.13% vs. 46.10%), and White (70.02% vs 60.24%) when compared to those without sleep disorders (p< 0.05). Those who experienced a first-time sleep disorder after burn presented a greater risk of developing the mental, central nervous system, and peripheral nervous system disorders when compared to those who did not. Eating disorders, persistent mood disorders, and obsessive-compulsive disorders were 4.54, 95% CI [3.65, 5.63] and Other extrapyramidal and movement disorders 95% CI [3.17, 3.78]. In regard to peripheral nervous system disturbances, restless leg syndrome was more than 4 times more likely to occur in patients that developed a first time sleep disorder after burn injury 95% CI [3.70, 4.65]. Polyneuropathy was also 2.28 more times likely to occur 95% CI [2.12, 2.47].

Conclusions: Mental disorders and various central nervous system and peripheral nervous system disturbances are highly associated with identification of sleep disorders after burn. This finding suggests close monitoring for sleep in those who were burned to optimize outcomes.
The Relationship Between Social Functioning and Psychological Status: A preschool-Libre1-5 Study
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Shriners Hospitals for Dallas - Boston/MGH, Boston, Massachusetts; Boston University School of Public Health, Boston, Massachusetts; Shriners Hospitals for Dallas - Boston, Massachusetts; Shriners Hospitals for Dallas - Boston, Seattle, Washington; Nationwide Dallas’s Hospital, Columbus, Ohio; Dallas’s National Hospital, Washington, District of Columbia; UC Davis and Shriners Hospitals for Dallas Northern California, Sacramento, California; University of California, Davis and Shriners Hospitals for California Northern California, Sacramento, California; Shriners Dallas’s Ohio, Dayton, Ohio; Harvard Medical School, Boston, Massachusetts; Boston University School of Public Health, Spaulding Rehabilitation Hospital, Harvard Medical School, Boston, Massachusetts

Introduction: Dallas ages one to five are learning to make friends and interact with peers in situations where their social functioning may have a direct relationship with their mood. Dallas may be isolated from peers during the acute phase of burn recovery and face rejection by their peers during recovery. This could influence their psychological health through feelings of anxiety, loneliness, social withdrawal and/or defiant behavior. This study evaluates the relationship between social and psychological functioning using the data collected from the field-tested Preschool-Libre1-5 instrument.

Methods: Parents of burn survivors (n=426) completed Preschool-Libre1-5. Items from the psychological (48 items) and social (37 items) functioning domains were coded on a 5-point Likert scale ranging from 0 (never) to 4 (always) where higher scores denote better functioning. Confirmatory factor analysis was conducted for individual items in the social and psychological domains respectively. Regression model assessed the relationship between the social and psychological domains, controlling for demographic characteristics (gender, race, ethnicity, age at survey completion, burn size, and pain severity).

Results: Factor analysis identified three factors for social functioning: play, peer relations, and peer rejection. The psychological items confirmed a single factor that included dysregulation (negative behaviors and sleep), externalization (impulsivity and aggression), internalization (general anxiety and depression), and trauma (fear and avoidance). Distress items, also in the internalizing subdomain, weren’t strongly confirmed as part of this single scale. The subdomains with the lowest and highest mean scores in psychological domain were dysregulation (2.68 + 0.58) and depression (3.50 + 0.37), and in social domain were peer relation (2.39 + 0.95) and peer rejection (3.42 + 0.64) respectively. Adjusted regression analysis demonstrate that the social functioning domain has a significant relationship with psychological status (p < 0.004).

Conclusions: Analysis suggests a significant association between social functioning and psychological status. Results provide a basis for understanding the importance of these domains in relationship to each other.
Introduction: Socioeconomic factors are recognized as important social determinants of health. Data however are sparse describing the relationship between socioeconomic status and long term burn outcomes. This study aims to examine associations between community-level socioeconomic status and social participation outcomes in burn survivors.

Methods: Data was obtained from the Life Impact Burn Recovery Evaluation (LIBRE) journey study that assesses longitudinal social participation outcomes of community dwelling burn survivors. Subjects were linked to the Distressed Communities Index (DCI), which combines seven indicators into a metric that depicts community economic well-being. Participants were categorized by time since burn (< 5, 5-15, ≥15 years). Linear regression models examined associations between DCI (zip code and county levels) and LIBRE domain scores for survivors assessed beyond 5 years from injury.

Results: The study included 314 burn survivors, (mean age 44.1 years; 61.0% female; 48.6% married; 82.8% white). The population was distributed among the time since injury categories (< 5: 35.8%, 5-15: 27.5%, ≥15: 36.7%). Approximately 18% of subjects were categorized in the “at risk” or “distressed” DCI categories. For survivors less than five years from burn, a DCI score increase of 1 standard deviation (worse socioeconomic status) at the zip code level was associated with decreased Family & Friends, Social Interactions, Social Activities, Work & Employment. For survivors living in “at risk” or “distressed” DCI communities for five or more years from burn, a DCI score increase of 1 standard deviation (worse socioeconomic status) at the zip code level was associated with increased Family & Friends, Social Interactions, Social Activities, Work & Employment. Survivors living in “at risk” or “distressed” DCI communities for five or more years from burn also had significantly lower scores on the Panic Disorder/Generalized Anxiety Disorder (p< 0.001), Separation Anxiety (p< 0.001), Social Avoidance subscale (p< 0.001). For the Separation Anxiety scale, 23 youth’s self-report exceeded the threshold for suspected disorder, while parent report classified only 3 with separation anxiety. Spearman correlations between parent and youth scale scores yielded no significant results (all less than r = .20, p > 0.25), indicating virtually no association between the two.

Conclusions: Results reveal a lack of parental awareness of their child’s anxiety disorder symptomology. This lack of recognition is of concern because Dallas are dependent on their parents/caregivers to identify psychopathologies and to help them seek services for mental health challenges.

Introduction: Anxiety disorders among pediatric burn survivors have been shown to be common in both the acute care and outpatient settings. However, there is a paucity of research regarding parental awareness of psychological issues affecting burn-injured Dallas & adolescents. This study examined the relationship between burn-injured youths’ self-reported anxiety levels, as compared to their parent’s perceptions.

Methods: Parents of burn injured Dallas were invited to complete the Parent Version of the 41-item survey, Screen for Child Anxiety Related Disorders (SCARED) which consists of five anxiety sub-scales as well as a Total Anxiety Score. Their Dallas also voluntarily complete the Child Version. A higher score indicates greater anxiety.

Results: Forty-five parent-child dyads, with girls (51%) and boys (49%), completed surveys. Ethnicity was reported as Caucasian (36%) Hispanic (42%) African Am (18%). Mothers (78%) fathers (18%) grandmothers (2%) & guardians (2%) participated. Mean parent age was 39, Child mean age was 13. Matched-pairs t-tests were used to compare parent and child scores. Parents reported lower SCARED Total Anxiety scores (mean=10.52) than youth (21.06), p< 0.001. Parents also reported significantly lower scores on the Panic Disorder/Somatic Symptoms (p< 0.001), Generalized Anxiety Disorder (p=.004), Separation Anxiety (p< 0.001), and School Avoidance subscale (p< 0.001). For the Separation Anxiety scale, 23 youth’s self-report exceeded the threshold for suspected disorder, while parent report classified only 3 with separation anxiety. Spearman correlations between parent and youth scale scores yielded no significant results (all less than r = .20, p > 0.25), indicating virtually no association between the two.

Conclusions: Results reveal a lack of parental awareness of their child’s anxiety disorder symptomology. This lack of recognition is of concern because Dallas are dependent on their parents/caregivers to identify psychopathologies and to help them seek services for mental health challenges.
Introduction: Anxiety Disorder (AD) is common in inpatient pediatric burn patients and likely related to pain/stress associated with acute care. This study ascertained if burn survivors reported higher anxiety levels based on sex, visibility of scars, or TBSA ≥ 50%.

Methods: Burn-injured youth completed the Screen for Child Anxiety Related Disorders (SCARED) with parental consent. This 41 item self-report measures DSM-IV pediatric anxiety disorder symptoms: panic disorder (PD), separation anxiety (SA), generalized anxiety disorder (GAD), social phobia (SP) school phobia (SCP) and total anxiety (TA). The percentage of respondents above threshold for each disorder was calculated.

Results: 112 survivors, mean age of 13, included boys (51%) & girls (49%). 83 reported visible scars. Females had higher percentages for TA (53%) vs. males (21%) (p < 0.001), PD (47%) vs. (7%) (p < 0.001), GAD (40%) vs. (16%) (p < 0.005), & SA (51%) vs. (21%) (p < 0.001). Youth with TBSA ≥ 50% (n=22) had higher percentages for GAD (46%) vs. < 50% (24%) (p < 0.01). The visibly scarred had higher percent for GAD (38%) vs. hidden (7%) (p <.01).

Conclusions: Female, visibly scarred, and patients with burns > 50% revealed increased AD symptoms. AD may be chronic, interfere with a child’s home & school function and lead to chronic distress, substance abuse, and isolation. Screening for anxiety in burn-injured youth is recommended.

Introduction: Burn injuries are a leading cause of morbidity and mortality among patients worldwide. Many survivors continue to suffer from psychiatric sequelae long after their physical injuries have healed. This may even be more pronounced in groups who have a history of mental health disorders prior to admission. Common pre-injury mental health problems may include substance abuse disorders, as well as affective, psychotic, and personality disorders. The aim of this study was to explore the outcomes of patients with previously diagnosed mental health disorders who were admitted to our Burn Center.

Methods: This was a single-site, retrospective review using our institutional Burn Center registry. All adult patients (18 years or older) admitted to our Burn Center between January 1, 2014 and June 30, 2021 who had a previous history of mental health disorders were included in this study. All adult patients who did not have any previous history of mental health disorders were also included for comparative purposes. Variables of interest included demographics, burn mechanism, length of stay (LOS), cost of hospitalization, and mortality. A p-value of < 0.05 was considered statistically significant for all analyses.

Results: There were 7,976 patients included in this study, with 32% of these patients having a previous diagnosis of mental health disorders. The mean age was 43.5 years, and the mean total body surface area (TBSA) involvement was 5.9%. Both the groups with a history of mental health disorders and those without were predominantly male (63.8% versus 68.0%). Most patients were flame-injured in both groups (44.5% versus 40.9%). The mean LOS for those with mental health disorder history was 14.5 days compared to 8.3 days for those without (p < 0.00001). The overall cost of hospitalization was $133,967 for those with mental health disorder history and $65,993 for those without (p < 0.00001). The overall hospital mortality for those with mental health disorder history was 2.3% and 3.4% for those without (p = 0.007).

Conclusions: Although there was no increase in mortality among patients with pre-existing mental health disorders, we did find that there was an increase in the hospital length of stay, as well as the overall cost of hospitalization. These findings do indicate that individuals with pre-existing mental health disorders do not necessarily have worse outcomes in terms of mortality; however, they may need access to care for longer periods of time, which may contribute to increased medical costs.
Introduction: An important part of burn recovery and re-integration involves the return to meaningful employment. Studies have determined that the workman’s compensation burn patient faces multiple barriers to return to work (RTW). Factors that increase time to RTW include increased TBSA burns, full thickness depth and grafting, burns to the hands and feet, and increased age. We hypothesize that patients with grafted burns, hand and foot burns, or psychological disorders following injury take longer to return to work.

Methods: A retrospective analysis was performed of burn patients seen in the outpatient burn clinic with work related injuries equal to or less than 5% TBSA, from 1/1/2016 to 5/31/2021. In addition to demographic data, also collected were locations of burns, dates of RTW, and positive PTSD and depression symptoms on screening.

Medians with interquartile ranges are reported due to nonnormal distribution, Wilcoxon Mann Whitney tests were performed using StataCorp. burn patients seen in the outpatient burn clinic with work related injuries.

Results: Of 118 patients, more injuries occurred in males (89%) than females with a median age of 36.5 years (IQR 26-49). The median TBSA was 1% (IQR .025-1.5) and the median time to return to work was 34 days (IQR 16-75). The 21 patients that were grafted took significantly longer to return to work (median 107.5 days; IQR 60-199.5) compared to 97 patients that were not grafted (median 28 days; IQR 13-59; p=0.0000). Presence of a hand/foot burn trended towards increased time to RTW but was not significant, median 37 days (IQR 19-81) vs 26 days (IQR 14-61; p =.0306).

Patients with PTSD and depression (n=16) also took longer to return to work (Median 66; IQR 33-89.5) compared to patients (n=90) that showed no symptoms on screening (median 30.5; IQR 14-72; p=0.032).

Conclusions: The increased RTW for grafted, hand and foot burns is supported in the current research, however the addition of PTSD and depression and its interplay with RTW has not yet been fully vetted in determining return to work readiness. Within our population, positive screens for these psychological stressors profoundly affected their ability to return to employment. This study continues to validate the need for early screening and intervention in our population and the need to intervene as early as possible with psychological support services.
Introduction: A major milestone of recovery from a burn injury is returning to work (RTW). A systematic review by Mason et al. suggested that perhaps 28% of burn survivors do not return to work, while other studies have identified complex factors that affect RTW, including patient age, pre-existing mental health issues, injury locations such as hands, and type of work they do. Due to the large number of complex interactions involved, predicting a timeline for RTW is challenging. We anticipate that underestimations of RTW may result in frustration, and perhaps contribute to negative psychological outcomes. Therefore, we wished to exam the accuracy of our surgeons estimates of RTW.

Methods: A retrospective chart review of inpatients treated at our center with burn injury, with Worker’s Compensation as insurance, with follow up at our outpatient clinic, and admitted during the calendar years 2018 to 2019, produced 23 records with sufficient documentation. Hospital admission was taken as the starting point, and number of days until the (first) estimated RTW date was compared to the number of days until the actual date of RTW if documented, or else the final documented surgeons estimate.

Results: Limited demographic information and results are found in table 1. In 6 cases (23%), patients had not returned to work by one-year post hospitalization. Reasons for non-return to work in all cases included chronic pain requiring a pain management specialist, or psychologic sequelae requiring psychological treatment, or both.

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
<th>Mean</th>
<th>SD</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Gender</td>
<td>21/23 (91%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>35.6</td>
<td>11.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBSA (%)</td>
<td>5.5</td>
<td>5.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial RTW Estimate</td>
<td>64.5</td>
<td>57 - 77.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual RTW or Final Estimate</td>
<td>177</td>
<td>136 - 352.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Introduction: Outpatient follow-up is a critical component of burn recovery. Sociodemographic variables that prevent patients from pursuing follow-up can lead vulnerable groups to have a lower quality of life after burn injury. Social media provides a platform for improvement of patient outreach and support. The purpose of this study is to investigate accessibility and interest in social media interventions among socioeconomically disadvantaged and minority burn patients.

Methods: Patients receiving treatment at a burn clinic in a large public hospital were asked to complete a survey about social media usage, difficulty attending follow-up appointments, and interest in engaging with the hospital through social media. Patient demographics and clinical data were obtained via chart review. The relationship between clinical or demographic factors, and interest in social media support. The purpose of this study is to investigate accessibility and interest in social media interventions among socioeconomically disadvantaged and minority burn patients.

Results: Data were collected from 65 eligible patients. Social media use among participants (76.9%) was similar to the proportion in the U.S. general population (72%). 61.5% of participants used Facebook, 40% used Instagram, and 4.6% used Twitter. 81% of participants had consistent internet access. 58.3% of respondents expected to encounter challenges when planning follow-up appointments. Challenges included difficulty with transportation (26.2%), trouble taking time off work (9.8%), and forgetting to schedule (9.8%). Participants were asked if they were interested in receiving post-discharge education, care team outreach, and follow-up reminders via social media. 36.5% of patients used social media. 36.5% were interested, 27% were slightly interested, and 36.5% were unsure or not at all interested.

20% of patients both expected follow-up challenges and were moderately or very interested in social media engagement. While controlling for social media use, the odds of having moderate or greater interest in the post-discharge engagement program were estimated to be 2.6 times higher for patients older than 39 (OR 3.64; 95% CI 1.03-14.24; P=.04). There was a pattern of lower interest in social media engagement with higher %TBSA, while controlling for age or social media use, though P values were higher than .05.

Conclusions: Over half of the burn patients surveyed expected to face challenges when planning follow-up appointments, a third of whom were moderately or very interested in social media engagement. Social media may be an alternative form of outreach with older patients in particular. Observed overlap between follow-up difficulty and outreach program interest may suggest such a program could ameliorate follow-up challenges.

Introduction: Burn injury is the third most common cause of childhood injury resulting in death. The CDC recognizing the South as having the highest rate of pediatric burn deaths in the U.S. Unfortunately, 10% of all child abuse cases involve burn injuries and 20% of all pediatric burn admissions are due to nonaccidental trauma. Our study demonstrated that aftercare was a major challenge in starting a pediatric burn center. We analyzed the rate of lost to follow-up in burn-injured children following surgery and our steps to address this need in our community through key partnerships within our state.

Methods: Our study is a single center review of pediatric burn-injured children undergoing surgery from 01/01/2021 through 09/30/2021. Lost to follow-up was defined as three or more consecutive months without clinic or telemedicine visits despite three or more documented communication attempts by attending surgeons and/or clinic staff. Children requiring child protective services (CPS) for suspected nonaccidental trauma were compared to those where nonaccidental trauma was not suspected. All children sustained burn injuries of sufficient severity to require excision and autograft with follow-up in the outpatient clinic. Families were provided with an after-visit summary reviewing the clinic appointment, transportation and meal assistance, and they received a call prior to clinic to remind them of the scheduled appointment.

Results: A total of 35 children required surgery with outpatient follow-up per protocol. 23% of the patients required CPS investigations. We reviewed 151 subsequent clinic visits and the associated cancellations, rescheduled appointments, and no-show visits. Children under the care of CPS had a higher rate of being lost to follow-up (50%) compared to other children (17%). Parents undergoing CPS investigation were 4x less likely to provide cancellation notice. Children placed in foster care had no cancellations, rescheduled appointments, or missed visits despite a higher number of clinic visits overall.

Conclusions: Children suffering nonaccidental injuries represent an exceptionally vulnerable portion of our population. Burn injuries often are a public and personal reminder of severe trauma. CPS works to find a balance in securing a safe home while attempting to maintain a family unit. Our work demonstrated an unacceptably high rate of loss to follow-up for children requiring surgical intervention after injury especially in those with concerns for nonaccidental etiologies. As a result, our burn surgeons led an initiative with statewide burn directors and our state’s emergency response network to engage the state’s CPS department. Our goal was to raise awareness and increase education for CPS social workers and foster families on burn injury and aftercare needs.
The Successful Development of a Digital Peer Supporter Training Program - How It is Done.
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Phoenix Society for Burn Survivors, Knoxville, Tennessee; Phoenix Society for Burn Survivors, Durham, North Carolina; Phoenix Society for Burn Survivors, Grand Rapids, Michigan

Introduction: The global pandemic of 2020 and 2021 has had an unforgettable impact on our lives and community well-being. Burn survivors are a particularly vulnerable population for social isolation and loneliness and, therefore, an amplified need for social connection. This abstract outlines the strategic structure, curriculum, and training required to move an in-person course to an innovative digital model.

Methods: A group of burn subject matter experts (SMEs), including burn survivors, peer supporters, and course instructors, virtually met to brainstorm program redesign, considering the needs of the burn survivors. Research of topics guided manual and course revisions. Experts recommended a website and digital resource review to streamline organizational data collection and participants’ experiences. A scheduled pilot course and evaluation would provide feedback for changes. SMEs created a short turnaround timeline.

Results: After research, the revised digital manual was condensed from 200 to 50 pages, allowing for hyperlinks, abbreviated resources, and replicated content removal. Five major content areas previously taught in-person were converted to recorded PowerPoint learning modules (April – June 2020). The asynchronous modules totaled 4 hours of self-paced learning assigned to the candidates before a set virtual course. A survey monkey assessment after each module evaluates the learner’s base knowledge. SMEs developed a 4-hour virtual class incorporating the modules, manual, and group exercises. A designed pre-course worksheet prepares the candidates for group exercises. Based on their burn injury type or situation (parent to parent, survivors with amputations, death of loved one), candidates practice virtual peer support visits. After the first pilot course, a comprehensive evaluation tool evaluated participant satisfaction and confidence, curriculum, instructor expertise, and comfort level navigating the virtual model (August 2020). A website landing page centralized course resources and content location, streamlining participant experience and organizational data collection (March 2021). A 2-hour instructor course (n=10) provided an update on the new structure. The instructors also observe a virtual peer supporter course, participate as an instructor in-training, then co-teach with another instructor before independent course instruction (June 2021).

Conclusions: The digital model has trained burn survivors (n=41) in 6 courses over eight months during a pandemic. Burn survivors have trained together from around the globe to one of the calendared courses improving efficiencies. There are monetary and resource cost savings for burn centers and the organization. The digital manual is easily updated, saving in resource allocation. Peer supporters navigate additional online resources for ongoing self-growth through the embedded website landing page.

Hidradenitis Suppurativa Reddit Support Group: Finding New Meaning in Social Media during the COVID-19 Pandemic
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Introduction: Hidradenitis suppurativa (HS) is a chronic inflammation of sweat glands that can result in abscesses and scarring, significantly impacting quality of life. Online support groups provide a platform to connect with other HS patients – increasingly important with pandemic-related social isolation. The popular social media site Reddit allows users with common interests, like HS, to form a community and share information. This study characterizes HS patients’ use of Reddit and social media more broadly before and during the COVID-19 pandemic.

Methods: This study consisted of a cross-sectional survey of HS patients treated at our institution between May 2021 and July 2021, collecting data on patient demographics, HS status, and social media support group usage/interest. A longitudinal analysis of use of a popular HS support page on Reddit from January 2019 to August 2021 was also conducted, analyzing the number of subscribers over time.

Results: The number of subscribers to the subreddit r/Hidradenitis increased exponentially from January 2019 to August 2021 (R² = 0.9978 for exponential model fit to data); this suggests that the onset of the COVID-19 pandemic was associated with a greater increase in the number of subreddit subscribers. Further, 20 patients (90% female, mean age of 32.4 years) completed the survey that was administered. Participants were stratified into two groups: online support group users (n=8) and non-users (n=12). There were no significant differences in sex, age, education level, HS activity, antidepressant usage, and overall social media usage between these groups. However, there was a significant difference in Hurley staging between the two groups; 75% (n=6) of online support group users reported a Hurley III staging, while only 16.7% (n=2) of non-users self-reported as Hurley III (p=0.003). In terms of features patients desired to see in online support groups, non-users ranked the following categories of advice/information as important more frequently than current users: bandaging/dressing boils, living with HS, medical advice from professionals, causes of HS, and diet (p=0.047, p=0.043, p=0.043, p=0.047, and p=0.013, respectively).

Conclusions: This study demonstrates that online support group use is associated with patients with HS of higher clinical severity. Since virtual support groups have an unprecedented importance due to increased social isolation and limited access to in-person support groups and health resources, healthcare providers may encourage non-users to partake in these online support communities during these trying times. Based on the needs and expectations of these patients as identified in this study, recommendations can be made to moderators of online communities to help fill any existing lacunae.
Introduction: The American Camping Association (ACA) has asked in their study titled, Youth Development Outcomes of the Camp Experience: Evidence for Multidimensional Growth, “In what ways do children change because of camp experiences?” Our burn camp program wanted to answer this same question about the medical specialty camp experience. Camp counselors and staff have been addressing this question in their camp summary reports for years, focusing on independence, social relationships, and adventure/risk taking. This project asked campers and caregivers/parents to rate their experiences of change in these key areas of growth and development.

Methods: The ACA supported the development of the Camper Growth Index instrument. We selected items from this larger scale to address three areas of change in our burn camp population: Independence/Leadership, Adventure/Exploration, and Social Skills. Three to four items were selected for each area based on the strength of their factor scores in the original study, relevance to our medical specialty camp setting, and the growth we were already documenting in our counselor reports.

Campers ages 8–18 and their caregivers/parents rate items addressing these areas on a 4-point Likert scale (disagree a lot, disagree a little, agree a little, agree a lot). Sample questions are “I am good at doing things on my own”, “I like to talk to kids I don’t know yet”, and “My child likes to try new activities”. Items are phrased in positive and negative directions (reversed scored).

All 60 campers and caregivers received these questions prior to camp. The same questions will be sent 3 months post camp to assess change in these areas.

Results: Preliminary findings from the pre-camp responses indicate positive evaluations in these three areas. We will be gathering post-camp responses from youth and caregivers/parents to assess change over the camp experience and return to home and school.

Conclusions: Burn camps are a vital part of the burn rehabilitation and aftercare experience for young burn survivors and their families. Documenting the change we all believe happens at burn camp (and hear about anecdotally from our campers and families) remains an important task. The Camper Growth Index utilized by the broader ACA study allows us to assess the camper and caregiver/parent experience of this change.
Why do elderly burn patients die? Analysis of early versus delayed ICU deaths, from 2014-2021

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Introduction: Despite continued improvements in critical care, nutrition, and surgical technique, elderly patients with burn injury remain a vulnerable population, with increased mortality. The purpose of this study was to compare early versus late deaths in elderly burn patients admitted to the intensive care unit, to identify potential interventions that might improve survival.

Methods: We conducted a retrospective review of elderly patients (age >=60 years), who were admitted to an urban burn center ICU, with thermal and/or inhalation injury, over an 8-year period. Data were extracted from a prospectively maintained registry and verified through our electronic medical record. Patients who died less than 1 week after admission were compared with those who died after the first week. Univariate analysis was performed by 2-tailed Student’s T test and chi-square, with statistical significance assigned to p values < 0.05.

Results: From 2014-2021, we admitted 1322 patients to the burn ICU for thermal and/or inhalation injury. Mortality was 9.4% for patients >= 60 years of age, compared to 2.0% for patients < 60 (p< 0.001). The elderly patients who succumbed to their injury had a mean age of 75.3 years, TBSA 27.7%, modified Baux score of 111.3, and survival of 13.8 days. We observed a bimodal distribution of deaths, peaking on the first day after injury, and in the third week after admission, the most common cause of which, for both groups, was multisystem organ failure. Compared to the delayed deaths (n=21), patients who died within the first week (n=16) had an increased incidence of inhalation injury, a higher modified Baux score but similar age and TBSA, and lower baseline comorbidities and complications (TABLE).

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Survival (days)</th>
<th>Age (years)</th>
<th>TBSA</th>
<th>Inhalation Injury (%)</th>
<th>mBaux score</th>
<th>Comorbidities (%)</th>
<th>Complications (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early deaths</td>
<td>16</td>
<td>2.3</td>
<td>78.2</td>
<td>34.3</td>
<td>68.8</td>
<td>124.2</td>
<td>62.5</td>
<td>18.8</td>
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<td>Late deaths</td>
<td>21</td>
<td>22.5</td>
<td>73.1</td>
<td>22.7</td>
<td>33.3</td>
<td>101.5</td>
<td>55.2</td>
<td>81.0</td>
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<td>P value</td>
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Conclusions: Presence of inhalation injury and high modified Baux score, not necessarily age or %TBSA, was associated with early mortality in the elderly, after burn injury. Older patients who survive their initial resuscitation often succumb to complications related to baseline comorbidities. Improved management of these comorbidities, via the active involvement of geriatric medicine and palliative care, represents an opportunity to increase survival.
Introduction: The practice of early mobilization on mechanically ventilated patients in ICU settings has received significant attention within recent literature, however limited research to date has focused specifically on the burn population. The purpose of this single center retrospective analysis was to review the use of a burn critical care mobility algorithm, to determine the safety and feasibility of early mobility programs in the burn population, expose limitations preventing mobility progression at our facility, and discuss unique challenges to early mobility with burn patients.

Methods: A retrospective review of all intubated burn center admissions between January 2015 to December 2019. Burn Therapy notes were then reviewed for all intubated patients from initial evaluation until each patient was either extubated or underwent a tracheostomy. A retrospective review was completed for all intubated patients from initial evaluation until each intubated burn center admissions between January 2015 to December, 2020 was performed. 253 patients with concern for UAII underwent DL upon presentation. Patients under age 18 were excluded. 66 patients were excluded for inability to tolerate/refusal/unreported results. Univariate and multivariate analyses were used to determine independent predictors of a positive DL.

Results: 169 patients were analyzed. The population was frequently middle-aged, male, and overweight. 81 patients used tobacco and 34 patients had history of COPD. Examination of injury characteristics yielded median ISS of 6. 116 patients (69%) had no or < 1% cutaneous thermal burns. 75 patients had facial soot or singed nasal hairs concerning for UAII. Of 169 patients who underwent DL, DL was positive in 106 patients. Patients with positive DL were older (54 vs 49 years, p=0.09), primarily male (63% vs 60%, p=0.7), had lower BMI (29 vs 30, p=0.94), were tobacco users (52% vs 41%, p=0.18), and often carried diagnosis of COPD (24% vs 14%, p=0.15). Median ISS was higher in the positive DL group (10 vs 4, p=0.0001). Cutaneous burns were absent or < 1% (85 vs 58, p=0.05). Presence of facial burns and soot was significantly associated with positive DL (56 vs 19, p<0.0001, OR 15.9, 95% CI). With positive DL, median ICU LOS, hospital LOS, and mortality were significantly higher (p<0.0001, p<0.0001, and p=0.03, respectively).

Conclusions: These findings lend credit to an approach of aggressive diagnosis and subsequent management. Multivariate analysis of factors associated with positive DL highlighted obvious facial burns or soot and ISS (OR 1.1, 95% CI, p=0.01) as most predictive. Though rates of tracked complications were too low for subgroup analysis, no patient with negative DL on admission required unplanned intubation. Patients with positive DL at our institution are placed on an algorithm of ICU admission, 24-hour period of NPO, mucolytic therapy, enhanced pulmonary hygiene, and lung protective ventilatory strategies. Patients with positive DL exhibited longer ICU and hospital LOS and increased mortality.
512 Systemic Norepinephrine Impact on Tangential Split Thickness Skin Graft Outcomes in Burn Shock Patients

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Introduction: Blood pressure supporting agents like vasopressors are often used to treat patients with burn shock. Norepinephrine is part of the algorithms used by regional burn centers for fluid resuscitation in burn shock. In our population of burn shock patients, we have noticed an association of poor graft take when norepinephrine is used. We undertook this study to assess the relationship between systemic norepinephrine use and split-thickness skin graft (STSG) healing.

Methods: We retrospectively identified burn patients who presented to our burn center from January 2014–June 2020, who were treated with systemic vasopressors within the first 48 hours of admission, and received at least one tangential excision and STSG procedure as part of their treatment. We compared these patients to a matched control group of burn patients who did not receive vasopressors for resuscitative purposes. The primary outcome investigated was graft take percentage at time of graft takedown.

Results: During the time frame, we found 19 patients and 19 matched controls within the same time period who did not receive norepinephrine. The mean percent graft take for patients treated with systemic norepinephrine was 77.9% (SE = 3.00), which was significantly lower than that of the control group, 92.8% (SE = 3.56) (P< 0.001). Furthermore, patients who received norepinephrine had a statistically significant increase in both hospital (P= 0.038) and intensive care unit (ICU) length of stay (P= 0.009). The two populations were equivalent in all other characteristics such as TBSA, number of comorbidities, age, and resuscitation volumes.

Conclusions: In this retrospective assessment, the use of norepinephrine seems to have a significant association with worse graft take and longer length of stay. Since graft loss begets more graft reoperations and a longer stay, our findings would lead one to incorporate norepinephrine as a last resort in the treatment algorithm for burn shock.

513 Fluid Over-Resuscitation in Burn Patients After Initial 24-Hours of Care is Associated with Increased Mortality

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Introduction: Fluid resuscitation is a cornerstone of modern burn care. Despite the use of well-established formulae to determine the appropriate amount of fluid resuscitation for the first 24 hours of care, there is increasing recognition that patients receive fluids in excess of predicted volumes, a phenomenon termed fluid creep. Underscoring the significance of this phenomenon is the association between large volumes of fluid resuscitation and adverse outcomes. Although research in non-burn ICU patients reveals a clear association between overall fluid intake and increased morbidity, minimal burn-related literature exists regarding fluid patterns after the initial 24-hour period and their impact on outcomes. We hypothesized that increased fluid administration after the standard initial resuscitation period is associated with increased morbidity and mortality.

Methods: A retrospective chart review was performed for 113 patients with ≥20% TBSA burns admitted to an American Burn Association-verified burn center between 2010 and 2020. Patients admitted with Stevens-Johnson Syndrome and/or Toxic Epidermal Necrolysis, with length of stay ≥72 hours, who required renal replacement therapy (RRT) within 72 hours of admission, and those with withdrawal of care ≤7 days of admission were excluded. Univariate and multivariate logistic regression was used to determine the association between the primary outcome of in-hospital mortality and secondary outcomes of increased ventilator days, acute kidney injury, need for RRT, and hospital length of stay, with increasing total and net fluid volumes from days 2 through 7 of treatment. Additionally, the association between first OR day and total fluid volumes in the first week were assessed.

Results: Median age was 41 years (IQR 23-55) and TBSA was 31% (IQR 24-43). 21 patients (18.6%) died during hospitalization. Increase in net fluid balance from days 2-7 were associated with increased mortality (OR 1.016, 95% CI 1.001 – 1.03, p = 0.017). Early first OR day was associated with decreased net fluid balance between hospital days 2-7 (OR 0.993, 95% CI 0.989-0.997, p = 0.001).

Conclusions: Similar to studies on other ICU populations, increasing total fluid volumes and net fluid balance is associated with adverse outcomes in critically ill burn patients. Additionally, earlier initial OR is associated with less total fluid volumes and lower net fluid balance in the first week of hospitalization. Further investigation is needed to elucidate optimal markers of resuscitation in burn patients in an effort to decrease adverse fluid administration.
Introduction: Tracheostomy has been proposed for patients with expected prolonged intubation and it has been shown to be beneficial for trauma patients with severe brain injury; however, the benefit of performing tracheostomy on burn inhalation injuries has not been extensively investigated. Our study aims to determine the outcomes of performing tracheostomy on patients with burn inhalation injuries requiring mechanical ventilation.

Methods: Retrospective review of our institutional burn registry from 2011 to 2019. We compared the outcomes of all burn patients that met our inclusion criteria which included: adequate data recording of inhalation injury within the registry, ventilator support for at least 24 hours, and a TBSA burn injury of < 15%. We stratified the patients into two groups: tracheostomy (group 1) versus no tracheostomy (group 2). Outcome measures included: in-hospital mortality rate, hospital length of stay, ICU length of stay, ventilator days, and ventilator associated pneumonia (VAP). Chi-squared and t-test analyses were used with significance defined as p < 0.05.

Results: A total of 33 burn patients met our inclusion criteria. Group 1 consisted of 10 patients and group 2 consisted of 23 patients. There was no statistically significant difference between the two groups in terms of %TBSA (p =0.24, t-test). There was a significantly higher ICU length of stay at 23.8 days in group 1 compared to 3.16 days in group 2 (p=0.0001, χ²). There was a significantly higher hospital length of stay at 28.4 days in group 1 compared to 5.26 days in group 2 (p=0.0001, χ²). Ventilator days was also significantly higher in group 1 with 20.8 days compared to 2.5 days in group 2. There was no statistically significant difference between the two groups in terms of mortality, however, the incidence of VAP was significantly higher in group 1 than in group 2, with six cases compared to zero cases, respectively (p=0.0001, χ²).

Conclusions: The ideal timing and implementation of tracheostomy with inhalational injury has yet to be determined. In our study, tracheostomy was associated with much longer lengths of stay and pneumonia. The impact of the underlying lung injury, versus the tracheostomy itself on these observations, is unclear. The challenge of characterizing the severity of an inhalation injury based on early visual inspection remains.
516  Phosphorus Requirements in Patients with Severe Thermal Injuries Requiring High-Volume Hemofiltration

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Introduction: Patients with thermal injuries have increased metabolic demands, requiring increased phosphate supplementation. Evidence is scant depicting incidence of hypophosphatemia and repletion requirements in patients with thermal injuries treated with high-volume hemofiltration (HVHF) and a high-flux membrane. The objective of this study was to determine the incidence of hypophosphatemia and characterize repletion requirements in this population.

Methods: This study was a case-control, retrospective chart review. Patients were included if sustained at least 20% total body surface area (TBSA) thermal injuries and required continuous HVHF (prescribed doses ≥ 35 mL/kg/hr). A randomly selected cohort (matched to age, TBSA, and inhalation injury) without acute kidney injury (AKI) was used to compare phosphorus requirements over an initial 14-day period. An a priori sample size was calculated (n = 26) to detect a minimum difference of 0.3 mmol/kg/day. Repeated measures ANOVA was used to compare requirements and concentrations. Demographics, diet, and variables affecting phosphorus concentrations were compared utilizing Fisher’s exact, Student’s t-test, or Mann-Whitney test depending on type and distribution.

Results: One thousand sixty-six patients were screened. Most were excluded from the HVHF group for TBSA < 20% (58%) or not a burn injury (29%). Sixteen patients were included in each group. The average age was 60.2 ± 15.1 vs 53.3 ± 16.4 (p = 0.22) with median TBSA (p = 0.73) of 30% (23.4, 56.3) vs 29% (26.4, 33.9). All patients in the study group were started on HVHF for AKI, utilizing a 1.6m² polyethersulfone membrane (mean delivered prefilter dose of 54.7 ± 1.5 ml/kg/hr), and had statistically higher potassium and phosphorous laboratory values at baseline. Parenteral phosphorus replacements were 2 fold higher in the HVHF group (p = 0.02), but not statistically different after accounting for estimated enteral intake. Despite providing 0.75 mmol/kg/day of phosphorous supplementation (vs 0.66 mmol/kg/day in control, p = 0.45), the HVHF group experienced more days with hypophosphatemia (49.6 ± 12.4 % vs 29.3 ± 16.3 %, p = 0.012). By 72h, every HVHF patient experienced at least one episode of hypophosphatemia. Patients on longer durations of therapy had increasing risk of hypophosphatemia. There was a significant difference in days requiring mechanical ventilation (p < 0.001)

Conclusions: This study demonstrates thermally injured patients receiving HVHF for AKI are at increased risk for hypophosphatemia and require higher phosphate supplementation to maintain lower average serum concentrations, as compared to the controls with similar burns but without acute kidney injury.

517  Outcomes of Patients with Burns Associated with Home Oxygen Therapy: An Institutional Retrospective Review

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Introduction: Home oxygen therapy (HOT) is frequently prescribed for patients with pulmonary dysfunction, which predisposes them to a unique health hazard at home. Prior studies show that HOT burns carry high morbidity and mortality, in large part due to inhalational injury. A significant portion of HOT patients are active smokers, which is the most frequent cause of HOT ignition. We conducted a retrospective review of patients with HOT related burns at our institution to characterize demographics and outcomes in this patient population.

Methods: An IRB-approved single-institution retrospective review was conducted by querying our institutional burn registry for patients diagnosed with head and neck burns between July 2016 and January 2021. Patients with burns due to HOT ignition were included. Patients were separated into three groups: i) discharged from the emergency department (ED), ii) observed for less than 24 hours, and iii) admitted to the hospital. Demographic and clinical outcome data were compared between groups.

Results: We identified 100 patients with HOT burns, who were evaluated from 2016-2021, during which time we treated 3606 patients with burn injuries. Mean age was 66.6 ± 9.3 years with a male to female ratio of 1.3:1 and median TBSA of 1%. In these patients, 97% were on HOT for COPD and smoking caused 87.3% of burns. Thirteen were discharged from the ED, 35 observed for less than 24 hours, and 52 admitted. For admitted patients, 69.2% were admitted to the ICU with a median ICU stay of 1.5 days, 37% required intubation for a median duration of 1 day, and 11.5% required debridement and grafting with an average of 2.6 ± 1.6 procedures. Inhalational injury was found in 26.9% of patients, 3.9% underwent tracheostomy, and 17.3% experienced hospital complications. In-hospital mortality was 9.6% and 7.7% discharged to hospice. Among

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those admitted, median length of stay was 4 days and 67.3% discharged home. After discharge, 13.5% required readmission within 30 days. Patients admitted to the hospital had significantly higher rates of admission to the ICU, intubation, and inhalational injury compared to those that were not admitted (p < .01).

**Conclusions:** Most HOT-related burns are caused by smoking and these injuries can result in significant morbidity and mortality. Efforts to educate and encourage smoking cessation with more judicious HOT allocation would assist in preventing these unnecessary highly morbid injuries.

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**518 Prescribing practices of atypical antipsychotics in the burn ICU**

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**Introduction:** Atypical antipsychotics are commonly used in the management of agitation and delirium in the intensive care unit (ICU). Patients admitted to the burn intensive care unit (BICU) with burns with large total body surface involvement (>20%) require prolonged mechanical ventilation and prolonged ICU stay, putting them at risk of ICU delirium. Furthermore, patients with burn injuries often have underlying psychiatric conditions, and some can develop new psychiatric disorders secondary to the trauma associated with their burn. Due to these factors many burn patients receive scheduled oral atypical antipsychotics during their ICU stay. The purpose of this study was to retrospectively characterize the prescribing practices of atypical antipsychotics in the BICU.

**Methods:** This was a single-center, retrospective chart review of adults admitted to the BICU with a burn injury who received scheduled oral atypical antipsychotics. Prescribing patterns in the ICU and on all transitions of care were analyzed. Additionally, the appropriateness of AAP prescribing at discharge was evaluated. AAPS were considered to be appropriately prescribed at discharge if a patient was continuing a home medication, or if psychiatric consult services recommended continuing at discharge.

**Results:** During the five year study period, 440 adults were admitted to the BICU with a burn injury, 18.2% of which were prescribed an AAP during their ICU course. Of those prescribed an AAP, 28.8% had a documented underlying psychiatric condition. Most patients were male (70%) with an average age of 41 years, and a mean total body surface area burn of 32%. The average ICU length of stay was 32 days. AAPS were primarily used to treat agitation/delirium (72.5% of patients). Quetiapine was the most commonly prescribed AAP. On transfer to stepdown, AAPS were continued in 78.4% of patients. Additionally, 67.7% were discharged on an AAP. Of these patients, continuation was considered appropriate in 54% of patients.

**Conclusions:** Despite overall lower AAP prescribing in the burn ICU compared to other ICUs, over two thirds of patients initiated on AAPS in the BICU were prescribed AAPS at discharge. AAPS should be evaluated for appropriateness at each transition of care.
Introduction: Invasive fungal wound infection (FWI) in burn patients is a high-mortality complication; early diagnosis and treatment may improve outcomes. Management of suspected FWI includes initiating broad-spectrum antifungals, obtaining a biopsy for histopathology and culture, and performing urgent surgical excision. However, the relationship between clinical suspicion (manifested by initiation of antifungals) and histopathological diagnosis is unknown.

Methods: Patients admitted between 2004 and 2019 to our burn center, and initiated on any systemic antifungal, were included. The electronic medical record (EMR) was reviewed to determine the indication for such therapy. Patients were included if antifungals were initiated out of concern for FWI. If the indication was not clear, patients were included if systemic antifungal agent(s) initiated were triazoles (not fluconazole), echinocandins, or amphotericin B.

Results: Two hundred one patients who received 251 courses of broad-spectrum antifungal therapy were included. Thirty six patients (17.9%) received more than one course of antifungal therapy. One hundred sixty five (82%) patients were male, with an average age of 41.1 ± 17.7 years. The average burn size was 49.7 ± 22.8% total body surface area (%TBSA) and 60 (29.8%) patients had inhalation injury. The median time from injury to antifungal initiation was 17.5 days (IQR 10.7, 38.6 days).

One hundred sixty eight biopsies were obtained within 3 days initiation of antifungal therapy. Aspergillus was the most commonly isolated genus (n=47) followed by Candida (n=46), Fusarium (n=26), Mucor (n=10), and other (n=20). There were 35 instances where multiple fungal organisms were recovered in tissue culture. One hundred five patients (52.2%) died during their hospital stay; 38 of these patients had FWC, 25 had FWI, 20 had negative biopsies, and 22 did not have biopsies taken.

Conclusions: Of 251 systemic antifungal courses initiated out of concern for FWI, FWI was biopsy-proven 14.7% of the time. Antifungal stewardship is needed to better identify appropriate high-risk patients for FWI. The development of a novel criteria or scoring system may be warranted to assist in deciding when to initiate systemic antifungal therapy for FWI in burn patients.
Introduction: Children with major burn injury frequently require prolonged central venous access to assure appropriate fluid management and pain control. Central venous catheters in children frequently develop clots that prevent drug administration, requiring administration of tissue plasminogen activator (TPA). The purpose of this study was to identify the frequency and efficacy of TPA use in burned children with central venous catheters (CVC).

Methods: This retrospective chart review evaluated all children requiring CVC admitted to our tertiary pediatric burn center from 2018-2019. Data collected included patient demographics (age, burn size, hospital length of stay (LOS)), catheter-related data (number of central lines, lines replaced due to clotting), TPA administration (number of administrations, successful TPA administrations, how often repeated), and line clotting data (time from insertion to clot, interval between TPA order and administration).

Results: In 2018, 116 lines were place in 49 children with mean age of 8.4 years and mean burn size of 29%, intensive care unit LOS was 24 days. TPA was infused in 20% of lines to relieve obstruction and was successful in relieving the clot in 21% (5/23). The interval between identification of the obstructed line to TPA order was 191 minutes, with the administration of TPA 83 minutes after order placement. The average time from identification of obstruction to TPA administration was 257 minutes. In 2019, 150 lines were placed in 65 children with mean age of 5.2 years and mean burn size of 25%, LOS was 13 days in the PICU. TPA was infused in 5% of lines to relieve obstruction and was successful in relieving the clot in 0% (0/8). The interval between identification of the obstructed line to TPA order was 117 minutes, with the administration of TPA 49 minutes after order placement. The average time from identification of obstruction to TPA administration was 158 minutes.

Conclusions: The incidence of obstruction in pediatric central venous catheters in our unit decreased from 26% in 2018 to 3% in 2019. TPA was successful in clot resolution in only 5% (2018), and 0% (2019). Based on our results, we targeted areas for improvement including: Standing order for TPA; staff education on TPA use; decreasing our average time to identify, order, and administer TPA; and standardizing the frequency of flushing unused central venous catheter lumens with heparinized saline flush.
Reduced Incidence of Fractures After Treatment with Oxandrolone in Burn Patients

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Introduction: Bone density loss is a significant and well documented complication after major burns. Oxandrolone and bisphosphonates have both been used successfully to mitigate this outcome. Studies show these agents reduce both short-term and long-term bone loss, but no studies have examined the long-term clinical outcomes of these agents. This study investigates long-term outcomes of treatment with oxandrolone and bisphosphonates in burn patients.

Methods: We examined a deidentified database of electronic medical records across 55 healthcare organizations including over 75 million patients. ICD 10 codes were used to identify patients with thermal or chemical burns from January 1, 2010 to December 31, 2020. We included patients who received their first dose of oxandrolone or bisphosphonate within one month of injury. Propensity score matching was used to balance patient cohorts. ICD 10 and CPT codes were used to evaluate outcomes.

Results: We identified 280,367 patients with burn injuries during the study time period. Of these, 903 (0.32%) received at least one dose of oxandrolone and 307 (0.11%) received at least one dose of a bisphosphonate medication within 1 month of injury. Mortality was higher among matched patients receiving oxandrolone (OR: 3.146, CI: 2.224, 4.449) or a bisphosphonate (OR 3.027, CI: 1.8, 5.092). Fracture at any site and fracture of long bones were significantly lower among matched patients who received oxandrolone (OR: 0.704 CI: 0.542, 0.914; OR: 0.689, CI: 0.51, 0.931; respectively) compared to those who did not. No reduction of fractures was seen among patients who received bisphosphonates (p >0.05). Among patients receiving oxandrolone acute kidney failure was increased (OR: 1.941, CI: 1.454, 2.592) compared to those not receiving the medication but chronic kidney failure was reduced (OR: 0.513, CI: 0.351, 0.749). There was no increase in acute or chronic kidney failure among patients receiving a bisphosphonate (p >0.05). Liver injury was not increased among patients receiving either medication (p >0.05).

Conclusions: Oxandrolone and bisphosphonate medications have been well studied and shown to decrease bone density loss after burn injury. Fractures of all bones and specifically long bones were reduced in patients receiving oxandrolone, suggesting that decreased bone catabolism during the acute recovery period may provide long-term injury protection. While we do see an increase in mortality with both of these medications, there is no we do not see any increase in liver failure or chronic kidney failure suggesting that factors unrelated to the administration of these medications are driving the increased mortality and may be related to selection bias. This is the first study to show that oxandrolone decreases the incidence of fractures after burn injury.

Dysphagia in Thermal Injury: The Impact of Inhalation Injury on Incidence and Recovery

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Introduction: Dysphagia is known to be a prevalent condition in the burn population. Dysphagia can lead to adverse events such as aspiration pneumonia, dehydration, and malnutrition. However, there is little data on the incidence and duration of dysphagia specifically in the inhalation injury subset of burn patients. The aim of this study is to determine the incidence and factors that contribute to dysphagia in the inhalation injury burn population as compared to the cutaneous burn population.

Methods: A retrospective study was conducted of patients admitted to a burn center from January 2016 - January 2021 and intubated for >48 hours. Patients who died during hospitalization or transferred hospitals were excluded. Dysphagia duration was analyzed based on days free from the ventilator. Two groups were compared: 1) non-inhalational injury vs inhalational injury patients and 2) Grade 1 vs Grade ≥2 inhalational injury patients. Statistical analysis included student’s t-test, chi-square test, and Kruskal-Wallis test. Bayesian generalized linear models were created to measure the independent association of inhalational injuries with the outcomes.

Results: During the study period, 142 patients were admitted, of whom 49 patients had inhalation injury (35%). Inhalational injury patients had a lower %TBSA burn than non-inhalational injury patients (mean 18% ± 21% vs 31% ± 15%, p= 0.001). There were no significant differences in age, sex, tracheostomy placement, ventilator days, or hospital length of stay between the two groups. The inhalational injury group had a higher rate of dysphagia at the first Speech Language Pathologist (SLP) instrumental assessment (88% versus 51%, p< 0.001) and at discharge (55% versus 28%, p=0.001). After controlling for %TBSA, inhalational injury was independently associated with an increased odds of dysphagia at first SLP instrumental assessment (OR 13.0, 95% CrI 4.7-43.4, posterior probability ≥99%) and at discharge (OR 3.2, 95% CrI 1.5-6.9, posterior probability ≥99%). Additionally, inhalational injury patients had a longer period of dysphagia post-extubation with an average of 9.5 vs 7.1 days to any diet (p< 0.006) and average of 12.6 vs 7 days to a regular texture diet (p < 0.001). Grade 1 inhalational injuries had no difference in duration of dysphagia or dysphagia at discharge compared to Grade ≥2 inhalational injury patients.

Conclusions: Inhalational injury was independently associated with dysphagia upon initial SLP instrumental assessment and at discharge. Patients with an inhalational injury also had a longer dysphagia resolution time. The severity of the inhalation injury did not impact dysphagia incidence.
Introduction: Burn patients with >20%TBSA suffer from a hypermetabolic state causing loss of muscle mass as well as a compromised immune system and delayed wound healing. Weight loss is most severe in patients with >20%TBSA with an initial gain of weight due to fluid resuscitation. These findings led the American Burn Association to propose new quality measures for burn-injury admissions, including weight loss from admission to discharge. We aim to assess how our institution’s outcomes adhere to the proposed measures and if our findings correlate with previously described results.

Methods: A retrospective review was conducted for adult patients admitted to our institution with burn injuries of >20%TBSA since 2016. Three groups were established based on %TBSA: 20-29% (Group 1), 30-39% (Group 2), and >40% (Group 3). We assessed weight changes from admission to discharge and performed a multivariate analysis to account for age, sex, number of surgical procedures, and hospital length-of-stay (LOS).

Results: Data from 40 patients suffering burn injuries of >20%TBSA showed 11 patients with %TBSA of 20-29%, 10 patients with %TBSA of 30-39%, and 19 patients with %TBSA of >40%. When comparing groups 1 and 2, we saw significantly more weight loss in group 2 over the course of admission without a significant change in total hospital LOS. The average %weight loss for group 1 was 1.46%, 8.36% for group 2, and 10.56% for group 3. No patients in group 1 had a weight loss >15%. For group 2, patients with weight loss >15% had a significantly longer LOS and underwent significantly more surgical procedures during their admission. For group 3, most patients who experienced weight loss >20% did not have a longer LOS but did require more surgical procedures during their course of admission.

Conclusions: Analysis of the data demonstrates that patients with >20%TBSA do suffer significant weight changes, likely due to extreme metabolic disturbances. Our data suggests that an increased length of stay is not a significant driver for weight loss changes between patients with %TBSA of 20-29 and 30-39, suggesting other pathophysiologic mechanisms in play. Our data supports the idea that patients with %TBSA >40 are a unique subset of patients, requiring specialized nutritional protocols and metabolic analysis.

Introduction: Current guidelines for evaluating nutritional risk in acutely ill patients incorporate the assessment of inflammation and disease burden. Inclusion of laboratory measures such as C-reactive protein (CRP) in screening criteria used to identify nutritional risk has gained credibility. Other biomarkers influenced by inflammation include visceral proteins albumin (ALB) and pre-albumin (PAB). While visceral proteins are not valid indicators of nutritional status, they may be indicators of nutritional risk, which could potentially lead to poor clinical outcome. The purpose of this study is to evaluate if PAB, ALB, CRP, are useful markers for predicting clinical outcomes in children with severe burn injury.

Methods: As part of our quality assurance program, we collect data on all nutrition support interventions, monitoring and outcome in children admitted to our hospital with significant burn injuries. This analysis describes data collected from 2006-2019 in children who had a burn injury and received nutritional support for five days or greater. Data elements collected include general demographics, weekly measures PAB, CRP, ALB; length of stay (LOS), number of intensive care unit (ICU) days, days to wound closure, and days on nutrition support. Biomarkers PAB, ALB, CRP and burn size (as an indicator of disease burden) were entered into a multiple regression model using a stepwise procedure for each dependent outcome variables (LOS, ICU LOS, Days to Wound Closure, and Days on Nutrition Support).

Results: A total of 182 patients, 7.0 ± 5.0 years of age with 41.1 ± 16.9 % total body surface area (TBSA) burns were included in the analysis. TBSA, mean CRP and mean PAB were significant predictors of hospital LOS (R=0.60; p < 0.001); TBSA and PAB were significant predictors of ICU LOS (R=0.67; p< 0.000), days to wound healing (R= 0.37; p < 0.000) and days on nutrition support (R=0.60; p< 0.000). Albumin was not a significant predictor for any of the clinical outcome measures.

Conclusions: Our findings indicate that monitoring PAB and CRP is useful for identifying risk of poor outcome. Mean PAB was inversely associated with LOS, ICU LOS, days to wound healing, and days on nutritional support even when controlling for CRP and burn size.
Evaluation of phosphate replacement practices in burn patients

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Introduction: Burn injury causes acute shifts in phosphorus leading to hypophosphatemia and negative sequelae, such as motor neuropathy, muscle weakness, cardiac failure, and respiratory failure. These patients require frequent phosphorus level monitoring and repletion beyond the needs of a general critical care patient. Data suggests patients with normal phosphorus levels have lower incidence of ventilator wean failure and positive clinical outcomes. There is limited data evaluating phosphate replacement practices in burn patients for their intensive care unit (ICU) length of stay while also evaluating those who concomitantly receive continuous renal replacement therapy (CRRT) as it is the primary mode of renal replacement therapy in this population and further depletes phosphorus levels.

Methods: This was a single-center, retrospective, observational study of patients with a burn injury admitted and discharged from a burn intensive care unit (BICU) from January 1, 2016 to June 30, 2020 who received phosphate. Patients less than 18 years of age and those admitted to the BICU for non-burn injuries were excluded. Burn injury type, number of phosphorus doses per day, and phosphorus levels were collected. Normal phosphorus was defined as 2.5-4.9 mg/dL and hypophosphatemia as < 2.5 mg/dL. Patient data was evaluated in 24-hour time intervals as defined as midnight to midnight. Phosphorus lab values were included in data analysis. The mean age was 51.51 years and the mean total body surface area burned was 21.48%. Flame burn accounted for 83.6% (n=97) of patients and phosphorus levels were collected. Normal phosphorus was defined as 2.5-4.9 mg/dL and hypophosphatemia as < 2.5 mg/dL. Patient data was evaluated in 24-hour time intervals as defined as midnight to midnight. Phosphorus lab values were included in data analysis if there was corresponding phosphate administration in that 24-hour interval. The primary objective was to assess the temporal dose-response to phosphate replacement in burn patients.

Results: There were 291 patients who met criteria, 116 were included in data analysis. The mean age was 51.51 years and the mean total body surface area burned was 21.48%. Flame burn accounted for 83.6% (n=97) of patients and 37.06% (n=43) of patients had concomitant inhalation injury. The mean amount of phosphate given to a patient per day was 28.38 mmol and patients on CRRT received a mean amount of phosphate of 33.34 mmol per day. In response to phosphate administration, the mean change in phosphorus was 0.334 ± 1.08 mg/dL. In patients on CRRT, the mean change in phosphorus was 1.4 ± 1.89 mg/dL. Patients experienced hypophosphatemia 69.63% of the days that they received phosphate repletion and patients on CRRT had hypophosphatemia 87.39% of the days they received phosphate repletion.

Conclusions: Hypophosphatemia is common in the burn injury population and current phosphate replacement practices are insufficient to replete phosphorus in burn injury patients.

Outcomes of Total Parenteral Nutrition Use in Burn Patients at a Single Institution

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Introduction: Total parenteral nutrition (TPN) has been widely used among critically ill patients. Some of the controversy surrounding parental nutrition stems from its early use in the 1980s, which primarily focused on hyperalimentation. In burn patients, nutritional support is a critical aspect of treatment. The metabolic rate in this patient population can be greater than twice the normal rate, and this hypermetabolic response can last more than a year after the burn injury has occurred. The objective of this study was to evaluate the outcomes of patients in our Burn Center who received TPN during their hospitalization.

Methods: This was a single-site, retrospective review using our institutional Burn Center registry. All adult patients (18 years or older) admitted to our Burn Center between July 1, 2015 and June 30, 2021 who had received TPN during their hospitalization were included in this study. Adult patients who had not received TPN were included for comparative purposes. Variables of interest included demographics, burn mechanism, length of stay (LOS), ICU and ventilator days, and mortality.

Results: There were 20 burn patients who received TPN during their hospitalization. Of those patients who received TPN, 90% were male. The mean age was 45 years, and the mean total body surface area (TBSA) involvement was 32%. The mean resting energy expenditure (REE) was 3,084. On average, the time from day of admission to initiation of TPN was 40 days, and the mean length of TPN administration was 20 days. The overall decrease in patient weight from admission to discharge was 10%. The mean LOS for the TPN group was 118 days. The mean LOS in the ICU was 92 days. The mean ventilator days were 89 days. The overall hospital mortality of patients who received TPN was 20%. When matched with patients who had similar TBSA involvement and who had not received TPN, there was no difference in mortality. However, there was a significant difference in weight loss (4% for non-TPN group), overall LOS (63 days), ICU LOS (29 days), and ventilator days (31 days).

Conclusions: Burn patients who received TPN during their hospitalization had a greater decrease in their overall weight, had a longer hospital and ICU length of stay, and were ventilated longer than those patients who did not receive TPN. These findings are to be expected given that patients who receive TPN tend to be more critically ill, and therefore, require more nutritional support.
Conclusion: Stereophotogrammetric measurement of maximum scar height and total scar volume is more reliable than clinical photograph assessment. Clinical estimation of scar volume is significantly less than instrumented measurement, although maximum estimated vs. measured scar height was not significant in this study. There are limitations in measuring scar properties for image capture that exceeds the visual field.

Conclusions: Silver sulfadiazine remains one of the most commonly used topical antimicrobials in burn care due to its broad spectrum of activity, low cost, and ease of use. Adverse reactions to topical silver sulfadiazine and mafenide acetate are rare, even in those with reported sulfa allergies. Topical sulfonamide antimicrobials can commonly be used safely in most patients with allergies to systemic sulfa antibiotics, and the rate of cross-reactivity appears to be low. A test patch is recommended prior to application over a large area.

Introduction: Silver sulfadiazine cream 1% is a sulfonamide topical antimicrobial commonly used in burn care, in part due to its wide spectrum of activity, particularly against Pseudomonas aeruginosa. Contact dermatitis due to sulfadiazine component is a known but rare complication of silver sulfadiazine. In contrast, systemic sulfonamide antimicrobials are a commonly reported allergy and have been implicated in multiple hypersensitivity reactions. Some authors recommend avoidance of all sulfonamide antimicrobials regardless of route of administration for a patient with a known allergy to a sulfonamide antimicrobial due to structural similarities between all drugs in the class, resulting in a high risk of cross-reactivity. Clinical reports are lacking, however, and the few reports that do exist implicate silver as the culprit rather than the sulfadiazine component. Therefore, while the theoretical risk of reactivity to a topical application of sulfadiazine exists, there is no data to support this in practice.

Methods: A retrospective review of 42 patients with a sulfa allergy who were admitted to the burn unit of an academic medical center between June 2016 and June 2021 were reviewed. Inclusion criteria were age > 18, burn requiring admission, sulfa allergy, and receiving topical sulfa antimicrobial therapy. Data on the reported allergen, reaction, and any adverse reaction from the use of topical sulfa agents were recorded.

Results: Forty-two patients were identified. Of these, 32 (76%) reported a non-specific “sulfa” allergy, while 10 (24%) reported a specific allergy to trimethoprim-sulfamethoxazole. The reactions were reported as unknown (20, 48%), rash (9, 21%), hives (6, 14%), gastrointestinal (4, 9%), or other (3, 7%). One patient had a history of respiratory distress with trimethoprim-sulfamethoxazole administration. All 42 patients received treatment with topical silver sulfadiazine and 10 also were treated with topical mafenide acetate solution. There were no reported adverse events and no patients discontinued therapy. Two patients were identified with no previous sulfa allergy but who discontinued topical silver sulfadiazine due to burning sensation, a rare but previously reported side effect of this medication.

Conclusions: Stereophotogrammetric measurement of maximum scar height and total scar volume is more reliable than clinical photograph assessment. Clinical estimation of scar volume is significantly less than instrumented measurement, although maximum estimated vs. measured scar height was not significant in this study. There are limitations in measuring scar properties for image capture that exceeds the visual field.

Introduction: Descriptive clinical tools for the characterization of burn scar features are limited by variability between users and unknown sensitivity to change over time. We have previously described pre-clinical assessment of stereophotogrammetry as a valid measure of burn related scar and in this study compare the estimated vs. instrumented measurement of maximum height and total positive volume of burn scars in a tertiary care adult outpatient burn clinic.

Methods: This study was approved by our university’s research ethics board. All participants provided written informed consent. Persons 18 years or older presenting to an outpatient burn clinic with closed burn scar that may be captured in a single image were enrolled in the study. Patients with scars from other injuries or who were unable to provide consent were excluded. Photographs of burn scars were taken with commercially available 3D camera. Three experienced wound care therapists estimated the maximum height and total positive volume of the collected images. The images were assessed with stereophotogrammic software with results exported to a spreadsheet for further analysis. Two factor analysis without replication was performed to calculate intra-class correlation coefficients (ICC) between the assessors estimated analysis without replication was performed to calculate intra-class correlation coefficients (ICC) between the assessors estimated

Conclusions: Stereophotogrammetric measurement of maximum scar height and total positive volume of the collected images. The images were assessed with stereophotogrammic software with results exported to a spreadsheet for further analysis. Two factor analysis without replication was performed to calculate intra-class correlation coefficients (ICC) between the assessors estimated scar height and volume and the measured height and volume. The measured scar height ICC was 0.933 and volume 0.890. Two sided Wilcoxon tests were performed comparing mean estimated height and volume between estimated and measured output.

Results: Fifteen participants with a mean age of 42.6 (21-68) were enrolled. Twenty-six scar images were taken from wounds that were managed by non operative treatment (20), excision and grafting (5), and 1 image was collected from a skin graft donor site. Scar images were taken of the trunk and extremities, but none of the head nor neck. The estimated maximum scar height ICC was 0.595 and volume 0.531. The measured scar height ICC was 0.933 and volume 0.890. Wilcoxon tests of estimated and measured volume were significantly different (z = -2.87, p = 0.041). Comparison of estimated and measured height were not significant (z = -1.39, p 0.161).

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Comparison of Clinical Estimation and Stereophotogrammetric Instrumented Imaging of Burn Scar Height and Volume

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Introduction: Determining the depth of skin burns in patients is critical for surgical decision making, but currently lacks accuracy in clinical practice. Short-wave infrared (SWIR) light penetrates tissue more than visual or near-infrared light and is very sensitive to water content. We have shown in animal models that imaging of skin burns in the SWIR range distinguishes between superficial and deep tissue necrosis. Here we present the first 2 cases of multispectral SWIR imaging of human burn injury as a first step toward a non-invasive, label-free, technique for burn depth determination.

Methods: Two subjects admitted for mixed depth, thermal, 6% and 7% total body surface area (TBSA), burns were studied. Prior to burn excision, a novel system, based on a specialized camera, imaged the burn areas and normal skin at 4 different SWIR bands. Standard photographs from imaged areas were collected and presented for 5 independent, blinded, surgeons’ assessments. In SWIR images, 3-5 regions of interest (ROIs) were selected in burned and adjacent normal skin and the reflected light intensity in each ROI was averaged.

Results: Visual and SWIR images were collected for 9 burn areas in the hands, arms, and shoulder of 2 patients (Panel A). Fifty ROIs from the burn areas were assessed by the surgeons and 30 (60%) ROIs were agreed as being superficial or superficial partial thickness (n=5), deep partial thickness (n=11), or full thickness (n=14) burns by a majority (60% or above consensus together with a possible disagreement only between deep partial and full thickness burn). In Panel B the cumulative SWIR reflectance intensity at the 4 SWIR bands for the 3 burn groups, determined by expert surgeon evaluation, and normal skin are compared. The reflectance from superficial and superficial partial thickness burns (yellow) were 102.7±1.2%, 102.3±0.7% and 103.4±1.4% of the normal skin reflectance for 1200, 1650 and 1940 nm, respectively.

Conclusions: We present the first human SWIR study demonstrating a distinct reflectance intensity of SWIR wavelengths for different burn depths based on surgeon assessments. The results motivate further studies of SWIR imaging of burns in the hope to non-invasively and accurately identify operative versus non-operative burns.
**534 Allogeneic Cellularized Living Tissue in Pediatric Deep Partial Thickness Burns Reduces Need for Donor Sites.**

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**Introduction:** Healing potential of deep partial thickness burns is not easily determined early after injury. Prolonged and continued inflammation can contribute to burn wound conversion. Early excision compared to a wait and see approach to wound healing decreases inflammation, shortens length of stay, and decreases painful wound procedures. However, early excision is at the expense of removing tissue that may otherwise heal without autografting. Use of a cryopreserved, allogeneic cellularized scaffold living tissue product (CTP) in pediatric deep partial thickness wounds with dermal elements remaining after excision is an alternative approach to wound closure. CTP may allow early excision without compromising healing potential, thereby minimize donor site morbidity, infectious complications and decrease length of stay. This case series describes the expanded access experience of a CTP on pediatric patients with thermal injury.

**Methods:** Expanded use approval of a CTP was obtained through the FDA for pediatric patients with burns at three burn centers. Patients were taken to the operating room for excision and grafting of burns at the discretion of the attending surgeon. In wounds with dermal elements present after excision, CTP was grafted to the wound bed (Table 1). Postoperative wound care and follow up was per institutional standards of care.

**Results:** Six pediatric patients (9 weeks – 13 years old) with mixed depth burns having dermal elements remaining after excision were treated successfully with a CTP. Donor site surface area was reduced in all patients. No serious adverse events related to the CTP were noted in any of the cases. Average time to heal wounds treated with the CTP was approximately 2-3 weeks. In wounds ultimately deemed to be full thickness, CTP was not detrimental to subsequent autograft take. See Table 1.

**Conclusions:** This case series demonstrates that use of a CTP in pediatric patients is donor site sparing without any serious adverse events. Furthermore, use in full thickness burns is not detrimental to subsequent autograft take. The degree of dermal elements necessary to support wound healing is unknown and requires further study. This case series supports the application for a clinical trial investigating the safety and efficacy of CTP as an adjunct to wound healing in pediatric deep partial thickness burns.

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**535 Pre-operative Expectations, Post-operative Satisfaction and Patient Directed Priorities for Clinical Burn Research**

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**Introduction:** Patients receiving split thickness skin grafting due to deep burns are left with scarring and chronically dysfunctional skin at the graft site. Given evidence that patients’ pre-operative expectations mediate post-operative outcomes and satisfaction, we sought to describe burn patients’ experience, expectations, and satisfaction with their skin graft, and their views towards a future cell-based clinical trial to improve their graft, over time. We also aimed to identify graft outcome measures for use in future studies.

**Methods:** This study was approved by our university’s research ethics board. All participants provided written and informed consent. Data were collected via patient questionnaires pre-operatively, one, and three months post-operatively.

**Results:** Most patients had small burns. Expectations of graft function were consistent pre- and post-operatively. Expectations of graft appearance showed significant decrease over time ($\beta_1 = -0.290, p = 0.008$). Significant improvements in skin function ($\beta_1 = 0.579, p = 0.000$) and appearance ($\beta_1 = 0.247, p = 0.025$) at the wound site during recovery were observed, although patients noted great difference between grafted and normal skin. Patient satisfaction with their graft did not change significantly over time. Patients were willing to participate in a cell-based clinical trial that may improve graft symptomology. They prioritized diminished scarring, redness, and improved sensation and elasticity as the most salient aspects of grafts to be enhanced by cell-based therapy.

**Conclusions:** Patient graft concerns changed over time; outcome measures in trials advancing skin grafting should reflect chronic, patient prioritized limitations.
Introduction: Very few objective scar evaluations have been conducted with the burn survivor population, which limits our knowledge of the clinical recovery profile of hypertrophic scars (HSc) and donor site scars (D), thus having an impact on rehabilitation intervention and treatment prioritization. The purpose of this study was to prospectively quantify the thickness, pliability, erythema and pigmentation of post-burn HSc, donor sites (normal scar) and normal skin in different anatomical locations between 2 and 7 months post-burn using objective instrumentation. A secondary objective was to compare this data with anatomic-specific normative data using the same objective instrumentation.

Methods: Skin characteristics of HSc, D and N in 44 burn survivors were measured at 2, 3, 4, 5, 6 and 7 months post-burn using validated instrumentation: high-frequency ultrasound for thickness, Cutometer® to measure pliability and Mexameter® to measure erythema and pigmentation. Up to five sites were assessed on the same participant if their scar was located on the upper extremity (UE), lower extremity (LE) and trunk. A mixed model two-way analysis of variance was used to investigate the differences in means between sites at each time point and between time points at each site.

Results: The results revealed that HSc sites were thicker than D and N at all time points and UE and trunk HSc were thicker than LE HSc at 7 months post-burn, pliability of trunk HSc did not improve over time, and UE HSc was more erythematous at 7 months compared to other anatomical sites whereas D erythema decreases from 2 to 7 months.

Conclusions: Scar management treatments should prioritize the UE and trunk sites which developed HSc during the first two months post-burn and continues to vary significantly from normal scar and normal skin at 7 months. Furthermore, these results provide preliminary evidence that the recovery profile of HSc varies at different anatomical sites and that thickness is the characteristic that distinguishes HSc from normal scar and normal skin.

Introduction: Hypertrophic scars (HTS) and keloids (K) cause significant morbidity and disfigurement. Care of HTS and keloids range from less invasive treatments, such as pressure garments and silicone products, to more invasive treatments, such as intralesional injections (ISI) of medication, and surgical excision. Laser-Assisted Drug Delivery (LADD) is becoming a more popular treatment for HTS and K. The ablative fractional laser creates microchannels in the skins which allows the delivery of drugs into deeper skin layers. We have conducted a systematic review of the literature to assess the effectiveness of LADD in the treatment of HTS and K.

Methods: A search was performed on PubMed between January 1998-August 2021 using the following keywords: Laser Assisted Drug Delivery, Laser Combined Drug Delivery, Laser Drug Delivery, Laser Drug, Hypertrophic, Burn, Keloid, Scar. Inclusion criteria was the use of LADD in HTS or K. Exclusion criteria were studies in animal models, case reports, reviews, and non-english articles. One article was excluded due to concerns of plagiarism.

Results: A total of 11 articles were included in the final review. One study found no difference in HTS outcomes between LADD of corticosteroids (CTS) and laser with topical petrolatum used as a control. Two prospective studies found that LADD of CTS led to improved HTS outcomes. Two split-scar studies found no difference in K outcomes between LADD of CTS and ISI of CTS. One prospective study assessed LADD of CTS in K and found statistically significant improvements in scar outcomes. A retrospective study looking at K outcomes found a 50% mean improvement when treated with LADD of CTS. A split-scar study found statistically significant better HTS outcomes with LADD of 5-FU compared to topical 5-FU alone. One study found no difference in HTS outcomes between LADD of CTS and 5-Fluorouracil (5-FU). Two studies assessed both HTS and K. The first study found that both LADD of 5-FU and LADD of CTS led to significantly better scar outcomes when compared to laser monotherapy. The other reported that HTS outcomes were significantly better with LADD of Botulinum toxin A and K outcomes were better with ISI of Botulinum Toxin A.

Conclusions: The use of LADD is effective in the setting of HTS. There is evidence that LADD of scar modulating agents to HTS lesions is more effective than topical delivery or ISI of the same agent. LADD shows promise as an alternative treatment for K as it displays similar efficacy as ISI.
Introduction: Management of pediatric burn injuries resulting in optimal aesthetic remains a significant challenge in burn care. Wound care and acute surgical intervention coupled with reconstructive interventions is an essential component of burn care. Incorporation of new technologies in burn care has challenged historic paradigms. Our goal was to evaluate the use of autologous skin cell suspension (ASCS) for the treatment of partial-thickness pediatric burn injuries.

Methods: A retrospective chart review from a single pediatric institution over a 10-month period was performed on patients undergoing treatment with ASCS. Patients with full-thickness injuries treated with autografting were excluded. Demographics and data collection included total burn surface area (TBSA), location of burn, mechanism of burn, time to ASCS application, time to >90% re-epithelization, hospital length of stay, ASCS failure requiring repeat operation, and reconstructive procedures or laser interventions.

Results: 26 pediatric patients ≤13 years of age were reviewed. 14 patients received ASCS and met inclusion criteria. 8 faces were included in our study along with 11 upper extremity burns, 5 lower extremity burns, and 8 torso burns or some combination of the above. The most common etiology was scald injury from hot water followed by needle burns, other etiologies included road rash, flame burn, and a steam burn. ASCS was applied 2 days (range 1-4) after injuries and patients only required 1 operation. The average length of hospital stay was 4 days (range 1-10) and the average TBSA was 10% (range 4-17). The average time to >90% re-epithelization was 7 days with one outlier with healing at day 24. This is the only patient in the ASCS group that required laser interventions. No patients required repeat procedures, subsequent autografting, or reconstructive procedures.

Conclusions: Pediatric patients with partial-thickness burns benefitted from the ASCS by having limited donor sites, short hospitalizations compared to %TBSA, improved time to >90% re-epithelization, and no repeat surgical interventions. The fast-healing time and good cosmetic outcome decreases the need for compression garments and subsequent laser interventions. Key factors include patient selection and appropriate wound preparation.
Introduction: Accurately transmitting information in a burn mass casualty incident (BMCI) is critical. Modern technology, including "apps" and web-based systems coordinated through a central command center addresses this need. The system should 1.) Function as a real-time link between on-scene personnel, local hospitals or trauma centers and regional burn centers and 2.) Organize triage in accordance with accepted burn mass casualty national standards; and 3.) Match acuity of age and percent burn to immediate open beds, either direct from the scene or from secondary hospitals, without overwhelming any one particular facility.

Methods: Extensive literature review was conducted to do a comparative study of similar/existing commercial data management tools; investigate technology designs of mobile apps and web browsers accessible to cloud-based systems, and identify what data and processes needed to be tracked and coordinated across diverse stakeholders to deliver real-time situational awareness for definitive medical planning capabilities.

Results: Development of a Burn Patient Transfer System (BPTS) web-based application with mobile access resulted. The BPTS is a series of dashboards designed for specific patient management for both referring (RF) and receiving facilities (RC), coordinated through a central command center. Focus for RFs includes an ability to list number of patients by acuity, addition of new patients, transfer status confirmation and situational awareness throughout the BMCI. RCs report or modify open bed availability of both immediate and eventual beds, for adult or pediatric patients. With this information, appropriate receiving facilities are identified by command personnel to coordinate approval of patient transfer, mode of transport and maintain situational awareness between medical personnel at referring and receiving facilities without exceeding facility surge capability. Clinical experts are responsible for final decisions on a case-by-case basis at both RF and RCs, as defined by a patient transfer algorithm matching patients by age and acuity.

Conclusions: The BPTS is an accessible communications system designed to serve three critical functions; A). Provide a mechanism and platform to report both immediate and surge burn bed capacity; B). Match patient acuity with available open beds at registered medical facilities and burn centers in accordance with ABA Disaster Triage recommendations and C). Track patient movement in real-time. Its core functionality is patient transfer management to and from locations where appropriate care can be delivered based upon clinical needs. This may include initial transfer to a local hospital or trauma center for primary stabilization, or direct to a burn center if and when weather, security and infrastructure permit.
Challenges in Burn Nurse and Therapy Staffing During and After a Category 4 Hurricane

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Introduction: Burn nurse/therapy staffing has been stretched for months by the pandemic. Along the Gulf Coast, Hurricane Ida recently taxed these resources further as regional burn centers saw a weeks-long surge in serious burn injuries in the setting of prolonged power and water outages. We reviewed the execution of a plan for the provision of burn nurse/therapist staffing at an ABA-verified adult burn center that experienced a direct hit by a Category 4 storm.

Methods: Hospital leadership planned to activate Code Gray on 8/29/21 at which time the hospital would be placed on lockdown with no one allowed in or out until Code Gray was lifted.

Our burn leadership subsequently designed a plan to have ten burn nurses and one Occupational Therapist (TEAM A) in house from the inception of Code Gray at 7am on 8/29 thru 7am on 9/1. If Code Gray conditions persisted, nine dedicated burn nurses (TEAM B) were to relieve TEAM A. TEAM B was planned to remain in-house until 7am on 9/4. If Code Gray conditions continued, the plan was to be reassessed at that time. The same burn therapist was planned to remain in-house throughout. Physician coverage was to be provided by the in-house trauma team during Code Gray. No housing or bedding was provided for in-house personnel, and the hospital generator system ostensibly had a 30-day fuel supply.

Results: TEAM A day/night staffing was 6/4 with the off crew sleeping in conference rooms and clinic spaces. An unexpected event occurred when a mission-critical tower for the city’s grid toppled into a river resulting in delays for restoration of the grid, and city-wide boil-water and burn-ban policies. As generators came into widespread use, our pre-storm census of 9 increased to a mean of 12.7 + 1.4. Due to this increase, on the morning of 9/1 six TEAM A nurses elected to stay and be absorbed into Team B with day/night staffing of 6/6.

The rapid influx in number and complexity of burn patients made it clear a burn surgeon presence was needed during Code Gray. One burn attending was able to make it to the hospital at 7am on 8/30 and worked until being relieved at 7am on 9/5. An informal triage strategy was enacted in which only burns of >10% TBSA would be considered for admission. OR availability went down to 2 + 1 at the inception of Code Gray and 3 + 1 on 9/6. Eleven cases were done during this time with a mean TBSA of 20.2 + 10.7%.

Hospital generators were found to consume fuel at a rate almost twice predicted. Due to prioritization, the hospital went back on city power on 9/2. Code Gray was lifted at 7am on 9/4 and normal operations resumed at 7am on 9/11.

Conclusions: The successful provision of care required a willingness for nurses and one therapist to remain in the hospital for six consecutive days and for hospital administration to approve the overtime.
Introduction: Burn mass casualty incident (BMCI) planning efforts have been in practice and publication for 40+ years. Through these ongoing efforts, we know there are measurable limits to burn center capacity and capability through modeling and real-world events relying on conventional and contingency standards of care, even when the only focus is those patients with burn injuries. The southern region of the American Burn Association (ABA) includes 37 burn centers and continues to play a critical role in the BMCI preparedness process.

COVID-19 has emerged as the greatest pandemic in terms of morbidity and mortality since the 1918 influenza pandemic. While COVID-19 has no direct connection to burn injuries, the impact of COVID-19 on the American Healthcare System to include burn care was and remains significant.

Methods: We conducted a retrospective analysis of (southern) regional data voluntarily submitted to the ABA from March 2020 to June 2021 and generally coincides with the first three waves of the pandemic. We focused on the self-reported data specific to the three critical components in managing a surge of patients: staffing, space, and supplies (to include pharmaceuticals and equipment).

Results: Staff: These data were collected over a period that coincided with the first three waves seen in the region. Staffing shortages were noted during each of the surges but were most excessive when a regional surge paralleled surges in other parts of the country (November–December 2020).

Space: Late November and early December 2020, space was in short supply with the surge of patients for more of the region than at any other time during the 28 weeks of reporting. While single facilities reported other episodes of limited space or supplemented with temporary structures, the peak was early December.

Supplies: As the first surge began to subside, the supply shortages were abated. However, as additional surges occurred, the supply chain had not recovered. Supply shortages were reported in greater numbers than either space or staffing needs through the multiple waves of the pandemic.

Conclusions: The surge of patients that had to be managed by the greater healthcare community placed a substantial strain on the burn centers to keep beds dedicated for patients with burn injuries. The pandemic directly led to a diminished available capacity for burn care in such a way that it could have compromised our ability to confront a surge of burn-injured patients. Future BMCI planning efforts must consider this aspect of the process. Crisis Standards of Care may come into play during such an event.
Health Disparities Among Rural Burn Patients

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Introduction: Socioeconomic status is a risk factor for sustaining a burn and for burn mortality. Patients from rural areas make up a minority of the population but are frequently more isolated from life-saving care and burn centers. Lower socioeconomic status patients may delay seeking treatment of their burns for concern over medical costs, time away from work, and overall distance from accredited burn centers. We aim to explore disparities in burn outcomes at our institution based on patient socioeconomic status.

Methods: Between January 2020 and January 2021, patients presenting for management of acute burns were reviewed. Patient demographics and outcomes were collected, including time to presentation, total body surface area burned, presence of inhalational injury, and mortality. Patient socioeconomic status and rural designations were assigned based on a validated metric derived from Census endpoints, with higher scores reflecting lower socioeconomic status.

Results: A total of 524 patients were identified. Overall, 30% of our patients were from areas defined as being small towns or rural by the Census. Racial demographics did not differ between rural and urban areas (p = 0.099), but Hispanic ethnicity was less common (16% vs. 29%, p = 0.002). Rates of alcohol, tobacco, and illicit drug use did not differ between groups. Compared to the urban/suburban cohort, rural patients were from less affluent areas (63.6 vs. 58.5, p = 0.001) and traveled farther to our center (112 miles vs. 70 miles, p = 0.029). Despite these distances, rural patients did not have a higher rate of delayed presentation (35.7% vs. 43.3%, p = 0.105), or longer average time to presentation (3.4 days vs 4.4 days, p = 0.222). Flame burns were the most common mechanism overall (44.3%) and were significantly more common in the rural population (59.2% vs. 37.8%, p < 0.001). Scalds, the second most common burn mechanism (25.9%), occurred less frequently in rural patients (18.5% vs. 29.2%, p = 0.011). Controlling for age, TBSA, inhalational injury, and ventilator requirement, patients from rural areas were at a significantly higher risk of mortality (OR 24, p = 0.024).

Conclusions: Rural burn patients face many challenges receiving appropriate care following a burn. They frequently come from less affluent backgrounds, limiting their ability to access care, and they must travel greater distances to a qualified burn surgeon. Despite these barriers, our rural patient population did not present any later following a burn compared to our more urban patients. Rural patients sustained more extensive burns but were not hospitalized at a greater rate. Even when controlling for numerous factors associated with burn mortality, rural patients were still at an increased risk. Burn prevention strategies targeting rural communities should address the unique challenges facing these areas.
548 Toward a Burn Risk Calculator
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Introduction: Risk adjusted statistical modeling of deaths in burns has two major purposes. One is to enable comparison of outcomes between centers (Benchmarking). That requires as precise a model as possible and is applied retrospectively. The other objective is to inform patient and family discussions about prognosis and plans of care. These models are applied prospectively based on limited clinical data. The purpose of this study was to derive a model that could be the basis for such a risk calculator.

Methods: We identified 128,252 records in a national burn registry for initial patient admissions to 103 burn centers between July 2015 through June 2020. Cases from centers with < 100 admissions annually were omitted. We compared a logistic regression model based on the revised Baux score (RBS) (age, burn size, inhalation injury) with a logistic regression model involving age, age$^2$, burn size, presence of 3rd degree burn, inhalation injury, respiratory failure, burn etiology, gender, and admission year. We compared the Adjusted $R^2$, c statistic and average precision for each model. All calculations were done using CatBoostClassifier in Python.

Results: There were 127,018 patients that served as the basis for these analyses. The RBS model had an Adjusted $R^2$ of 0.41 compared with 0.54 for the more detailed model, a c statistic of 0.95 vs 0.98, and an average precision of 0.69 vs 0.76.

Conclusions: Both statistical models of mortality following burn injury demonstrated good accuracy. The model with the most predictor variables had better precision. Both models could serve as useful risk calculators for patients following burn injury.

549 Length of Stay per Total Body Surface Area Burn: Validation Using the National Burn Repository
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Introduction: A length of stay (LOS) of one day per percent total body surface area (TBSA) burn has been widely accepted in clinical practice but not validated in current pediatric burn studies. Additionally, TBSA burn data is often presented in ranges, which lacks granular details. The primary objective of this study is to validate our previous Pediatric Injury Quality Improvement Collaboration (PIQIC) findings by using a national burn registry to evaluate LOS per TBSA burn relative to burn mechanism, sociodemographic characteristics, and clinical factors which influence this ratio.

Methods: We evaluated patients 0-18 years old who sustained a burn injury and whose demographics were submitted to the National Burn Repository (NBR) dataset from July 2008 through June 2018. Patients sustaining inhalation injury and electrical burns were excluded due to LOS being significantly increased unrelated to cutaneous injury. Mixed effects generalized additive regression models were then performed to identify characteristics associated with the LOS per TBSA ratio, a nonparametric variable.

Results: Among 51,561 pediatric burn patients, 45% were Non-Hispanic White, 58% were male, and the median age was 3 years old (IQR: 1, 9). The most common burn mechanism was scald (55.9%), followed by flame (19.4%), and contact (16.4%), with most burns occurring at home (82.2%). The median LOS per TBSA burn ratio across all cases was 0.9 (IQR: 0.4, 1.8). In adjusted models, scald burns and radiation burns had similar LOS per TBSA burn ratios (mean predicted values: 1.22 vs 1.77), while all other burn mechanisms had a significantly higher LOS per TBSA burn ratio ($p< 0.0001$). Chemical burns had the highest ratio (predicted mean: 4.8), followed by contact burns (mean predicted value: 2.8; Table 1, Figure 1). Non-Hispanic White patients had lower LOS per TBSA ratios than all other races and ethnicities ($p< 0.05$) with mean predicted values of 1.6. Native Americans and Hispanics had the highest ratios (2.0 and 1.8 respectively, (Table 1).

Conclusions: These data substantiate evidence on variance in LOS per TBSA burn relative to burn mechanism, previously demonstrated by PIQIC centers. It also validates differences in LOS per TBSA burn ratios among race/ethnicity.
Results: Odds ratio and multivariate analyses were performed to identify risk factors for short- and long-term ophthalmologic complications in facial burn patients to prioritize patients that require urgent ophthalmologic evaluation.

Methods: Retrospective review of facial burn patients presenting to an American Burn Association-verified regional burn center between June 2007 and May 2016 was conducted. Demographics, presentation, time to ophthalmologic consultation, and short- and long-term complications were recorded. Odds ratio and multivariate analyses were performed to assess for significant risk factors.

Results: A total of 1,126 facial burn patients were identified, of which 135 (12%) involved periorbital and orbital injury. Average TBSA burned was 9.68%, with an average facial surface area burned of 1.56%. The most common ocular injury was eyelid burn (65.9%). Ophthalmology was consulted for 118 (87.4%) patients. Short-term ophthalmologic complications were noted in 58 (43%) patients, most commonly chemosis (n = 34, 25.2%). Long-term complications were rare, occurring in only 7 (5.2%) patients. Odds ratio analysis revealed that inhalation injury significantly increased the likelihood of both short- and long-term complications (OR 3.16 and OR 9.81, respectively). Active smoking increased the likelihood of long-term complications (OR 14.76). Ophthalmologic intervention, including need for consult, and use of lubricant, antibiotics, or steroids were each associated with increased risk of short-term complications.

On multivariate analysis, those with long-term complications tended to be older (p = 0.045). Those with corneal injury generally had worse outcomes, with higher likelihood of short- and long-term complications (p < 0.001, p = 0.057, respectively). Blindness did not occur in any patient, and no long-term complications occurred in those who did not receive ophthalmologic consult. Neither TBSA nor facial SA burned was associated with the development of short- or long-term complications.

Conclusions: Providers should obtain early ophthalmologic evaluation and frequent follow-up exams for facial burn patients presenting with advanced age, active smoking status, corneal injury, or inhalation injury to reduce development of long-term complications.

Introduction: Advances in burn management have led to significant improvement in survival rates, even in patients with high total body surface area (TBSA) affected. Ocular morbidity in facial burn patients remains high, partially attributable to the life-threatening nature of these injuries. Previous studies have shown that early ophthalmologic intervention leads to better outcomes, however, specific risk factors for short and longer term ophthalmologic outcomes have not been elucidated. This study aimed to identify risk factors for short- and long-term ophthalmologic complications in facial burn patients to prioritize patients that require urgent ophthalmologic evaluation.

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Conclusions: Providers should obtain early ophthalmologic evaluation and frequent follow-up exams for facial burn patients presenting with advanced age, active smoking status, corneal injury, or inhalation injury to reduce development of long-term complications.

Introduction: Burn patients are susceptible to wound infections, urinary tract infections, pneumonia, and bloodstream infections. With rising rates of community colonization with multidrug-resistant organisms (MDRO), the colonization of wounds with commensal organisms is more concerning than ever, which is particularly true in patients with recent hospital admissions, advanced age, or institutional living situations. The purpose of this study was to examine if age was a factor in obtaining admission cultures and if older patients were more likely to have positive cultures.

Methods: A retrospective chart review was conducted involving burn patients admitted at three ABA verified burn centers from January 2016 - December 2017. Data collected included demographics, burn injury, and cultures obtained within 24 hours of admission. Patients were divided into 10-year age increments from 20 to ≥ 80 years old. Data analysis was conducted using Chi-square, Fisher Exact, and Kruskal-Wallis tests.

Results: A total of 1615 patients (mean age 45.9± 17.7 years, 1145 males (70.9%), mean burn size (TBSA) 9.6± 14.2%) were analyzed. Admission cultures obtained were: 656 (40.6%) wound cultures, 196 (12.1%) urine cultures, 139 (8.6%) blood cultures, and 1445 (89.5%) Methicillin-Resistant Staphylococcus Aureus (MRSA) screen. In all age groups, there were no significant differences between patients who had wound cultures (p = 0.97), blood cultures (p = 0.39), or MRSA screening (p = 0.9). As patients aged, they were more likely to have urine cultures obtained (p=0.01): - 23% of patients >80 years old had urine cultures ordered at admission compared to 8.6-16.9% of younger patients. Positive results by age group: wound cultures (p= 0.09), urine cultures (p= 0.16), blood cultures (p= 0.01), MRSA screen (p=0.98). In looking at increased exposure to MDROs prior to admission by age groups, patients in the 61–70year (8.33%), 71–80-year (5.68%), and >80-year (6.67%) age groups were more likely to have a recent (within 30 days) hospitalization (p = 0.02), but there was no significant difference in pre-hospital institutionalization (i.e., prison, skilled nursing facility) by age group (p = 0.6). With a recent hospitalization, MRSA screening was more likely to be positive (11.3% vs. 4.9%, p = 0.05).

Conclusions: All burn patients are susceptible to infections. Urine cultures were more likely to be obtained in older burn injured patients who are 80 years of age or older. There was no significant difference in culture positivity by age. Apart from MRSA screen positivity, there was no increased risk of urine, wound, or blood culture positivity with recent hospitalization or institutionalization. The utility of screening all
patients for MDROs on admission should be considered for patients 20 years of age and older.

Introduction: In the United States, >30 million people (10.5% of the population) have diabetes, both diagnosed and undiagnosed. Many of these patients go on to develop diabetes related complications, such as peripheral neuropathy. Patients with diabetes are also prone to foot injury. The purpose of this study is to determine clinical outcomes associated with foot burns in patients with diabetes.

Methods: A retrospective chart review of adult patients (≥18yo) admitted to a major metropolitan burn center at a safety-net hospital from 2008-2021 with an isolated burn to the lower extremity and a diagnosis of diabetes mellitus. Patients were categorized based on admission hemoglobin A1C. The primary outcome was hospital length of stay and secondary outcomes were time to presentation, infection, amputations, and mortality.

Results: A total of 136 patients were included in the study, 79% of which were male. 84% of the patients were < 65yo and the mean age was 54.1yo and an average HbA1C of 9%. Scald injury was most common mechanism of injury (54%) followed by radiant (24.3%) and contact burns (16.2%). The average burn size was 2.3% TBSA. The median length of stay was 7 days (3 days per percent TBSA). Patients presented on average 5.2 days following injury with 44.8% patients presenting with an infection. More than half (54%) of the patients had peripheral neuropathy at baseline. A majority (74%) of the patients underwent surgical excision. About 18% of the patients underwent an amputation and 3.7% were admitted to the intensive care unit with an average ICU length of stay of 7. Additionally, there was 1 inpatient mortality.

Conclusions: Our study found that lower extremity burns in patients with diabetes were associated with a prolonged hospital stay, high infection rate, need for surgical intervention and high morbidity/disability rate as evident by the number of patients requiring amputations despite the small size of the burn. Peripheral neuropathy may be one of the reasons leading to delayed presentation to a burn center following injury. Hence, burn prevention in this patient population through intense education on proper foot care and inspection along with adequate glycemic control are key to improving outcomes for patients with diabetes.
Does COVID-19 Lead to Worse Outcomes in A Burn Center?
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Introduction: The global pandemic caused by severe acute respiratory syndrome coronavirus-2 (COVID-19) has exhausted resources and devastated at-risk populations. Our objective was to determine if COVID-positive patients have worse outcomes compared to COVID-negative patients after burn injury or desquamating skin disorders.

Methods: Patients were identified using our institutional Burn Center registry and linked to the clinical and administrative data. All patients admitted between March 1, 2020 and August 31, 2021 were eligible for inclusion. Demographics, length of stay (LOS), co-morbid conditions, and mortality were evaluated. Statistical analysis was performed with Students' t-test, chi-squared, and Fischer's exact test.

Results: A total of 1,994 patients were admitted during this period, and of those patients, 1,467 were adults. Twenty-three adults were COVID-positive. There were no significant differences in age, LOS, total body surface area (TBSA) involvement, hospital costs, sex, race or ethnicities of patients. There were no significant differences in percentage of patients presenting for burn or desquamating skin disorders. COVID-positive adult patients had a significantly higher mortality after injury than COVID-negative adults, p=0.003. There were no differences in COVID-positive pediatric patients admitted to our burn center.

Conclusions: A positive COVID test is associated with worse outcomes in patients admitted for burn injury or skin-sloughing disorders. Further study is warranted to investigate and mitigate what aspect of their care could be adjusted to improve outcomes.

Preventing accidental central line removal: Early success through a novel securement device
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Introduction: Central Venous Catheter (CVC) placement and maintenance can be difficult due to non-intact skin and possible surrounding weeping wounds. In addition, routinely used products require intact skin for the adherence of the central line dressing along with sutures or securement devices. With the increased number of line dislodgements, the Burn Intensive Care Unit (BICU) searched for alternative means of line securement. A subcutaneously anchored sutureless system (SASS) was found that could secure the line and allow for improved cleaning around the insertion site. The SASS is a device made of metal which resides in subcutaneous portion of the skin and anchors the CVC while allowing lifting of the catheter to clean underneath.

Methods: After identification of the SASS product, a trial was implemented. Nurses (RN) and providers were trained virtually by the product representative. Nursing champions were selected to be a liaison between the product representative and the staff. Patients included burn patients or Steven Johnsons (SJS) patients, with large open total body surface area, who had a CVC placed peripherally or centrally between September 2020 to June 2021. A survey was conducted upon insertion of the device, with dressing changes, and upon removal.

Results: In 2018, there were a total of 14 CVC dislodgements and 12 in the year 2019. For the year 2020, there were 4 dislodgements and 2 in 2021. Both adult and pediatric patients utilized approximately 12 SASS. From the nurses who cared for the patients, 19 responses were obtained regarding the SASS. Overall, 94% of staff recommended this product for use. No accidental removal of the CVC was reported with use of the SASS. With cleaning around the catheter insertion site, 53% believed that they were able to clean better while 47% felt that it was the same with the previous practice. In terms of duration of changing the dressing and maintaining the catheter, 53% felt that it was the same while 47% thought it was faster. During maintenance, the most discomfort reported by patients was 4/10.

Conclusions: The SASS can be implemented as another viable method to prevent accidental dislodgement of the CVC while securing CVC without sutures. In addition, RNs believed it allows for faster cleaning around the insertion site and faster dressing changes with minimal discomfort to the patient. More data can be collected over longer periods of time and to look at its efficacy in non-burn patients.
Introducion: Providing Burn Care is a physically and emotionally demanding job. AND, it is a rewarding and inspiring profession. 2020 and 2021 saw unprecedented rates of burn out and turn over in staff. Our concern for the well being of staff as well as our need to increase retention motivated our desire to provide staff with tools to build resiliency and coping strategies. Traditionally, this education comes in the form of teaching mindfulness, breathing exercises or self care outside of the burn center. We recognized that while these approaches are important and effective, they are not the right fit for everyone. The current times require us to use a multipronged approach to the tools we offer our burn teams. Our regional burn center partnered with a community based arts education nonprofit to re-think how we provide staff with tools for adaptability. A curriculum was formulated that provided therapeutic art to nursing staff via four weekly zoom meetings. This resulted in a novel approach to resiliency building and self care.

Methods: The program was opened to all burn center staff members. Staff registered in advance for the four week program; the arts organization mailed each participant a box containing all the supplies they would for need. Each week, a different art modality/artist was paired with therapeutic discussions grounded in a trauma informed approach. Discussions focused on emotional and physical safety, building a community of support, finding balance between work and home and identifying coping skills to use to help ground ourselves during times of stress.

Results: Seven burn center staff members signed up for this program. Weekly attendance averaged 6-7. A program evaluation was completed by participants at the end of the final session. Questions were divided into three sections: program logistics, community building and the artistic process. Results indicated that this was an extremely valuable experience for participants. In addition, staff made comments such as “allowing myself to be vulnerable in the process has built trust and connection between myself and the other participants”, “I don’t remember the last time I did something like this just for myself”, “I feel like I can add art to my list of coping strategies, despite never thinking of myself as an artist”.

Conclusions: Offering burn center staff with an alternative program to help build resiliency resulted in an increased sense of trust between staff members, provided one more outlet for self care and allowed participants to build resiliency in a new way.
Introduction: At a newly developed burn unit, the program decided to expand further and start admitting pediatric patients. While there are many working parts to this endeavor, we will primarily address staff preparedness. Prior to the introduction of a burn education course entitled Burns in the Pediatric Population, only a handful of nurses had received any hospital-based education for caring for pediatric patients. A previous pediatric course had been taught, however, this course focused primarily on illnesses of childhood. Staff had voiced on many occasions that they felt the education they received was not adequate and felt uncomfortable taking care of pediatric burn patients.

Methods: All Burn Intensive Care (BICU) nurses, regardless of having received the prior pediatric education, were required to take Burns in the Pediatric Population (n=42). The course content was based on the Burn Nurse Competencies. The course consisted of didactic lectures and hands-on sessions. Each participant was required to take a pre-test before the class and a post-test at the conclusion. The test included knowledge-based questions and self-rated confidence level questions. In addition, each participant was sent a survey three months after the completion of the class to evaluate their knowledge and confidence level.

Results: At the conclusion of the class, the average test score went from 49.3% to 92.7%. Both the pre-test and post-test had each nurse evaluate their own confidence level for caring for a pediatric patient. Initially, 19.5% of the nurses stated that they had no confidence in caring for a pediatric patient. At the conclusion of the class, all nurses expressed some confidence with caring for a pediatric patient, with the majority, 72.7%, stating they had moderate or high confidence.

The return rate of the three-month evaluation was 81% (n=34). The knowledge-based test had an average score of 71%. Of the staff, 30.3% of the staff stated that their confidence in caring for a pediatric patient increased, 54.5% stated their confidence level remained the same, and 15.1% of those returning the survey stated that their confidence level decreased in the three month time period.

Conclusions: The results from the three-month survey have been utilized to edit and make our pediatric mock codes and course more specific to the needs of the bedside nurses. In addition, we are planning to increase the frequency and the level of participation in our pediatric mock codes. All Burn ICU nurses will need to participate in a pediatric mock code on a semi-annual basis. In addition, there will be a section that is added to each Burn ICU nurse’s annual competency specifically covering pediatric burns.

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Introduction: The migration of paper medical records to electronic health record (EHR) has been in process for a few years now and most facilities have achieved this successfully. EHR has streamlined care and documentation. Further developments such as Computerized Physician Order Entry (CPOE) has been noted as one of the most promising functionalities of Health Information Technology (HTT), as it allows providers to enter orders, medications, diagnostic tests, and procedures, with the intent of improving the clarity and specificity of physician orders, facilitating the rapid communication of orders to pharmacies, and providing significantly enhanced decision support capabilities compared to traditional handwritten orders. In our experience, initiation of CPOE has been beneficial in many ways, namely in decreasing medication errors related to handwritten orders. However, in the clinical scenario of acute resuscitation of a critically injured burn patient, the CPOE structure did not address each and every need that would arise, especially if fluid titration was necessary. Nursing staff were left unsure of what to do in terms of their role in adjusting fluids and assessing for adequacy of resuscitation. This led to gaps in care in which potential critical situations needed to be addressed. For instance, the possible development of abdominal compartment syndrome and how to respond to it was not part of CPOE set that was implemented. This was placing the patient at risk by delaying initiation of hemodynamic monitoring and delaying electrolyte replacement as well.

The goal of this study is to report the outcomes of this quality improvement initiative and to describe the resultant research that is in place to evaluate its effectiveness.

Methods: This is a QI project that will identify and describe how a protocol was developed post-CPOE implementation to address gaps in nursing care during fluid resuscitation of critically ill burned patients.

Results: We created a protocol that allows the nurse to have better insight into what is happening with the patient and what physician orders are most pertinent at any particular time. The protocol sets parameters that alerts the nurse when additional intervention is necessary. For instance, monitoring for abdominal compartment syndrome begins once resuscitation exceeds 6 mL/kg/TBSA and allowing for the nurse to call the primary physician for hypotension that is refractory to fluid bolus. This was not clear before and nurses were not intervening appropriately, which resulted in gaps in delivery of care. We have not had to report any adverse or sentinel event related to fluid resuscitation since the implementation of this protocol.

Conclusions: A nurse-driven protocol helped address gaps in care for nurses at the bedside during fluid resuscitation.
Nursing Management of Multiple Concurrent Pediatric Patients with Cultured Epidermal Autografts

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Introduction: For patients with large areas of full-thickness burns and limited autologous donor sites, cultured epidermal autografts (CEAs) can provide life-saving coverage. Nursing care of a patient with CEAs can be challenging due to the fragility of these grafts and compounded by the critical status of the patient. Care of a single patient with CEAs can prove challenging, but in cases in which multiple patients receive CEAs concurrently, these challenges are amplified.

Methods: Three pediatric patients with large burn injuries were admitted on a single day to a large academic hospital with a Burn Center (Table 1).

Table 1. Pediatric Cases

<table>
<thead>
<tr>
<th>Age</th>
<th>% TBSA</th>
<th>No. CEA Grafts</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>65</td>
<td>48</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
<td>51</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>72</td>
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Nursing care of these children with concurrent CEA placement required an all-hands-on-deck approach and collaboration between the Burn Center (BC) and the Pediatric Intensive Care Unit (PICU) with regards to staffing, care, and positioning. Consistent primary RNs from both the BC and PICU staffed patients and volunteered to work additional shifts during a period of high census. To meet patient needs, the multi-disciplinary care team developed a schedule for CEA exposure, wound care, and therapy interventions.

Results: To meet the needs of these patients under the current staffing pattern, a team schedule was developed (Table 2). Table 2. Care Schedule

0300-0400 Night shift staff removed anterior and extremity dressings with patients in supine.
0800-0900 Therapy staff arrived early during the day shift to perform therapy interventions with anterior CEAs exposed. Multi-disciplinary teams applied anterior and extremity dressings, positioned patients prone, and removed dressings from posterior CEA sites.
1700-1800 After approximately six to eight hours of CEA exposure, teams reapplied dressings and positioned patients supine.

Conclusions: Staff followed this schedule for these patients until their CEAs were determined to be integrated. Planning and collaboration among all members of the treatment team are integral to the successful care of pediatric patients with CEAs. A schedule for wound care, turning, and CEA exposure can improve staff communication, ease hand-offs, and ensure optimal quality of care for multiple patients with these large burn injuries.
Introduction: Whereas older age strongly predicts higher burn mortality, the impact of age on discharge disposition is less well defined. Both providers and patients need a better understanding of the likelihood of discharge to non-independent living, as this factor may matter most to older patients. This investigation assesses the relationship between older age and discharge disposition after burns, in a nationally representative sample.

Methods: We queried the 2007-2015 National Trauma Data Bank (NTDB) for burn hospitalizations in older adults. Pre-defined age categories were 55-64 years (working age group), 65-74 years (young-old), 75-84 years (middle-old), and 85+ years (old-old). Covariates included inhalation injury, comorbidities, burn total body surface area (TBSA), injury mechanism, and race. Discharge to non-independent living (nursing home, rehabilitation, and other facilities) was the primary outcome. Logistic regression was used to assess the association between older age and discharge to non-independent living, adjusting for covariables.

Results: There were 25,840 burn hospitalizations in older adults with complete data during the study period. Working-age patients comprised 13,563 (53%) of admissions. Young-old accounted for 7,342 (28%), while middle-old comprised 3,876 (15%), and 1,059 (4%) were classified as old-old. Discharge to non-independent living steadily increased with older age in survivors (Table). Beginning in the 65-74 age group (young-old), most patients with burns ≥20% TBSA and older age in survivors (Table). Beginning in the 65-74 age group (young-old), most patients with burns ≥20% TBSA were discharged to non-independent living. After adjusting for patient and injury factors, odd ratios for discharge to non-independent living were 2.1 for young-old, 3.5 for middle-old and 7.6 for old-old patients, when compared to working-age patients (all P < 0.001).

Conclusions: Older age is a strong predictor of discharge to non-independent living after burns. These findings provide a realistic discharge framework for providers and older adults with acute burns.

Introduction: Outcomes of burn survivors is a well-studied field of research for burn providers; however, there has been little data comparing the outcomes of burn survivors by ethnicity. This study seeks to identify any disparities in burn outcomes of broad ethnic groups. Adjustment was made for demographic, social and pre-hospital clinical factors to help isolate ethnic disparities that might not be explainable by other factors.

Methods: A retrospective chart review of an American Burn Association verified burn center identified adult inpatient admissions from 2015 to 2019 with documented insurance status. A total of 1142 patients were categorized by recorded primary ethnicity: 142 Black (or African American), 72 Asian, 479 Hispanic (or Latinx), 90 white, 215 other, and 144 patients whose race or ethnicity was not indicated. A retrospective chart review of an American Burn Association verified burn center identified adult inpatient admissions from 2015 to 2019 with documented insurance status. A total of 1142 patients were categorized by recorded primary ethnicity: 142 Black (or African American), 72 Asian, 479 Hispanic (or Latinx), 90 white, 215 other, and 144 patients whose race or ethnicity was not indicated. Firth logistic regression was used to study the relationship between ethnicity and each of several binary outcomes. Zero-truncated negative binomial regression was used to examine hospital length of stay (LOS) and intensive care unit LOS. Adjustment was made for several confounders (age, gender, homelessness, primary insurance type, diabetes, inhalation injury, primary burn depth, percentage of total body surface area injured) to clarify the statistical effect of ethnicity. The specific adjustment set used depended on the outcome type or frequency.

Results: Relative to white patients, surviving Black patients had an estimated 29% higher average hospital LOS (ratio 1.29; 95% CI 1.01-1.64; unadjusted P=.04). Had the average surviving patient in this sample been Black, their hospital stay would be 2.7 days longer (95% CI 0.1-5.4). Relative to white patients, the odds of being discharged home with or without services, or to hospice care, were an estimated 123% higher for Hispanic patients (OR 2.23; 95% CI 1.28-3.88; unadjusted P=.005). Compared with non-Hispanic ethnicity, Hispanic ethnicity was associated with a 44% decrease in the odds of discharge to acute care, inpatient rehabilitation, or a ward outside the burn unit (OR 0.56; 95% CI 0.34-0.92; unadjusted P=.022). Black and Hispanic patients had a higher relative chance of having publicly assisted insurance, versus private insurance, than their white counterparts (P=.041, P=.011 respectively).

Conclusions: Even when controlling for burn severity, age, and other factors, Black patients had longer hospital stays. Hispanic patients were more likely to be discharged to home or to hospice care. The causes of these disparities are indeterminate. They may stem from socioeconomic status not entirely accounted for, ethnic differences in comorbidity related to stressors, or inequity in health care delivery or insurance coverage.
Introduction: The COVID-19 pandemic was a devastating occurrence that left millions in critical condition in emergency rooms (ER) across the country. While hospitalizations due to COVID-19 increased exponentially in the last year, several reports have indicated declines in ER use due to common non-COVID related problems. There is currently a dearth of literature examining the effect of the COVID-19 pandemic on emergency room use for acute burn injuries. Thus, we performed a retrospective database analysis using the TriNetX database to quantify the effects of COVID-19 on United States ER visits for acute burn injuries. We hypothesize that ER visits due to burn injury decreased, especially in patients with severe burn injuries—defined as burned total burn surface area (TBSA) >20%.

Methods: Patients who visited the ER from 2010-2020 due to burn injury were identified using ICD-10 codes. We then stratified these patients by age (<18 and ≥18), severe (>20% TBSA) vs. non-severe (<20% TBSA) burn injury, and by change over time in 1-year intervals from 2010 to 2020. Extracted data was analyzed using chi-square with p<.05 considered significant.

Results: We identified a total of 24,620,393 ER visits from 2010-2020. Of these, 142,007 (0.58%) were due to burn injury. A large majority of burn-related ER visits were for non-severe burns (n=134,120, 94.4%). ER visits for acute burn injury decreased by 21.6% during 2020 when compared to years prior. Stratification by age group revealed that pediatric patients (<18) had more significant decreases in ER Visits than adult patients (≥18). Pediatric patients visited the ER 71.6% less than adults during 2020. When stratified by burn severity, patients with severe burns (>20% TBSA) and patients with non-severe burns (<20% TBSA) had similar decreases in ER usage during 2020 when compared to years prior (21.7% and 24.6%, respectively). Further age analysis revealed that both pediatric patients with severe burns and pediatric patients with non-severe burns visited the ER less than their adult counterparts (71.4% and 60.9%, respectively). All of the above differences were statistically significant (p<.05).

Conclusions: During the COVID-19 pandemic in 2020, there was a sharp decrease in ER usage by patients with severe and non-severe burn injuries. This decrease was particularly salient in pediatric populations across all TBSA data points measured.
Introduction: The WHO declared the outbreak of COVID-19 a pandemic in the spring of 2020 which led to widespread restrictions on daily life activities as people were instructed to isolate at home. Given that 75 – 85% of pediatric burns occur in the home, it is likely that these measures had an impact on pediatric burn care. Thus, the aim of this study was to investigate the impact of the COVID-19 pandemic on the provision of pediatric burn care at an American Burn Association-verified pediatric burn center.

Methods: Data was retrospectively extracted from all new burn patients aged 0-18 years during a pre-pandemic period (April 2019 – August 2019) and a pandemic period (April 2020 – August 2020). Continuous data was examined using 2 tailed t-tests (p < 0.05), while non-continuous data was examined using Pearson chi-squared tests (p < 0.05). These analyses were used to analyze burn demographics and examine changes in the delivery of acute and follow-up burn care before and during the pandemic.

Results: During the pre-pandemic period, 213 new burns were identified, compared to 172 new burns during the pandemic period. No clinically significant changes were observed in patient age at presentation (p = 0.54), total body surface area of burn (p = 0.85), and time to presentation following the injury (p = 0.24). Interestingly, a significant increase in friction burns (p = 0.023) was observed, which mainly consisted of treadmill burns. During the pandemic, burn operating room utilization remained high and represented approximately 25% of the hospital’s total surgical capacity. In addition, there were no significant changes to inpatient and outpatient encounters (p = 0.56 and p = 1.00) between the two periods thereby highlighting the need for these essential services during the pandemic.

Conclusions: Burn-related service needs remained consistent across the pre-pandemic and pandemic cohorts as demonstrated by the number of new burns as well as the continued provision of burn care. Overall, no clinically significant changes to patient demographics, aside from the increase in friction burns, were observed. Furthermore, the ability to provide all aspects of pediatric burn care at this tertiary pediatric hospital remained consistent across the pre-pandemic and pandemic cohorts. Although this study presents data from the first five months on the pandemic, further analysis of the entire year will be carried out in order to identify additional trends.

Introduction: There is significant heterogeneity in firework-related legislation across the country, with some states outright banning sales, possession, and use. Others restrict the dates and types of fireworks that can be purchased. Municipalities often adopt firework ordinances that apply within their city limits, pushing the sale and use into unincorporated areas or permitting easy access to illegal fireworks for transport into city limits. We seek to understand how effective firework ordinances are at preventing firework injuries. We hypothesize lax municipal ordinances will have a limited effect on firework-related injuries.

Methods: Two time periods where the commercial sale of fireworks is legal were identified, and we reviewed patients presenting during those windows for the acute management of firework-related burns. This corresponds to June 24 – July 11 and December 20 – January 8. Patient demographics and burn outcomes were collected. Socioeconomic status was determined using a standardized scale (0-100) that incorporates Census data, with higher scores reflecting more disadvantaged communities. Legality was determined by a review of municipal ordinances and patient residence.

Results: Thirty-five patients were identified between December 2016 and January 2021. More injuries occurred around July 4th compared to New Year's (54% vs. 46%). The cohort was predominantly men (77%) with an average age of 29 years. Patients most commonly came from suburban areas (34.3%), compared to rural (25.7%), urban (20%), or small towns (17.1%). Alcohol use at the time of injury was reported in 14% of cases. Explosive fireworks (e.g., mortar shells) (63%) were more common than sparklers. Hands were the most frequently injured area (83%), but no amputations, traumatic or surgical, occurred. Eye injuries occurred in 17.1% of patients, but no long-term damage to vision was sustained. Eight patients (23.9%) required inpatient management, and six (17.1%) required operative management. Split thickness skin grafting and local tissue rearrangement were the extent of the operations performed. One patient required neurosurgical intervention after a mortar shell detonated adjacent to their cranium, representing the lone fatality in the cohort. There was no significant difference in the number of legal (18) and illegal (17) firework injuries. Socioeconomic status was not different between legal and illicit groups (46 vs. 54, p = 0.101).

Conclusions: A substantial number of patients sustained firework-related injuries in municipalities where fireworks are banned, giving the impression that current ordinances are ineffective. Public health officials and legislators may consider the more widespread implementation of regulations or increased penalties to combat firework-related injuries.
566 Burn Disparities: Do Race, Gender and Insurance Status Affect Mortality?

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Introduction: The National Inpatient Sample (NIS) provides ideas of trends across the country. A recent study in trauma patients found that there were no differences in race or insurance status in regard to mortality. As such, we sought to examine these effects in burn patients and hypothesized that these trends would be similar.

Methods: The NIS was queried for all patients age ≥18 years with ICD-9 codes for total body surface area (TBSA) burn ≥ 20% and non-elective admissions. Years included were 2013 to the third quarter of 2015. Age, race, insurance status, TBSA, median household income for patient’s zip code quartile and mortality were recorded. Cases with missing data for race, insurance status and mortality were excluded. Statistical analysis was done with student’s t-test and Chi-Square testing, as appropriate. Mortality was then used to run a binary logistic regression using these variables. A p-value ≤0.05 was considered significant.

Results: There were 5685 weighted cases. Females encompassed 28.3%. The mortality rate was 21.1%. The patients that died were older (58.6 ± 19.1 years versus 44.7 ± 17.1 years for survivors, p< 0.001).

On multi-variate analysis of mortality using these variables, older age (p< 0.001), female gender (odds ratio (OR) 1.26 [1.05-1.50], p=0.011), lower median household income zip code quartile (highest quartile compared to lowest OR 0.69 [0.51-0.80], p< 0.001) and insurance status (compared to government insurance, private insurance OR 0.59 [0.47-0.72]; self pay OR 1.51 [1.18-1.93], p< 0.001) were associated with mortality. Increasing TBSA was also associated with mortality. Race was not a significant contributor (p=0.432).

Conclusions: While there was a trend towards a higher rate of mortality in the black population, race was not associated with mortality in a statistically significant manner. Socioeconomic factors were associated with higher mortality. The dynamics between race and other social determinants of health, and the potential impact of structural racism and bias should be the focus of future research rather than on race itself, especially considering that access and resources vary by state.
Introduction: Youth is categorized as combination of adolescence and young adulthood. Young people are prone to injuries, because this period involves essential changes in many aspects of life within a complicated physiological and mental developmental age. Our aim was to investigate the features of burn injuries in youth.

Methods: Subjects were 622 adolescents (10-18yrs, n=313) and young adults (19-24yrs, n=309) who were treated at our burn-center from 2010 to 2021. Data collected for each case were age, sex, social-security status, occupation, marital status, scene of injury, burn extent, burn cause, history of injury, affected major body sites, and need for inpatient-care (median±SD,mean±SD)(p<.05).

Results: Median age was 18yrs±4.76. Male to female ratio was 0.66:1 with female predominance especially among young adults (0.48:1)(p<.05). Most subjects were in civil social-security-system (n=612, 98.4%); most were students (n=475, 76.4%); a total of 103 subjects were in labour-force(16,5%); 44 were unemployed(7,1%). Most young people were single (n=600, 96,4%); 4 subjects in adolescent group and 18 subjects in young adult group were married(0,64% and %2,9 respectively); 15 of married cases were female(68,2%)(p<.05). Injuries occurred mostly at home (n=411, 66,1%). Mean total body surface area (TBSA) burned was 3.21 % ± 7.5(min:0,2 max:75). The most commonly affected body site was the hand (n=165, 26,5%). Leading burn cause was scalds (n=433, 69,6%). Female subjects mostly suffered from scalds with mean TBSA burned of 2.0%±2.21 (min:0,2 max:18)(n=297, 79,2%). However, vast majority of flame burn victims were male (n=41, 82,0%) (mean TBSA burned: 12,8%±21.35, min:0,2 max: 75) and almost all severe electrical injuries happened to male subjects (n=13, 86,7%)(mean TBSA burned:14,2±14.81, min:0,2 max:40) (p<.05). All cases were preventable accidents; the unique instance for 'substance-abuse related burns' was butane-lighter-liquid burns in 9 cases(1,4%). Inpatient-care was needed for 52(8,2%) victims. Mean TBSA burned for inpatients was 13,5%±19.6(min:1, max:75). All subjects survived.

Conclusions: Our results suggest that young female subjects are prone to burn injuries, but severe injuries happen to male and there are many other aspects that should be considered. Combined evaluation of adolescents and young adults may provide purposive data for burn repositories.
Introduction: Registry science applies observational study designs to interpret large secondary databases. It can be utilized to understand disease and injury, answer research questions, inform regulatory decision making, and engender benchmarking of quality-of-care indicators. Numerous burn registries exist globally, however their contributions to the science of burn epidemiology, care and treatment have not been summarized. The objective of this study is to characterize the available literature on burn registries.

Methods: We conducted a scoping review, having registered the protocol a priori. A comprehensive literature search across several databases, including the grey literature, was carried out. Studies of all methodological designs were included provided they utilized, analyzed, and/or critiqued burn registry data. Pilot projects from registries in development were included as well. Studies involving non-burn specific registries or registries from a single burn centre were excluded.

Results: Two hundred and sixty-eight studies were included, encompassing 16 existing burn registries. Although registry science has been used to investigate burn care since 1970, the majority of studies were published after 2007. Most studies utilized the American Burn Association Burn Registry or one of its previous versions (75.7%) and the Burns Registry of Australia and New Zealand (10.4%). Main limitations of existing registries are the inclusion of patients admitted to burn centres only, deficient capture of outpatient and long-term outcome data, and lack of data standardization across registries.

Conclusions: Registries are an invaluable source of data for research, delivery of care planning, and benchmarking of processes and outcomes. Efforts should be made to stimulate other jurisdictions to build and maintain burn registries, to incorporate data linkage from administrative and other secondary databases, and to standardize data collection, in order to maximize the potential of registry science in burn care.

Introduction: Natural disasters are commonly associated with mass destruction and severe injuries. On August 29th, 2021 a category 4 hurricane made landfall before mandatory evacuations were ordered in a major metropolitan community. The powerful storm challenged disaster management teams and first responders as communities struggled to recover. Our study analyzes the demographics of those injured and the injury patterns treated at our state’s only verified burn/trauma center and the adjacent children’s hospital in the aftermath of the hurricane.

Methods: A retrospective chart review was performed on patients seeking emergent care following the hurricane. Demographic data was abstracted from the medical records along with injury pattern including age, gender, mechanism of injury, total body surface area (TBSA), surgical interventions, and length of stay. In addition, brief surveys of fire chiefs from the two most impacted regions were performed to assess prehospital challenges.

Results: 41 patients (76% male) presented to our ER with a median age of 44 (7 patients < 12 years of age). 85% of injuries occurred at home while 15% occurred at work. Of the 78% requiring admission, 66% underwent excision and autograft with a mean TBSA of 17% (range 1-80%). Power outages resulted in increased gas generator usage across the region. Most of the burn injuries following the storm were due to generator and cooking accidents (56%). Each fire chief reported up to 91 calls/day due to suspected carbon monoxide poisoning for the two weeks following the storm. A single event resulted in 8 inhalation injuries treated in our ER with one burn ICU admission. The mean hospital length of stay was 1.11 days/%TBSA for those undergoing surgery.

Conclusions: Hurricanes are more common today with many coastal cities as risk for similar natural disasters. Despite our generator safety media outreach efforts prior to the storm, this remains an opportunity for improved injury prevention. Many patients suffered delays in discharge as their homes/nursing facilities suffered structural damages and were without power and water. Disaster planning should account for limited disposition options during severe storms. Our study is the first to describe burn-related injuries from a category 4 storm and our communities’ response.
Introduction: The purpose of this study was to analyze data from the American Burn Association National Burn Repository (NBR) with particular focus on patient ethnicity and burn etiology. We hypothesize that burn etiology, severity and other characteristics will be significantly different between differing ethnic groups throughout the database. This information can be used to augment burn prevention strategies by targeting at risk ethnic groups.

Methods: Data on burn patients was derived from the American Burn Association National Burn Registry including all burn entries for a 10 year period (2009 to 2018) from 46 burn centers. The ethnic categories for this study were White, Black, Hispanic, Indigenous and Asian. The study also involved analysis of patient demographics, burn severity, context of injury, and hospital course.

Results: White patients were the largest group (64.0%), had the highest proportion of flame injury (53.1%) and shared the highest mortality rate with indigenous patients (3.1% compared with 2.6% for all other ethnicities). Black individuals (22.2%) had higher rates of scald burns (53.2%), the shortest average hospital stay (16.8 days) and along with indigenous patients the highest rates of assault/abuse (2.0% compared with 2.6% for all other ethnicities). Black patients (3.1%) had the highest mortality rate with indigenous patients (2.0% versus 1.1% for all other ethnicities). Hispanic patients (10.0%) had more scald burns (47%), the largest proportion of men (66.5%), the highest incident of work-related injuries (18.0%) and the largest average TBSA at 10.1%. Asian patients (2.7%) had the largest proportion of scald injury (63.1%) and the smallest proportion of male patients (54.5%). Indigenous patients (1.1%) had higher rates of flame burns, suffered full thickness burns at the highest rate (32.8%), had the longest average stays in hospital (21) and the ICU (15) and had the highest rates of blanks for data entry.

Conclusions: This study found multiple significant differences in burn populations when compared by ethnicity. We have found that the indigenous population suffered full thickness burns at the highest rate and have had the longest average hospital stay as well average ICU stay. We have also had the unexpected finding of higher rates of unknowns in the indigenous population which may reflect racial bias at an institutional level nationally.

Introduction: Burn injuries from exploding electronic cigarettes have been well documented in the medical literature and lay press, as have injuries from smoking conventional cigarettes while on supplemental oxygen. However, there is a paucity of literature regarding injuries from smoking electronic cigarettes while on supplemental oxygen. Empirically, it might seem safe to use e-cigarettes while on oxygen, but it can result in explosion. The electronic cigarette coil can heat up to 350°C and serve as a source of ignition. The purpose of this study is to describe and characterize this relatively novel and uncommon mechanism of injury.

Methods: This study was a descriptive review of 2013-2016 National Burn Repository (NBR) Data. Injury description fields were queried for “oxygen”, “O2”, “electronic cigarettes”, and various abbreviations and misspellings. Demographics, burn size, length of stay, expected length of stay using 1.1 days per %TBSA, and LOS index were reported. In addition, a Google search for lay press articles using the terms “smoking,” “oxygen,” and “electronic (or e) cigarettes was performed, and these cases were tabulated.

Results: Of approximately 60,000 NBR entries, only 8 records of injury while smoking e-cigs on oxygen were found. Patients were predominantly male (63%) with a mean age of 63±9 years old, burn size of 3.4%±4 TBSA and LOS of 5.8±7 days. Inpatient stay averaged 1.65 days per %TBSA, which was 150% of expected LOS for the cohort. Two patients sustained third degree burns of 0.5% and 11%TBSA. Three patients were intubated, and had a mean of 3.33 ventilator days. Most injuries occurred at home (88%), while one occurred in a hospital. All 8 patients had Medicare and none of them suffered mortality. A google search revealed three distinct lay press articles regarding this topic.

Conclusions: Although an uncommon mechanism of injury, smoking electronic cigarettes on supplemental oxygen can result in injury and a significant hospital stay. Limitations in abstraction from the database and/or reporting might have resulted in an under capture of the true number of injuries. Circumstances resulting in this phenomenon require further investigation, as it is unclear if it occurs from malfunction or a hot coil alone. Patients who are prescribed home O2 should be warned about this potential danger.
573 Interfacility Transfers for Burn Patients with Concomitant Traumatic Injuries

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Introduction: Burn patients with concomitant traumatic injuries suffer increased morbidity and mortality. Complex care coordination for these patients often requires interfacility transfers. We sought to examine the outcomes for traumatically injured burn patients to identify the occurrence and associated reasons for trauma system transfers in this group.

Methods: The National Trauma Data Bank was examined from years 2007 to 2016 for 6,565,577 patients with traumatic, burn, and concomitant burn & traumatic injuries to evaluate demographic data, ED and hospital dispositions, length of ICU stay, ventilator days, mortality, and interfacility transfers. There were 5,068 patients with both traumatic and burn injuries, 145,890 patients with burn injuries, and 6,414,619 patients with traumatic injuries. Non-parametric Kruskal Wallis, analysis of variance, chi-square, Mann Whitney, and T-tests were utilized for comparisons.

Results: Patients were 69.1% male in the trauma/burn, 67.1% male in the burn, and 62.2% male in the trauma groups (P< 0.001). Trauma/burn patients were more often admitted to the ICU from the ED at 35.5% compared to 27.1% for burn and 19.4% for trauma (P< 0.001). ICU stay was longer for trauma/burn patients at 5.00 median days (IQR 2.00, 15.00) versus 3.00 (IQR 1.00, 10.00) for burn and 3.00 (IQR 1.00, 5.00) for trauma (P< 0.001). Trauma/burn patients had more ventilator days at 3.00 median days (IQR 1.00, 11.75) compared to 2.00 (IQR 1.00, 7.00) for burn (P< 0.001). Trauma/burn patients had increased mortality at 4.9% versus 2.5% for burn and 3.2% for trauma (P< 0.001). For hospital disposition, trauma/burn patients required more interfacility transfers 2.5% compared to 1.7% for burn and 1.3% for trauma (P< 0.001). For level 1 trauma centers, 5.5% of trauma/burn, 7.1% of burn, and 0.5% of trauma patients required interfacility transfers. For level 2 trauma centers, 29.1% of trauma/burn, 47.0% of burn, and 2.8% of trauma patients required interfacility transfers.

Conclusions: Among level 1 and level 2 trauma centers, patients with only burns and burn patients with concomitant traumatic injuries required more interfacility transfers, and level 2 trauma centers required more interfacility transfers for all patients.

574 Want some s’more? The hidden risks of marshmallows

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Introduction: Marshmallows are a spongy confectionery commonly made with gum Arabic or gelatine, corn syrup, sugar, and flavouring. It is common, in many Anglophone countries, to toast marshmallows as an outdoor childhood pastime. Being an aerated aqueous mixture, marshmallows have unique properties when exposed to high temperatures, resulting in a Maillard reaction between the sugars and proteins. They therefore present a distinctive and significant method of burn injury.

Methods: We reviewed our regional online burns database for marshmallow related burns in the last six years to collate data on patient demographics, burn size and depth, method of injury, and outcome.

Results: Between 2015-2020, our Regional Burns Centre treated 35 patients with an average age of 8.3 years (range 4-14). The most commonly injured area was the face in 44% of the cases (lips specifically in 25%), followed by hands in 36%. The burn depth extended from deep dermal to full thickness in 6% of cases and the total body surface area affected was 0.3% on average. No admission or surgical intervention was required. A significant proportion of burns were associated with camping, open fires or barbecues (63%), however the recorded mechanisms of injury were not limited to these activities alone. 77% of injuries occurred between Friday and Sunday.

Conclusions: Marshmallow burns are hazardous due to their composition and response to heat. The adhesive nature of a toasted marshmallow leads to a deeper pattern of burn injury, even though, the majority can usually be managed conservatively due to the limited area affected.
Introduction: Events in the past two years highlighted disparities in outcomes based on race for severe disease conditions. There have been reports suggesting racial disparities may exist for burn care. This burn center has long been committed to serving all groups within the city. The purpose of this study was to determine if race might influence the outcome of burn care at this center.

Methods: We reviewed inpatient admissions for eight years, 2012 through 2019. Racial identity was reported by patients and their families and categorized as Asian, Black, Latino, or White. Place of residence was categorized by Zip code. Other variables were recorded. The revised Baux Score (RBS) was calculated according to Osler and Hosmer (2010). Several logistic regression models were tested for each racial group. They related death to RBS as well to age, burn size, and inhalation injury. An additional predictor variable for race was then added to each regression model. Statistical calculations were performed using SAS 9.4 (SAS Institute Inc., Cary, NC).

Results: 5,440 patients were admitted as inpatients. Of these 4,626 (85%) resided in a zip code within this city, and patients lived in essentially every zip code. The racial distribution of the patients reflected the racial distribution of the city and of the several neighborhoods within the city. Death was strongly related to RBS or to age, burns size, and inhalation injury for all groups. In all cases, an additional predictor for race was not significant.

Conclusions: This burn center serves all areas and populations of the city. Outcome of burn center care was related to burn extent, age, inhalation injury. There were no detectable differences in the outcome of burn center care associated with race. Burn Center care should be equally effective for all races.

Introduction: Severe burn injuries create systemic insults that are life threatening and require immediate stabilization, resuscitation, and, potentially, emergent surgery. Non-burn emergencies, such as stroke, have shown improved survival benefit and outcomes when patients are immediately transferred to specialized facilities. Our objective was to compare the outcomes between burn patients who were transferred to the burn unit from outside hospitals (HT) to controls who were directly admitted from our own emergency department (ED). We hypothesized that HT patients were at increased risk for mortality, wound healing complications, and infectious sequelae relative to the ED cohort.

Methods: A matched retrospective cohort study from July 1, 2015 to November 1, 2019 was performed at an ABA-verified burn center. HT patients were identified and matched with ED patients by age and percent total body surface area burned (TBSA). HT and ED cohorts were compared as a whole and then stratified into groups according to % TBSA burned (< 10%, 11-20%, 21-40%, and > 40%). Patient and burn characteristics were recorded. The primary outcome was mortality, and secondary outcomes included total length of stay (LOS), ICU requirement and complications.

Results: A total of 410 HT and 377 ED patients were identified. There were no significant differences in age (P=0.17), burn severity (TBSA: P=0.27; full thickness burns: P=0.13), and inhalation injury (P=0.29). There were no demographic differences when comparing cohorts according to TBSA. For the primary outcome, there were no significant differences in mortality in the cohorts at large (P=0.48) nor between the groups when stratifying for TBSA (< 10%: P=0.35; 11-20%: P=0.44; 21-40%: P=0.30; >40%: P=0.26). For the secondary outcomes at large, there was no significant difference in LOS (P=0.35), ICU requirement (P=0.17), or wound and infectious complications (P=0.14). HT patients at large, however, spent less time in the ICU (P=0.03).

Conclusions: There was no significant difference in overall mortality rates between the HT and ED groups regardless of TBSA. Additionally, there was no difference in hospital course between the cohorts except for longer ICU stays in those admitted directly from the ED. Once the transfer process is initiated, our unit maintains close physician-to-physician communication with the transferring facility throughout the transfer process, including guiding initial resuscitation efforts. This may play a role in the parity of outcomes between groups.
577 Expanding Outpatient Burn Therapy Services to Address Social Determinants of Health
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Introduction: Occupational and Physical Therapist provide acute services to burn-injured patients and continue treatment well into their functional recovery for mobility, strengthening, scar management, contracture prevention and return of independence. Unfortunately, we recognized that patients encountered obstacles when attempting to access these services in the outpatient setting. It was evident that these impediments frequently coincided with social determinants of health (SDOH). According to Healthy People 2020, SDOH represent the cumulative influences of individual, cultural, community and societal attributes on health and quality-of-life. Self-pay patients accounted for 12% of clinic patients. However, patients with coverage were not always receiving adequate therapy due to lack of burn knowledge among community-based therapist. By expanding outpatient burn clinic services, we are better positioned to meet the needs of all burn-injured patients in our community.

Methods: A plan was outlined to increase the presence of Occupational and Physical Therapy (OT/PT) in the outpatient burn clinic. Pertinent literature was reviewed, and a presentation was developed to establish need and outline a model for integration of services. The inpatient OT/PT department managers collaborated with the Burn Director and Burn APRN on projecting staffing and equipment needs. Multidisciplinary cost analysis was completed. Guidelines for outpatient burn rehabilitative therapy staffing and a description of services were developed.

Results: After much collaboration and effort, and with community support, our PT/OT inpatient burn staff provide rehabilitative therapy to all patients attending outpatient burn clinic two days weekly. Additionally, educational material, hands on range of motion training and free new and donated compression garments are readily available during all four burn clinics weekly. The new outpatient burn clinic opened in 2021, equipped with two large showers and a designated therapy room, ready to wear compression garments, putty, and assistive devices designed to further support burn recovery. Attendance for burn outpatient visits increased significantly from 2015 to 2018.

Conclusions: Transportation, childcare, employment restrictions, individual health and wellness beliefs, lack of funding and access to technology represent examples of blockades to healthcare care. This multidisciplinary effort increased the availability and scope of rehabilitative services in the outpatient burn clinic patient, allowing patients to receive comprehensive burn wound care and rehabilitative therapy in one location to promote healing, manage pain, improved function, maximizes independence and reintegrate into their family and community.

578 A Multi-pronged Approach to Improving Communication, Collaboration and Outcomes in the Burn ICU
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Introduction: Effective communication between members of the burn healthcare team is vital as it impacts both patient outcomes and staff satisfaction. Discontinuity is a consistent barrier to communication. Fragmented communication may occur for a variety of reasons, including delineated shifts for staff, a decreased presence of physicians and allied health professionals at night, and variable levels of collaboration between nursing, therapy, allied health professionals and physicians. The purpose of this quality improvement project (QI) was to evaluate 3 interventions aimed at improving communication, collaboration, and ultimately patient outcomes.

Methods: The 3 interventions included the use of daily goal cards, increased frequency of interdisciplinary bedside rounds from once daily to twice daily and expanded in-house burn team coverage to include a burn-specific Physician Assistant/Nurse Practitioner (PA/NP) staffed in the center from 3:00pm to 11:00 pm. A 12-item survey consisting of a 5-point Likert scale and open-ended questions was distributed to team members to evaluate effectiveness of the interventions. Incidence of code events were evaluated as an indicator of patient outcomes.

Results: There were a total of 29 respondents, including physicians, allied healthcare professionals, therapists, and nurses. Sixty-nine percent of participants felt that the daily goal cards were an effective means of communication however only 45 % strongly agreed/agreed that achievement of daily goals had increased. The expanded coverage by a burn PA/NP was viewed as an improvement to patient care by 90 % of respondents, with 79 % strongly agreeing/agreeing that the expanded coverage prevented errors. When evaluating afternoon rounds 69 % of respondents either strongly agreed/agreed that it improved patient care and 52% found it to prevent errors. Nocturnal code events decreased by 56% over the one-year period following the institution of expanded coverage. There was no added expense associated with any of the three interventions.

Conclusions: While the results of this QI project were overwhelmingly positive, the expanded coverage by a dedicated burn PA or NP was viewed to be the most beneficial change. Temporally, the expanded coverage was also associated with a marked decrease in nocturnal code events. The addition of afternoon rounds was the next most beneficial change noted with positive findings in both effectiveness and improvement of patient care. There was a dichotomy between the effectiveness of the daily goal cards and the accomplishment of the goals that were set forth that needs further exploration.
Introduction: Burn peer review (PR) is an important process for quality assurance and process improvement. Our division consists of five burn surgeons, seven advanced practice providers (APPs) and four night house officer (NHO) APPs. As the APPs are intimately integrated within the burn service - both on the inpatient (IP) and outpatient (OP) settings, a subsequent need to create an independent peer review process for the APPs was identified. We describe our process and evaluate the results after two years of a monthly APP PR meeting.

Methods: All data is entered into a quality management software. Triggers for APP PR include complex discharge, inappropriate OP referral, delay in treatment, OP treatment greater than three weeks without surgical intervention, pressure wound, patient discharge with greater than 30 morphine equivalent dose (MED) of narcotic, readmission or unexpected admission from OP clinic, substance abuse, and self referral. Cases with individual improvement opportunities result in real time direct feedback from the director, lead APP, and peers. These may be escalated to the provider's ongoing professional performance evaluation (OPPE) or trigger a focused professional performance evaluation (FPPE). Systemic issues identified are referred for multidisciplinary discussion in our Performance Improvement/Quality Assurance (PI/QA) process. Complicated issues involving multiple disciplines may trigger a root cause analysis. If an individual or system issue is not identified, a group discussion about process improvement and standardization of practice ensues.

Results: From initiation of the Burn APP PR process in May of 2019, to September 2021, there were 37 cases reviewed. Twelve were for indicated triggers and 25 for self-referrals. Breakdown of these cases is as follows: outpatient treatment greater than three weeks without surgical intervention (3), readmission or unexpected admission from outpatient clinic (4), delay in treatment impacting clinic course (5). Self referred cases included graft loss (8), cellulitis (3), venous thromboembolic event (2), and wound dressing discussion (2). There were three cases where clinical issues were identified of which one was referred for root cause analysis, and the other two led to real-time education and feedback from the director.

Conclusions: PR is important to ensure that high quality patient care standards are met. Autonomous APP practice is important for the function of a team, quality of care delivered, professional satisfaction of the APP, and enables financial optimization for burn centers. Creating an independent burn APP peer review process allows for time-sensitive feedback to patient care related events, improves collaboration and practice standardization, and provides an important educational opportunity for the team.

Conclusion: The use of a comprehensive burn order set can help a hybrid burn center ensure they are set up to meet ABA verification criteria. These order sets when used consistently can not only ensure consults are ordered, but also help remind providers of the unique needs of the burn patients and improve efficiency.
Results: Central line-associated bloodstream infections (CLABSI) remains a high risk for burn patients due to their compromised integumentary system. Additionally, identifying bloodstream infections secondary to a burn infection versus a central line remains a challenge. Literature review suggests multidisciplinary CLABSI bundles (MCB) demonstrate reduction of CLABSI. This research looks at the use of a MCB compared to the application of the standard CLABSI bundle alone reduce CLABSI incidence and standardized infection ratios over the past two years in the Burn Center. We hypothesize a MCB will have sustained CLABSI SIR and incidence reduction over time.

Methods: Infection Prevention & Control CLABSI data collection on all burn patients pre-intervention (2017-2018) and post-intervention (2019-2020) were performed as a quality improvement project; IRB was not obtained. In addition to the CLABSI Bundle (optimal site, aseptic insertion, aseptic maintenance, timely removal, & education), MCB was also implemented in Qtr. 1, 2019. MCB includes necessity of line discussion during daily and multidisciplinary rounds, strategic blood culture collection upon admission/transfer for patients with existing central line, improved nursing and provider documentation of burn infection per CDC definitions, integration of CLABSI reviews in tiered Burn Quality Improvement Program, and universal zero CLABSI goal setting for RNs. Two-sample t-test will be used to compare results pre-intervention (2017-18) & post-intervention (2019-20). CLABSI incidence and standardized Infection ratio will be illustrated per year.

Results: The post-intervention CLABSI SIR data (M= 0.08, SD=0.11) significantly improved when compared to the pre-intervention CLABSI SIR data (M= 0.77, SD= 0.169), t(2)=4.72, p = 0.02. The post-intervention CLABSI incidence data (M=0.5, SD=0.70) significantly improved when compared to the pre-intervention CLABSI incidence data (M=4.5, SD= 0.70), t(2)= 5.65, p= 0.01

Conclusions: The combination of the CLABSI bundle with the MCB demonstrated favorable CLABSI SIR and incidence reduction, as literature suggests. Implementing multimodal, multidisciplinary interventions must be a priority for sustained CLABSI reduction. Considerations for future studies should measure length of catheter days, incidence of positive blood cultures on admission/transfers for patients with existing central lines, and incidence of burn infection rates with positive blood culture and an existing central line.

Introduction: Inexperience of frontliners and referring physicians from non-specialty centers in burn wound assessment results to the incorrect triage of patients, thereby aggravating the current hospital situations and causing unnecessary exposures. Emergency care in burn centers in developing countries must strike a balance between doctor and patient safety, and uncompromised care of burn patients. Telemedicine is deemed a valid and sound option to maintain social distancing and promote safety, yet provide proper burn care. It is a valuable and indispensable tool for all doctors of all branches of medicine and surgery. Although many of its limitations in developing countries are still being unraveled, the benefits of this technology are being realized worldwide. This study determined the accuracy and timeliness in diagnosing and classifying burn patients assessed by a frontline non-burn specialist in-person (NBSP), a Burn Specialist online (BSO), and a Burn Specialist in-person (BSP).

Methods: All burn patients (January to March 2021) with signed consent for participation were photographed in a standardized manner by the NBSP and referred to a BSO via an online messaging application. These patients were also assessed independently by the BSP. The % total body surface area (TBSA), burn depth classification, and the time the patients were seen by the NBSP, the time the online referrals were sent to the BSO through the messaging application, the time the BSO sent the diagnoses, and the time of assessment by the BSP were recorded. One-Way Repeated Measures Analysis of Variance (ANOVA) with and without blocking time the BSO sent the diagnoses, and the time of assessment by the BSP were recorded. One-Way Repeated Measures Analysis of Variance (ANOVA) with and without blocking ANOVA was done. Post-hoc Tukey-Test was used to analyze the pairwise differences for any ANOVA that showed significant statistical differences.

Results: Data gathered from 82 patients throughout the 3-month study duration demonstrated that burn size (% TBSA) among the three different physicians (NBSP, BSO, BSP) was not statistically significant (p=0.8794). Our analysis also showed no statistical difference for the 19 different body parts per patient and burn depth classification (p=0.9718). One-way ANOVA tests on timeliness were statistically significant with a p-value of p < 0.0001. A post-hoc comparison using Tukey test revealed no statistical significance between the BSO and BSP (p=0.892).

Conclusions: Smartphone telemedicine platform through photographic transfer and analysis is an accurate method in estimating burn size and depth classification. Timeliness
can be improved with a dedicated 24/7 online available burn specialists and a reliable network access. Hence, frontliners can refer to burn specialists in a developing country using this telemedicine platform for optimum burn care with an accurate diagnosis and overcome the challenges during and even after this pandemic.

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**583 Photos of Burn Wounds Can Help Reduce Over-Triage and Prevent Unnecessary Ambulance Transfer**

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**Introduction:** Burn wounds can be difficult to assess for providers outside the burn center and can result in over triage. The combination of photos of burn wounds with a clinical history can help burn practitioners make appropriate triage decisions, including immediate ambulance transfer vs scheduling an outpatient follow up appointment. Appropriate photo triage can help reduce healthcare costs by eliminating both unnecessary transfers to the burn center and overburdening burn resources. This performance improvement project involved the development of a secure photo sharing web portal and photo triage clinical pathway to help burn practitioners appropriately triage burn patients being evaluated at health care facilities within the catchment area of an American Burn Association verified adult and pediatric burn center.

**Methods:** Existing technology was used to develop a burn photo sharing web portal that can be easily accessed by providers outside the burn center. A new clinical pathway for burn photo triage was developed. Education was formulated for nurses and providers within the burn center and for referring facilities. Retrospective data was collected for the 4 years of ambulance transfers captured in the outpatient burn registry prior to the implementation of the photo triage clinical pathway. Comparison data was also abstracted for the first year after implementation. Patients were categorized as over triaged or appropriately triaged based on the first set of photos captured in the EMR.

**Results:** In the pre-triage years there were a total of 242 ambulance transfers to the outpatient burn clinic. 150 (62%) of those patients were appropriately triaged, while 92 (38%) were over triaged. In the year following implementation there were 27 ambulance transfers to the outpatient burn clinic. 25 (92.6%) of these patients were appropriately triaged while 2 (7.4%) were over triaged. Overall ambulance transfers to the outpatient burn clinic dropped by more than 50% (average of 60.5 transfer per year down to 27 after implementation).

**Conclusions:** Patients with burn injuries at referring facilities were more appropriately triaged when using photos of wounds which ultimately reduced the number of unnecessary ambulance transfers.
Introduction: Burn surgery encompasses different surgical disciplines such as general surgery, trauma, surgical critical care and plastic surgery. Those who apply to burn fellowship also have various interests. This study’s purpose was to discern the various career paths of burn fellowship graduates. It also investigated the frequency of specific chosen specialties and workplace settings. The results of the study could be used to modify current clinical burn fellowship curriculum.

Methods: A survey was created using an internet tool and emailed to graduates of the clinical burn fellowship program from an American Burn Association verified burn center. The survey was sent to graduates of the last 10 years (2010–2020). The questions inquired about surgical field of work, board certification, additional training experience, work setting, and time since fellowship graduation. The participants’ responses were recorded anonymously to account for biases. The quantitative data was then collected for each question, and the data was calculated into percentages.

Results: Of the possible 17 fellows who graduated in the past ten years, 11 responded to our survey (64.7%). The most common surgical field pursued after the fellowship was plastic surgery with 5 graduates (45.5%). The following three fields all had 2 graduates each: burn surgery (burn/trauma), general surgery and wound care (18.2%). Almost all of the participants had completed additional training: 6 in plastic surgery (54.5%), and 4 in surgical critical care (36.4%). The work settings were primarily academic institutions (45.5%), followed by office-based practices (35.4%), ambulatory surgery centers (9.1%), and community hospitals (9.1%). Of the participants, 4 are board-certified in their chosen field, and 5 are board-eligible. Only 3 graduates are affiliated with a burn center.

Conclusions: The results of the study indicate the interests and career choices of previous burn fellows. This information can be used to modify burn fellowship curriculums to the needs and future career paths of the fellows. Traditional clinical burn fellowship programs emphasize burn critical care and acute burn surgery. Since some of the graduates are interested in plastic surgery, burn reconstruction could be added to the current curriculum. Plastic surgery faculty members could also serve as mentors to the fellows.
Conclusions: Adverse wound care events can happen despite nursing self-reported high level of wound care proficiency. To ensure accurate plan of care, wound care routine needs to be communicated at multiple levels: during rounds, in daily progress notes, and on electronic medical record orders.

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586 Graft Loss: 5-year Review of a Single Burn Center’s Experience with an Institutional Grading Scale
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Introduction: Despite increasing attention on provisioning quality burn care, there continues to be no consensus definition of burn “graft loss”, nor a uniformly adopted scale to grade severity. The American Burn Association Burn Quality Improvement Project metric is a binary code identifying only “failure to achieve >95% autograft take.” We introduced an institutional graft loss scale in 2014 for quality improvement and reported initial results and interrater reliability. With additional data now available for analysis, a secondary review was undertaken.

Methods: All patients with graft loss were identified on departmental Morbidity and Mortality (M&M) reports between 7/2016-7/2021. Graft loss grades were assigned during clinical care per institutional scale (Table 1). Non-burn acute surgical wounds that underwent skin grafting were included, but chronic non-healing wounds were excluded. Data abstracted included demographics, medical history, injury details, surgical procedures, graft loss, and lengths of stay. In situations where the graft loss grade recorded on M&M documentation was discordant with the grade documented in the medical record, the grade assigned at the later point in time was used for analysis.

Results: Graft loss was noted in 260 instances for 200 patients. Mean age was 51.4(±7.5)y years. The majority were male (60.7%) and African American (48.0%). Smoking (26.0%) and diabetes (37.5%) were prevalent. Overall mortality was 4% (8/200). Graft loss percentages by grade are 28% (grade I), 28% (grade II), 13% (grade III), and 22% (grade IV). An additional 9% were deemed either unknown or due to a technical error. Overall reporting of graft loss grades improved over time as surgeons became more familiar with the scale. Reported percentages of Grades I and II graft loss also increased over time, indicating better compliance with the overall goals of this quality improvement project.

Conclusions: A graft loss grading scale can be applied to track split thickness autografting outcomes among a diverse group of surgeons. Regular reporting of low grade graft loss needs to be done to understand the complete distribution of graft loss after surgical intervention, including documentation of allograft and other skin substitute loss. Improved reporting in the medical record can optimize data collection for quality assessment purposes.
Introduction: Patients with burn injuries are particularly susceptible to perioperative hypothermia, which is associated with a range of complications, including infection, bleeding and delayed wound healing. Raising the operating room (OR) ambient temperature is an important strategy to prevent hypothermia, but we were uncertain about how strictly we do this. The purpose of this study was to determine the ambient OR temperatures during acute burn surgery as the first step of a quality improvement initiative to ensure we are maintaining a warm OR environment.

Methods: Between 1/3/2020 and 28/2/2021, ambient temperatures during surgery in the burn OR of an ABA-verified burn center were recorded every 15 minutes. Temperatures were measured using a wall-mounted smart sensor, transmitted to a mobile smartphone application via Bluetooth. All patients undergoing acute burn excision and closure procedures lasting > 2 hours were included in the study. Hypothermia was defined as a core temperature < 36°C.

Results: Of the 119 patients, the majority were male (n=86; 72.3%), the mean age was 49.8 years (range 18-89) and the mean total body surface area (TBSA) was 15.8% (range 1-62%). They underwent 261 operations (mean 2.2 cases per patient; range 1-62%) with a mean duration of 211.1 minutes (range 120-468 minutes). Sixty-two patients underwent 1 surgery, and 31 had 2 surgeries. Eight patients (6.7%) died. Thirty-three patients (27.7%) were hypothermic at the end of surgery, and 31 had 2 surgeries. Eight patients (6.7%) died. Thirty-three patients (27.7%) were hypothermic at the end of surgery, and 31 had 2 surgeries. Eight patients (6.7%) died. Thirty-three patients (27.7%) were hypothermic at the end of surgery, and 31 had 2 surgeries. Eight patients (6.7%) died.

Conclusions: We have identified that the ambient temperature in our burn OR is lower than desirable and that this is directly related to development of hypothermia. These results now indicate that a QI intervention (stricter attention and manoeuvres to ensuring a warm operating room at the start and during surgery) is required.
589 Video-Enhanced Telepresence for Burn Care may Improve Patient and Staff Satisfaction
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Introduction: Telemedicine and telepresence technology successfully contributes to the care of patients in different medical disciplines. Burn care is a highly specialized field that requires a multidisciplinary team and frequent visual evaluation of a patient’s injuries. Wound care can be extensive and demanding. Physician availability at the “Wound Care Room” is often limited by other responsibilities in the operating room, emergency department, surgical clinic, or academic conferences. We hypothesized that the incorporation of a telemedicine platform would provide greater access to surgical providers (SP- burn surgeons, general and plastic surgery residents) and allow for more efficient evaluation and prompt decision making. We also predicted that it would improve communication among SP, nursing staff (NS-nurses and nurse aids), and burn patients (BP) in real time without compromising BP privacy and comfort.

Methods: A dual-way video and voice telemedicine platform was incorporated into burn care at a Level-1 Trauma Center and ABA-verified Burn Center. The video module was positioned so that SP were able to remotely assess the progression of burn injuries during wound care. Patients included were hospitalized and undergoing wound care by NS. Adult BP were included regardless of age, burn thickness, and burn surface area. BP, SP, and NS were asked the following questions after wound care had been provided:
1. Did you feel comfortable using this technology?
2. Was the patient’s sense of privacy compromised?
3. Did use of the video module enhance the provision of care?
4. Did use of the video module improve team communication?
5. Overall, were you satisfied with the use of the platform?

Results: BP with ages ranging from 18-74 years old and with injuries involving 8-44% TBSA were included. Interviews from 38 patient encounters were conducted, and included input from 4 SP, 6 NS, and 24 BP. The BP, SP, and NS surveyed all reported comfort using this technology. There were no reports of concern for patient’s privacy. SP felt they could make a final management plan in 74% of the cases, with difficulty arising in 26% of cases due to image resolution. BP reported that use of the video modules contributed positively to their care in 87% of cases, with issues related to communication and lack of understanding arising in the other 13%.

Conclusions: Telemedicine was well accepted by all the BP, SP, and NS. The perception from NS and SP was that it enhanced prompt communication contributing to better patient care. Final management decisions were achieved in most cases, with picture resolution being identified as an area for improvement. With improved picture quality, this technology can likely be used as a reliable decision-making tool to improve care.

589 Burn Center Trainees: Not Just for Surgery or Plastic Surgery Residents
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Introduction: The Burn unit offers a unique training environment for residents. The Accreditation Council for Graduate Medical Education (ACGME) requires all General Surgery trainees to have knowledge of burn physiology and experience with initial burn management. However, there are no burn requirements for other ACGME-sponsored training programs except for Plastic Surgery. Since care of the burned patient spans multiple settings – the intensive care unit, operating room, wards, outpatient clinic, and the emergency department – having residents from varied specialties might benefit not only the trainee, but also the Burn Center.

Methods: A retrospective review of all residents rotated to the burn center of an American Burn Association verified unit was performed. Data from the 7/2018-6/2018 academic year were collected by analyzing resident rotational and call schedules of both intra institutional and inter-institutional residents. The specific time period was chosen to account for COVID affecting the number of residents more recently.

Results: A total of 48 residents rotated at the burn center during the studied academic year. Within the institution, there were 34 residents (71%): 12 general surgery interns (8 categorical, 4 preliminary), 2 plastic surgery interns, 10 emergency medicine (EM) residents, and 10 anesthesia residents. There were 14 residents (29%) from 3 outside institutions: 3 plastic surgery residents, 8 surgery interns from one program, and 3 surgery interns from another program. All surgical specialty trainees were interns, whereas other specialties, EM and anesthesia, were PGY2 trainees.

Conclusions: While most residents were from general surgery and plastic surgery programs (58%) due to ACGME requirement, a significant portion of the resident complement (42%) was from non-surgical specialties. EM residents gain competency in wound reading as well as burn critical care. Anesthesia residents learn surgical management of the burn patient and critical care procedures. Since the burn center is a tertiary referral center, having outside residents rotating in the burn unit might facilitate transfers and increase knowledge of proper resuscitation.
Transition to an Advanced Practice Provider led burn service: process and lessons learned

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Introduction: Burn is not a required rotation for general surgery residency training. Additionally, mandates on resident work hours have created a deficiency in resident support for many burn programs across the country. Subsequently, the need to transition to an Advanced Practice Provider (APP) service was identified. At our institution, a medium volume (~250 admissions/year) burn center, we created an APP service and evaluated the evolution and lessons learned during the transition.

Methods: Timeline of recruitment of APPs was reviewed along with the recruitment process, onboarding process and orientation process. Exit interviews were conducted with all APPs who resigned to delineate strengths and weakness of the APP program. Functionality of the institution's APP recruiter, manager and Lead Burn APP (LAPP) were reviewed as well.

Results: Between 2014 and 2021 the daytime burn APP service expanded from two to six APPs and the Night House Officer (NHO) APP service was created and expanded to four APPs. Based on thorough review of the APP program, key changes were made including improvements in team communication, daily nurse-driven rounds, the 90-day focused professional performance evaluation (FPPE), enhanced and structured education, and critical care exposure.

The need for a LAPP was identified and designated in 2019. The LAPP is responsible for making an equitable schedule, execution of new APP orientation, organizing the 90 day FPPE and ongoing professional performance evaluation (OPPE), monthly APP peer review and APP meetings, coordinating OR coverage, and functioning as an APP advocate at division leadership. The LAPP enacted changes to the existing hiring/onboarding process as described below.

All APPs are now recruited through an APP recruiter who discusses the hospital contract and salary as well as organizes the logistics of the interview, formalizes the offer, and aids with the transition to credentialing. All new APPs are given a hospital onboarding checklist, that includes hospital orientation, APP boot camp, simulation and electronic health record training classes. In addition they are given a clinical orientation checklist, which includes BLS/ABLS/ACLS/ATLS certification, exposure to various phases of patient care, tracking of quantitative patient care metrics, participation in monthly burn APP peer review and burn triage simulation. There are subtle differences with the NHO APP clinical checklist. After 90 days of employment a new employee FPPE is held with the LAPP and burn director. This allows for direction of areas to focus on, comprehensive feedback, and discussion about increasing autonomy.

Conclusions: Through a focused process, APPs can play an integral role in the daily functioning of a burn center. We believe that a similar effective and financially sound model can be created for similar sized units.
Introduction: Wound care compliance is a critical component in the success of treating burns in the outpatient setting. Patients and caregivers are educated with demonstration and written materials which have demonstrated a 24-hour retention rate of 30% and 10% respectively. This can leave the patient at higher risk for infection, increased pain from suboptimal dressings, and feelings of frustration. Research has shown that visual learners make up 65% of the population, with auditory learners at 30%, and tactile learners at 5%. We assessed that a combination of demonstration and visual aids could better assist different learning styles and improve wound care compliance. Our study goal was to assess the efficacy of the visual aids component through new patient encounters in the emergency department and outpatient setting using a six-question survey at subsequent encounters.

Methods: The study design is a prospective analysis with comparison to historical controls. Visual aids were designed by the burn physician assistants with assistance at an ABA-verified burn center. We created four double-sided cards made out of a water-resistant synthetic paper, with one for each of our most used dressings. The content of the cards included one of the following: bacitracin/fine mesh gauze with bismuth tribromophenate, bacitracin with low-adherent acetate gauze, silver nylon dressings, and silver foam dressings. Each card contains moulage wounds, step-by-step, and corresponding written instructions at a 4th grade education reading level. These visual aids were given to patients being discharged from the emergency department, or to new patients in the burn clinic. A six-question survey was administered at one week follow-up encounters with a scale of 1-10 (one being least helpful, and ten being the most helpful) assessing patients understanding of burn wound care and compliance. Compliance rates were abstracted from historical controls with similar burn wound severity.

Results: Limited data is available at the time of submission as the study is currently in-progress and anticipated to be completed by March 2021. We will be using descriptive statistics and comparative analysis to evaluate the results.

Conclusions: Patients initial feedback has been overall positive with a corresponding compliance rate that is successful. Our patients verbalized their approval, with multiple patients stating that they plan to keep the wound care card for any burn injuries that might occur in the future. Additional research is needed to examine the impact of combined demonstration, tactile, and auditory learning aids. In addition, we plan to further expand our engagement effort to include similar wound care cards for pediatric patients as well as language alternative cards to meet our surrounding community’s needs.
Introduction: The purpose of debriefings are to help facilitate a healthier work environment for team members, improve processes, and improve patient outcomes. Debriefing staff members after specific events provides a time to support team member’s emotional needs, improve communication among the team members, and improve patient outcomes (Schulman, Jhanwar, and Shara, 2015; Wolfe et al., 2014). Multi-disciplinary team members working in Burn Units are repeatedly exposed to stressful patient events such as end of life, escalation of care, major burn admissions, or mass casualty events. These traumatic exposures can all increase the risk of staff burnout, which is negatively associated with resilience (Colville et al., 2017).

In 2019, our Burn Unit had 7 events that met criteria for a formal debrief but had no process for conducting these debriefs. Without a formal team debrief there is no loop closure of an event for staff and no platform to discuss potential ways to improve practice. The purpose of this project was to develop a formal debrief process and institute the process on the Burn Unit.

Methods: Criteria for debriefing were identified as adults and pediatric patients requiring CPR, end-of-life care, and emergent escalation of care. Six registered nurses volunteered to be Debrief Facilitators (DFs) and underwent training utilizing real-time simulation scenarios conducted by the Simulation Education Center. DFs were provided a Process Map along with debrief tools and resources needed to conduct a formal debrief. Facilitators were responsible for initiating, organizing, facilitating, and documenting a debrief after an event that met criteria.

Results: The formal debrief process was initiated in September of 2020. Since the initiation, 12 events have met criteria for debrief. 12 formal debriefs were conducted during the following 10 months.

Conclusions: After a formal debrief process was identified and education provided by the Simulation Education Center the Burn Unit conducted 100% of events that met criteria for debriefing through June of 2021. In conclusion, giving team members formal processes, tools, and educational opportunities has proven successful for formal debriefs in the Burn Unit.
Conclusions: Operative management of head and neck burns with dermal matrix is associated with a shorter hospital stay, greater likelihood of home discharge, and decreased hospital costs. Patients with autologous grafting had higher rates of inhalation injury, which may account for longer hospital stays and increased discharges to nursing facilities. A limit of this study is the inability to differentiate patients undergoing staged procedures. Further study is needed to evaluate factors contributing to faster discharges home in the head and neck burn population.

595 Hypochlorous Acid for Skin Preparation in Fractional Ablative CO2 Laser Treatment of Burn Scars

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Introduction: While complications from fractional ablative CO2 laser treatment for burn hypertrophic scar (HTS) are relatively rare, the risk of surgical site infection (SSI) after laser treatment exists. When infection occurs, it has been linked to further morbidity, such as scar development in previously unaffected skin. Hypochlorous acid is a non-flammable and colorless antiseptic solution that has been used to treat wounds and is believed to be a less cytotoxic alternative to other agents such as betadine and chlorhexidine. This study aims to investigate the use of hypochlorous acid solution as a skin prep for patients undergoing laser scar revision for HTS and determine its efficacy in preventing SSI.

Methods: All patients undergoing fractional ablative CO2 laser revision of HTS at a single center from September 2016 through September 2021 were retrospectively reviewed. Data pertaining to patient demographics, skin characteristics, treatment sessions, and post-treatment complications were recorded. All patients underwent topical skin preparation with hypochlorous acid-soaked laparotomy pads for 10 minutes before laser treatment. No perioperative oral or topical antibiotics were given to any included patient. Patients were excluded from analysis if they were not treated with a fractional ablative CO2 laser, were treated for a scar etiology outside of burn injury, or if insufficient follow-up was documented.

Results: A total of 208 patients undergoing a total of 758 laser treatments were identified. Average patient age was 45 years (SD 16), with 112 (53.8%) patients being female and 96 (46.2%) being male. Median number of laser treatments was 3 (IQR: 1-5). Patients from all Fitzpatrick skin types were treated, with the most common type being type 5 (n=54, 26.0%). None (n=0, 0.0%) of the 208 patients experienced a surgical site infection after any of the laser treatments received.

Conclusions: Hypochlorous acid is a safe and effective skin preparation for patients undergoing laser burn-scar revision to prevent SSI. Moreover it is non-flammable, colorless and does not need to dry prior to procedure.
596 Implementation of a Burn Laser Program at a Children’s Hospital
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Introduction: Carbon dioxide ablative fractional laser (CO2-AFL) therapy has become standard of care for adult burn hypertrophic scars (HTS). This therapy option has not been widely adopted in pediatric burn care and no established guidelines for treatment protocols have been published. We sought to modify our American Burn Association Adult Verified Burn Centers laser protocol at our Children’s Hospital with hopes to provide optimal care to our pediatric burn population. We present our protocol and early experience of CO2-AFL therapy for pediatric burn HTS.

Methods: We conducted a retrospective chart review of pediatric burn patients undergoing CO2-AFL treatment of HTS during the study period of Jan 2021-Oct 2021. Pediatric burn patients were offered laser treatment if their scars were symptomatic with patient complaints of HTS, pruritis, neuropathic pain, and scar contractures. 37 pediatric patients ≤13 years of age were included in our review.

Results: We treated 13 pediatric patients for a total of 40 laser sessions with each patient averaging 3 sessions. Of the 13 patients that were treated with laser, 62% (8 of the 13 patients) had split-thickness skin grafting with 38% (3 of the 8 patients) of those having a staged grafting procedure with dermal substitute. 15% (2 of the 13 patients) healed primarily and 15% (2 of the 13 patients) required excision and closure. Only 1 patient treated with ASCS alone required laser therapy. Our protocol requires patients to receive preoperative Tylenol, Benadryl, Pepcid, and Oxycodone. The patients then received MAC anesthesia with Toradol, Demerol, Ketamine, Propofol, and Zofran. Patients with extensive HTS on the face or neck were intubated for the procedures. Oxycodone and/or Dilaudid were provided if needed in the post-operative phase. All patients were discharged with Tylenol or Motrin and Triamcinolone 0.1% ointment to be applied daily for 48 hours and then 3-4x/day until the follow-up clinic appointment at one week. Patients were able to resume normal activities the day following the procedure.

Conclusions: Patients and their parents have reported improvements in pigment, pliability, thickness, and pruritis following laser treatments. We created a protocol that allows on average 8 pediatric patients per day to receive laser treatment without it overburdening the pre-operative and post-operative recovery room nursing staff. We are currently tracking outliers of patients requiring increased post-operative analgesia and/or greater than 1 hour in the recovery phase. With the implementation of a laser protocol, we have successfully introduced laser therapy as a viable option for our pediatric burn survivors.

597 Reconstruction of Lop Ear Deformities After Severe Burn Injury in Pediatric Patients: An 11-year Experience
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Introduction: The ear is one of the most highly visible structures on the face. One or both ears are frequently involved in panfacial burns. Because they are bilateral structures, asymmetries are clearly visible. Reconstruction of burned ear deformity often requires replacement or modification of skin and/or cartilage. Even these are successfully replaced, scar contractile forces can cause deformation of the ear. One of these deformities is lop or cup ear, in which the helical rim is either folded over, wrinkled or tight. We describe the necessity of applying otoplasty techniques to address this problem.

Methods: A retrospective chart review analysis was performed to assess demographic variables, procedural indications and procedural outcomes in pediatric patients treated at our hospital for complex ear reconstruction for ear deformities after her surgery. Inclusion criteria were pediatric patients aged 0 to 21 years admitted to Shriners Hospital for Children-Boston from January 1, 2010 to January 1, 2021 for burn injury, who subsequently required follow-up complex ear reconstruction for ear deformities after burn injury. Of these patients, those with lop ear deformities who required construction were examined. Using the Trauma Registry of the American College of Surgeons (TRACS) and Shriners Hospital for Children Information Source (SHCIS) databases, we identified 12 eligible patients. Surgical procedure data was obtained from the SHCIS electronic medical records. Surgical photographs were obtained with patient informed consent. Those patients who required Medpor or cartilage frame reconstructions were excluded.

Results: 12 patients required an otoplasty-type procedure to obtain desired results or symmetry with the contralateral ear. This technique involved a posterior incision in the auriculomastoidmastoid sulcus, are you a year and cartilage modification with sutures to to re-create the antihelical fold an superior crus as well as conchal setback sutures.

Conclusions: Because ears are bilateral structures, symmetry is extremely poor. Because of multiple contractile forces on the external ear from secondary healing or contraction of skin grafts, the ear is often displaced anteriorly and the upper portions become folded. Treatment requires reconstruction of the natural folds of the ear and shortening of the helical rim to mastoid distance. this requires an otoplasty approach with a posterior incision., exposure of the cartilaginous framework and modification of the cartilage with incisions and sutures. This technique however requires adequate soft tissue coverage of the ear.
Reconstruction of Trochanteric Pressure Ulcers with Pedicled Vastus Lateralis-Anterolateral Thigh Flap

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Introduction: Trochanteric region is one of the most frequent sites for pressure ulcer development. High-voltage electric injuries with neurovascular damage is an important reason of paraplegia. These patients have prolonged hospitalization period and develop cachexia by time. Grade 3-4 sores with thoracanter major of femur exposition generally need flap reconstruction. Musculocutaneous flaps are preferred to cover exposed bone and fill the dead space. Although local re-locating flaps such as tensor fasia lata, gluteus Maximus muscle flap have been used for thoracanteric ulcers, these flaps have mandatory muscles for ambulation in the following rehabilitation period. Another disadvantage of these flaps are the possible donor site problems due to pressure loading. Thus, we aimed to used vastus lateralis- anterolateral thigh (VL-ALT) flap for decreasing donor-site morbidity and tension.

Methods: Between 2019 and 2021 we have operated 6 trochanteric pressure ulcers in 5 patients. All patients had history of electric injury related paraplegia. The mean age of the patients was 33 (24-50). The defect size were ranging between 5x4cm and 10x12 cm. Flap size were planned according to exact size of the defect. VL muscle were harvested according to the size of dead space. The donor site was closed primarily in 3 patients. Split thickness skin graft were needed in 2 patients. Patients were hospitalized in lateral decubitus or supine position during follow –up.

Results: Mean follow up time was 10 months (6-18). All flaps were survived. Hematoma development were seen in 1 patient in the donor site which were treated with bedside debridement. No recurrence was seen during follow-up period. No restriction or morbidity were encountered during ambulation.

Conclusions: VL-ALT musculocutaneous flap provides the required tissue for dead space filling and defect closing simultaneously. The advantages of this flap are; lower donor site morbidity, perfect match in terms of skin quality and bulk, protecting the major muscles such as gluteus maximus and tensor fascia lata. The technique needs knowledge of quadratus femoris anatomy which has a short learning curve.

Eyelash Reconstruction Utilizing a Strip Graft for Burn-related Madarosis: A Case Report and Operative Technique

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Introduction: Facial burns are a common occurrence with a small percentage causing injury to the periocular region. Although the eye itself is often spared, madarosis may occur from deep burn injury to the eyelid. Reconstruction of the eyelid margin is technically difficult due to the challenging aesthetic region, as well as specific characteristics of eyelashes. Although there are several options for eyelash grafting there is no established gold standard, and there is little to no literature related to procedures involving burn madarosis.

Methods: Here we describe a case of unilateral eyelash grafting utilizing a composite strip graft in a 20-year-old female who sustained a 70% flame injury at the age of two.

Results: The presented results show the efficacy of this technique at restoring function and providing a good aesthetic result which is maintained at 1 year follow up.

Conclusions: Utilization of a composite strip graft to recreate the eyelid margin is a viable choice for reconstruction of burned upper eyelids in the appropriate patient. Further exploration regarding procedure timing and choice of donor site are warranted.
Introduction: The first dorsal metacarpal artery perforator (DMCAP) flap is frequently used to cover exposed bone, tendon and neurovascular structures in the hand after trauma and burns. The size and width of DMCAP flap is limited and rotation arc generally lets to cover defects up to middle phalanx. Expansion of the DMCAP flap has not been reported in the literature and this technique might be solution to increase flap viability and size in order to cover defects up to distal phalanx. In this study, we will describe utilization of tissue expander to first DMCAP and present a case of electric burns with flexor contracture.

Methods: A nine-year-old male patient applied to our clinic with the complaint of inability to extend the second finger of the left hand after an electrical burn. Physical examination revealed flexor contracture in the distal interphalangeal (DIP) and proximal interphalangeal (PIP) joints. Reconstruction revealed flexor contracture in the distal interphalangeal (DIP) and proximal interphalangeal (PIP) joints. Reconstruction was planned for the patient with a two-session expanded first DMCAP flap.

In the first session, a 16 cc 5x3 cm tissue expander placed through a 3 cm vertical incision at the fifth metacarpal level. From the second postoperative week, the tissue expander was inflated with 1 ml of isotonic saline three days a week. Six weeks later, the DMCAP area was enlarged by giving 45 cc saline. K-wire was removed at 6 weeks postoperatively. There were no complications in the post-operative period. There were no infections, and response to grafting were analyzed.

Results: In the second session, contractures at the level of the left hand 2nd finger DIP and PIP were excised. Left hand 2nd finger was fixated in extension with K-wire. 9x3 cm DMCAP flap was elevated by dissection over the paratenon and the pedicle was preserved. The flap was adapted to the defect area on the volar face with 180-degree rotation angle. The flap donor site was closed primarily.

Conclusions: In cases where the tissue defect cannot be closed with loco regional flaps, extra tissue can be provided by free flaps or using tissue expanders. Primary closure of the donor area, appropriate flap thickness for the finger, and aesthetically pleasing results are among the advantages of the expanded DMCAP flap. However, in tissue expander applications in the upper extremity, the patient should be followed closely, and pain and finger circulation should be constantly questioned.
Foot burns in diabetic patients: A single center experience

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Introduction: The most significant sequelae of foot burns in diabetic patients is a non-healing wound that results in a diabetic foot ulcer, which has been a predictor for need for amputation and mortality. Even minor amputations in patients with diabetes have a significant mortality rate. Our systemic review found that when 60% of a diabetic patient cohort with foot burns was managed by skin grafting, 29% subsequently required amputations, which is concerning. The practice at our regional burn center has been to manage patients with foot burns and diabetes non-operatively with daily dressing changes, and we believe that this may result in better functional outcomes, ambulatory status, and lower amputation rates.

Methods: A retrospective review of patients with diabetes and foot burns admitted to an ABA verified regional burn center was conducted. The primary outcome was amputation. Secondary outcomes were ambulatory status, wound closure, and infection. Rank sum and fisher exact tests were performed to compare patient demographics, comorbidities, uncontrolled DM (A1c >9%), and burn characteristics between patients who were treated surgically and those who received daily wound care only. These associations were subsequently evaluated with odds ratios (OR) and 95% confidence intervals (CI). A multivariable logistic regression was performed to evaluate for possible differentiating factors that resulted in maintaining ambulatory status at completion of burn care. Statistical significance was defined as p< .05.

Results: Of 75 patients identified, median TBSA burned was 2% (IQR 2), and 61% (n=46) had full thickness burns. Mean A1c at admission was 9% (SD 2). In terms of management, 9% (n=7) were treated with debridement and/or skin grafting, and 9% (n=7) later required lower extremity amputations. Infection during first admission developed in 8% (n=6). At completion of burn care, 73% had normal or same ambulatory status, and older patients were less likely to maintain ambulatory status (p=.009, OR=0.92, 95% CI=0.86-0.98). Median time to wound closure was 95 (IQR 130) days, and 12% (n=9) of wounds never fully closed. Burn depth (second vs third degree), burn location (plantar burn vs other areas), uncontrolled DM, and surgical treatment did not result in a statistically significant difference in maintaining ambulatory status at completion of burn care.

Conclusions: Diabetic patients with foot burns are best managed non-operatively with daily dressing changes, and should be allowed to heal secondarily. This may result in a longer time to close the wounds, but the amputation rates were much lower when compared to surgical management. However, 5% of our cohort developed diabetic foot ulcers at completion of burn care, which is a complex disease process that carries a dire prognosis.
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**Timing of autologous spray cell suspension: better early than late**

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**Introduction:** Autologous spray cell suspension is associated with multiple beneficial outcomes, however, the optimal timing of use has not been determined. We examined the timing of spray cell application, and hypothesize that early (< 72 hr) use is associated with faster definitive wound coverage, impacting multiple clinical outcomes compared to late (>72 hr) use of spray cells.

**Methods:** A retrospective review of 28 patients with spray cell application from March 2020 -- May 2021 was conducted. Pediatric patients < 16 yrs (n=1) as well as deaths (n=2--including 1 withdrawal) were excluded, leaving 25 patients. Those that received spray cells early (< 72 hrs, n=14) were compared to late (>72 hrs, n=11). Time to index operation, time to spray cell application, rate of complete wound coverage, number of OR trips required for wound closure, wound infection rates, LOS / % TBSA, and overall hospital LOS were examined.

**Results:** There was no difference in demographics or % TBSA burn (21.4% vs. 23/5%), between early and late spray cell groups. The early group had a significantly faster time to index operation (1.2 dys vs. 2.5 dys P=.05), and faster time to spray cell application (1.6 dys vs. 18.1 dys P=.036) (**Table 1**). The early group had a greater wound coverage rate at index operation —64.2% complete coverage vs. 18.1% in the late group (p< .03). The total number of OR trips needed for wound coverage was less in the early group (1.5 trips / pt) vs. the late (7.0 trips / pt) P=0.03. The early group had less wound infections, a shorter LOS / % TBSA burn (0.83 dys vs. 1.85 dys P=0.005), and shorter overall LOS (16.5 dys vs. 46.9 dys P=0.03).

**Conclusions:** Autologous spray cell use has multiple beneficial outcomes, however, the optimal timing of application has not been determined. We report that early (< 72 hr) application of spray cells is associated with greater rate of complete wound coverage at index operation, decreased total number of operations needed for wound coverage, less wound infections, shorter LOS / % TBSA, and shorter overall LOS. This is likely related to earlier definitive wound coverage, which is afforded by the large expansion ratio of spray cells.

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**From admission to discharge: a total friction burn review from a single institution**

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**Introduction:** Most friction burns are adequately managed in an outpatient setting. However, many require hospital admission, operative excision, and extended care especially those that present at trauma or burn centers. There is a wide variance in friction burn management. Our goal is to review the etiology, management, and outcomes of such burns warranting hospitalization.

**Methods:** We conducted a retrospective review of all friction burns admitted to a single, American Burn Association verified burn center from January 1, 2016 to December 31, 2020. Individual chart analysis was performed using data from the hospital’s burn registry. Statistical analysis was performed using Chi-square and Wilcoxon rank-sum test with p< 0.05 being significant.

**Results:** Eighty-two patients met the inclusion criteria. Mean age was 35.4 years (95% CI 31.6-39.2). The overall mean Total Body Surface Area (TBSA) was 9.0 % (95% CI 7.5-10.6), and mean TBSA of 3rd degree burns was 1.1 % (95% CI 0.6-1.7). The most common mechanism of injury was motorcycle collision (45, 55%), followed by pedestrian struck by automobile (13, 16%). Fifty-four individuals (65%) had a concomitant injury. The most common topical agent used was silver sulfadiazine (52%), followed by bacitracin (21%). Sixteen patients (20%) required ICU level of care. Twenty-eight (34%) patients required surgery for their friction burns and 15 (18%) ultimately required a split-thickness skin graft. The mean number of operations was 2.4 (95% CI 1.6-3.1).

Overall, the operative group was younger (29.9 vs 38.3 years, p=0.026), more likely to have a concomitant traumatic brain injury (25% vs 7%, p=0.027) and had a longer hospital length of stay (17.5 vs 3.9 days, p< 0.001). Both groups had a similar overall TBSA (8.5% vs 10.0%, p=0.35), but the operative group had larger surface area comprised of 3rd degree burns (3.05% vs 0.2%, p< 0.001). Eighty-one patients survived with the sole death due to massive hemoptysis.

**Conclusions:** Friction burns resulting in hospital admission are associated with high-energy traumatic mechanisms and concomitant injuries. Patients who need operative intervention of their burns typically require multiple procedures often culminating in a split-thickness skin graft.
**Revision Surgery Following Severe Frostbite Compared to Similar Hand and Foot Burns**
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**Introduction:** Severe frostbite is associated with high levels of morbidity through loss of digits or limbs. The current practice is to salvage as much of the limb/digit as possible with the use of thrombolytic and adjuvant therapies. Sequelae from amputation can include severe nerve pain and poor wound healing requiring revision surgery. The aim of this study was to examine the rate of revision surgery after primary amputation and compare this to revision surgery in isolated hand/foot burns.

**Methods:** Frostbite and burn patients from 2006 to 2019 were identified in the prospectively maintained database at a single urban burn and trauma center. Patients with primary amputations related to isolated hand/foot burns or frostbite were included in the study. Descriptive statistics included Student’s T-test and Fisher’s Exact test.

**Results:** A total of 63 patients, 54 frostbite injuries and 9 isolated hand or foot burns, met inclusion criteria for the study. The rate of revision surgery was similar following frostbite and burn injury (24% vs 33%, P=0.681). There were no significant differences in age, gender, or LOS on the primary hospitalization. Neither the impacted limb nor the presence of infection or cellulitis on primary amputation were associated with future need for revision surgery. Of the 16 patients requiring revision surgery, 5 (31%) required additional debridement alone, 6 (38%) required re-amputation alone, and 5 required both. A total of 6 patients (38%) had cellulitis or infection at the time of revision surgery. Time from primary surgery to revision ranged from 4 days to 3 years.

**Conclusions:** Planned, delayed primary amputation is a mainstay of frostbite management. To our knowledge, this is the first assessment of revision surgery in the setting of severe frostbite injury. Our observed rate of revision surgery following frostbite injury did not differ significantly from revision surgery in the setting of isolated hand or foot burns. This study brings up important questions of timing and surgical planning in these complex patients that will require a multicenter collaborative study.

**Novel application of a surgeon-operated clysis delivery system in burn surgery**
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**Introduction:** Tangential excision of burns is associated with significant bleeding. Sub-eschar insufflation of epinephrine-containing clysis has shown to decrease blood loss and associated complications. Administration of adrenaline-containing infiltrates are also beneficial in the harvest of split thickness skin grafts. Clysis is typically delivered with the assistance of a perfusionist-operated system. This method, however, is associated with significant cost and dependent on personnel availability. This study evaluated the use of a novel surgeon-operated fluid management system in the delivery of clysis in burn surgery.

**Methods:** Our initial experience with a novel fluid management system is presented. Prospective collection of infiltration data, including average temperature, pressure, and volume of clysis was performed. Patient and burn factors were evaluated and complications collected. Finally, a cost-effectiveness analysis was conducted.

**Results:** Thirty-seven consecutive cases comprising 22 adult patients (15/22, 68% male), with a mean age of 49 years (+/-19) were reviewed. The mean % total body surface area of all patients was 39 (+/- 21.7). The mean temperature, pressure and volume of administered clysis was 32.2 degrees Celsius (+/- 4.4), 265.04 mmHg (+/-56.17), and 5805.8 mL (+/- 4844.4), respectively. The mean dose of epinephrine administered was 14.5mg (+/- 12.1). The mean temperature variability was 1.1 °C (+/- 1.2). Total mean packed red blood cells (PRBC) transfused was 507.6 mL (+/- 624.4). There were no recorded complications. We identified a cost savings of $20,766 CAD over the cases examined.

**Conclusions:** We present the novel application of a fluid management system in burn surgery. This technique provides rapid and safe infiltration of warmed clysis. We are able to maintain intra-operative euthermia despite a large volume of administered clysis and significant intraoperative vulnerability to hypothermia. In addition, this technique may be transfusion-sparing. The introduction of this method of clysis administration was associated with significant cost-savings.
607 Use of Autologous Skin Cell Suspension (ASCS) for Full-thickness Burn Injuries Reduces Autograft Procedures

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Introduction: Pediatric burn patients and patients with large TBSA injuries are vulnerable to morbidity and mortality, requiring multiple autograft (AG) procedures to obtain definitive closure due to limited donor site availability. The primary objective of this study was to understand the impact of ASCS, as an AG-sparing technology, on the number of AG procedures required to achieve definitive closure of full-thickness (FT) acute thermal burns.

Methods: Retrospective analyses of real-world data were conducted, evaluating clinical outcomes of ASCS-treated patients in prospective, uncontrolled observational studies compared to control data from patients in the National Burn Repository version 8.0 (NBR) who had conventional AG (SOC). The pediatric population consisted of patients <18 years of age, inclusive of any size TBSA, and the adult cohort included patients ≥ 18 years of age with >50% TBSA injury. Propensity score stratification was used to reduce bias attributed to potential differences in the patient cohorts as seen in other reports, this finding may be confounded due to potential differences in the patient cohorts relative comorbidities and polytrauma, as well as variability in clinical site inpatient/outpatient management strategies for OT/PT.

Results: The median number of AG procedures for pediatric patients treated with ASCS and control NBR cohorts was 1.0 (1.0-5.0) and 2.0 (1.0-20.0), respectively. For adult patients, the ASCS-treated and NBR cohorts had medians of 2.0 (1.0-6.0) and 5.0 (1.0-32.0) treatments, respectively. Overall, ASCS lead to approximately 60% fewer mean AG procedures for both populations. By week 8, re-epithelialization was observed in 91.8% and 90.6% of wounds in the pediatric and adult ASCS-treated cohorts. Median LOS for both cohorts were not different between the treatment groups. No significant differences were observed for mortality between cohorts and no adverse events attributed to ASCS were reported.

Conclusions: ASCS treatment reduced the number of AG procedures needed to achieve closure, benefiting patients and offering burn centers reduced complexity and cost in the patient care pathway. While LOS was not significantly reduced in this study as seen in other reports, this finding may be confounded due to potential differences in the patient cohorts relative comorbidities and polytrauma, as well as variability in clinical site inpatient/outpatient management strategies for OT/PT.

608 Utilization of Phase-Based Guidelines For Patient Care After Application of Cultured Epithelial Autograft

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Introduction: Cultured epithelial autografts (CEA) have been clinically utilized since 1981 & can be a lifesaving procedure in patients with extensive full thickness burns. CEA is more susceptible to bacterial contamination & complete graft loss than traditional split-thickness autografts, yet no standard of practice exists for the postoperative care of these grafts to minimize infection & maximize graft take. Prior to 2019, care of CEA patients at our institution was not standardized & instead varied upon the attending surgeon's practice. With the input of interdisciplinary team members, CEA patient care was standardized via phase-based guidelines (PBGs), leading to improved team communication & improved patient outcomes.

Methods: PBGs were created via interdisciplinary collaboration among surgeons, APCs, nursing staff, PT/OT, & psychosocial providers. Team members agreed upon 3 facets of patient care: Wound Care/Airing Out, Restrictions/Visitors, & Burn Therapy (Figure 1). As wounds progressed postoperatively, patient phases were advanced, liberalizing them from rigorous infection-prevention techniques to strict unit standards for non-CEA burn patients. In 2019, the utilization of patient-specific CEA care plans ceased in favor of standardized PBGs. A retrospective chart review was conducted on all patients from 2018-2021 who received CEA & survived their injuries. Some patients underwent a single CEA application while others underwent multiple operations. CEA graft take was assessed on all wounds from each surgery.

Results: CEA was rarely used at our institution. Beginning in 2018, seven patients received CEA & survived their injuries, ranging in age from 4-59 yrs (mean 24) & %TBSA from 38-80 (mean 53) (Table 1). Implementation of PBGs correlated with subjective improvement in team communication & increased mean percentages of CEA graft take from <35% to >75%.

Conclusions: PBGs have standardized care for our CEA patients, eliminated communication errors among team members, & increased CEA graft take. Further research is needed to determine efficacy in decreasing infection, antibiotic use, hospital stay length, & mortality in these patients.
Available non-invasive skin probes distinguish between normal skin and hypertrophic scar but not laser-treated scar

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Introduction: Skin fibrosis is the most under-studied fibrotic condition, and as such, there are limited treatment options for hypertrophic scar (HTS). HTS is difficult to study because scars improve over time, thus making the distinction between natural improvements and interventions difficult. In addition, clinical, histologic, cellular, and molecular outcome metrics are not agreed upon among providers/researchers. It was hypothesized that a set of non-invasive skin probes would be able to distinguish between HTS and normal skin (NS), but not between HTS before and after treatment with fractional ablative laser, despite histologic-level evidence showing improvement with treatment.

Methods: Wounds were created and HTS were allowed to form (n=8 scars). At Day 77, HTS and NS (n=4) were assessed with non-invasive skin probes measuring elasticity and trans-epidermal water loss (TEWL). HTS were then treated with CO₂ fractional ablative laser (FLSR) at 70 mJ, 250Hz, and 1% density. The same data, sample collection, and FLSR treatment was carried out at weeks 1, 2, 3 and 4. Formalin-fixed biopsies were processed and stained with H&E, Herovici, Masson's Trichrome, and Picrosirius red stains. Collagen type and architecture were qualitatively evaluated. Rete ridge ratio (RRR) was calculated from H&E stains.

Results: All stains distinguished between HTS and NS with ease. Herovici stain showed differences in collagen architecture and collagen type after treatment with FLSR. Pre laser treatment, elasticity was different between HTS and NS (290.50±32.90 N/m vs. 90.92±5.61 N/m, p< 0.001). However, elasticity did not change after FLSR at 1, 2, 3, or 4 weeks (248.17±48.54, 215.54±44.68, 295.29±37.5, 290.79±30.17, p >0.05). RRR was different between HTS and NS (1.22±0.11 vs. 1.51±0.03, p=0.08). FLSR induced a significant increase in RRR in HTSs (pre=1.3±0.1 vs. week 4=1.9±0.1, p< 0.05). Pre-treatment, TEWL was different between HTS and NS (12.96±1.99 g/m²h vs. 8.72±1.11 g/m²h, p=0.09). However, TEWL did not change after FLSR at 1, 2, 3, or 4 weeks (15.95±1.99, 20.35±3.15, 15.9±1.96, 14.01±2.22, p >0.05).

Conclusions: Outcome metrics that non-invasively measure the qualities of scar are critical for HTS research to evaluate treatment effectiveness. Currently available technologies distinguish between NS and HTS well. However, they are inadequate to distinguish scars pre- and post-treatment despite evidence at the histologic level that changes occur. New technologies should be developed that are able to more effectively demonstrate changes to HTS after treatment.
Potential role for myofibroblasts in early development of abnormally maturing lesions, were examined; thus we cannot rule out a diagnostic role for keloid fibroblasts (N=9 donors). Therefore, therapies targeting myofibroblasts is unclear. The current study evaluated the presence of αSMA+ myofibroblasts in keloids, and analyzed αSMA expression in keloid-derived fibroblasts, to determine whether myofibroblast presence can be considered diagnostic of keloid lesions.

Methods: Keloid, hypertrophic scar (HTS), and normal human skin samples were collected with Institutional Review Board approval and primary fibroblast cultures were established. Myofibroblasts in tissue sections were localized by αSMA immunostaining, and αSMA expression in pericytes of blood vessels was distinguished from αSMA+ myofibroblasts by collagen IV immunostaining of vessels. Expression of αSMA mRNA (ACTA2 gene) was measured using quantitative real-time PCR. Statistical analysis via t test was performed using SigmaPlot.

Results: Normal human skin samples did not exhibit αSMA+ myofibroblasts (0/8), but myofibroblasts were identified in 53% of keloids (8/15) and 60% of HTS (3/5) tissue samples. When present in keloids or HTS, the αSMA+ cells were not uniformly distributed, but were often observed in clusters in the deeper regions of the lesions. Comparison of ACTA2 mRNA expression did not reveal any significant differences between normal skin and keloid tissues (N=3/group), or between normal fibroblasts (N=7 donors) and keloid fibroblasts (N=9 donors).

Conclusions: The results suggest that although many keloids contain αSMA+ myofibroblasts, these cells do not appear to be diagnostic for keloids. Therefore, therapies that target myofibroblasts may not be effective for all keloid lesions. However, a limitation of this study is that only excised keloid and HTS tissues, which tend to be larger, more mature lesions, were examined; thus we cannot rule out a potential role for myofibroblasts in early development of abnormal scars.
Method: Clean and contaminated full-thickness wounds were made using a porcine model, and treated with either Silver Matrix or Collagen Matrix. Treatment groups included: 1) Clean treated with Silver and Collagen Matrix, 2) Clean treated with Collagen Matrix only, 3) Contaminated treated with Silver and Collagen Matrix, and 4) Contaminated treated with Collagen Matrix only. The Silver Matrix was applied directly to the wound bed, followed by the Collagen Matrix. Clean wounds were analyzed 14 and 27 days after treatment to evaluate wound healing progression as evidenced by angiogenesis, re-epithelialization, inflammation, and fibroplasia. Contaminated wounds were analyzed 5 days after treatment to measure bacteria reduction, as evidenced by colony forming units (CFUs).

Results: At day 14, angiogenesis, re-epithelialization and fibroplasia were insignificantly different, and inflammation markers were modestly higher in the Silver and Collagen Matrix group. At day 27, there were no statistically significant differences in these metrics between groups. At day 5, infected wounds treated with Silver and Collagen matrix showed a 2-log reduction in CFUs, whereas wounds treated with Collagen Matrix only did not show a reduction.

Conclusions: Covering full-thickness porcine wounds with a biodegradable Silver Matrix before application of the skin substitute Collagen Matrix resulted in a significant decrease in bioburden without impairing wound healing progression.

Introduction: Skin substitutes are indicated for clean wounds because their use in colonized or infected wounds can lead to non-adherence, loss of graft, and subsequent waste of resources. Wound colonization can be hard to detect, and skin substitutes can trap microbes and potentiate wound infection. Therefore, the aim of this study was to evaluate the compatibility of a novel biodegradable antimicrobial wound matrix containing low levels of silver (Silver Matrix), with a widely used skin substitute composed of a crosslinked bovine tendon collagen and glycosaminoglycan matrix (Collagen Matrix), to assess effects on wound healing progression and bioburden management.

Method: Forty-eight deep partial-thickness burns were created on the dorsum of four anesthetized swine (Sus scrofa domestica) using a thermocoupled burn device at 100°C. One hour following burn, biopsies from each site were collected and either NEPE-14, NEPE-14 Vehicle Control, Silverlon®, or dry gauze was placed on the wound. Wounds were assessed on post-burn days (PBD) 3, 7 and 14. Assessments consisted of digital photographs, Laser-Speckle imagery (blood perfusion), FLIR imagery, MolecuLight® imagery and biopsies for histology and immunohistochemistry.

Results: By PBD 14, no significant differences in re-epithelialization or contraction were observed between any of the tested treatment groups. Silverlon® had the highest percent re-epithelialization with 42%, and the Vehicle control has the lowest percent re-epithelialization with 28%. Both NEPE-14 and dry gauze performed intermediate with 29% and 34% re-epithelialization, respectively. On PBD 14, the wounds of the NEPE-14 treated wounds contracted 8%, the vehicle control 7%, Silverlon® treated wounds 10%, and gauze treated wounds showed 9% contraction compared with the original wound area. Blood perfusion at PBD 14 indicated that NEPE-14 treated wounds had the lowest amount of observed blood flow and the gauze treated wounds contained the highest amount of observed blood flow. However, no statistically significant differences were observed.

Conclusions: Covering full-thickness porcine wounds with a biodegradable Silver Matrix before application of the skin substitute Collagen Matrix resulted in a significant decrease in bioburden without impairing wound healing progression.
Introduction: Mechanisms and timing of hypertrophic scar (HTS) improvement with laser therapy are incompletely understood. Epidermal keratinocytes influence HTS through paracrine signaling, yet they are understudied compared to fibroblasts. It was hypothesized that fractional ablative laser therapy would change the fibrotic histioarchitecture of the epidermis in HTS.

Methods: Duroc pigs (n=4 FLSR and n=4 controls) were induced by FLSR. The timing of laser intervention was confirmed by IF where INV staining decreased at week 4. This was no increase in controls. Late intervention trended towards increase (pre=1.17±0.05 vs. week 4=1.4±0.1). There was no increase in controls. There was increased INV gene expression in HTS vs. NS that decreased after FLSR. Eight scars had up-regulated gene expression of INV vs. NS levels (FC >1.5) compared to 4 scars at week 4. This was confirmed by IF where INV staining decreased at week 4.

Results: After treatment, peeling sheets of stratum corneum were apparent which were not present in the controls. TEWL was increased in HTS vs. NS at day 49 indicating decreased barrier function (42.2±8.0 vs. 22.0±4.62g/m²h, p=0.05). In the early group, TEWL was significantly decreased at week 4 to 16.4±3.5 g/m²h (p<0.05). The late group was not significantly altered from NS at the pre-laser time point (day 77=12.1±1.99 g/m²h). Hence, there was no decrease in TEWL post-FLSR. After 4 sessions, epidermal thickness was significantly increased in treated scars in both FLSR groups (early: pre=85.6±6.8 vs. week 4=115.2±12.0 μm, p<0.01) and (late: pre=75.2±6.6 vs. week 4=125.7±12.0 μm, p<0.01, n=8 scars.). There was no increase in controls. Late intervention significantly increased RRR (pre=1.3±0.1 vs. week 4=1.9±0.1, n=8 scars, p<0.05), and early treatment trended towards increase (pre=1.7±0.05 vs. week 4=1.4±0.1). There was no increase in controls. There was increased INV gene expression in HTS vs. NS that decreased after FLSR. Eight scars had up-regulated gene expression of INV vs. NS levels (FC >1.5) compared to 4 scars at week 4. This was confirmed by IF where INV staining decreased at week 4.

Conclusions: Changes in epidermal HTS histioarchitecture and expression levels of epidermal differentiation markers were induced by FLSR. The timing of laser intervention contributed to differences in TEWL, epidermal thickness, and RRR.
wound progression, re-epithelialization, wound contraction, SEI, and CFU. Although significant differences in burn progression and re-epithelialization for burns treated with AASS were seen. In the future, we hope to continue to discover and test various OTS dressings to determine their appropriateness for use in the PFC setting.

Introduction: Burn wound infections are a serious complication of thermal injury. Among the many factors that may limit effective wound healing in patients with burn, bacterial infection and poor cell recruitment appear as the leading causes for prolonged healing. Thus, a novel strategy that aims to prevent bacterial infection within the wound, while at the same time providing structural scaffolding that promotes endogenous tissue repair, would be of great interest. As a nutritional protective barrier for the wound, we developed a thermosensitive collagen-based matrix called MeshFill (MF) that contains all nutrition required for cell growth with the ability to fill up all the cavities and void areas in wounds regardless of their geometry. In a previous study, MF was successfully combined with partial-thickness mesh grafted skin in a porcine model and improved healing and aesthetic outcomes. In the present work, we report on the development, and in vitro and in vivo testing of a new formulation of MF containing silver nanoparticles (AgNPs), which simultaneously prevent bacterial infection and promote skin regeneration.

Methods: We fabricated MF/Ag formulation by loading different concentrations of AgNPs in MF hydrogel. The antibacterial activity of MF/Ag formulation against Methicillin-resistant Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa (PA) was examined in vitro. The wound healing efficacy of the formulation was evaluated in a silicon ring splinted delayed wound healing model in rats. The splinted full-thickness wounds were generated on the back of rats and treated with either MF or MF/Ag with different concentrations of AgNPs or were bandaged with no treatment (NT) as a control. The healing process was monitored for 18 days. Clinical wound measurements and histological assessments were performed to compare different treatment regimens.

Results: The results of in vitro antibacterial study showed MF/Ag released a sufficient concentration of silver which caused a marked reduction in colony forming units (CFU) of MRSA and PA as compared to MF alone. MF/Ag did not show any cytotoxicity to human fibroblast. Moreover, the result of the animal study confirmed the safety and efficacy of applying different concentrations of AgNPs loaded in MF without compromising the healing outcome in our rat model.
Conclusions: These findings suggest that AgNPs loaded MF would be a safe, nutritional, flowable hydrogel that provides an ideal moisture environment for healing while protecting the wound from bacteria and can potentially be used as a functional scaffold in partial-thickness mesh grafted skin in burn patients.

617 Indocyanine Green: Harnessing Novel Methods to Identify Burn Wound Healing Potential

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Introduction: Objective determination of burn wound healing potential remains elusive and significantly impacts decision making for surgery, the extent of tissue excised intraoperatively and the use of donor site-sparing alternative tissue therapies. Indocyanine green angiography (ICGA) has promise as an adjunct to evaluate healing potential, but feasibility has limited adoption in clinical practice. Delayed fluorescence imaging of indocyanine green (ICG), in a method called second-window ICG (SWIG), is a new technique used intraoperatively to guide tumor resection via increased peritumoral endothelial permeability. The objective of this study is to examine ICGA and SWIG fluorescence in burns requiring excision and grafting, and to correlate SWIG fluorescence to microscopic localization of inflamed and necrotic tissue.

Methods: Deep partial thickness, indeterminate depth or full thickness burns were identified in adult patients scheduled for excision and grafting. 24 hours prior to surgery, baseline bright light and fluorescence images were obtained before the administration of up to 5 mg/kg ICG intravenously. ICGA was performed within 5 minutes of infusion initiation. On the day of surgery, bright light and SWIG fluorescence images were obtained before and after burn excision. The excised tissue was imaged ex-vivo to determine the presence of fluorescence in the tissue compared to that remaining within the wound bed. Excised tissue was processed for histologic analysis of cellular architecture, viability, inflammation and necrosis. Macroscopic ICGA and SWIG fluorescence images were compared to the associated microscopic tissue sections to determine the presence of inflammatory infiltrate, localization of non-viable tissue, and co-localization of ICG fluorescence.

Results: ICGA imaging performed preoperatively demonstrated variable fluorescence throughout the burns without a clear cutoff value to delineate deep partial versus full thickness burns. SWIG imaging revealed a speckled fluorescence pattern prior to burn excision that became diffuse after excision suggesting a potential utility of SWIG to intraoperatively identify excision completion. ICGA and SWIG fluorescence demonstrated an inverse relationship, and SWIG fluorescence was associated with non-viable tissue.

Conclusions: ICGA imaging alone was unreliable to delineate the need for surgical intervention. SWIG imaging of burn injuries may represent a valuable tool to guide the extent of excision intraoperatively and reduce unnecessary excision of viable tissue. Further studies are needed to understand SWIG fluorescence at the inflammation-necrosis border and how ICGA fluorescence along with SWIG can synergistically improve detection of healing potential in burn patients.
Firefighter Resiliency Project: Survey Findings and Implications for a Program Model

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Introduction: Firefighters are trained to respond to an array of acute emergencies that culminate in repeated exposure to trauma subsequently impacting their mental health. Yet, they often fail to seek services that could mitigate those adverse effects due to stigma, as well as a dearth of systematized resources and first responder proficient trained mental health professionals. This study explored work-related traumatic event exposure, PTSD symptomatology, levels of depression, anxiety, and suicide risk, and barriers to care for firefighters in a designated catchment area of a southeastern state. Results were used to inform local departments interested in culture change and intervention, as well as providing the basis for successfully obtaining federal grant monies.

Methods: Using Qualtrics, a web-based survey platform, researchers administered a cross-sectional survey to firefighters between Fall 2020 and Spring 2021. The survey included the PCL-5, PHQ-9, GAD-7, SBQ-R, and BACE. Descriptive statistics, correlations, and independent t-tests were run to determine the level of trauma exposure and clinically significant mental health symptomatology, associations between different types of trauma and mental health symptoms, and barriers to accessing care. The sample (N=511) primarily identified as Caucasian (n=421) and male (n=477). Mean age and time in fire service were 39.1 and 14.5 years, respectively.

Results: In this sample, 18.7% met the criteria for a provisional diagnosis of PTSD based on the PCL-5; 24.4% met the criteria for moderate to severe depression based on the PHQ-9; 14.5% met the criteria for moderate to severe anxiety based on the GAD-7; and 13.7% reported a significant risk of suicidal behavior as measured by the SBQR. Firefighters also indicated the following as the most common barriers to accessing care: 1) being unsure of where to get care (47.3%); 2) thinking the problem would get better on its own (41.8%), 3) feeling embarrassed or ashamed (39%), 4) concern that they might be seen as weak for having a mental health problem (36.2%), and 5) thinking they did not have a problem (34.3%).

Conclusions: Due to the high levels of work-related trauma exposure, firefighters in this study were at an increased risk of developing mental health symptomatology including PTSD, depression, anxiety, and risk of suicidal behavior when compared to the general population. Additionally, perceived and actual barriers to care provided implications for the grant program application.

Pain Management in Burn and Wound Patients: Effects of Acupuncture in Pain Score and Medication.

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Introduction: Pain management in burn patients is a complex ongoing problem. Opioid and non-opioid medications have historically been used as the primary pain management modality in burn care. Considering the ongoing opioid epidemic, a multidisciplinary holistic approach is needed for pain management. Acupuncture has been recognized to help in different settings such as chronic back pain, neurological problems, depression, and anxiety.

We hypothesize that burn and wound patients receiving acupuncture will have a decrease in opioids and non-opioid medications on acupuncture day (ACd) compared to non-acupuncture day (n-ACd) and a reduction of pain scores before and after acupuncture.

Methods: A prospective observational study in all patients admitted to the burn service was made. We exclude patients that were unable to provide consent or age 6 years and younger.

A numeric pain score (1-10) was collected from the patients before and after each acupuncture session; if patients were sleeping after acupuncture pain score was collected when they woke up. A prospective collection of daily opioids and non-opioids medications was made. Opioids were converted to daily morphine equivalents (MME).

Results: From February to August 2021, 53 patients on the burn service were treated with acupuncture for a total of 185 sessions. The median age was 49 years (IQR:32.5-63.0). Median TBSA for burn patients was 3.3% (IQR:1.5-8.1). The number of sessions per patient ranged from 1-12 with a median of 3 (IQR:1.7-4). Before acupuncture, the median pain score was 5 (IQR:2.6-6.4), and after treatment it was 1.5 (IQR:0.2-2.8).

Of 185 sessions, 49 (26%) of those sessions, patients fell asleep afterward. Median morphine use on ACd was 26.6 MME (15.8-62.1) vs. n-ACd 27.35 MME (15.5-65.3).
For non-opioid medication, the median of acetaminophen on ACd 1007.5mg (313.39 -1950) vs. n-ACd 1381.25mg (642.5-2535). After adjusting for TBSA and chronic opioid use, patients were given a daily mean of 391 MME CI: (1201.12-419.12 p=0.334) less in ACd vs. n-ACd. In addition, acetaminophen had a daily mean of 395.12mg CI: (130.05, 660.19 p=0.005) less in ACd vs. n-ACd. Overall, acupuncture was associated with a significant lower pain score with a mean of 2.799 points less.

**Conclusions:** Acupuncture seems to abrogate pain in burn and wound patients, as demonstrated by doses of pain medication. While there was no significant difference in opioid medications, there was a significant difference in acetaminophen, indicating that additional education of a tiered approach to pain medications is essential to reduce unnecessary opioid use.

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**Introduction:** Essential oils have been used for centuries for their calming properties. This alternative medicine therapy is gaining popularity in the inpatient setting for symptom management including pain, anxiety, nausea, and insomnia. The purpose of this project is to evaluate the effectiveness of aromatherapy complement as an alternative and/or treatment for pain and anxiety in the acute care setting at Parkland Health and Hospital System. The target population for this study was patients who were receiving care in the Surgical Services inpatient units including burn patients.

**Methods:** This study included all surgical patients admitted to one hospital and this is an analysis of the burn cohort enrolled thus far in this study. All adult burn patients that met inclusion criteria were included to evaluate the impact of aromatherapy on the administration of pain and anxiety medications (PANX). After introducing the patient to the study and obtaining informed consent a Lavender-Sandalwood scented aromatherapy sticker was placed on the patients' gown. The aroma last from the sticker last for twelve hours and could be replaced upon patient request. The stickers were used for a total of three days. Survey data was collected to describe the experience with the sticker as well as PANX medication administration and demographic information. Pain scores were recorded for each patient before PANX administration within the 72 hour time period after surgery or burn wound care procedures.

**Results:** To date a total of fourteen patients were enrolled in the study mean age was 44 years old, 71% of the patients were male and the mean TBSA was 5%. Two patients withdrew one because the scent gave them a headache and one because there were no study logs completed. Each of the twelve patients used a total of 6 stickers over the 3 days of the intervention. Prior to the start of the study the average pain score was 8.6 (range 7-10). On day one of the intervention the mean pain score was 4.75 (range 3-8), day two 4.25 (range 2-8), and on day three 4.3 (range 0 - 9). Post intervention pain scores were 5.75 (range 0-9). Comparison of the pain scores pre and post intervention were statistically significant t= -2.904(95% CI = -4.85 to -0.81) p = 0.0082. Of note patients reported that sleep was improved while using the aromatherapy sticker.

**Conclusions:** Aromatherapy may provide a natural alternative to reduce opioid pain medications and improve sleep in the burn patient thereby improving long term outcomes.
621 Ethical Considerations to Prevent Burns in Patients Who Smoke While Receiving Home Oxygen Therapy

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Introduction: Home oxygen therapy (HOT) is prescribed to patients with pulmonary dysfunction as a means of improving survival and quality of life. However, ignition of HOT can lead to burns that carry significant morbidity and mortality. This is especially true for patients who actively smoke while on HOT, with prior studies showing that 87.3% of HOT-related burns were due to smoking. An ethical issue thus arises for providers who routinely treat this patient population: how to balance providing beneficial treatment for a patient with the responsibility to protect that patient from suffering unnecessary burn injuries.

Methods: A literature review was conducted to determine the conversations surrounding this ethical dilemma in the scientific community. Thought was given to various solutions to address issues, and each solution was analyzed with respect to the traditional ethical principles of autonomy, beneficence, nonmaleficence, and justice.

Results: Multiple prevention considerations should be made for this patient population of active smokers on HOT. The first is to encourage more judicious prescription of home oxygen. This approach supports the principle of nonmaleficence as well utilizing prudence with prescription may prevent unnecessarily putting a patient at risk. A second strategy would be to discontinue a patient's HOT if they were found to be an active smoker despite proper education; however, this solution conflicts with beneficence, especially if the patient relies heavily on HOT. A third, more drastic approach would be to withhold treatment of patients who repeatedly present with burns acquired secondary to smoking while on HOT. Refusal to treat conflicts not only with beneficence and nonmaleficence but also with justice, as social factors play into which patients are more likely to smoke and, thus, may present with smoking-related burns while on HOT. Lastly, it is possible to address this challenge with broader, upstream solutions such as more thorough, longitudinal patient education on smoking cessation and the risks of smoking while on HOT. By doing so, physicians support all four of the traditional ethical principles.

Conclusions: Patients who suffer from burn injuries secondary to HOT ignition present a unique ethical challenge. Though physicians are tasked with the duty to provide optimal care for these patients, they are also shouldered with the responsibility of patient education and advocacy. Physicians should address this outstanding dilemma by thinking more critically about potential solutions that are bolstered by ethical considerations.

622 Oral Ketamine Administration During Bromelain Based Enzymatic Debridement of Burn Injury

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Introduction: Existing literature supports bromelain enzymatic debridement as an early tool for selective escharectomy, resulting in fewer skin grafts after burn injury. Enzyme application is painful, so many centers use continuous infusions of narcotics, ketamine, and sedatives in the intensive care unit. The authors utilize oral ketamine in burn practice— it is safe, can decrease the need for higher level of care, and be used without fasting. The purpose of this study is to evaluate whether oral ketamine can safely be utilized as an alternative to continuous infusions of medications for bromelain treatment.

Methods: This was a retrospective study of patients who received oral ketamine (for analgesia) and oral lorazepam (for anxiolysis and prevention of dysphoria) for bromelain-based selective enzymatic debridement application over a 6-month period. Data collected included patient demographics, burn characteristics, sedatives and analgesics administered, pain scores, adjunct medications, and vital signs. Presence of respiratory insufficiency (desaturations < 93%, need for bag-valve mask, or intubation), hypertensive urgency (SBP > 180, DBP > 110 w/out end organ dysfunction), dysphoric reactions, and uncontrolled pain were recorded. Oral ketamine (2-4 mg/kg) was given 30 minutes prior to the procedure. Patients were monitored per sedation guidelines and had capnography plus supplemental oxygen. Small PRN IV boluses of narcotics were given during the procedure, along with their baseline oral multimodals and narcotics. Pain was measured with the 1-10 verbal rating scale with minimal pain defined as < 4 or the patient clinically observed as sleeping. Patients were not made NPO for the procedure.

Results: Ten patients were included. Four patients (40%) had minimal pain during enzyme application, 3 (30%) patients slept through their procedure, and 3 (30%) patients reported 10/10 pain during treatment (2 had 10/10 pain before treatment). Five patients were treated on the floor, 7 were treated in the ICU. The median ketamine dose was 225 mg (IQR:177,250), or 3 mg/kg (IQR:2.75,3). Additional oral and IV opioids received during the 8–14-hour interval was 21 morphine milligram equivalents (MEs). The median benzodiazepine dosing before and during enzymatic debridement was 1.4 lorazepam MEs. Three patients (30%) had hypertensive urgency, 2 (20%) of whom reported 10/10 pain, and all 3 received 10mg IV labetalol. No one had dysphoric reactions or respiratory insufficiency.

Conclusions: This preliminary study reveals oral ketamine administration is safe and effective for pain control during bromelain-based enzymatic debridement. Most patients required small to moderate amounts of PRN IV opioids, had acceptable pain control, and there were no significant adverse effects. Future large, prospective studies should evaluate dosing and timing for optimal patient outcomes.
**623 Multi-Modal Analgesia for > 10% TBSA Pediatric Burns**
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**Introduction:** A review of literature revealed no analgesia or opioid sparing treatment guidelines for > 10% TBSA pediatric burns. Clinicians may benefit from an analgesia support guidance tool for the management of critically ill PICU and non-PICU inpatient pediatric burn patients with > 10% TBSA.

**Methods:** A multi-disciplinary team of experts created a pediatric analgesia support guidance tool for clinicians managing non-procedural pain in critically ill pediatric burn patients in the PICU and non-PICU inpatient setting. Agent selection was at the discretion of the clinician based on FLACC scoring. We performed a retrospective chart review, Jan 2019 to Jun 2021, of pediatric patients age 1 month to 14 years of age admitted to the Pediatric Burn Trauma service with > 10% TBSA. Analgesia was categorized as Yes/No for acetaminophen, ibuprofen, opioids (morphine, fentanyl, oxycodone, hydromorphone), gabapentin, alpha-2-agonists (dexmedetomidine, clonidine).

**Results:** 16 pediatric burn patients age 2 months to 14 years. 75% male, 4 (25%) PICU, 3 (19%) mechanically ventilated. Average LOS 7.19 days, range 1 to 25 days. 9 (56%) received standing acetaminophen, 1 (6%) ibuprofen, 12 (75%) opioids, 4 (25%) gabapentin, 3 (19%) alpha-2 agonists.

**Legend:** Y, years; M, months; TBSA Total Body Surface Area; MOI mechanism of injury; LOS length of stay; vent ventilator; PICU pediatric intensive care unit

**Conclusions:** We found 75% of our pediatric patients received opioids, and only 56% received standing acetaminophen. 7 patients (43.8%) received either gabapentin and/or alpha-2 agonists. Our pediatric analgesia support guidance tool influenced clinician pain management practice for the pediatric burn patient. With continued use, we will determine if this multimodal approach can reduce an over reliance on opioid analgesia regimens.

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**624 Implementation of a Collaborative Drug Therapy Management Protocol in an Adult Burn Clinic**
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**Introduction:** Collaborative Drug Therapy Management (CDTM) protocols allow qualified clinical pharmacists working within a defined context to independently assume responsibility for a variety of direct patient care activities. The goal of this model is to improve access to care, often in a more affordable and timely manner. Pharmacists in our burn center have historically assisted with discharge planning and transitions of care for patients being sent home or to a facility. Despite these efforts, pharmacists were not formally involved in managing Burn Clinic patients. The objective of implementing a CDTM Protocol in Burn Clinic was to streamline management of burn-related pharmacologic issues.

**Methods:** The CDTM protocol allows the pharmacist to assess patients’ therapeutic needs related to thermal injury, inhalation injury, or dermatologic disorder. Disease states managed include: pain, agitation, delirium, insomnia, venous thromboembolism, skin and soft tissue infections, and complications of hypermetabolic burn response.

**Results:** In Burn Clinic, via in-person or telephone visits, pharmacists can independently evaluate and modify pharmacologic treatment regimens in accordance with state legislation, including initiation, renewal, and adjustment of drugs and vitamins. The pharmacist can also review, order, interpret, and conduct pertinent laboratory studies and wound culture results. In addition, the pharmacist completes medication reconciliation, performs patient education, and consults other healthcare providers, as needed. All visits, patient care, education, and treatment decisions are documented in the electronic record. “Incident-to” billing is completed at Level 99211, as this is a hospital-based clinic.

**Conclusions:** Historically, pharmacists were peripherally involved with Burn Clinic patients when issues arose, serving in an “as-needed” capacity. With more proactive involvement, pharmacists are uniquely positioned to help with de-prescribing, drug interactions, insurance issues, access to medications, adherence, and dose optimization. Implementing a CDTM protocol allows pharmacists to become more formally involved in post-discharge follow-up and to help manage ambulatory burn patients.
Patient Centered Depression and Anxiety Screening in an Adult Burn Clinic

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Introduction: Depression and anxiety are seen in burn patients at rates up to 45%. Untreated, they can lead to long-term complications of posttraumatic stress disorder. Treating the psychological consequences of burn injury leads to increased quality of life for patients.

Methods: Rapid-cycle quality improvement using four plan-do-study-act cycles was used to evaluate interventions. Reviewing the data helped guide new tests of change each cycle. Data were analyzed using run charts to assess each intervention’s impact.

Results: A medical screening rate of 100% was achieved. Thirty three percent of patients screened were positive for depression and/or anxiety. Of the patients who screened positive, 100% chose an intervention on the Shared Decision Making Tool.


Use of Antibiograms and Changes in Bacterial Resistance Patterns

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Introduction: Infection is a leading cause of death in burn patients. With an increase in resistance patterns, management of these infections has become progressively difficult. Antibiograms, a summary of susceptibilities to bacteria in a given institution or area, are often used to guide empiric treatment of infections. However, inappropriate prescribing and use of empiric antimicrobials may greatly impact the incidence of resistance. Currently, we do not know the patterns of antibiotic use since the introduction of institutional antibiograms or associated changes in antibiotic resistance. The objective of this study is to describe trends in antibiotic susceptibilities in burn patients in Canada pre- (PrA) and post-introduction (PoA) of antibiograms.

Methods: We performed a retrospective review of patients admitted to an ABA-verified Burn Centre 2 years pre- (2013-2014) and post-introduction (2016-2017) of institutional antibiograms and started on broad-spectrum antibiotics (meropenem, piperacillin-tazobactam, and/or vancomycin).

Results: A total of 864 patients were admitted during the study period (n=420 PrA and n=444 PoA). Average age, % total body surface area (%TBSA), and length of stay were similar between cohorts. Administration of empiric meropenem increased (43.2% vs. 56.8%) and piperacillin-tazobactam decreased (60.6% vs. 39.4%), which was significant (p=0.002). The use of vancomycin was unchanged. There was a significant decrease in the overall use of empiric antibiotics (p=0.002) since the inception of antibiograms, with a significant improvement in culture and sensitivity (C&S) testing within 5 days of starting empiric antibiotics (p=0.002). There was no significant difference in use of targeted antibiotics pre- or post-antibiogram introduction.

Conclusions: Our study demonstrates that since the inception of antibiograms, there has been a significant decrease in overall use of empiric antibiotics and improvement in acquiring C&S within 5 days. However, these antibiotics were not always targeted to the appropriate organism and therefore may contribute to multi-drug resistant organisms in a burn population.
Outcomes of Patients with Burns Associated with Home Oxygen Therapy: A Systematic-Review and Meta-Analysis

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Introduction: Home oxygen therapy (HOT) is frequently prescribed for patients with pulmonary dysfunction, which predisposes these patients to a unique health hazard at home. Given the combustibility of oxygen and method of delivery, HOT can result in burns that will affect primarily the facial area and may potentially be associated with inhalational injury. Additionally, a significant portion of patients on HOT are active smokers, which further heightens the risk of these HOT-related burns. The outcomes of burn patients with burns associated with HOT is not yet completely understood. We conducted a systematic review and meta-analysis to characterize the outcomes of burn patients with burns associated with HOT.

Methods: We searched MEDLINE (Pubmed) for studies that reported on outcomes of burns associated with HOT. From this search, we screened 80 articles via online platform. Through our selection criteria, 17 articles focusing on patients with HOT-related burns were selected for systematic review and meta-analysis. Data was analyzed using a data analysis program.

Results: Seventeen studies observing a total of 1460 burn patients, published between 1990 and 2020, were included. Of these, one is a prospective study, twelve are retrospective chart reviews, and four were case reports/series. The mean age of the patients was 64.3 ± 4.5 years with a male to female predisposition of 1.5:1 and an average TBSA of 4.2 ± 4.1%. Of these burn patients, 93.4% were on HOT for COPD and 85.2% of injuries occurred while at home. Smoking caused 84.3% of all HOT-related burns and accrued a mean hospital charge of $73,628. With respects to clinical outcomes, the overall mortality rate was 11.3%, 33.6% required intubation, the average duration of intubation was 8.5 days, 31.3% had inhalational injury, 7.8% underwent tracheostomy, and 60.8% of patients were discharged home.

Conclusions: The majority of HOT-related burns are secondary to smoking and these injuries can result in significant morbidity and mortality and associated healthcare costs. A significant portion of these injuries can be prevented with smoking cessation and/or more judicious HOT allocation, however further studies and efforts will be needed to address this issue.
Results: and mortality. The mean LOS for the COPD group was 11.9 days +/- 19.4 days and 13.4 days +/- 31.0 days for the non-COPD group. The mean ICU LOS for the COPD group was 11.2 days +/- 19.9 days and 18.0 days +/- 37.0 days for the non-COPD group. The mean number of ventilator days was 16.5 days +/- 35.4 days for the COPD group and 26.3 days +/- 42.0 days for the non-COPD group. The overall hospital mortality was 10.3% for the COPD group and 4.3% for the non-COPD group.

Conclusions: This study demonstrates that the overall hospital mortality was highest in the COPD group. Although hospital and ICU length of stay, as well as the number of ventilator days were higher in the non-COPD group, it remains clear that an existing diagnosis of COPD can negatively impact the outcomes of burn patients.

Introduction: Chronic obstructive pulmonary disease (COPD) is a condition with significant morbidity and mortality. In 2018, about 16 million adults in the United States reported a diagnosis of COPD based on data from the American Lung Association. Home oxygen is often used in more severe cases of COPD, and despite warnings against smoking while using home oxygen, many patients continue to sustain burn injuries. An existing diagnosis of COPD can further complicate management of a burn patient, especially if there is concomitant inhalation injury present. The objective of this study was to explore the outcomes of COPD patients admitted to our Burn Center.

Methods: This was a single-site, retrospective review using our institutional Burn Center registry. All adult patients with flame burns (18 years or older) admitted to our Burn Center between July 1, 2011 and June 30, 2020 who had a history of COPD and without home oxygen use were included in this study. All adult patients with flame burns, who did not have a history of COPD, were included for comparative purposes. Variables of interest included demographics, burn mechanism, length of stay (LOS), ICU and ventilator days, and mortality.

Results: There were a total of 4,397 patients with flame burns included in this study, and 515 of those patients were identified to have an existing diagnosis of COPD. The mean age of the COPD group was 45.1 years +/- 13.0 years, and the patient population was predominantly male (60.4%). The mean total body surface area (TBSA) involvement was 5.12% +/- 10.38%. Inhalation injury was present in 10.1% of patients with COPD and in 7.8% of those without COPD. The mean LOS for the COPD group was 11.9 days +/- 19.4 days and 13.4 days +/- 31.0 days for the non-COPD group. The mean ICU LOS for the COPD group was 11.2 days +/- 19.9 days and 18.0 days +/- 37.0 days for the non-COPD group. The mean number of ventilator days was 16.5 days +/- 35.4 days for the COPD group and 26.3 days +/- 42.0 days for the non-COPD group. The overall hospital mortality was 10.3% for the COPD group and 4.3% for the non-COPD group.

Conclusions: This study demonstrates that the overall hospital mortality was highest in the COPD group. Although hospital and ICU length of stay, as well as the number of ventilator days were higher in the non-COPD group, it remains clear that an existing diagnosis of COPD can negatively impact the outcomes of burn patients.
Fifteen patients with 17 courses evaluated. Most results: Logistic regression was used to control and analyze failures. Description of treatment failures, and adverse events were provided using descriptive statistics. Treatment success, described and July 2020. Demographics and treatment data were reported receiving at least 48 hours of CZ/AV between Jan. 1, 2017 and longer lengths of stay augment risk of requiring several antimicrobial courses, leading to higher resistance rates. The objective of this study was to evaluate the outcomes of patients with thermal injuries including clinical success, the frequency of adverse effects, and emergence of resistance.

Methods: The design was a retrospective chart review. Patients were included if admitted with thermal injuries, where pharmacokinetic derangements are common and associated with ceftazidime/avibactam use. The efficacy of CZ/AV has not been studied in patients with thermal injuries, where pharmacokinetic derangements are common and longer lengths of stay augment risk of requiring several antimicrobial courses, leading to higher resistance rates. The objective of this study was to evaluate the outcomes of patients with thermal injuries including clinical success, the frequency of adverse effects, and emergence of resistance.

Results: Fifteen patients with 17 courses evaluated. Most were male (87%) and African American (53%). The mean age and weight was 47.7 ± 13.6 and 96.3 ± 29.4. Seventy-three percent had a flame injury. Mean TBSA was 34 ± 18.7. Twenty percent had an inhalation injury and 80% a significant substance use history. Clinical success occurred in 65% (11/17) although 29% died. E. cloacae (88%) was the most common treated pathogen, but 81% were polymicrobial. The most common sources were wounds (29%), blood (29%), and lungs (26%). Median days until CZ/AV initiation was 32 (14, 76). CZ/AV was dosed at 2.5 g every 8 hours in all courses. Median treatment duration was 12 days (9, 14). Fifty-three percent received CVVH with a mean delivered dose of 47.6 ± 9.5 ml/kg/hr. Resistance developed in 19% (3/17) of courses, but follow up sensitivities were rarely available. Logistic regression did not reveal any variables significantly associated with failure. There were no adverse events attributed to CA/AV.

Conclusions: Although lower than desired, clinical success rates in this sample were similar to other reported populations treated with CZ/AV. However, the emergence of resistance occurred more frequently, and was likely underreported in this sample. HVHF did not contribute to failure, but CZ/AV was aggressively dosed in this cohort.

Introduction: Rising antimicrobial resistance is a pressing public health concern. Emergence of carbapenem-resistant organisms has led to increased use of novel antibiotics, such as ceftazidime/avibactam (CZ/AV). However, recent studies have shown increasing treatment failures and resistance rates associated with ceftazidime/avibactam use. The efficacy of CZ/AV has not been studied in patients with thermal injuries, where pharmacokinetic derangements are common and longer lengths of stay augment risk of requiring several antimicrobial courses, leading to higher resistance rates. The objective of this study was to evaluate the outcomes of patients with thermal injuries including clinical success, the frequency of adverse effects, and emergence of resistance.

Methods: The design was a retrospective chart review. Patients were included if admitted with thermal injuries and receiving at least 48 hours of CZ/AV between Jan. 1, 2017 and July 2020. Demographics and treatment data were reported using descriptive statistics. Treatment success, description of treatment failures, and adverse events were described. Logistic regression was used to control and analyze failures.

Results: Fifteen patients with 17 courses evaluated. Most were male (87%) and African American (53%). The mean age and weight was 47.7 ± 13.6 and 96.3 ± 29.4. Seventy-three percent had a flame injury. Mean TBSA was 34 ± 18.7. Twenty percent had an inhalation injury and 80% a significant substance use history. Clinical success occurred in 65% (11/17) although 29% died. E. cloacae (88%) was the most common treated pathogen, but 81% were polymicrobial. The most common sources were wounds (29%), blood (29%), and lungs (26%). Median days until CZ/AV initiation was 32 (14, 76). CZ/AV was dosed at 2.5 g every 8 hours in all courses. Median treatment duration was 12 days (9, 14). Fifty-three percent received CVVH with a mean delivered dose of 47.6 ± 9.5 ml/kg/hr. Resistance developed in 19% (3/17) of courses, but follow up sensitivities were rarely available. Logistic regression did not reveal any variables significantly associated with failure. There were no adverse events attributed to CA/AV.

Conclusions: Although lower than desired, clinical success rates in this sample were similar to other reported populations treated with CZ/AV. However, the emergence of resistance occurred more frequently, and was likely underreported in this sample. HVHF did not contribute to failure, but CZ/AV was aggressively dosed in this cohort.
Introduction: While vitamin C is a regular part of burn management, there is no consensus on the most effective dose for a reduction in mortality, fluid resuscitation requirement, and other various clinical benefits. In this study, we aim to evaluate the potential protective effects of a higher dose of intravenous vitamin C in burn patients with greater than 40% total body surface area (TBSA) as compared to the effects on low dose oral vitamin C with lower TBSA burns.

Methods: A total of 54 subjects were retrospectively reviewed with burns greater than 20% TBSA from January 2018 to 2021. In our burn unit, patients with smaller burns were given 2,500 mg PO vitamin C and larger TBSA burns were given 15,000 mg IV vitamin C within 72 hours. During this period, we found 40 patients in the low dose group and 14 patients in the higher dose group. Demographics, length of stay, length on a ventilator, fluid requirements, number of procedures, days to the first infection, and mortality were compared using the Chi-square test.

Results: We found that there was a significant difference in the degree of burn on admission and reassessment between the dosing groups (30% vs. 48%, p = 0.006; 32% vs. 57%, p < 0.001). Overall fluid requirements for the first three days (9 liters vs. 25 liters, p = 0.001), length of stay (13 days vs. 38 days, p = 0.011), length on a ventilator (2 days vs. 13 days, p < 0.001), and total procedures required (1 vs. 5, p = 0.014) were also significantly higher in the group given the IV dose. No significant difference in other outcomes such as days until first infection and mortality rate were found (p=0.451 and 0.326, respectively).

Conclusions: Parameters that were statistically significant were consistent with the higher burn TBSA. Despite the group with larger surface area burns to require much higher fluid requirements (25 liters vs. 9 liters in 72 hours), high dose IV vitamin C may have been protective since the outcomes of days until first infection and mortality rate had no significant difference compared to the group with the smaller TBSA burn which should have predictably better outcomes. This clinical study supports other studies that high dose oral vitamin C may improve outcomes from a reduction in capillary leak to mortality but an adequately powered randomized prospective approach is needed to better define the benefits as well as dosing.

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Introduction: Burn patients have higher infection rates due to loss of the protective skin barrier. The past decade shows increased rates of burn infection with atypical invasive fungal organisms. After a recent trend of life-threatening atypical fungal burn infections at our hospital, we conducted this study to further characterize this.

Methods: We identified patients admitted to our burn center from January 2008 to June 2021, who developed fungal non-Candida burn infections while admitted. We gathered demographic data, burn injury details, surgical treatment course, and fungal and bacterial infection data. Descriptive statistics were used to characterize the data and identify trends.

Results: We identified 37 acute burn patients with atypical invasive fungal infections. Of these, 28 were infected with 1 species, and 9 were infected with multiple fungi. Non-Candida fungi included Aspergillus (20), Fusarium (8), Mucor (6), and 11 other species. Three fungi were resistant to antifungals including amphotericin B. Other organisms included Candida (18), Enterococcus (13), Pseudomonas (9), and 19 other species. On average, patients were infected with 5 bacteria, had 13 antibacterial resistances, and required 6.5 antibacterials. There was one case of total-drug-resistant Pseudomonas aeruginosa. Every patient required Infectious Disease consultation. Eight patients became bacteremic and 1 became fungemic.

The average burn surface area was 35%. All patients required excisional treatment, with an average of 7 excisions, 7 coverage procedures, and 3.5 other procedures; 44% of patients required amputations for infection control. The most common complications were graft loss (39%), ventilator-associated pneumonia (28%), and death (28%). The median length of stay was 40 days (IQR = 89) for survivors and 28 days (IQR = 14) for nonsurvivors. All fatalities were from overwhelming polymicrobial infection. The average modified Baux score was 73 (±28) for survivors and 102 (±38) for nonsurvivors. All nonsurvivors had clean wounds without penetrating trauma.

Conclusions: Burn patients with atypical invasive fungal infections have severe polymicrobial infections and extreme
antibiotic resistance. Patients may require, or fail, treatment with last-line antibiotic therapy and amputation. Early Infectious Disease consultation and aggressive treatment is critical. Further research may elucidate risk factors and ideal treatment patterns.

708 Serratia infections in burn care
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Introduction: Burn wound infections, ventilator associated pneumonia, line sepsis and urinary tract infections are common in patients with major burn injuries, and remain prominent causes of morbidity and mortality. Within the spectrum of organisms responsible for infections, some are more common, while others might be relatively more virulent. This study sought to determine the impact of Serratia infections within the context of a verified regional burn centre.

Methods: All patients admitted with a diagnosis of burn injury who developed an infection with Serratia Marcescens in the six years between 1 January 2015 and 31 December 2020, from any site, were included in the study. Data collected included demographic details, mechanism and extent of the burn, as well as the clinical course and complications.

Results: Twenty-two patients were included in the study, with a mean age of 46.5 years (range 27-70). Most had at least one significant co-morbidity. The mean burn size was 28% TBSA (range 2% - 71%), nine sustained inhalation injury and 13 required mechanical ventilation. Most patients underwent several surgeries (mean 3.4, range 1-9). The mean duration of hospital stay was 32.2 days (range 8-65), or 1.8 days per percentage burn (range 0.73 - 4). For those who died, the mean number of days from admission to diagnosis of Serratia infection was 3.8 days (range 2-7), as against 10.11 days (range 1-27) for survivors. Eight of the first cultures were from sputum, 11 wounds, 4 blood cultures, and 1 from the urine. No significant resistant strains were identified, and all patients received timely and appropriate antibiotic therapy. Five of the patients died.

Conclusions: Patients with major burn injuries are especially vulnerable to morbidity and mortality should they develop a systemic Serratia infection early in their hospital stay. Awareness of the natural history of these infectious episodes may improve the directed therapy required to improve outcomes.
Reconfiguration: Extracorporeal blood purification of a burn patient on ECMO

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Introduction: Patients who require extracorporeal membrane oxygenation (ECMO) have a very high mortality if they develop septic shock. Extracorporeal blood purification has been studied as an adjunct to antimicrobials but has yielded mixed or even disappointing results. The Seraph-100 Microbind Affinity Blood Filter (ExThera Medical Corporation, Martinez, CA) is currently undergoing clinical trials. The filter consists of polyethylene beads, coated in heparin sulfate, that irreversibly binds bacteria, fungi, viruses, and toxins. Seraph-100 therapy is traditionally delivered through conventional hemodialysis or continuous renal replacement therapy (CRRT), with the filter being placed in-line with these circuits. We present a case of a burn patient on venovenous (VV) ECMO in septic shock, who was treated with a Seraph filter by connecting it directly to the ECMO circuit.

Methods: We present a case.

Results: A 34-year-old male presented with 56% thermal burns and grade 1 inhalation injury from a fuel tank explosion. He underwent a large-volume resuscitation for burn shock with lactated Ringer’s and albumin, receiving 18,152 mL (163 mL/kg) in the first 24 hours. He was placed on CRRT for acute kidney injury and underwent escharotomies of the hands and legs. On day 4, he developed bacteremia, septic shock and progressed to acute respiratory distress syndrome requiring VV ECMO. Extracorporeal blood purification was started via the Seraph-100 filter. Due to limitations of blood flow rates on CRRT, the Seraph-100 filter was added directly into the ECMO circuit. Inflow tubing was connected to an existing port on the oxygenator (Fig 1) and returned to the venous drainage by cutting a new port into the drainage tubing (Fig 2). The filter itself did not require any special configuration or orientation (Fig 3). This configuration allowed for pressures generated by the ECMO circuit to drive blood flow through the Seraph-100 filter (Fig 4). After 6 hours of treatment, vasopressor requirements drastically decreased.

Conclusions: Complications related to the Seraph-100 filter are rare but may include catheter thrombosis. This is typically due to the type of catheter used and/or the blood-flow rate through the filter rather than the filter itself. This issue was avoided with the ECMO configuration. Similarly, clinicians can avoid transient hypotension, blood loss from a clotted circuit, catheter-site bleeding, and other complications frequently associated with a renal replacement circuit.

Specific Patterns of Vital Sign Fluctuations Predict Bloodstream Infection in Pediatric Burn Patients

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Introduction: Early recognition of the clinical signs of bloodstream infection in pediatric burn patients is key to improving survival rates in the burn unit. The objective of this study was to propose a simple scoring criteria that used readily available temperature, heart rate (HR) and mean arterial pressure (MAP) data to accurately predict bloodstream infection in pediatric burn patients.

Methods: A retrospective chart review included 100 patients admitted to the pediatric burn unit for >20% total body surface area (TBSA) burns injuries. Each patient had multiple blood culture tests, and each test was treated as a separate and independent “infection event” for analysis. The time at each blood culture draw was time 0 for that event, and temperature, HR and MAP data was collected for 24 hours after the blood culture was drawn. “Infection events” included in this study had at least six complete sets of temperature, HR and MAP data entries. Median temperature, HR and MAP, as well as mean fever spikes, HR spikes and MAP dips, were compared between infection group (positive blood cultures) and control group (negative blood cultures). These vital sign fluctuations were evaluated individually and as a combination of all three as timely predictors of bloodstream infection. In addition, we tested the prediction of Gram-negative bacteria versus Gram-positive or fungi present in blood cultures.

Results: Patients in the infection group had significantly higher median temperatures (p < 0.001), mean fever spikes (p < 0.001) and mean HR spikes (p < 0.001), compared to the control group. Using the combination scoring criteria to predict bloodstream infection, the strongest predictive values in the 24-hour timeframe had high sensitivity (93%) and specificity (81%). The predictive test metric based on vital sign spikes predicted Gram-negative bacteria, but with limited sensitivity (57%) and specificity (44%).

Conclusions: This study found that using a combination scoring criteria of fever spikes, HR spikes and MAP dips predicted bloodstream infection in pediatric patients with burn injuries with 87% accuracy, which may justify its use in resource-poor environments, or in cases where practical supporting evidence is needed for preemptive antibiotic treatment before culture results are available.
Introduction: Much has been written about burn resuscitation and, despite preponderant studies, the topic remains controversial. Over-resuscitation can result in burn wound conversion and other complications. Our team switched from using modified Parkland (PF) to Brooke formula (BF) in January 2020. Secondary to difficult resuscitations, we sought to review our data to identify factors associated with over-resuscitation using either formula. We hypothesized that the Brooke formula under-predicted resuscitation volumes compared to Parkland, particularly in older patients or in more severe burn injuries.

Methods: Medical records from patients who were admitted to the burn unit between 1/1/2019 and 8/29/2021 for a burn injury with %TBSA \( \geq 15\%\) were retrospectively reviewed. Exclusion criteria included age < 18 years, weight < 30 kg, patient not requiring resuscitation, or death within 24 h of admission. Demographics, injury information, resuscitation formula used, predicted 24-h resuscitation goal, the administration of HC, and arrival through ground transportation (OR = 10.523 [1.179-94.597], \( p = 0.036 \)). Patients who arrived through ground transportation took longer to reach the burn center (3.98 h [2.65-5.15] vs. 2.57 h [1.93-3.2], \( p = 0.004 \)) and presented with lower %TBSA (20.8 [18-27.9] vs. 31.3 [21-55], \( p = 0.004 \)).

Conclusions: Time to reach definitive care was the only independent variable associated with over-resuscitation. While not significant, compared to PF, using BF tended to be associated with over-resuscitation. More studies are warranted to determine if BF continues to underperform and, if so, the populations in which it underperforms will be identified.
**Introduction:** Burn Intensive Care Units (BICUs) are resource-heavy and labor-intensive units with very sick patients. The removal of burns as a requirement from the surgical curriculum has decreased the number of rotating surgical trainees, but did not impact patient care needs. Our unit adopted an Advanced Practice Provider (APP) service model in fiscal year 2018 to provide consistent standardized clinical care, with surgical trainees rotating monthly, to mitigate the loss of residents over time. We aimed to critically evaluate the impact of an APP run BICU on mortality and quality improvement initiatives.

**Methods:** Patients were identified using Institutional Burn Center registry, and linked to the clinical and administrative data. All patients admitted to the BICU between July 1, 2016 and June 30, 2020 were eligible for inclusion. All central line associated blood stream infections (CLABSI), catheter associated urinary tract infections (CAUTI), ventilator associated pneumonias (VAP) and mortality rates were compared. Demographics, length of stay (LOS), co-morbid conditions and mortality were evaluated. Statistical analysis was performed with Students’ t-test, and chi-squared tests. Significance was accepted as p< 0.05.

**Results:** There were no significant differences in admission rates over the study period. The number of CLABSIs significantly decreased each year (15 (2017), 6 (2018), 5 (2019), 3 (2020)). The number of CAUTIs significantly decreased ((13 (2017), 6 (2018), 1 (2019), 3 (2020))). The number of VAPs significantly decreased (15(2017), 12 (2018), 7 (2019), 3 (2020)). Mortality was unchanged from 2017-2019 but significantly decreased in 2020 (2.2% (2017), 2.4% (2018), 2.5% (2019), 0.9% (2020)).

**Conclusions:** There were no significant differences in admission rates over the study period. The number of CLABSIs significantly decreased each year (15 (2017), 6 (2018), 5 (2019), 3 (2020)). The number of CAUTIs significantly decreased ((13 (2017), 6 (2018), 1 (2019), 3 (2020))). The number of VAPs significantly decreased (15(2017), 12 (2018), 7 (2019), 3 (2020)). Mortality was unchanged from 2017-2019 but significantly decreased in 2020 (2.2% (2017), 2.4% (2018), 2.5% (2019), 0.9% (2020)).
715 The incidence of refeeding syndrome in burn patients receiving enteral nutrition
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Introduction: A major burn injury result in a hypermetabolic response which leads to increased nutritional requirements. Previous studies have shown that burn patients experience severe electrolyte abnormalities that are likely the result of multiple factors, but share similarities to refeeding syndrome (RS). Recently, the American Society for Parenteral and Enteral Nutrition (ASPEN) published consensus recommendations on RS, including clinical definitions and a grading system. Our aim was to evaluate this definition in a cohort of burn patients.

Methods: A retrospective analysis was performed of adults admitted to an American Burn Association-verified center from 2015-2020 with a burn injury who received enteral feeding for at least 72 hours. Patients with a length of stay < 7 days were excluded. Patients were categorized as having mild, moderate, or severe RS based on the newly established ASPEN criteria, defined by a decrease in any one, two, or three of serum phosphorus, potassium, and/or magnesium levels from baseline by 10%–20% (mild RS), 20%–30% (moderate RS), or >30% and/or organ dysfunction resulting from a decrease in any of these and/or due to thiamin deficiency (severe RS).

Results: A total of 350 patients were reviewed, from which 72 met the inclusion criteria. The mean patient age was 52 ± 18 years, and the average BMI was 28.3 ± 7.4. The average burn size was 21.7 ±17.0% TBSA and the average length of stay was 36 ± 32 days. A total of 57 (89%) patients had severe RS while five (8%) exhibited moderate and two (3%) developed mild refeeding syndrome. Of the 57 patients with severe RS, hypophosphatemia was the most prevalent (89%) followed by hypokalemia (19%) and hypomagnesemia (13%). Regression analysis comparing those with severe RS to those with mild or moderate RS revealed that number of surgeries performed was positively associated with the development of severe RS (p=0.0006), %TBSA trended but was not statistically significant (p=0.063). All other variables evaluated were not significant on univariate analysis.

Conclusions: The presence of severe electrolyte abnormalities as a result of burn injuries is significantly more common than originally anticipated. Further investigations are needed to determine if these abnormalities truly reflect RS or are primarily a result of the hypermetabolic response characteristic of burn patients.

716 Safety and benefits of intraoperative enteral nutrition in critically ill pediatric burn patients
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Introduction: Burn injuries significantly increase a patient's metabolic demand. Adequate nutrition is essential to aid in recovery and reduce morbidity and mortality. This is important for pediatric patients, who have limited reserves and are in a period of growth, in contrast to adults. Burn patients often need multiple surgeries, with standard perioperative fasting periods leading to multiple nutritional interruptions. Continuous intraoperative feeding has been a proposed solution, but there is no current consensus on its role and safety, particularly in the pediatric population. The goal of our study was therefore to examine the safety and benefits of intraoperative nutrition in critically ill pediatric burn injury patients.

Methods: A systematic review of MEDLINE, PubMed, Scopus, and Google Scholar was conducted using the following terms: Feeding or enteral or nutrition of fasting and adolescent or youth or pediatric or child or teen and burn or thermal injury or fire. The primary outcome was incidence of aspiration. Secondary outcomes included patient nutritional status (caloric deficit, weight), wound healing, days spent in the intensive care unit, ventilator days, pneumonia, number of surgeries, length of hospital stay, and mortality. Pooled analyses of binary outcomes were computed.

Results: Four studies consisting of 496 patients, met inclusion criteria. All studies were level IV evidence, but had high methodological quality. The median burn total body surface area (TBSA) was 43.8% (IQR 33.4-58.8%), with a median of one-third of patients having an inhalational injury. Patients underwent a median of 4.2 surgeries (IQR 1.8-7.4). Intraoperative feeding was conducted through nasoduodenal tubes. There were no aspiration events. Pooled analysis demonstrated that there were no differences in rates of aspiration, pneumonia, or wound infection (p >0.05) between patients who were intraoperatively fed and those who were not. Those fed intraoperatively had significantly more surgeries, ventilator days, longer hospital stays, but lower mortality (p< 0.05). There was large heterogeneity in nutritional assessment methods. Intraoperatively fed patients had an average gain of 144.4 kcal/kg and 1.7 days of exclusive enteral nutrition (vs. loss of -119.1 kcal/kg and -1.4 days) and cumulative positive caloric balance of +2673kcal ±2147 (vs. loss of -7899kcal ±3123), compared to those with interrupted feeding.

Conclusions: Continuous intraoperative duodenal feeding during burn surgery appears to be safe in the Pediatric burn population, with no reported episodes of aspiration. Uninterrupted feeding was also associated with weight maintenance and reduced caloric deficit. It may also have survival benefit, as continuously fed patients needed more surgeries and intensive/hospital care, but had decreased mortality.
Critically injured patients receiving kefir may have lower rates of Clostridium difficile

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Introduction: Kefir is an easy to administer per feeding tube probiotic yogurt that does not contain the risk of powdered probiotics, which may contaminate patient wounds or intravenous lines. Previous studies show patients taking probiotics may decrease hospital-acquired infections (HAI) although kefir has not been well studied. We hypothesized that kefir would be well tolerated and prevent infections among critically injured patients including patients with burn injury on enteral nutrition (EN).

Methods: We performed a retrospective review of adult critically injured patients at a level 1 trauma and burn center from January 2018 to March 2021 who received EN. Patients with a history of clostridium difficile (C. diff) were excluded. Patients who received kefir were given 120ml twice daily. The kefir protocol was improved with input from clinical stakeholders. The rate of C. diff, catheter-associated urinary tract infection (CAUTI), and central line-associated blood stream infection (CLABSI) were compared between patients who received kefir and those who did not. Incidence rate ratios (IRR) and corresponding 95% confidence intervals were calculated to assess differences in these rates.

Results: 3,814 patients met criteria, 545 of whom received kefir (14%). Suggested improvements to the kefir protocol by stakeholders were changing flavored to plain kefir to decrease the amount of carbohydrate, change to lactose-free kefir to improve usage in lactose intolerant patients, and educate nurses on flushing feeding tubes to avoid clogs. None of the incidence rates of HAI were significantly different between patients who received kefir and those who did not (Table 1). Crude IRRs suggest that C. diff infections may have occurred less frequently among patients who received kefir while the reverse occurred for CLABSI infections, though these results are not significant.

Conclusions: The kefir implementation was refined by stakeholder feedback. Although no clear benefit of kefir was observed with HAI reduction, future research should investigate the potential association between kefir use and C. diff.

Indirect Calorimetry is Necessary to Optimize Nutrition in Large Burns

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Introduction: Assessing nutritional requirements in large total body surface area (TBSA) burns is a challenge due to frequent metabolic variation. Studies have compared indirect calorimetry (IC) with predictive equations and identified formulas that are frequently used in the absence of IC. Large TBSA burns remain poorly understood, as does the role of frequent calorimetry. Studies have compared indirect calorimetry (IC) with predictive equations and identified formulas that are frequently used in the absence of IC. Using total energy expenditure (TEE) by IC as the standard, we assessed variation of each predictive equation for accuracy. Only the Milner and Toronto formulas are dynamic, and we analyzed variation by post-burn day (PBD) compared to dates of major surgical procedures in these studies. The patient was excised on PBD 1, 2, 5, 7, 9, 21, and 25; he was grafted on POD 5, 11, 20, 41, and 56. Weekly monitoring of prealbumin and CRP indicated adequate nutrition.

Results: On post-burn day (PBD) 5, when all major burns were excised, all predictive equations inappropriately estimated the patient’s energy expenditure. On longitudinal analysis of 16 IC studies (Table 2), the Milner equation was most accurate, estimating within 5% variance of TEE at 5 time points (31%). The Toronto formula did not estimate within 5% variance at any time point. No energy equation consistently and accurately estimated energy expenditure over all calculated time points.

Conclusions: Although predictive equations are frequently used, in high TBSA burns with many operations and changing nutritional needs, equations are not as accurate as IC. Given that over- or under-estimating needs result in many complications avoided with IC, we propose frequent IC for intubated, high TBSA patients.
Effects of Obesity on Outcomes of Adult Burn Patients at a Single Institution
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Introduction: Obesity is a global epidemic that continues to worsen. In 2016, more than 1.9 billion adults were considered overweight worldwide and over 650 million were obese. It is well-known that excess adipose tissue may alter inflammatory and immune mediator regulations, which can lead to challenges in managing resuscitation efforts, respiratory support, and thromboprophylaxis of burn patients. The objective of this study was to evaluate the outcomes of burn patients with obesity at our institution.

Methods: This was a single-site, retrospective review using our institutional Burn Center registry. All adult patients (18 years or older) admitted to our Burn Center between July 1, 2013 and June 30, 2021 who were classified as obese (i.e., body mass index > 30.0) were included in this study. All adult patients who were classified as underweight, normal weight, or overweight were also included for comparative purposes. Variables of interest included demographics, burn mechanism, length of stay (LOS), cost of hospitalization, and mortality.

Results: There were 7,626 patients included in this study, with the largest percentage of patients included in the obese category (38.4%). Among the obese population, most of the patients (53.2%) were classified under ‘Obesity Class I’ (i.e., body mass index 30.0 – 34.9). The majority of patients in each category were male, except in the ‘Obesity Class III’ category (i.e., body mass index > 40.0) where 54.8% of the population were female. The mean age of the entire study sample was 44.9 years +/- 17.5 years, while the mean total body surface area (TBSA) involvement was 5.1% +/- 10.0%. The mean LOS of the entire study population was 10.3 days +/- 22.6 days, with patients in the ‘Obesity Class III’ category (i.e., body mass index > 40.0) having the longest LOS with 14.0 days +/- 36.5 days. The cost of hospitalization was lowest in the overweight group with $82,661, while the highest cost was in the ‘Obesity Class III’ group with $130,683. The overall hospital mortality for the entire study population was 3.0% with the highest mortality noted in the ‘Obesity Class III’ group (4.7%).

Conclusions: Obesity affects all aspects of a burn patient’s care throughout their hospitalization. In our study, obesity was associated with longer LOS, cost of hospitalization, and mortality; therefore, it is imperative to understand the negative effects that obesity can have on burn patients, not just in terms of their acute management, but also their continued care after hospitalization.

Intensive Insulin Therapy in the Burn Intensive Care Unit: A Systematic Review of Literature
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Introduction: The significant burden of burn-related morbidity and mortality is partly due to the complex pathophysiological derangements that occur in the acute post-burn period. Critical care literature has pushed for tighter glycemic control, but these studies often use heterogenous groups of medical and surgical patients. Furthermore, some of these studies present conflicting evidence of whether there is true mortality benefit. Providers must balance the risks associated with hyperglycemia such as infection, inflammation, and pour wound healing against the risks associated with severe hypoglycemia, most notably coma and death. This study aims to review the literature on outcomes in tight glucose control regimens (glucose < 150mg/dL) in the burn ICU population to help guide further research and practice guidelines.

Methods: A systematic review of literature utilizing PubMed was conducted for any article published at any time. Searches used the AND function to identify articles with a burn term (burn injury OR burn care OR burn ICU OR burn OR thermal injury OR burned) and a glucose control related term (glucose control OR glycemic control OR glucose management OR insulin OR metformin OR glipizide). Exclusion criteria were English studies that describe intensive care unit (ICU) glucose management in adult burn patients. Inclusion criteria were involvement of children, animals, and settings outside of the ICU. Case reports, editorials, and position pieces were also excluded.

Results: The search identified 2,154 articles. Full text review of 61 articles identified 8 that met inclusion criteria. Two randomized control trials, 3 retrospective case-control studies, 2 retrospective cohort studies, and 1 systematic literature review. Only 1 study showed mortality benefit of tighter glucose control (< 150 mg/dL) compared to controls (< 200 mg/dL), while 3 studies showed no difference in mortality between cases and controls. Three studies demonstrated a reduction in infectious complications including sepsis, pneumonia, urinary tract infection, and bacteremia. Nearly all studies (6/8) showed increased rates of hypoglycemia with tight control, but very few instances of adverse sequelae following hypoglycemia were noted.

Conclusions: Like the broader critical care population, tighter glucose control may be beneficial to burn patients but with some variability. Balancing the complications of hypoglycemia with hyperglycemia continues to be a challenge with no clear guidelines. Further research in a burn specific population would help create a safe and effective treatment algorithm which could be adapted widely.
Defining Bleeding Characteristics in Frostbite Patients Managed with tPA

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Introduction: Frostbite is caused by exposure to cold temperatures and can be a severe injury leading to hospital admissions, surgeries, or amputations. Disease progression involves endothelial injury, thrombosis, and tissue necrosis; therefore, management of patients involves a process of rewarming and restoration of blood flow to the affected area. Tissue plasminogen activator (tPA) is a thrombolytic agent that has demonstrated efficacy at restoring tissue perfusion in patients with frostbite. The goal of frostbite management with tPA is to salvage tissue without causing clinically significant bleeding, a documented adverse effect of tPA administration. The purpose of this study was to characterize specific bleeding complications associated with tPA administration. The secondary objective was to compare the rate of bleeding complications in frostbite patients treated with intravenous (IV) tPA to frostbite patients that did not receive tPA.

Methods: This single center retrospective study included all adult patients with severe frostbite who presented between October 2013 and March 2020. tPA was given to patients per institutional protocol. To assess for bleeding events, patient charts were reviewed and any instance of bleeding was categorized based on severity. Bleeding was categorized as: 1) none, 2) mild: not clinically significant (bandage or moved IV site), 3) moderate: change of management (tPA stopped, enoxaparin held, or specialty consult), and 4) severe: included a change and intervention (transfusion, fasciotomy for compartment syndrome). Any change in management or any additional therapies used to control bleeding were documented, as well as the timing of bleeding in relation to tPA administration.

Results: Over a 7-year period 209 patients were analyzed and 202 patients were included. For patients with bleeding events requiring intervention, the mean time to bleed was 105.5 hours (range 4 to 576 hours). Of these, 4 (3 transfusions and 1 fasciotomy for compartment syndrome) were temporally associated with tPA administration (within 24 hours). Two of the 4 patients had minor to moderate traumatic injury prior to admission, the 3rd patient had incomplete work-up at referring center that initiated tPA prior to transport, and the 4th patient was in restraints. Of the patients who did not receive tPA, 3.39% had a severe bleeding event requiring intervention compared to 6.99% of patients treated with tPA (P=0.516).

Conclusions: Though there was a higher incidence of bleeding in tPA-treated patients, for the majority of patients studied, tPA was safe for the treatment of severe frostbite. Bleeding events occur in frostbite patients treated with or without tPA and warrant close follow-up for these infrequent complications.
Collagen-elastin matrix for defect coverage in exposed bradytrophic tissue after severe burn and degloving injuries
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Introduction: Despite successful defect coverage by means of complex skin or muscle flaps, particularly large and deep problematic wounds with exposed bradytrophic tissues after soft tissue loss are very susceptible to surgical revision. A dermal matrix, consisting of native collagen (collagen type I, III and V) supplemented by an elastin hydolyzate was first used for the treatment of burns, predominantly those that were full-thickness. Subsequently, its use was extended to defect coverage especially after soft tissue loss caused by degloving injuries.

Methods: 52 patients with exposed bradytrophic tissues caused by severe burn or degloving injuries were treated the same way.
In all patients operative debridement showed soft tissue loss with free bone or free periostal structures, exposed tendons or joint capsules.
In all patients after accurate wound bed preparation defect coverage was performed with collagen-elastin matrix and unmeshed split skin grafts in combination with negative pressure wound therapy for fixation of dermal matrix and split skin grafts.

Results: Two-years follow up of these collagen-elastin matrix procedures in defect coverage showed an excellent functional outcome:
Up until now, no areas with unstable scars have occurred, no surgical scar revisions were required. The patients were still able to wear normal footwear, clinical gait analysis showed perfect functional outcome.

Conclusions: The application of collagen-elastin matrix in patients with exposed bradytrophic tissues after severe burn or degloving injury treated so far represents an excellent reconstruction method, from initial coverage to scar development.

Carbon Dioxide Laser Treatment Practices for Hypertrophic Burn Scars Amongst American Burn Association Burn Centers
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Introduction: Scarring is a major outcome of severe burn wound healing. Severe scars often persist and diminish quality of life by disfigurement, pain, and pruritis. In the last decade, utilization of ablative fractional carbon dioxide (CO2) laser therapy has become a popular treatment modality for severe burn scars. Although the efficacy of CO2 lasers for the treatment of hypertrophic burn scars has been established via systematic reviews, there have been no attempts to query the 63 American Burn Association (ABA) centers across the United States regarding specific treatment parameters involving serious, sometimes high, total body surface area (TBSA) burns.

Methods: Throughout October and November of 2020, a Qualtrics survey consisting of 14 questions was administered to burn surgeons practicing at all 63 ABA burn centers across the United States. Topics assessed were specific laser parameters utilized (5), treatment preferences (2), perioperative follow-up (5), scar assessment practices (1), and TBSA treatment tolerance (1).

Results: Exploratory, descriptive data was analyzed. Surgeons practicing at 27 of the 63 total ABA burn centers responded to the survey (43% response rate). Data elucidates the level of variance regarding current initial management of hypertrophic burn scars via CO2 laser treatment. Surgeons demonstrated variation in the level of TBSA treatment tolerance and pulse energy settings, respectively.

Conclusions: Our findings show a substantial amount of variation in several aspects of CO2 laser hypertrophic scar revision between ABA centers across the country, including preoperative evaluation, laser settings, treatment regimen, and postoperative recommendations. Standardization of care when utilizing ablative fractional CO2 lasers should be further explored.
Role of synthetic dermal matrix for reconstruction of complex non-graftable wound defects

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Introduction: The aim of this study was to investigate the role of a synthetic dermal matrix, Biodegradable Temporising Matrix (BTM), for coverage of complex wounds. The authors defined complex wounds as wounds not amenable to reconstruction with skin grafting alone due to an inherent avascularity of the wound bed, such as the presence of exposed bone, tendinous or neural structures.

Methods: A retrospective review of a prospectively maintained database of complex wounds as defined above was carried out. Clinical and operative notes were reviewed along with review of an extensive photographic database demonstrating wound healing progress using staged dermal matrix and autologous skin graft reconstruction.

Results: 55 patients were identified who underwent staged dermal matrix and autologous skin graft reconstruction for complex wounds affecting a wide variety of patient demographics, treatment indications and body sites. Wound aetiology varied between burn injury, non-burn related trauma including degloving injury and infective complications. We discuss caveats relating to successful application of a dermal matrix, technique tips, prevention and management of complications.

Dermal substitutes play an integral role in providing biological wound cover for avascular wound beds which may otherwise require complex distant flap or microsurgical free flap reconstruction. BTM is a completely synthetic dermal matrix comprised of a 2-mm-thick sheet of biodegradable polyurethane foam bonded to a non-biodegradable polyurethane sealing membrane. Our department has developed significant expertise in the use of BTM throughout its development from initial animal studies through to recent human clinical trials. The synthetic composition of BTM does not require rapid neo-vascularisation for its integrity or survival. As such, two-stage BTM reconstruction has proven robustness in the face of unfavourable wounds compared with other popular dermal matrices, physiologically covering avascular structures, allowing for early graft take, expediting rehabilitation and mobilisation with excellent scar cosmesis and limited contracture formation.

Conclusions: Dermal matrices such as BTM play an important role in complex wound healing, frequently achieving excellent results with a low complication profile. BTM has been used successfully in cases where biological matrices would not routinely be considered as demonstrated by this clinical series. It has provided a valuable alternative to free-tissue transfer in patients with significant co-morbidities, vascular insufficiency and/or those for whom long operations are undesirable.

Case Series: New Porcine Placental ECM for Burn Injuries

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Introduction: Human amniotic membrane (HAM) has been used as a biologic dressing for burn wounds since 1955 but limited due to availability, size, and processing costs. In 2021 a new porcine placental product was FDA-approved overcoming challenges with human-sourced products. Our study is the first case series to report outcomes using porcine placental extracellular matrix (PPECM) in the use of adult burn patients.

Methods: Adults with thermal burns resulting in partial-thickness burn wounds (PTBW) were consented and included in the study from 03/2021 to 09/2021. Patients with full-thickness injuries, concomitant trauma, or adverse beliefs to porcine products were not included in the study. Serial still images and initial wound measurements were obtained intraoperatively and post-operatively. PPECM trial product processed with a proprietary decellularization method to produce single sheets up to 15x20cm was approved by the facility value assessment committee. Adverse events were defined a priori as infection, increased pain or itching relative to adjacent autografts, or failure to heal. Infection was defined as a PPECM treatment site requiring any change from standard of care or initiation of local or systemic antibiotics. Pain was assessed using a visual analogue scale. Itching was assessed at discharge and follow-up. Healing was assessed using the FDA guidance for wound closure with 2 consecutive visits 2 weeks apart demonstrating 100% epithelialization without drainage or dressing requirements.

Results: Four patients were treated during the study period with wounds involving the torso and major joints such as the hands/wrists and knees. None of the PPECM wounds demonstrated failure to heal or required revision excision, or autograft. None of the PPECM wounds had evidence of infection. PPECM wounds had decreased pain/itching relative to adjacent burn wounds which were treated with split-thickness autograft, autologous skin cell suspension, or allogeneic cultured skin substitute (VAS mean 1 vs 3.1). Healing was noted in all wounds at 1-week primary dressing removal with confirmation at 2-week interval follow-up.

Conclusions: PPECM treatment of PTBW was not associated with adverse events and resulted in favorable outcomes clinically. The large size, ease of use, and lower costs relative to HAM is an intriguing alternative for PTBW. Comparative studies are needed in the field to determine best practices and overall value.
**Results:** A total of 26 patients were included with a mean conducted. Patients were excluded if they were not admitted to the burn for burn injury from 3/14/21 to 6/14/21 were included.

**Methods:** All admitted patients who received collagenase criteria for use. A medication utilization evaluation was to characterize the use of collagenase and evaluate compliance to our institution’s criteria for use.

**Results:** A total of 26 patients were included with a mean (SD) age of 45 (17) years. Most burns were thermal (77%) with a median (IQR) of 7.5% (1.9,13.5) total body surface area (TBSA). Twenty-three patients presented with mixed partial thickness or partial thickness burns (89%). The three remaining patients had full thickness burns, which is not an indication for collagenase use at our institution. There was a median of 1 (0.1) collagenase treatment day per TBSA. Median length of hospital stay was 5 (2.22) days with a length of stay per TBSA of 1 (1.2). Approximately 58% of patients required a surgical procedure. Of these, 8 had documented graft loss or failure while 7 did not. In those who experienced graft loss, median TBSA was higher [31.4 (7.8,57.5) vs. 10 (2.5,15); p = 0.269] and they required more surgeries [7 (1,9) vs. 1 (1.3); p = 0.104]. A potential total revenue of $428,280 (2.5,15); p = 0.269] and they required more surgeries [7 (1,9) vs. 1 (1.3); p = 0.104]. A potential total revenue of $428,280 was found. Additional cost data are provided in Table 1.

**Conclusions:** There was a high level of compliance with criteria for use, with some opportunities for improvement. Over 40% of patients who received collagenase for partial thickness burns were treated non-operatively, supporting its likely benefit, despite the cost. The potential exists for significant revenue for the health-system.

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**Introduction:** Collagenase is routinely used for partial thickness burns at our health-system. A 30 gram tube costs over $300, which creates financial challenges for uninsured patients and impacts revenue capture. The objective of this medication evaluation utilization was to characterize the use of collagenase and evaluate compliance to our institution’s criteria for use.

**Methods:** All admitted patients who received collagenase for burn injury from 3/14/21 to 6/14/21 were included. Patients were excluded if they were not admitted to the burn unit or left against medical advice. A cost analysis was also conducted.

**Results:** A total of 26 patients were included with a mean (SD) age of 45 (17) years. Most burns were thermal (77%) with a median (IQR) of 7.5% (1.9,13.5) total body surface area (TBSA). Twenty-three patients presented with mixed partial thickness or partial thickness burns (89%). The three remaining patients had full thickness burns, which is not an indication for collagenase use at our institution. There was a median of 1 (0.1) collagenase treatment day per TBSA. Median length of hospital stay was 5 (2.22) days with a length of stay per TBSA of 1 (1.2). Approximately 58% of patients required a surgical procedure. Of these, 8 had documented graft loss or failure while 7 did not. In those who experienced graft loss, median TBSA was higher [31.4 (7.8,57.5) vs. 10 (2.5,15); p = 0.269] and they required more surgeries [7 (1,9) vs. 1 (1.3); p = 0.104]. A potential total revenue of $428,280 was found. Additional cost data are provided in Table 1.

**Conclusions:** There was a high level of compliance with criteria for use, with some opportunities for improvement. Over 40% of patients who received collagenase for partial thickness burns were treated non-operatively, supporting its likely benefit, despite the cost. The potential exists for significant revenue for the health-system.

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**Introduction:** Exfoliative skin conditions such as Steven Johnson Syndrome (SJS)/toxic epidermal necrolysis (TEN) and other significant drug related reactions are complex medical conditions that provide a challenge to the burn surgeon, especially with regards to local wound care. Various modalities of wound care require frequent dressing changes; however, these changes put the patient through significant pain and potentially harmful experiences that could lead to worse skin exfoliation, scarring and pigmentation changes. As part of our burn unit, we have created a dressing utilizing silver impregnated nylon sheets that limits the amount of wound care performed and therefore the amount of potential exfoliative damage.

**Methods:** We have employed this means of dressing in all our Steven Johnson patients with significant open or blistered areas. We performed a retrospective analysis looking at our patients who were admitted with Steven Johnson Syndrome/toxic epidermal necrolysis or other exfoliative skin disorder over the last 7 years. We had 52 patients who ranged from having 2-100% of skin involved with significant blistering or exposed areas. The suit is made specific to the patient as each area is measured and the silver sheets are formed to the patient and secured in place. The silver sheets are saturated with sterile water and rewet with saline every four hours and changed every three days.

**Results:** By utilizing these silver-based dressings, we have limited the amount of dressing changes and concomitant pain for patients while also limiting skin infections to only 1 out of our 52 patients. For blisters on the face, a local antibiotic ointment was used; and once the skin lesions had healed, a moisturizing lotion was used.

**Conclusions:** Steven Johnson Syndrome and other exfoliative skin conditions require significant wound care. By minimizing dressing changes, one can lessen the pain to patients and by utilizing dressings that are infused with silver, one can also potentially decrease the risk for infection as was seen in our patient population.
Introduction: Here we present the case of chemical burns following professional eyebrow tinting, a phenomenon rarely described in the literature.

Methods: A 50-year-old previously healthy female presented to our emergency department for evaluation and treatment of chemical burns to her eyebrows. Fifteen days prior, she underwent professional eyebrow tinting by a local esthetician. Blistering developed the following day, and progressive swelling prompted her to present to an outside hospital. There she was prescribed acyclovir, ketoconazole cream, and silver sulfadiazine, but despite these measures, her symptoms progressed, leading to her presentation to our facility. Both brows were remarkable for significant swelling with exudative crushing on the surface concerning for superficial infection of partial-thickness chemical burns. She was prescribed bacitracin, prednisone, and clindamycin and discharged with instructions to follow up in burn clinic. Six days later, both brows had developed 2x3 cm scabs, but no signs of infection were appreciated. She was instructed to apply bacitracin/polyymyxin B ointment to the scabbing areas and open wounds. Forty-nine days after her tinting, both brows were noted to be completely healed with no alopecia.

Results: Burns following cosmetic procedures most commonly occur during hair lightening treatments where products frequently contain caustic chemicals such as hydrogen peroxide or persulphates leading to oxidation reactions lightening the hair. Thermal burns in hair salons have also been reported to heated hair-dressing instruments or external heat to hasten the highlighting process. The periorbital area is becoming an increasingly popular target for nonsurgical cosmetic procedures, including permanent eyelid tattooing, eyelash dying, and extensions, more recently, eyebrow tinting. Eyebrow tinting involves the application of semipermanent dyes to give the appearance of a fuller brow. There are no FDA-approved brow tinting formulations, and many contain para-phenylenediamine (PPD), a dying agent frequently associated with allergic dermatitis and less commonly chemical burns. This patient underwent brow tinting in a professional setting and still experienced a chemical burn. As the popularity of brow tinting increases, some patients will undoubtedly seek out readily available, unregulated products for self-application. The potential for dermatitis and chemical burns following eyebrow tinting will only increase.

Conclusions: Eyebrow tinting is not a benign cosmetic procedure, and even professional application of dyes may lead to chemical burns. We believe an increased awareness of brow tinting and its potential complications is warranted given its increasing popularity, the preponderance of unregulated products, and the potential for poor cosmetic outcomes.
Clinical utility of the portable pressure measuring device for garment therapy on burn scar

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Introduction: The experimenters developed a portable pressure measuring device using silicon piezoresistive pressure sensors. The purpose of this study was to determine the effectiveness of pressure garment therapy using proposed device with objective data obtained through a randomized controlled trial.

Methods: Pressure measurements were acquired through a readout circuit consisting of an analog-to-digital converter, a microprocessor, and a Bluetooth transmission module for wireless data transmission to an external device. This was a double-blinded, randomized, controlled trial in patients with hypertrophic scars. In the pressure monitoring group, garment pressures were monitored using the portable pressure measuring device, and the compression garment was adjusted so that the pressure was maintained at the therapeutic range of 15 – 25 mmHg. In the control group, non-surgical standard treatment was performed in the same manner.

Results: No significant intergroup difference was noted at the initial evaluations (p >0.05) between two groups. The pre-to post-treatment change in the scar thickness (p=0.03) and erythema (p=0.03), more reductions were found in the pressure monitoring group than control group. There were no significant differences between the two groups for melanin levels (p=0.62) and transepidermal water loss (TEWL) (p=0.94). The changes (skin distensibility, biological skin elasticity, gross skin elasticity, and skin viscoelasticity) measured with the cutometer showed no significant differences between the two groups (p=0.87, p=0.32, p=0.37, and p=0.29, respectively).

Conclusions: Complementary characteristics such as wireless transmission to an external device may allow burn patients to continuously wear the device for real-time measurements. A Portable pressure monitoring device is effective for significantly improving burn-associated scar characteristics.

Utilizing call for burn admissions to guide clinical staffing decisions for Advanced Practice Providers (APP)

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Introduction: Over the past decade, the Advanced Practice Provider (APP) role has expanded into various care settings. The literature confirms that APPs contribute positively to the ICU setting, where better patient outcomes are noted, and they are seen as a safe adjunct to the ICU team. The VA recognizes the need for a more significant presence, and practice-based variations are considered crucial as restructuring goals are established. In 2014, Edkins et al. recognized the need for APPs in the burn setting as the number of residents declined. They stressed appropriate utilization and ongoing educational opportunities to develop the role in burns further.

Methods: This project was conducted by establishing a protocol within our burn referral call system to adequately and efficiently ensure accurate data is accumulated and leveraged to make staffing decisions. Implementation of the protocol began in January of 2018 and is well established. The primary purpose of the protocol is to efficiently store and transfer patient data to make informed decisions across both clinical and administrative departments. The Customer Relationship Management (CRM) System, Salesforce, was the primary software to implement and maintain this process.

Results: For three years, a total of 42,460 referral calls came through our burn call system. The number of patient calls that required admission to a regional burn center totaled 15,293. 70% of total patient referral calls came during the hours of Noon-Midnight; similarly, 72% of admission patient calls came during Noon-Midnight. Hourly trends were similar for both total patient call volume and admission patient referral call volume as they both had the highest number of referral calls between the hours of Noon-Midnight. The majority (32%) of total patient referral calls came in during earlier days of the week (Monday and Tuesday), while the majority (30%) of admission patient referral calls came in during the later days of the week (Friday or Saturday).

Conclusions: Our study demonstrates the benefits of implementing a collaborative protocol that allows sharing data and information across all facets of a burn center. Opportunities for additional studies include implementing similar protocols for administrative staffing and analysis of patient outcomes to see how staffing utilization has affected patient care.
Introduction: Laser doppler imaging (LDI) has been established as an accurate diagnostic tool to assess burn depth and measure healing potential. Despite this, its use in burn centers remain limited. While studies have examined challenges to LDI use, there is a paucity of literature factoring staff views and attitudes as a barrier to implementation into burn practice. The aim of this work was to assess and examine attitudes and perspectives following implementation of an LDI protocol into acute burn injury assessment.

Methods: Following institutional approval, a 22-question survey was disseminated among staff involved with implementation of an LDI device as a point of care tool to assess acute burn injury at a single ABA verified burn center. The survey focused on questions examining device ease of use, understanding of the underlying LDI technology, interpretation of imaging generation from wounds, and perceptions of patients’ experience. Questions were answered on a standard 5-point Likert scale. All survey data was collected anonymously into an electronic database for assessment.

Results: Overall, there were 15 respondents to the survey questions. Five respondents found the LDI device difficult to use (33%). Barriers to device ease of use included difficulty with device movement (60%), incorporation of scanning into wound care and dressing placement (60%), and management of hardware or software issues that arise during use (60%). Challenges noted by respondents external to device use was mainly high patient census (80%). Despite this, 60% of respondents found the device easier to use after performing several scans in one or more patients and 60% found that scans generated matched their assessment of burn depth. Among respondents, 66% found patients amenable to the scanning process and 80% did not feel that the scanning process worsened patients’ pain.

Conclusions: Challenges in LDI device use, implementation with wound care and dressing placement, and high patient census were identified as barriers to LDI use. Despite this, ease of device use improved with more frequent use. Identification of views and perceptions such as these can lead to protocol changes and additional training that facilitate ease of LDI use. Further examination will be required to better elucidate this information.

Introduction: Advances in burn care have led to improved survival, with survival after a 50% total body surface area (TBSA) or larger burn being more common. Traditionally, age, TBSA burned, inhalation injury, delayed resuscitation and evidence of early organ dysfunction have been predictive of survival. The goal of this study was to describe a large series of massive burn injuries, treatment strategies and identify factors related to survival.

Methods: Following IRB approval, a retrospective review of adult patients who sustained 50% TBSA or larger burn from 8/2009 to 7/2019 at an ABA verified burn center was conducted. Demographic, burn size/depth, mechanisms of injury, treatments, and outcome data were collected. Univariate and multivariate analyses were performed using R statistical software (R-project.org).

Results: 155 patients were included which was 4.7% (155/3312) of all burn admissions during that time interval. Patients had an average age of 44±18 years, a male predominance (79%), and average TBSA burned of 70±15%. Overall mortality was 54% (83/155). One third of patients were transitioned to comfort care. The 103 treated patients were younger (37±12 vs 59±19 years; p<0.0001), more likely to be male (85 vs 65%; p=0.006), had smaller average TBSA (66±13 vs 78±16%; p=0.0001) and more likely to have a psychiatric condition (31 vs 13%; p=0.02). Approximately 70% of treated patients survived to discharge. Survivors were more likely to have smaller TBSA (63±13 vs 73±13; p=0.001) and less third-degree burns (49±24 vs 61±24; p=0.01). One third of treated patients developed renal failure. One quarter of patients had a mental health condition, and these patients spent more time in the hospital (61 vs 31 days; p=0.009), more time on ventilator (29 vs 12 days; p=0.046), required more surgery (3 vs 2; p=0.048), and were less likely to die (36% vs 59%; p=0.02). On multivariate regression analysis of treated patients, psychiatric illness (OR 0.19; p=0.03) and burns related to marijuana/hash oil production (OR 0.13; p=0.015) were protective against mortality.

Conclusions: Surviving burns >50% TBSA is becoming more common as burn care continues to improve. Mortality in this study is lower than what would be predicted by an established revised Baux score regression model (predicted 61% overall mortality and 48% for treated). Care for these massive burn injuries is complex and requires an experienced multidisciplinary team. There is an established link between burn injuries and mental health conditions. Despite similar burn size/depth, patients with a mental health history spent significantly more time in the hospital, more time on the ventilator and required more surgery.
Early Treatment with NSAIDs Improves Blood Clotting Function in Severely Burned Patients

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Introduction: The risk of coagulopathy is increased in severe burns. Nonsteroidal anti-inflammatory drugs (NSAIDs) are commonly prescribed in burn patients to relieve pain and reduce inflammation. This study investigates the impact of NSAIDs on burn induced coagulopathy in severely burned patients.

Methods: Severe burn patients (total body surface area [TBSA] >20%) were identified with TriNetX, a North American federated health research network from 51 health-care organizations (HCOs) and categorized for those receiving NSAIDs during the first week following injury; those with NSAID use prior to injury were excluded. NSAIDs included in this study were ibuprofen, oxaprozin, indomethacin, aspirin, diclofenac, celecoxib, and naproxen. Burn induced coagulopathy was defined as international normalized ratio (INR) levels ≥1.5. Statistical significance of the rate of burn-induced coagulopathy in the week following injury among the two groups was analyzed with measures of association using chi-squared tests.

Results: We identified 709 severely burned patients receiving NSAIDs during the week after burn and 1,032 severely burned patients without NSAID use. Among those receiving NSAIDs, ibuprofen and aspirin were the most prescribed at rates of 80% and 36%, respectively. After cohort matching, the risk of burn induced coagulopathy was significantly decreased in patients taking NSAIDs (17.7%) compared to patients not receiving NSAIDs (32.3%) (p<0.0001). The protective nature of NSAIDs was greatest on the same day (p=0.0002) and first day following burn injury (p=0.0026). On average, those not taking NSAIDs had an elevated risk of developing coagulopathy compared to those who did as %TBSA increased in 10% intervals. This observation was confirmed in a linear regression analysis with slopes of 0.0453 and 0.0293, respectively. Furthermore, patients taking NSAIDs were less likely to develop sepsis (p=0.0046) and thrombocytopenia (p=0.0003) and die the first week following injury (p<0.0001).

Conclusions: The early protective effects of NSAIDs at reducing the risk of coagulopathy occurs during the acute phase of burns, though selection bias cannot be excluded. The potential risk of burn induced coagulopathy increased more with %TBSA in patients without NASIDs.
**Introduction:** Stevens-Johnson syndrome and toxic epidermal necrolysis (SJS/TEN) are rare severe cutaneous adverse reactions associated with high morbidity and mortality; however, there lacks an established treatment protocol. Treatment with intravenous immunoglobulin (IVIg) has demonstrated mixed success rates in improving mortality. It has been suggested that early intervention with IVIg in SJS/TEN patients may lead to a reduction in observed mortality rate when compared to the predicted rate. We present 24 patients with SJS/TEN treated in our burn unit with IVIg.

**Methods:** We conducted a retrospective analysis of patients who were hospitalized with the diagnosis of SJS/TEN in a specialized burn center over the years 2011-2020. Data regarding clinical factors, causative agent(s), disease severity, treatment received, and outcome were collected on chart review. SCORTEN and ABCD-10 prognostic scores were calculated for each patient at the time of admission. All patients were started on IVIg at the recommendation of dermatology. A standardized mortality ratio was obtained to compare the actual number of deaths to the predicted number based on SCORTEN and ABCD-10 formulas.

**Results:** A total of 24 patients were identified with a mean age of 49.8 ± 18.1 years. Most of the patients, i.e., 18 out of 24 had TEN, and 6 patients had SJS/TEN overlap with an overall average initial BSA involvement of 42.7% ± 25.3. Among the suspected drugs, sulfonamide antibiotics (41.7%) was the major predicted culprit. All patients were started on IVIg, 3 of which were treated in combination with corticosteroids. Most of our patients (23/24) received IVIg within 2 days of admission, but on average 11 ± 27 days (range: 2-135) after symptom onset. Many patients (10/24) experienced complications during hospital admission, such as: acute respiratory distress syndrome (8/24), sepsis (6/24), and anemia (2/24). There was no statistically significant difference in the overall observed mortality of 4 patients (16.7%) and the predicted overall mortality of 6.4 patients (26.7%) by the SCORTEN formula [standardized mortality ratio = 0.63; 95% confidence intervals, 0.17-1.61; P = 0.48], and the predicted overall mortality of 3.6 patients (15%) by the ABCD-10 formula [standardized mortality ratio = 1.12; 95% confidence intervals, 0.30-2.86; P = 0.96].

**Conclusions:** The findings of the present study do not support the clinical benefits of IVIg for SJS/TEN overlap and TEN patients.

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**Introduction:** Burn injuries are a significant cause of morbidity and mortality worldwide. Pre-existing conditions may further complicate a patient's outcome and delay wound healing. Human immunodeficiency virus (HIV) remains an ongoing problem globally and contributes to the morbidity of patients with burn injuries. According to the Centers for Disease Control and Prevention (CDC), the prevalence of individuals with HIV in the United States was 1.2 million in 2018. Burn patients and those with desquamating skin disorders are already in an immunocompromised state, and thus, the effect of HIV on the healing and recovery process can be significant. The objective of this study was to evaluate the prevalence and outcomes of HIV-positive patients admitted to our Burn Center.

**Methods:** This was a single-site, retrospective review using our institutional Burn Center registry. All adult patients (18 years or older) admitted to our Burn Center between July 1, 2010 and June 30, 2020 who were HIV-positive were included in this study. All adult patients who were HIV-negative and admitted during the same period were included for comparative purposes. Variables of interest included demographics, burn mechanism, length of stay (LOS), cost of hospitalization, and mortality.

**Results:** There were 32 HIV-positive burn patients and 16 HIV-negative patients with desquamating skin disorders (e.g., Stevens-Johnson syndrome/Toxic Epidermal Necrolysis). For the burn group, the mean age was 46.9 years +/- 10.6 years, and the mean total body surface area (TBSA) involvement was 3.2% +/- 4.2%. The mean LOS among HIV-positive burn patients was 9.13 days +/- 17.73 days, and the mean cost of hospitalization was $54,613. For the desquamating skin disorders group, the mean age was 47.1 years +/- 13.9 years, and the mean TBSA was 16.2% +/- 29.0%. The mean LOS was 17.25 days +/- 25.26 days, and the mean cost of hospitalization was $138,358. In terms of overall hospital mortality, there were no deaths among HIV-positive burn patients; however, the mortality was 25% among HIV-positive patients with desquamating skin disorders (n = 4). When both groups were compared to HIV-negative patients, overall hospital mortality remained higher among HIV-positive patients with desquamating skin disorders.

**Conclusions:** Management of HIV-positive burn patients presents a unique challenge for clinicians due to the immunocompromised state of this patient population. The challenge may even be more pronounced in HIV-positive patients with desquamating skin disorders as demonstrated in this study.
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738 Does A History of Malignancy Lead to Worse Outcomes in Burns?
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Introduction: A history of malignancy is associated with worse outcomes in cardiac disease and trauma. Our objective was to determine if a past medical history of cancer portends increased morbidity or mortality in burns or skin-sloughing disorders.

Methods: Patients were identified using our institutional Burn Center registry and linked to the clinical and administrative data. All patients admitted between January 1, 2014 and June 30, 2021 were eligible for inclusion. Demographics, length of stay (LOS), co-morbid conditions, and mortality were evaluated. Statistical analysis was performed with Students’ t-test, chi-squared, and Fischer’s exact test.

Results: A total of 8,018 patients were admitted during this period, and of those patients, 436 had a history of cancer (5%). Patients with a history of cancer were older (56 years versus 44 years), p< 0.0001. They had a significantly longer LOS. They had larger burns and higher hospital costs. They were more likely to be female and more likely to have a skin-sloughing disorder. Patients with a history of cancer also had higher mortality rates.

Conclusions: A history of cancer is associated with worse outcomes in patients admitted for burn injury or skin-sloughing disorders. Further study is warranted to investigate and mitigate what aspect of their care could be adjusted to improve outcomes.

739 A 14 Year Experience of Pediatric Complex Skin Disorders in a Burn Unit
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Introduction: Complex skin disorders including Stevens-Johnson Syndrome (SJS) / Toxic Epidermal Necrolysis (TEN), Ritter’s Disease (Staph Scalded Skin Syndrome), and Erythema Multiforme are uncommon, but result in significant injury to pediatric patients. Skin necrosis and desquamation occurs, which in some cases affects mcosa. Gynecologic, ophthalmologic, and dermatological complications also occur. The purpose of this work is to describe epidemiology and management trends in these cases.

Methods: Records were reviewed for all pediatric patients with skin disorders from 2006 - 2019 to evaluate trends in occurrence, age, length of stay, survivability, types of consultants, causative agent, and wound care strategies.

Results: One-hundred percent of pediatric patients were transferred from other hospitals for definitive management by the burn service. The incidence in pediatric patients was 21% compared to 79% in adults. Males were most often affected at 67% compared to 33% in females. The age range was 2-17 years, with an average of 9.2 years. The type most frequently seen was SJS/TEN at 60% of the cases. The total body surface affected ranged from 10-95%. Management of wounds commonly required operative management for dressing changes in children with large body surface involvement, in addition to ophthalmologic and gynecologic procedures in patients with mucosal involvement. In the subset of patients with SJS / TEN, 100% had ophthalmology consults and 50% were seen by gynecology. The average hospital length of stay was 11.3 days. All children survived.

Conclusions: Complex skin disorders in pediatric patients require a multidisciplinary team approach to care and wound management and benefit from burn service care. Early transfer is beneficial in order to definitively diagnose the specific disorder and prioritize strategies in care such as nutrition, wound care, and psychosocial support.
Cyclosporine in Stevens Johnson Syndrome & Toxic Epidermal Necrolysis: Experience from a Tertiary Care Center

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Introduction: Stevens-Johnson syndrome and toxic epidermal necrolysis (SJS/TEN) are rare severe cutaneous adverse reactions associated with high morbidity and mortality, however, there lacks an established treatment protocol. Treatment with intravenous immunoglobulin (IVIg) has demonstrated mixed success rates in improving mortality. More recently, cyclosporine (CsA) has been found to have a promising role in management of SJS/TEN owing to its potent anti-apoptotic activity. We present 3 patients with skin involvement who were hospitalized with the diagnosis of SJS/TEN in 2019 and started on CsA at a dosage of 5 mg/kg daily given in 2 divided doses. Predicted mortality by SCORTEN (12.2% to 32.4%) and ABCD-10 (5.4% to 12.3%) was compared with observed mortality rate to assess treatment guidelines.

Methods: We conducted a retrospective analysis of patients who were hospitalized with the diagnosis of SJS/TEN in a specialized burn center in the year 2020. Data regarding clinical factors, causative agent(s), disease severity, treatment received, and outcome were collected on chart review. SCORTEN and ABCD-10 prognostic scores were calculated for each patient at the time of admission. All patients were evaluated by a dermatologist and started on CsA at a dosage of 5 mg/kg daily given in 2 divided doses. Predicted mortality rate was compared with observed mortality rate to assess treatment outcomes.

Results: A total of 3 patients were identified with a mean age of 48.33 ± 16.50. All patients had TEN with an average initial BSA involvement of 56.67 ± 20.21 and peak BSA involvement of 63.33 ± 25.17. Lamotrigine was the presumptive causative drug in each case with an average duration of time from starting the medication to symptom onset of 19.3 days. Patients received CsA on average 7 days after symptom onset. Most of our patients had oral (100%), ocular (100%), genital (100%), and esophageal (33.3%) involvement during hospitalization. The observed mortality rate of 0% was lower than that predicted by SCORTEN (12.2% to 32.4%) and ABCD-10 (5.4% to 12.3%). No patients developed complications during admission. All patients had minimal wound care needs on discharge as most of the involved areas were healed by then.

Conclusions: Our study sheds light on a possible beneficial role of cyclosporine for the treatment of SJS/TEN and reinforces the necessity of further prospective studies to solidify treatment guidelines.

Introduction: Pregnancy naturally strains a woman’s body, and is exacerbated by additional stressors, such as severe burn. This study seeks to establish a national incidence rate of burns during pregnancy, as well as categorize the patients epidemiologically and by percent total body surface area (%TBSA) burned. We posit that pregnancies complicated by burn injuries have worse outcomes in mortality and comorbidities in comparison to pregnancies not complicated by burns.

Methods: Using an electronic medical record database, TriNetX, a retrospective cohort study was performed to identify burned pregnant patients within the last 20 years. The burn cohort included all pregnant women aged 12-55 who experienced a burn injury on the same day as pregnancy or anytime within nine months after the first record of pregnancy. The non-burned cohort included women who did not experience a burn within nine months of the recorded pregnancy. Outcomes compared were sepsis, pregnancy with abortive outcome, ectopic pregnancy, spontaneous abortion, complications of labor and delivery, preterm labor, postpartum hemorrhage, maternal mortality, and acute respiratory distress syndrome (ARDS). After matching for age at pregnancy, each outcome was compared at one, three, and five years after pregnancy. Risk ratios (RR) with a 95% confidence interval (CI) were used to compare cohorts, and a p-value < 0.05 was deemed significant.

Results: The TriNetX database contained 21,438,975 females between the ages of 12-55. Among these, pregnant women with burn injuries were found to have an incidence of 4.32% in the United States in the last 20 years (pregnant females with burn n = 4,721; females with burn n = 109,294). Of burns categorized by %TBSA burned, 84% were between 1-10%. Within one year of pregnancy, burned pregnant women have a three-fold increase in risk of development of sepsis compared to non-burned women (RR = 3, 95% CI = 1.518, 5.929), but are less likely to experience pregnancy with abortive outcome (RR = 0.612, 95% CI = 0.509, 0.735), complications during labor and delivery (RR = 0.863, 95% CI = 0.803, 0.928) or spontaneous abortion (RR = 0.707, 95% CI = 0.556, 0.899).

Conclusions: Pregnancy complicated by burn injury has a lower national incidence rate than the generally accepted 7% of reproductively aged females. Burned patients were more likely to experience sepsis than their non-burned counterparts one year after pregnancy, however, risk of maternal mortality was the same between the burned and non-burned patients within one year after pregnancy with a curious decrease in miscarriage and labor and delivery complications.
742 Is There a Mortality Benefit of Being Well-Insured in Burns?
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Introduction: The purpose of the Affordable Care Act was to make affordable health insurance available to more people, to cover adults with fewer resources, and to facilitate delivering health care in a cost-effective way. Burn care is both financially and medically intense, expensive, and prolonged. We aimed to compare outcomes of patients treated at a tertiary care center with no insurance, those considered under-insured (Medicare/Medicaid), and those with private/commercial insurance.

Methods: Patients were identified using our institutional Burn Center registry and linked to the clinical and administrative data. All adult patients admitted to the Burn Center between January 1, 2011 and December 31, 2020 were eligible for inclusion. Demographics, length of stay (LOS), co-morbid conditions and mortality were evaluated. Statistical analysis was performed with Students' t-test and chi-squared.

Results: A total of 9,306 patients were admitted during the study period. Forty-one percent of patients had private/commercial insurance. Thirty-four percent were under-insured, while 25% of patients had no insurance. Total body surface area (TBSA) of the burn was significantly higher for the under-insured, p< 0.05. Mortality was significantly higher for the under-insured, p< 0.05. The average LOS for the under-insured was 14.7 days, which was significantly longer than that for the insured (9.2 days) and for those without insurance (7.4 days), p< 0.05.

Conclusions: There are outcome disparities secondary to insurance coverage in burns. Under-insured patients had poorer outcomes than those with private/commercial insurance and those without insurance.

743 Virtual burn care - friend or foe? A systematic review.
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Introduction: Interest in virtual care has grown, but evidence surrounding its use for burn injuries is variable. This systematic review assesses the impact of virtual burn care in the past decade (2010-2020) by providing an overview of recent advances in the field. Data on efficacy, feasibility, cost-effectiveness, usability, pros/cons, satisfaction/acceptability, clinical outcomes, and triage effects are presented. Conclusions on its post-pandemic sustainability are drawn.

Methods: A systematic review with qualitative synthesis was performed according to PRISMA guidelines. Quality of included studies was assessed by validated tools. CINAHL, OVID MEDLINE, APA PsycINFO, and the CENTRAL trials registry were searched. Grey literature was searched for in OAster, Duck Duck Go, Bandolier Knowledge, LILACS and McMaster Health Systems Evidence. Primary literature published between 01/01/2010-12/31/2020 investigating any of the noted outcomes of interest was retrieved for data extraction.

Results: A total of 486 studies were identified for screening. 412 and 26 citations were excluded in title/abstract and full text screening, respectively. After removing 8 unretrievable works and 3 straggling duplicates, 50 citations were included. Most works were published from 2016-2020 (n=35, 70%). The most common uses (with some overlap) were acute assessment (n=35, 70%), remote follow-up (n=18, 36%) and tele-rounding (n=4, 8%). Remote photographic burn size (not depth) estimation was found feasible and acceptably accurate. Patient and provider satisfaction was high overall. Patient outcomes with virtual follow-ups were largely comparable to equivalent in-person services, though some adjunct programs saw little benefit. Increased specialist access, more accurate assessment/triage and saved travel time/cost were commonly noted. Challenges included logistics and language barriers for international interventions, IT issues and internet access limitations, HIPAA compliance and some wound/scar assessment challenges (e.g. burn depth and scar vascularity).

Conclusions: Evidence suggests that virtual burn care is largely safe, efficacious and could be feasible for continued use post-COVID-19 provided technological infrastructure is attainable and suitable regulation exists. Virtual acute specialist burn assessment is particularly well supported.
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Integrative Nursing framework in Burn ICU

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Introduction: Patient and staff experiences are enhanced through a holistic and relationship-based approach of care. An integrative nursing (IN) framework was created utilizing various therapeutic modalities to augment healing for patients. Additionally, staff RNs were encouraged to utilize some IN modalities to aid in their own well-being. In 2019, the Burn ICU (BICU) was selected as one of five pilot units in the hospital to implement the IN framework. Post-implementation, staff were surveyed on their attitudes regarding the IN framework.

Methods: The IN framework was created utilizing the IN principles and hospital policies. Two selected RN champions promoted this framework for staff and patients. In the BICU, over 95% of the RNs completed all five IN training modules: IN in Action, Acupressure, Clinical Massage, Aromatherapy, and Mind-Body skills. BICU was stocked with supplies, not limited to aromatherapy products, breathing ball, and massager chair. Additional resources were added including virtual reality (VR) and spiritual care. RNs documented and utilized IN tools believed it provided benefits. Addition of IN modalities is the next step in providing patients with holistic care that treats not only the physical wounds but the whole patient.

Results: A total of 27 surveys were collected from 29 available RNs. Aromatherapy, VR, therapeutic touch were the most utilized patient modalities, while staff mostly utilized the massage chair, aromatherapy, and deep tissue massager. Lack of time and personal discomfort were the highest reported barriers to utilization of the IN modalities.

Conclusions: Creating and implementing an IN framework is achievable and can assist with improving patient and staff experiences in the hospital. Most staff and patients who utilized IN tools believed it provided benefits. Addition of IN modalities is the next step in providing patients with holistic care that treats not only the physical wounds but the whole patient.

745 Evaluating Nurses' Perceptions of Code Cart Competency

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Introduction: This study was conducted to evaluate critical care nurses’ perceptions of competency when using the code cart during Advance Cardiac Life Support (ACLS) resuscitation. Following the pre-survey, various educational opportunities were offered to the nursing staff including written and hands-on activities in a low-stress setting. These activities were offered to day and night shift nurses on several occasions, and there was no limit to how many times a nurse could participate. Following 3 months of targeted educational intervention, a post-survey was conducted to re-evaluate the nurses’ perceived comfort level with using the code cart during ACLS resuscitation.

Results: The average years of nursing experience among participants was 3-4, with only two participants reporting 5 or more years of critical care experience. The nurses reported an increase in self-reported confidence level with using the code cart. The most common educational intervention that nurses felt would increase their comfort levels with using the crash cart were more frequent simulation scenarios (ie: mock codes), and hands-on training with open crash carts. After identifying that nurses were not confident in being able to work the crash cart and could not find necessary items when asked to do so during an emergency, a plan for additional hands-on education in a low-stress setting was developed. Using a pre/post survey, the multi-faceted educational opportunities were evaluated to see if they would impact the nurses' self-reported perceptions of code cart competency. Results indicated that not only were the educational interventions successful, but the nurses would like further opportunities for ongoing participation to maintain their level of comfort with the crash cart.
Nurse Driven Fluid Resuscitation in the Burn Center
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Introduction: The prior practice of the burn center was to resuscitate burn injuries over 20% total body surface area (TBSA) using a provider led modified Brooke fluid resuscitation formula. In that model of fluid resuscitation, the burn center provider ordered an initial fluid rate and adjusted hourly, where appropriate based on nurse recorded outputs. In Q4 2020 a nurse-driven fluid resuscitation was implemented in the adult Burn Intensive Care Unit (BICU). The primary purpose of the survey research is to evaluate the effect of the nurse-driven fluid resuscitation on nurse and physician communication.

Methods: Survey research was initiated in Q3 2020 with a pre-practice change survey for BICU staff. The 3-part survey included 10 questions. The post survey will be repeated in August and remain open through October or until 70% of participants have completed the survey, whichever comes first.

Results: Paired t-tests will be used compare survey research results pre and post-protocol implementation. In the pre-implementation survey there was a response rate of 44% (11/25). The average years of experience in the burn center was 11.64 years (median 7, SD 10.66). All survey questions were asked based on a 5-point Likert scale with anchors of 1 “strongly disagree” and 5 “strongly agree.” Question 1 the average score was 3.67. Question 2 the average score was 3.5. Question 3 the average score was 3.58. Question 4 the average score was 3.33. Question 5 the average score was 3.5. Content analysis was used to explore responses to open-ended questions. Three themes were identified: training, lack of communication, and over-resuscitation.

Conclusions: The pre-implementation survey revealed highest scores on nurses and physicians having a good map of each other’s skills and lowest on providers and nurses discussing ways to prevent errors. Content analysis also revealed common concerns about miscommunication and lack of resuscitation training leading to over resuscitation. Upon completion of the post-implementation survey, we anticipate reporting changes in low scoring questions. We look forward to reporting these results as part of this abstract.

Standardization of Upper Extremity Elevation
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Introduction: Elevation of burn-injured extremities is crucial to preserve function, prevent contracture and scar formation. Limited data leading to various techniques utilized across burn centers has resulted in no local, national, or international standard of practice. The absence of standardized documentation of these interventions prevents data tracking and outcome analysis.

Methods: A literature review was conducted to assess the various methods of upper extremity elevation in burn patients. A request was sent to ABA verified burn centers to collect feedback on elevation practices. The interdisciplinary team was consulted for their professional expertise and opinion. The unit practice council reviewed all data to establish a standard of practice for upper extremity elevation. A procedure was written explaining the purpose, proper implementation, and potential complications. Documentation in the electronic medical record (EMR) was updated to reflect the practice change. Education will be disseminated to bedside staff. Return demonstration will be required, completed with a trained validator to ensure staff competency. Data will be collected and analyzed through EMR audits.

Results: Information gathered via literature review proves there is inconsistent practice of upper extremity elevation post-burn injury. ABA verified burn center survey results support the current literature findings, and the importance elevation plays in preserving function and quality of life in burn survivors.

Conclusions: Upper extremities are frequently impacted by burn injury, potentially resulting in significant disability. A common physical complication of burn injury is contracture of major joints, leading to further surgical intervention and/or permanent disability. Standardizing the practice of upper extremity elevation has the potential to preserve joint function and range-of-motion. A procedure has been written and published hospital-wide. Staff compliance and documentation audits will assist in evaluating the efficacy of the upper extremity elevation. Barriers to optimal outcomes include staff compliance, documentation inconsistencies, and limited sample size.
**Burn Center Family Needs Study Brings Changes to The Unit Practice**
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**Introduction:** Pediatric burn patient family needs have many similarities to adult burn patients. However, based on our abstract Family Needs of Adult & Pediatric Burn Patients study from 2013 to 2018, there is a difference. We found our desire to preserve the pediatric burn patient family members as the "safe, comforting person" prevented them from learning all the necessary skills to be the successful caregivers once the child was discharged.

**Methods:** An integrative review is conducted using a literature search from EBSCOhost, CINAHL, Scopus, Medline, and PubMed. We found very little information addressing this specific concern for our pediatric burn population. However, there is a lot of literature discussing how to involve pediatric family members with other childhood diseases and the benefits of making pediatric family members a part of the treatment team. We shared our literature findings along with the results of responses we got from our Family Needs of Adult & Pediatric Burn Patients study with our Shared Decision-Making (SDM) Council and implemented our new practice.

**Results:** An informal interview results showed much improved pediatric burn family member satisfaction. By the time the family takes the burn child home, they demonstrate proficient dressing change skills along with the knowledge of how to manage their pain, itch, nutritional needs, and how to contact their care team as needed.

**Conclusions:** While most of us know the importance of family centered care, putting this concept into practice need more structured approaches and administrative support. Unit based SDM Council and Journal Club can help to keep our nursing staff, especially the new hires to embrace this practice.

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**Healthcare Disparity Increases Risk of Dog Bites in the Pediatric Population**
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**Introduction:** Long known to be a widespread source of injury, dog bites continue to occur and can frequently be devastating. There is lasting economic and personal hardship associated with this as many attacks can be severe, especially in children. This study describes the differences between dog bites and all other bites in the trauma patient population.

**Methods:** We included all patients from the National Trauma Data Bank (NTDB) from 2007 to 2016. All patients with an E-code for any type of bite were included. The following predictors were examined: year, age, gender, race, ethnicity, transfer, injury type, ED disposition, and ISS ≥15. Standard t-test for age, chi-squared test for all categorical variables, Wilcoxon test for non-normal quantitative variables. Statistical analyses were performed using R version 4.0.2 statistical software. "Under resourced" will be defined as Self-Pay and Medicaid. "Not known" is removed and replaced with NAs. All other insurance types are included in "Normal".

**Results:** All variables tested as significant. All variables analyzed tested as significantly different between dog bites and other animal bites. When the group, pediatric subset, and adult subset are evaluated (Tables 1), pediatric patients are more likely to be dog bite patients if they are from an under resourced background (OR 1.3, p-value < 0.001). Distribution of bites are not significantly different from Low to Normal resource adult patients.

**Conclusions:** Dog bites continue to be a public health problem and are more likely to be severe or fatal than bites from other animals and humans. Better methods of injury prevention and education need to be established. Children from under resourced backgrounds are at an increased risk of suffering a dog bite and all physicians should screen for and educate patients and families about this risk.
Introduction: Paddling pools are a source of entertainment for many children. In cooler climates, parents often attempt to heat up the water temperature by adding freshly boiled water into outdoor pools. Our Regional Burns Centre has seen many of these injuries and we wanted to investigate trends and prevalence.

Methods: Utilising the local Burn Injury Database, we searched for paddling pool related injuries which occurred between 2015-2020. We retrieved age, burn size and depth, need for surgical intervention and outcome, as well as circumstances surrounding the injury.

Results: We identified 26 injuries over six years, of which 11 were in 2020. The age of children ranged between 6 months and 13 years old (median 4 years 8 months). The majority, 22 (84%) of patients, had superficial partial thickness injuries. Only five patients (19%) had burns larger than 2% TBSA and only a single patient required general anaesthetic procedure to clean and dress the wounds. Two patients were admitted (length of stay 2-5 days). Burns affected a range of locations with the majority being lower limbs (11) and upper limbs (8). Head and neck area was affected in 4 cases followed by flank (3), abdomen (2) and buttocks (2). Injuries occurred between April and August and the majority happened during the Friday – Sunday period 18 (69%). All burns occurred between April and August and the majority happened during the Friday – Sunday period 18 (69%). All burns occurred between 11:00 and 18:30, with average time being 14:40.

Conclusions: Paddling pools represent a common potential risk to children. With the recent of COVID-19 pandemic leading to closure of the schools, there has been a significant increase in paddling pool sales, resulting in an increase in these injuries and, without relevant education, they are expected to become more common.

Introduction: Areas of the United States with desert climates and consistent ambient temperatures greater than 100 degrees Fahrenheit four to five months out of the year have a significant influx of pavement burn inpatient admissions during the summer season. These burns are caused when skin meets elevated pavement temperatures, even if the contact is just for a few seconds. We investigated retrospective data and the impact of the decreased outreach efforts during the pandemic on pavement burn admissions.

In 2018, due to an identified increase in pavement burn admissions in the community, the burn center created and implemented a pavement burn campaign to reduce pavement burn admission by raising awareness and providing education in the community. The campaign included specific messaging posted on billboards, public service announcements via news outlets and social media, printed flyers distributed during various community safety events, and the distribution of summer footwear between the months of April and September. The efforts proved fruitful in reducing rates. Due to the worldwide pandemic, prevention efforts were greatly decreased in 2020.

Methods: A 3-year retrospective data review of acute admissions to a 16-bed burn unit was conducted. Data was abstracted from the burn center’s registry, looking at rates of pavement burns within the months of April to September. Each of the three year’s inpatient pavement burn admission totals were compared.

Results: Our analysis showed a need for burn prevention strategies in 2018, leading to implementation of the pavement burn campaign. There was a 58% decrease in admission rates in 2019 compared to 2018. In March of 2020, the state ordered businesses to close; additional closures and restrictions continued over the summer months causing all prevention efforts to cease. In 2021, there was a 60% increase in pavement burn admissions compared to previous two years. There is a correlation between halted pavement outreach and the increase in pavement burn admissions.

Conclusions: The lack of burn outreach during the pandemic lead to a remarkable increase in pavement burn admissions in 2021, reinforcing the need for continued outreach in the hot summer months. Additional research is needed to identify specific populations admitted for pavement burns to identify needs of the community. Patient demographics such as age and geographical location can aid in targeting outreach strategies for the identified populations. Additional research with other burn centers may aid in constructing innovative outreach strategies moving forward.
**Results:** There were 622 inpatient admissions during the statistic were obtained for the population. COVID-19 status, and outcomes were collected. Descriptive graphics, injury circumstance and details, interventions, it’s burn registry from March 2020-June 2021. Data on demographic are needed to fully understand these initial findings. Further sub-analyses may also elucidate the influence of pandemic related behavioral changes as public health mandates evolved over time.

**Methods:** Following IRB approval, our institution queried regional burn center during the COVID-19 pandemic. Analysis shows burn injuries tend to cluster in areas marked by low-income, higher numbers of racial-ethnic minorities, and poorer quality housing. Table 1 shows preliminary descriptive data about the study population.

**Results:** There were 622 inpatient admissions during the study timeframe. Patients were primarily Black (44.4%) or Caucasian (32.6%) males (65.6%) identifying as Non-Hispanic (81.8%). The mean age was 46.73±18.6 years. Mean total TBSA burned was 6.7±10.7%, 2nd and 3rd degree percentages were 2.11±4.64 and 0.62±5.2 respectively with 47 total inhalation injuries. Top burn etiologies were 244 (39.2%) scald and 175 (28.1%) flame with 249 (40%) coded etiology associated with food prep or consumption. The majority of the burns occurred at home (93%). Time from injury to admission was 616.98±2199.42 minutes and time to first excision from admission was 4314.3 ± 5657.3 minutes. ICU and hospital length of stay were 12.7±18.3 and 8.73±13.3 days. In-hospital mortality was 31 (5%). Nineteen patients tested positive for COVID-19 during this time.

**Conclusions:** Nearly half of all burn center admissions were for cooking related etiologies during this time. Time to admission was over 10 hours in a population dense area. More information of site specific pre-pandemic etiology and treatment data are needed to fully understand these initial findings. Further sub-analyses may also elucidate the influence of pandemic related behavioral changes as public health mandates evolved over time.
Introduction: The COVID-19 pandemic has forced profound changes on many aspects of American healthcare delivery. Resource utilization and risk minimization have been the primary goals behind these shifts, and adaptations made to optimize public safety continue to affect patients. It is not known, however, how these changes have impacted burn patients. The aim of this study is to detect any effects the pandemic has had on this population by describing the incidence, nature, and short-term outcomes of patients treated by a single surgeon at a major burn center during the area’s shelter-in-place period.

Methods: A retrospective cohort study was performed using a database of one surgeon’s (RG) admissions and surgical procedures. All patients treated for acute burn injuries within the year following the announcement of COVID-associated shelter-in-place orders in the burn center’s area (March 2020-March 2021) were included. The control group consisted of the same surgeon’s patients treated in the prior year (March 2019-March 2020). All patients were included regardless of age. Patients treated for other conditions such as dermatologic issues or chronic burn sequelae were excluded. Delayed presentation was defined as an interval longer than 24 hours between injury and first medical encounter. Descriptive analyses were performed to compare the demographics, timing of presentation, treatment courses, and short-term outcomes between pre-pandemic and COVID period groups.

Results: 408 patients were included overall, with 227 admitted pre-COVID and 181 during the pandemic. The only significant difference in demographics between groups was a higher incidence of homelessness in the COVID group (7 vs 13%, p < 0.04). Delayed presentation was not significantly different between groups (15 vs 17%, p=0.75). We found no significant differences between groups in rates of cellulitis or sepsis at presentation (9 vs 10%, p=0.8; 5 vs 8%, p=0.32) or during admission (16 vs 18%, p=0.54; 5 vs 8%, p=0.32). The mean number of surgeries per patient was 2 in both groups. Rates of autografting (62 vs 56%, p=0.24), lengths of stay (16 vs 17 days, p=0.34), readmissions (2 vs 4%, p=0.11), and deaths (2 vs 2%, p=0.74) were also similar. There were several complicated cases of delayed care in the COVID group after burns were evaluated initially via telemedicine, including one patient who presented in septic shock, though this finding did not reach statistical significance.

Conclusions: Our results demonstrate that the pandemic did not have a significant impact on many key aspects of acute burn care in this cohort. Patients in the pandemic period did not delay treatment at a higher rate, and short-term outcomes were comparable overall between groups. Further studies will be useful in understanding the effect of the pandemic and telemedicine on burn care in a broader context.
(VR-12, SWL, 4-D Itch, PTSD Check List, self-reported PTSD, employment) were significantly different between groups at one-year after injury (p >0.05).

**Conclusions:** No significant differences in outcomes were found in the BMS Database between burn survivors with and without a history of military service. Harmonization of these data with other military service datasets will help us better understand long-term outcomes of this population.

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**756 Self-Inflicted Frostbite with Dry Ice: A Case Report**

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**Introduction:** Frostbite (FB) is a severe form of cold injury that may result in significant morbidity. Freezing causes formation of ice crystals and protein denaturation leading to cellular damage and tissue necrosis. Although commonly affecting populations who live and work or become stranded in cold environments, the true prevalence is unknown due to lack of standardized reporting. Dry ice is a solid form of carbon dioxide commonly found in the food industry, that can reach temperatures as cold as -110 degrees Fahrenheit and can be purchased at local department stores. Exposure to dry ice is an unusual cause of FB injury that could occur anywhere, especially in warmer climates. Healthcare professionals practicing in warmer climates may be unprepared to assess and treat patients with such injuries.

**Methods:** We describe a case of self-inflicted FB injury to the bilateral lower extremities (BLE) following intentional submersion in dry ice who presented to a Southern U.S. Burn Unit.

**Results:** A 20-year-old man with self-diagnosed Body Integrity Identity Disorder (BIID) sustained a 12% TBSA FB injury to his BLE following intentional submersion in dry ice for an estimated 4 hours (Figure 1). He presented to the Burn Center from an outside facility approximately 12 hours post injury with initial rewarming having already occurred. He immediately underwent catheter directed intra-arterial thrombolysis with tissue plasminogen activator (TPA) for leg length preservation. TPA infusion was initiated at 16 hours post-injury for a total infusion time of 24 hours. Wound care consisted of gentle twice daily cleansing with silver sulfadiazine and mafenide acetate creams. The patient ultimately required bilateral below the knee amputations which successfully healed with minimal autografting to the distal limbs. He was formally diagnosed with schizophrenia by our behavioral health team and initiated on risperidone. He underwent aggressive physical therapy and was discharged home with his parents after 21 days. He underwent weekly mental health follow up appointments and has been seen regularly in our burn and rehabilitation clinic.

**Conclusions:** This unusual case is one of few to describe Grade 4 FB after exposure to dry ice and highlights that severe FB may occur in any climate and can cause severe morbidity. Severe cold injury management is important for burn care professionals to maximize tissue and limb preservation.
A comprehensive review of the definitions provided for burn formation, and Quality & Registry Community discussion criteria statements, a BCQP Q&A session on admission inclusion criteria found in the ABA Burn Care & Quality Platform Data Dictionary 2020 version 1.1. The guidance is complex, often leading to confusion in determining proper patient identification. This is most problematic for new burn centers seeking to implement a burn registry. Therefore, at our burn center, we designed and implemented an algorithm based on a thorough literature review and ABA guidance to improve the accuracy and efficiency of patient identification.

**Methods:** A review of the literature was conducted using the PubMed database. In addition, utilizing the ABA's multitude of resources including, the Burn Care & Quality Platform (BCQP) Data Dictionary 2020 version 1.1. The patient inclusion criteria statements, a BCQP Q&A session on admission information, and Quality & Registry Community discussion boards, the following algorithm was developed by the compilation and simplification of the definitions provided for burn and non-burn injury patient inclusion criteria.

**Results:** A thorough literature review produced no articles that address NBR inclusion criteria. According to these documents, all patients admitted to the hospital for treatment of an acute burn or soft tissue wound should be included in the burn registry; however, a BCQP Q&A session expressed the Burn Service must provide medical care in order for a patient to be included in the registry. Furthermore, the BCQP Data Dictionary outlines patient inclusion based on a hospital length of stay >24 hours, a surgical operation, or expire at a hospital facility for registry inclusion. Observation patients and non-burn patient consults are excluded from the NBR. The ABA community discussion board revealed many centers only count and track non-burn injury admissions to the burn center service line. The compilation of information resulted in the development of a standardized algorithm defining a patient for registry inclusion.

**Conclusions:** A comprehensive review of the ABA resource documents was compiled to clarify the patient inclusion criteria for data submission to the NBR. The BCQP Data Dictionary 2020 version 1.1 patient inclusion criteria statements, the collaborative Ameriburn communities, and the BCQP Q&A session influenced the design of the clarification algorithm for patient identification to assist burn centers seeking to accurately and most efficiently implement a burn registry. Further research should be conducted on the utilization of the algorithm in comparison to other burn centers.
**Introduction:** The emergence of SARS-CoV-2 and the subsequent COVID-19 pandemic has been a significant disruptor to traditional medical care. Burn patients are an interesting population in which to evaluate this disruption due to the complicated, multidisciplinary nature of injury management. Understanding the current landscape of burn care during the pandemic is a crucial first step in preparing for future pandemic impacts. The purpose of this study was to identify the current status of burn treatment during COVID by evaluating existing literature surrounding burns and COVID.

**Methods:** A literature review of articles published between March 2020 and August 2021 was conducted to determine trends in studies evaluating burn patients and burn center operation during this time frame. All ABA abstracts published in 2020 containing the key words “burn,” “COVID,” and/or “coronavirus” were reviewed. Additionally, a PubMed search was conducted using the same keywords. Each abstract and article was sorted into one of four themes: Census/Etiology, Burn patients with COVID, Safe Practices/Protocols, and Telemedicine.

**Results:** A total of 23 ABA abstracts and 126 articles were collected in the initial search. 63 articles were ultimately excluded because they did not report on burn patients. By theme, the following trends were seen: 1. **Census/Etiology:** Data on demographics of burn patients during this period was varied. Admissions for adult and/or pediatric burns increased for multiple burn centers, while others reported decreases. Consistently, the most common etiology of burn injury was scald, and an increased proportion of injuries were found to occur at home. Changes in the rates of first, second, and third-degree burns were also observed. 2. **Burn patients with COVID:** Overall, numerous reports indicated decreases in patient length of stay. However, several groups found no differences in length of stay, surgery rate, and length of follow-up. 3. **Safe Practices:** A recurring trend was observed of numerous burn centers having to implement increased safety protocols due to COVID-19. Select burn centers updated prevention guidelines for burn surgeons and patient care. 4. **Telemedicine:** The implementation of telemedicine helped minimize risk and maximize resources. However, much remains to be standardized, including the quality of images used.

**Conclusions:** This analysis of the current literature identified several overarching themes in the care of burn patients. Continued evaluation can identify innovations from the past year that should become best practices, as well as optimize preparation efforts for future disruptions in care.
Introduction: The current literature of severe burns with autografting is scarce or limited to single data source. This study provides a wholistic view of the clinical and economic characteristics of the inpatient treatment of patients with burns using integrated medical chart abstraction with administrative claims.

Methods: Patients with thermal burns undergoing inpatient autografting between July 1, 2010 and November 30, 2019 were identified from large national health plans, representing over 50 million members in the US. The first observed hospitalization with autografting was regarded as the index event. Two hundred hospital patient medical records were abstracted for the clinical characteristics, using a standardized abstraction form, which were integrated with administrative data for economic characteristics. Those with large % TBSA were oversampled. Patients were stratified into three cohorts by %TBSA burned. A Bonferroni correction of alpha 0.017 was performed for post-hoc pairwise tests.

Results: Of 200 patients, 90 were categorized as low TBSA (< 10%), 75 moderate TBSA (10 – 24%), and 35 high TBSA (25+%). Overall, the high %TBSA cohort appeared to be younger, requiring more intensive care, and thereby incurring higher costs of care. The extent of some undocumented critical fields in the medical records was significant, for example (%undocumented): donor size (80%), BMI (31%), mesh ratio (30%), etc.

Conclusions: This study not only confirmed some conventional understanding of various TBSA cohorts, but also quantified their differences/similarities using multiple data sources. There was considerable incompleteness in many critical fields in the medical records, which limits the ability to generate broader insights. Despite the wide regard of medical records as a “gold standard” for outcomes analyses, future research should be aware of these limitations.

Introduction: Best-practice burns first aid is well defined as 20 minutes of cool running water (CRW) within three hours of injury and an expectation of burn care in Australia. This study aims to identify barriers to applying this intervention and assess burn first aid knowledge amongst Australian paramedics.

Methods: Using multiple methods we assessed; 1) burn first aid adequacy in a cross-sectional study of health care professionals, utilizing a prospectively collected registry of patients managed at an Australian tertiary children's hospital. Logistic regression models were used to evaluate the relationship between first aid adequacy between health services (eg. Paramedics and emergency departments). Then 2) paramedics completed a questionnaire containing demographic and clinical expertise and environment as well as recording immediate first aid management across five multiple choice burn case scenarios.

Results: Overall, 31.3% of children received adequate CRW from caregivers. Factors associated with caregiver inadequacy of CRW were very young age and early adolescence (p< 0.001) rural location (P = 0.045), low socioeconomic status (P = 0.030) amongst others. Paramedics and general practitioners provided adequate cooling to 184/735 (25.0%) and 52/215 (24.2%) of their patients, respectively. Local general hospitals provided adequate CRW to 1019/1809 (56.3%) patients. Paramedic questionnaire responses (n=326) identified 56% of paramedics answered all burn case scenarios correctly. Respondents who treated a burn within six months scored higher on burn first aid scenarios compared to paramedics who had not recently treated a burn (p=0.004).

Conclusions: Deficiencies remain in the cooling of paediatric burns patients at all levels of initial management. First aid delivery was significantly worse in children aged 0-2, adolescents aged 15-16, those living rurally, and the socioeconomically disadvantaged.
Resumption of Surgical Missions in Light of COVID-19: A Paradigm Shift
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Introduction: The COVID-19 pandemic has disrupted the lives of billions of people globally. Some medical systems continue to be overburdened due to the viral illness leading to incredible public health challenges domestically as well as abroad. However, with vaccination distribution increasing globally, many are pushing for a return to some form of normalcy. In the medical community, some are weighing the risks of returning to global health missions and considering protective strategies to minimize risk of viral spread.

Methods: Here we describe our experience in returning to an annual burn reconstruction mission in a low- and middle-income country (LMIC).

Results: We have implemented protective strategies and successfully carried out a return mission trip. Our team of 10 individuals was able to perform over 80 procedures on 26 pediatric patients in 4 operative days. There were no major complications reported.

Conclusions: Protection of our team and our patients from the risk of COVID-19 infection was paramount given the high mortality rate and disease duration. We applied a variety of protective strategies and altered mission protocol to limit exposure and transmission. The primary modifications (including; eliminating day of clinic with increased utilization of telemedicine for preoperative screening, only one vaccinated care giver permitted in the hospital, COVID-19 pre-operative screening for parents and patients, and increasing operative complexity) are likely to remain in place for the duration of the pandemic.

Characteristics and clinical outcomes in patients with combined burn and trauma in Japan
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Introduction: Patients with combined burn and trauma are common in the United States and combined trauma in the burn increase the mortality. On contrast, their characteristics and outcomes remain unknown in Japan. The aim of present study was to elucidate the characteristics of trauma combined burn in Japan.

Methods: A multicenter retrospective study was performed between 2004 and 2017 using data from the Japan Trauma Data Bank (JTDB). We evaluated characteristics in burn patients (n=5,783) by segregating them into two groups cohorts: burn only (n=5,537) and combined burn and trauma (n=246). Clinical characteristics such as patient background, severity of burn and trauma, mechanism of injuries, total body surface area (TBSA), injury lesion, treatment and outcome were examined.

Results: The results showed significant differences in age between the burn only group and combined burn and trauma group (median [IQR]: 61 [43–76] for burn only group vs 51 [39–66] for combined burn and trauma group, p < 0.001). Most patients were injured due to flame (burn only group, 65.7%; combined burn and trauma group, 54.9%). Furthermore, 40-89% TBSA was higher in burn only group (19.3%) than in the combined burn and trauma group (9.3%). In-hospital mortality in burn only group (18.2%) was higher than that in the combined burn and trauma group (6.9%).

Conclusions: We demonstrated that the characteristics of burn only and combined burn and trauma patients in Japan. Flame was main cause of burn and in-hospital mortality was higher in burn only group because of higher burn area.
Introduction: Outdoor activities and the associated sun exposure is a mainstay of summer activities for many children. This UV exposure presents a significant risk to children of Anglo-Saxon or Celtic origin. Whilst UV exposure is important for mood and vitamin D synthesis, too much results in premature ageing and increased risk of skin malignancy. We propose a classification system of these burns according to pattern of injury, related directly to patient age.

Methods: We collated data concerning paediatric sun burns over a five year period (2015-2019). This was collected from our Regional Burns Unit, covering a population of roughly 5 million. We present an analysis of age, sex, total body surface area and location of the burn, correlated with the local UV index on the day of injury.

Results: We identified 138 patients presenting with sunburn. They were predominantly (71%) in males, with an age range of 1m to 16y (average 7y9m median 6y10m). All burns were superficial partial thickness in nature and averaged 2.2% TBSA (range 0.1%- 15%). No patients required surgery, however, 19 required admission for analgesia (4 of whom stayed >1 day). All burns occurred between the months of April and September, with 24 (17%) associated with foreign travel. The average UV index, where applicable, was 6.5 (ranging from 3.6 to 8). The majority of patients had no or little sun protection applied.

We propose three patterns of sunburn from analysing the data: neonatal and toddler sunburns usually happen in the presence of a caregiver, but with inadequate protection, such as muslin cloth or a poorly shaded area. These injuries, whilst typically small, have significant impact, as radiation injuries are cumulative and may affect future skin cancer risk for young patients.

Young (4-9 yo) children get sun burn whilst out with their friends or in the garden with parents. Inadequate sun protection or prolonged exposure is a key preventable factor. Teenagers (12-16) are usually sun burnt whilst on a foreign trip to warmer countries or whilst with their friends during outdoor activities such as waterparks or surfing. Again minimal or no sunscreen application is a preventable cause.

Conclusions: In conclusion, this classification system, we seek to inform presenting units with a guide to management and common patterns, therefore improving the sun protection for children. Applicability of Research to Practice: We identify three preventable patterns of sunburns in paediatric population. This allows parents and health professionals to be educated in a targeted way on prevention of injuries which may have a lifelong effect on skin cancer malignancies risk.
Introduction: The importance of gender equity and gender representation in academic publications has long been emphasized in medicine. It has been established that women represent a smaller proportion of primary and senior authors in high-impact medical journals than men and that original research articles written by women as primary and senior authors are less frequently cited than those authored by men. Currently, there is limited data evaluating whether this gender bias is present in plastic surgery and burn publications. We used bibliometric analysis of original research publications to analyze gender bias against women in one burn journal.

Methods: Using the journal, Burns, we conducted a bibliometric analysis of research publications from 2009 to 2020. A gender determining application was used to characterize the gender of the first and senior author. Ratios of male:male, female:male, male:female, and female:female authors were obtained and analyzed.

Results: Of the 1677 publications included, 40% have female first authors and 25.5% had female senior authors. Male:male authorships had the highest number of publications. Female:female authorship had the lowest number of publications of all the other ratios from 2009-2012, however there was a steep increase in 2013 in which male:female authorship had the lowest number of publications. Male senior authorship was associated with 2.9-fold increase in male first authorship (OR=2.99(95% CI 2.39, 3.76); p < 0.0001).

Conclusions: Female representation in senior authorship positions in burn and wound care publications is increasing, however is still far from reaching gender parity. By analyzing authorship ratios by gender, we recommend a new way to evaluate gender disparity in burn and wound care academia.

Introduction: In 1973, Dax Cowart was severely burned as a result of a car explosion. He spent the next 46 years advocating for patients’ rights to decline treatment as he felt his repeated wishes to do so and be allowed to die were ignored by his burn providers. Due in large part to his advocacy, many strongly believe that burn providers are systematically paternalistic and force unwanted treatment upon incapacitated, autonomous patients (e.g., Hurst et al 2014). Unfortunately, there are only a few attempts to provide the perspectives of other severely burned patients (e.g., Brewster et al 2006 and Gerrek 2018). The purpose of this qualitative study was in part to gain further understanding of the views of severely burned patients regarding medical decision making during the acute phase of their injury.

Methods: Building on Brewster et al. and Gerrek, our team created a semi-structured interview questionnaire. We followed standard IRB research study protocols and then identified adult individuals with 2nd and 3rd degree thermal injury minimum 30% TBSA burns for recruitment. Though 20 patients met the criteria, we completed 5 (26%) interviews (3 females, 2 males).

Results: All interviewees discussed ways in which they struggled to make informed autonomous decisions for weeks or even months post-injury and felt dependent on the burn team to lead them through treatment decisions. “It’s all new to me … obviously I’ve never been burnt like this before. I will assume it’s similar for most of the people … when you wake up and find out how badly you were burned, and maybe you try to move and you figure out how bad you’re hurting, you don’t really make the decisions for yourself. I kinda put myself in their hands … I figured that’s my best shot, to listen to them and let them do what they need to do. Really, I didn’t want to make any decisions. I just listened to them and let my trust in them that they were doing the best they could for me”. (P2)

None of the interviewees, not even those who underwent amputation, felt the team acted in an inappropriately paternalistic manner. In fact, as a whole, they believed the team only did procedures that were absolutely necessary for their survival and wellbeing.

“I believe that they made all the right decisions surgery wise and everything.” (P5)

Conclusions: This study supports the limited but important work of the perspectives of severely burned patients’ regarding, among other things, how medical decisions were made during the acute phases of their injury. It shows that patients trusted their providers to make and encourage lifesaving, wellbeing enhancing decisions during the early stages of treatment when patients are not sure they are capacitated and autonomous. Furthermore, the positive feelings patients had about those decisions did not change over time.
The Significant Impact of Having a Dedicated Ambulatory Clinical Social Worker in the Burn Clinic
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Introduction: A licensed clinical social worker (LCSW) has been recognized as an essential role within the Burn Center inpatient multidisciplinary team. However, for ambulatory patients facing acute crisis, resources can be scarce; relying on clinic nursing staff or an inpatient LCSW to problem solve psychosocial concerns can leave large gaps of patient care unaddressed. An Ambulatory LCSW (ALCSW) assists transition of care working to prevent unnecessary Emergency Room visits and readmissions. We sought to examine our experience utilizing an ALCSW in the Burn Center.

Methods: A full-time burn ALCSW position was approved in fall of 2020 at our ABA verified Burn Center. The role includes extensive assessments of mental health, substance use, domestic violence, and safety concerns, connecting clinic patients to resources for transportation, benefits, insurance coverage, employment, food, and housing. The ALCSW also conducts short term patient centered, family & group therapy sessions. A retrospective review was performed on duties of the ALCSW comparing 9 months (December-August) pre and post hire. Data collected included visit types, hours of patient care, and interventions performed.

Results: During the first 9 months, the ALCSW completed 1,008 patient encounters (approximately 25 hours of direct patient care per week) and 510 psychosocial assessments. In the first three months alone 258 substance use screens, 166 mental health assessments, 44 ASD/PTSD therapy sessions, 205 Homeless Shelter referrals and 128 community resource encounters were performed that would have otherwise been left unaddressed or added to the workload of our Burn Clinic RN or provider.

The ALCSW was able to see up to 89.39% more patients per month (n=89) compared to the inpatient LCSW who only responding to clinic patients with emergent needs (n=13). The increase of ALCSW encounters showed a 35.37% increase of completed visits without IP admission (n=pre 665 vs post 1029), 39.73% decrease of IP admissions after clinic visit (n=pre 73 vs post 44), and 17.82% increase of patients without inpatient admissions entirely (n=pre 572 vs post 696). In addition, the added effort of an ambulatory LCSW, has increased SOAR support group participation by 60.13% in calendar year 2021 compared to calendar year 2020 (n= pre 63 vs post 158).

Conclusions: Hiring a dedicated Burn ALCSW can substantially increase the resources available to outpatients, fill voids of patient care, limit unnecessary hospital resources, and prevent admissions.
Results: In calendar year 2020 with one SW facilitator, over the past 2 years, reviewed our support group participation and attendance increased use of technology driven by the pandemic. Our dual SW model allows for continued recruitment of an ambulatory SW, we have been able to target support group participation in the larger ambulatory population. Prior to 2020, our ABA verified Burn Center only had an inpatient SW who was able to engage our admitted burn patients and their families in a meaningful and profound way. The participation rate of now bi-monthly support groups has increased to 9 participants per support group average. At this continued rate, we expect to serve 216 attendees per year through support group visits. In this same 9-month span 51 SOAR individual peer support visits (12 in-person and 39 virtual), were conducted. Which is an increase from the 22 total peer support visits facilitated in 2020.

Conclusions: An additional SOAR trained SW to our Burn Center has increased participation and availability of support groups and individual peer support visits. Peer support promotes socialization and can provide healing for the burn patients and their families in a meaningful and profound way. Burn centers must continue to prioritize the role of the clinical SW to ensure programs such as SOAR support group and individual peer support can be facilitated to ensure an environment that fosters psychological and emotional healing.

Introduction: Peer support has long been used in Burn Centers through organized support groups and programs like Phoenix Society for Burn Survivor’s SOAR (Survivors Offering Assistance in Recovery) individual peer support, often led by Social Workers (SW). The addition of an ambulatory SW in partnership with an inpatient SW allowed our Burn Center to continue participation in the group and individual peer support offerings despite the simultaneous COVID-19 pandemic. We sought to examine participation in support services using our dual SW model.

Methods: Prior to 2020, our ABA verified Burn Center only had an inpatient SW who was able to engage our admitted patient population to support services. With the addition of an ambulatory SW, we have been able to target support group participation in the larger ambulatory population. Our dual SW model allows for continued recruitment to our support services; meeting the patient’s needs at each stage of recovery. This tag team approach, coupled with increased use of technology driven by the pandemic, has shown to increase the average number of participants. We reviewed our support group participation and attendance over the past 2 years.

Results: In calendar year 2020 with one SW facilitator, only 14 virtual support groups were held with an attendance average of 4-5 participants and 22 individual peer support visits. In only the first 9 months of calendar year 2021 with the addition of a second SOAR trained SW, 18 support groups were completed virtually with new inpatient, in-person participation. The participation rate of now bi-monthly support groups has increased to 9 participants per support group average. At this continued rate, we expect to serve 216 attendees per year through support group visits. In this same 9-month span 51 SOAR individual peer support visits (12 in-person and 39 virtual), were conducted. Which is an increase from the 22 total peer support visits facilitated in 2020.

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Introduction: Amish communities present with a higher risk for sustaining traumatic burn injuries; thus, these communities have a high need for culturally competent burn care. Although homeopathic remedies for mild to moderate burn injuries have been studied in Amish communities, little is known about hospital-community partnerships to facilitate culturally competent burn care, particularly with more severe injuries. The current study aimed to 1) understand the successful aspects of an existing hospital-community partnership for facilitating culturally sensitive burn care for Amish communities, and 2) identify the ongoing physical, structural, and behavioral health needs of this population as the partnership continues to develop.

Methods: Qualitative data from 12 Amish caregivers who participate on a burn/wound team or an oil therapy team, were collected on through a focus group interview. Caregivers identified as White, were majority male (83%), and resided in Amish communities. Retrospective thematic analysis was used to analyze the qualitative data. Five major themes (i.e., informational needs, strengths of Amish burn care, behavioral health concerns, behavioral health resources, and preferred teaching methods) evolved.

Results: Results indicated that Amish caregivers displayed a great curiosity and openness to learning about all aspects of recommended burn care from the medical providers. Caregivers also cited their traditional (homeopathic) burn care procedures (e.g., oil therapy) as strengths, while simultaneously maintaining that their relationship to the hospital is a valuable part of their burn care. Relating to behavioral health, caregivers highlighted difficulties in helping their children cope with burn injuries and pain during rehabilitation and treatment. Caregivers emphasized the role of strong social support that the Amish community provides to burn survivors. Additionally, caregivers stressed the significance of delivering burn care information in a form that is culturally appropriate for their community.

Conclusions: Results of this study provide important considerations that other accredited burn centers may consider when establishing similar partnerships to enhance their delivery of culturally competent medicine for Amish burn survivors.
Introduction: There has been conflicting data on the relationship between burn severity and psychological outcome. The present study aims to characterize the baseline psychosocial disposition of adults attending outpatient burn clinic at a large county hospital, as well as the impact of clinical course on self-reported psychosocial well-being.

Methods: Adult patients attending outpatient burn clinic completed survey questions from National Institutes of Health (NIH) Patient-Reported Outcomes Measurement Information System (PROMIS) Managing Emotions (ME) and Managing Social Interactions (MSI). Sociodemographic variables collected from surveys and retrospective chart review included age, ethnicity, zip code, employment, and marital status. Clinical variables included total body surface area burned (TBSA), initial hospital length of stay (LOS), surgical history, and number of days since injury. US census data based on patient’s home zip code was used to estimate percent of community living below US poverty level. Scores on ME and MSI were compared to the population mean by one-sample T-test. TBSA, hospital LOS, surgery, and days since burn were separately evaluated for associations with ME and MSI scores by Tobit regression while adjusting for sociodemographic variables.

Results: 71 patients completed surveys. Compared to the general US population mean score of 50.0, had lower scores in MSI (mean=48.0, p=.041) but not significantly different ME scores (mean=50.9, p=.394). While controlling for age, ethnicity, marital status, employment status, and neighborhood poverty, increased LOS was associated with lower scores on both ME and MSI scores (Table 1); the associations of TBSA, surgical

Conclusions: Burn patients may experience difficulty in getting support after burn injury. This challenge may be increased in patients with more extensive debilitation after injury, as increased duration of hospitalization worsened self-efficacy for managing emotions and social interactions. Additionally, prolonged hospitalization may remove patients from their normal support systems.
Introduction: Burn survivors experience significant social participation challenges in their recovery. However, enrolment and compliance with face-to-face interventions for such issues are often limited by time, location, and financial resources. Digital technologies are increasingly utilized in healthcare and provide a flexible, accessible, and low-cost treatment option. Given the sparse literature on this topic in the burn field, this review evaluated digital interventions for social participation in adults with long-term physical conditions to inform future use in the burn population.

Methods: MEDLINE, EMBASE, CINAHL and PsycINFO databases were searched using keywords and Medical Subject Headings (MeSH) terms related to ‘digital intervention’ and ‘social participation’ for studies published in English between January 2010 and May 2021. Studies that adopted digital technology interventions to improve social participation in adults with long-term physical conditions were included. Study quality was evaluated using Oxford Levels of Evidence. Data on study methodology, digital intervention and findings related to social participation were summarized.

Results: The search yielded a total of 4646 articles, of which 158 were full-text screened and 14 met inclusion and exclusion criteria. There were five randomized controlled trials, two non-randomized clinical trials and seven one-group pretest-posttest clinical trials. Twenty-five different measurement tools were utilized to assess social participation and two of them were used twice. Three types of digital interventions were implemented to improve social participation: group support, individual skill training or counselling, and education and support. The group support intervention developed a social network among affected people through videoconference, app, or virtual reality platform (3 of 4 studies with positive results). Individual skill training or counselling utilized phone calls or videoconference to help participants with activity participation and interpersonal relationships (2 of 6 studies with positive results). The education and support intervention used messages and website information to increase participants’ knowledge and provide support (3 of 3 studies with positive results).

Conclusions: This review presents evidence of different digital interventions’ effect on improving social participation in adults with long-term physical conditions. However, the existing literature is limited by the heterogeneity of outcome measures and varied methodology quality that preclude larger generalizations.
The Ongoing Impact of the COVID Pandemic on Young Burn Survivors and their Families

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Introduction: The COVID pandemic continues to bring numerous challenges for young burn survivors and their families. This project addressed the ongoing impact that COVID-19 is still having on youth burn survivors and their caregivers.

Our burn camp program moved to a virtual format for 2020 but returned to an in-person camp experience for 2021. This project is an extension of our assessment in 2020 by asking youth and their families to reflect on the persistent effects of COVID-19 into 2021.

Methods: Prior to each camp year, we asked campers (ages 8 – 18) and their caregivers / parents to complete questionnaires about their year, rating and specifying the personal impacts of COVID as part of their overall camp application. We also asked “what has helped you get through tough times this year?” In 2020 we had 47 campers and caregivers / parents participate with an increase to 60 campers in 2021.

Results: The majority of youth continued to rate the impact of COVID-19 as “Somewhat” or “Highly” from 2020 to 2021, however the percent of youth rating these higher levels of impact decreased in 2021. The majority of caregivers rated the impact in 2020 as “Somewhat” while the percentage rating these higher levels of impact increased in 2021 with more caregivers also endorsing “Highly”.

Campers AND caregivers / parents identified the same top 3 impacts in 2020 and 2021: 1. Online school / virtual learning 2. Friends / Social 3. Quarantine

The impact on the fourth highest area of Sports / Activities decreased from 2020 to 2021. In both years, youth and caregivers rated Quality time with Family as a positive impact. Campers and caregivers endorsed Family, Friends, Faith, and What I learned recovering from my burn injury as factors helping them get through tough times.

Conclusions: Children, youth, and families who have experienced a burn injury continue to report both negative and positive impacts from the COVID-19 pandemic. Not all youth and families are equally affected, but burn survivors and their caregivers rated the highest impacts as online school / virtual learning, friends / social, and quarantine in both 2020 and 2021. Family and friends were the greatest sources of support during tough times.

Burn camp provided the opportunity for connection in the face of ongoing impacts of COVID-19.
Introduction: Effective communication between pediatric burn patients, their family members and the health care team is crucial to developing a “working alliance” and improving their overall experience in the Pediatric Intensive Care Unit (PICU). The aim of the project is to standardize and improve patient and parent communication through the implementation of weekly inter-disciplinary family rounds.

Methods: Our nursing team developed the innovate PICU survey which is a 9 question Likert scale survey that evaluates patient and family satisfaction. All pediatric patients being discharged or transferred from the PICU received the PICU survey. After reviewing baseline data, communication between patient/parents and the health care team was identified as a potential targeted area for improving satisfaction scores. Aimed at improving communication, we established weekly inter-disciplinary family rounds. Each family was designated a specific day of the week for inter-disciplinary family rounds. Survey scores from burn patients who received inter-disciplinary family rounds were compared to baseline scores, as well as to the scores of other pediatric patients of services that do not utilize family rounds.

Results: Prior to implementing family rounds, our PICU survey average score was 4.9/5 out of 6 surveys. After implementing inter-disciplinary family rounds, our average score for pediatric burn patients was 4.9/5 out of 10 surveys. The average scores of pediatric patients of services that did not utilize family rounds 4.7/5 out of 19 surveys.

Conclusions: Scheduled inter-disciplinary family rounds can improve communication and over patient care satisfaction in pediatric patients with complex critical care issues related to burn injuries. Scheduled family rounds may also be beneficial for other non-burn pediatric ICU patients.

Introduction: What is road rash? “Road rash is a unique burn injury due to imbedded foreign debris and deeply seeded bacteria. Literature on this injury fails to address its unique mechanism and ways to reduce scarring and infection.” (Collier 2020) In the study they found that road rash was not an easy subject to find information on. They did a systematic study to see what information was readily available on road rash. They found that only 24 pertinent articles were found.

Our policies and procedures are based on that of the American Burn Association within the Burn Center. When creating the Road Rash protocol. Use used the same transfer criteria that the American Burn Association identifies. As for the trauma aspect we have covered by ensuring that the trauma is ruled out by a hospital in our network before coming to our center to treat the wound.

Methods: We began to notice that most of the road rash patients that were transferred to us, had not gotten proper care in the outside hospital. The situation would be a patient who should have been directly transferred to us, came to the outpatient clinic where we then would have to perform a very painful dressing change that would have been avoided with the proper methods of transfer and education. We first gathered the data of the transfers that had not gone correctly. The data that we are looking at for our road rash patients are as follows; TBSA , depth of injury. Location of injury, age, socioeconomic status, type of dressing used, and photos taken before transfer.

We had used data from the year 2019- March of 2021. Total amount was 5 patients. Of these patients 0/5 had proper dressings, correct TBSA, or were transferred properly.

We then gathered our information and spent time hitting our trauma centers within our network. We gave presentations to the emergency department members. From there we created a list for when we saw the patients in our inpatient unit or our clinic. We wanted to look at the care done before coming to the burn center and what we actually did at the burn center. We looked at TBSA, Location of injury, Age, type of dressing and if there were photos taken before transfer.

Results: The resulted we wanted to show us if our teaching at these hospitals were effective. Of the 12 patients seen all the patients had the correct dressings on for the time of follow-up, 7/12 had pictures taken for the EMR. All 12 also had the right criteria for transfer or to follow-up in the clinic. The last result of the TBSA was not done correctly on all 12 of the patients.

Conclusions: In conclusion, This project had positive results in the fact that the teach was effective for the dressing changes and taking pre admission photos. We even saw an increase in the number of road rash patients we treated from 2019-2021. The negative results being the improper calculation of TBSA. This showed us where we need to adjust for the next presentations.
Introduction: Burn units’ nurses develop creative methods to mitigate unpleasant experiences. Peer reviewed research has affirmed that non-pharmacological stimuli can distract patients from noxious procedures. Therefore, novel virtual reality was introduced as a nurse-driven modality to improve patient care. Multiple approaches encouraged staff utilization of this exciting, yet unfamiliar, technology.

Methods: A needs assessment concluded that patients experience moderate pain and some anxiety during wound care - indicating an opportunity to explore virtual reality. The virtual reality headset was introduced to nurses via in-services to encourage hands-on experience. The following month, an interactive “VR Superstars” poster was developed as a visual cue to motivate nurses to attempt the new product. Whenever a nurse used the device with a patient, a star sticker was applied next to his/her name. Next, a resource binder was created: This binder included the device protocol, patient inclusion criteria, educational handouts to assist staff with introduction to patients, and surveys. Biweekly emails encouraged virtual reality use and acknowledged staff members who proactively utilized it. The multidisciplinary team also discussed virtual reality at daily rounds.

Results: To assess virtual reality’s effectiveness, patients completed surveys after each use. At the end of the first month, staff implemented virtual reality only three times - as identified by the number of surveys. Upon completion of the multi-modal staff encouragement, virtual reality use doubled. By the third month, nurses implemented the technology on six occasions within the month.

Conclusions: The multi-modal approach ultimately familiarized nurses. These techniques contributed to increasing staff experience, thereby improving staff confidence to utilize a new product. As exposure increased, nurses reported more excitement to introduce the product to patients. Due to the implementation of multiple motivators, nurses are more readily implementing an intervention to benefit a patient’s experience.
Use of Multidisciplinary Collaboration to Establish a Standardized Endotracheal Tube Wiring Guideline

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Introduction: Pediatric patients with facial burns and advanced airway needs precipitate acute situations requiring multidisciplinary team member collaboration. Significant facial burns, particularly involving considerable edema or smoke inhalation, may warrant dental or circum-mandibular endotracheal tube (ETT) wiring for stabilization. Guidelines were created, trialed, and revised based on patient outcomes and clinician feedback at a pediatric verified burn center.

Methods: The guideline was created by the burn team in 2019. This standard work was utilized with pediatric burn cases presenting to the burn center. Guideline variances, such as prolonged time from door to ETT wiring, prompted a gap analysis need to improve the process. Through two case review sessions held in 2020, a multidisciplinary team consisting of the burn providers, emergency department providers, nursing, and respiratory therapists revealed process knowledge deficits, unclear role expectations, and supply issues. Literature was reviewed and a myAmeriburn listserv inquiry of current practice was made to seek additional guidance.

Results: Based on feedback from the multidisciplinary group and data gathered from the literature and collegial burn community, action plans and guideline modifications were developed in 2021. The respiratory therapy department developed education for their staff highlighting use of twill tape and taping. The use of ETT suturing was removed from the guidelines.

Conclusions: Multidisciplinary contribution and engagement was necessary to produce, execute, and evaluate the pediatric endotracheal tube wiring guidelines. Through dialogue, patient trial, and constructive feedback, guidelines were amended to produce a smoother team process and better patient experience. The standard work is currently being evaluated in its modified version.

A Burn Resting Hand Orthosis Fit Checklist

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Introduction: Resting hand orthoses (RHO) are often used to manage hand burns but can be difficult for inexperienced clinicians to fabricate, assess, and utilize without causing complications to the patient. Previously we had shared data on how we reduced RHO related complications by utilizing burn and hand certified staff to fabricate RHOs.

Methods: Advanced clinicians certified in either hand, burn, or both were queried to describe the methodology they utilized to fabricate an effective RHO. From this query, a list of conditions was created. These conditions were presented to the entire group of certified clinicians and re-examined. Conditions were recorded if consensus was reached on their inclusion for a guide to fabricate a successful RHO.

Results: A 14-condition checklist, with 8 essential items, was developed. It is intended that this checklist can be utilized by less experienced clinicians to guide safe and effective RHO management.

Conclusions: The checklist is a straightforward way to assess commonly identified issues with RHO and offers a potential resource to manage effective fabrication for novice or inexperienced clinicians.
Assessing The Kinematics Of Virtual Reality Gaming As Physical Therapy In Burn Patients

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Introduction: Virtual reality (VR) gaming offers an immersive experience that can enrich physical therapy for the burn patient by introducing variability, enjoyment, and reward during functional motions of the upper extremities. In this study, we aim to support a proof-of-concept for VR gaming in upper extremity burn rehabilitation by characterizing shoulder and elbow kinematics during VR gaming in a healthy volunteer.

Methods: A healthy volunteer without burn injuries played two games, a virtual rhythmic baton and virtual boxing game, on a commercially available VR gaming platform. Kinematics during play were assessed using two external cameras placed orthogonally, to the player’s front and left, so that 3-dimensional motion of the player’s left arm could be captured. Video of each gaming session was processed using an open-source perceptual computing software that dynamically tracks the user’s upper extremity during play. Kinematics at the left shoulder and elbow were characterized with respect to range of motion (ROM) and time spent in composite positions.

Results: During the rhythmic baton game, the player achieved 157 degrees of elbow flexion ROM and 90 degrees shoulder elevation ROM. During the boxing game, the player achieved 156 degrees of elbow flexion ROM and 123 degrees shoulder elevation ROM. The baton game was associated with more time spent in the “rest” position (elbow extended with shoulder adducted, 60% of the game) while boxing was associated with more time in the “Guard” position (elbow flexed with shoulder elevated, 79% of the game) (Figure 1). Both games demonstrated simultaneous movement at both the shoulder and elbow during play.

Conclusions: The two VR games investigated in this kinematic assessment challenged players to achieve a wide range of motion at the upper extremity with functional, multi-joint movements. These findings support a potential role for commercial VR gaming in burn rehabilitation and future research in burn patients is required to demonstrate its therapeutic value.

Electrical Injury Resulting In Bilateral Upper Extremity Amputation: Improving Independence And Quality Of Life

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Introduction: Fifty seven year old male who sustained an electrical burn injury that resulted in bilateral below elbow amputation began inpatient rehabilitation program. Patient was motivated to increase independence to return home prior to prosthetic fitting and training being completed. Quality options for adaptive equipment required to increase independence were not sufficient to meet patients needs, thus innovative specialty fabrication of adaptive equipment were required to meet patient’s goals of independence.

Methods: Occupational therapist to use thermoplastic material to fabricate various adaptive equipment in order to address patient’s goals to increase independence with self care tasks. Occupational therapist and patient to have one time consult with hospital maintenance employee to create pant hook to use for ease of donning/doffing over hips. Patient participated in daily Occupational therapy sessions focused on trialing adaptive equipment and to provide feedback for any desired changes of equipment to maximize patient progress and success with reaching independence with self cares and return to life roles.

Results: Patient met all goals to become independent with self care tasks including: toileting, dressing and showering as a result of using fabricated adaptive equipment and techniques addressed during therapy sessions. Patient able to return home independently following discharge from inpatient rehabilitation stay.

Conclusions: Use of easily accessible ezeform thermoplastic material can result in fabrication of adaptive equipment to increase patient’s independence. It is important to maintain a creative outlook as a clinician and to continue to collaborate with our patient’s to identify barriers to success and explore options to increase patient’s desired independence.
Two Year Follow Up of Microblading in Patients with a Facial Burn Injury

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Introduction: Recovery from a facial burn injury can be challenging. Excessive reconstructive interventions and the emotional devastation can be taxing. Microblading, semi-permanent eyebrow tattooing, is a potential non-invasive alternative treatment. Little research exists on microblading's longevity and durability over burn scar or its impact on self-esteem. A single case study showed positive impact on patient perceived body image and maintenance of shape and color. Two years post microblading new data supports its efficacy as a potential treatment for patients with a facial burn.

Methods: Single case study two years post microblading of a 22-year-old female who sustained a 30% total body surface area burn injury to bilateral upper extremities, hands and face at age one. Based on referral from her plastic surgeon, she underwent first microblading treatment March 2019 with a standard touch up session May 2019. Patient has not undergone any additional sessions since. Photos 2019 with a standard touch up session May 2019. Patient report indicates increase in confidence versus appearance of the eyebrow.

Results: Photos were taken pre/post microblading, at nine months, and 2.5 years post. Comparison of photos over time showed some expected fading but maintenance of overall shape. Patient self-reports using an eyebrow pencil to darken when she desires brows that are more vibrant and trims hair as needed to maintain shape. Patient reports positive impact to her self-esteem post-microblading. "I most definitely did notice some changes in my self-esteem." She notes feeling happier and more confident, especially in social situations with peers. Comparison of responses immediately post-microblading with 2.5 years later show focus on improved self-esteem versus satisfaction with appearance of the eyebrow.

Conclusions: Comparison of follow up photos obtained 2.5 years after initial microblading shows maintenance of eyebrow shape with some fading of color. Further research is needed to determine if color fading is as expected or more pronounced in patients with scarred skin. Also important is the impact of characteristic dryness of scars on fading rate. To maintain adequate color, additional treatments would be recommended. Better understanding of factors affecting fading would help determine frequency and timing of maintenance sessions. Patient report indicates increasingly improved self-esteem over time as evidenced by focus on confidence versus appearance. Despite some fading, data supports microblading as an effective non-surgical treatment in establishing eyebrow appearance and function over burn scar.
Role of Speech Therapy (SLP) in the rehabilitation of a complicated case of glossoparesis (GP)
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Introduction: Glossoparesis is defined as a neurodegenerative process resulting in progressive dysphagia and dysarthria. The denervation of the tongue and related structures results in flaccid muscle function unilaterally and bilaterally, this process is difficult to treat and rehabilitate and prognosis is considered poor. We encountered this in a patient that had a complicated case of necrotizing fasciitis (NF) that arose from an abscessed tooth.

The purpose of this case report is to summarize the overall approach to a rehabilitation plan which resulted in successful return to speech and partial swallow.

Methods: The patient was diagnosed with an abscessed tooth which resulted in Nefrotizing fasciitis of the face, neck and chest. Multiple surgical interventions resulted in removal of necrotic tissue and reconstructive interventions were implemented. Initial prognosis of return of function was noted as “poor” per ENT services. Ear, Nose and Throat (ENT) specialist noted that prognosis for recovery of function is unknown but was low.

Speech Therapy was also consulted and an individualized plan of care to address the deficits assessed was developed. Initial prognosis of return of functional speech / swallow was guarded. It was felt to be highly appropriate to provide the patient with therapeutic options.

Speech Therapy sessions included use of Neuromuscular Electrical Stimulation, Thermal Stimulation, Tactile Stimulation, Therapeutic Massage to affected regions, Deep Pharyngeal Neuromuscular Stimulation, finger occlusion trials for speech production attempts to ready patient for use of Passy Muir Valve, Oral Motor Exercises, Laryngeal Elevation Tasks, Vocal Stretching / Relaxation tasks and oral trials of ice chips as musculature function improved.

Results: Through the use of these multiple modalities of skilled speech therapy intervention, the patient had return of functional verbal communication prior to discharge to a skilled rehabilitation program.

Conclusions: Upon initial evaluation, the true potential for return of function was questioned. It is paramount that patient be given an opportunity to succeed - to be included in the plan of care - to be provided with opportunities to return to their prior level of function or as close as possible. There is little to no research regarding return of function for patients affected by glossoparesis.
792 Exoskeleton Robot Using 3-Dimensional Modeling in Burn Patient
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Introduction: Hands are the part of the body that are most commonly involved in burns, and the main complications are finger joint contractures and nerve injuries. Hypertrophic scarring cannot be avoided despite early management of acute hand burn injuries, and some patients may need application of an exoskeleton robot to restore hand function. To do this, it is essential to individualize the customization of the robot for each patient. Three-dimensional (3D) technology, which is widely used in the field of implants, anatomical models, and tissue fabrication, makes this goal achievable.

Methods: Therefore, this report is a study on the usefulness of an exoskeleton robot using 3D technology for patients who lost bilateral hand function due to burn injury. Five burn patients with upper limb dysfunction after a flame and chemical burn injury, with resultant impairment of manual physical abilities.

Results: After wearing an exoskeleton robot made using 3D printing technology, the patients could handle objects effectively and satisfactorily.

Conclusions: This innovative approach provided considerable advantages in terms of customization of size and reduction in manufacturing time and costs, thereby showing great potential for use in patients with hand dysfunction after burn injury.

793 "Minimally Invasive" Skin Grafting with Enzymatic Debridement and Autologous Skin Cell Suspension
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Introduction: Minimally invasive surgery has become standard of care across numerous subspecialties. However, burn surgery has lagged behind; as the mainstay of treatment still involves excision with a knife and a split thickness skin graft (STSG) with a painful donor site. Enzymatic debridement with bromelain and autologous skin cell spray (ASCS) have independently been STSG use and decrease the donor site size. Due to constraints with the time course of these products only being available via studies before one was FDA approved, these technologies have not been utilized together in the United States until recently. Little literature exists regarding their use in combination. The current study characterizes a series of patients who received "minimally invasive" skin grafts with enzymatic debridement and ASCS as proof of concept.

Methods: This was a retrospective study of a single academic burn center’s experience using bromelain and ASCS together. Data collection included demographics, injury characteristics, length of stay, complications, and measurements of donor sites, STSGs, and ASCS treatment. Donor site size:total area treated with ASCS and/or STSG was calculated. Length of stay (LOS) was qualitatively compared to expected using a factor of 1.1 days:%TBSA, and O/E LOS ratio was calculated. Data was reported in medians with interquartile ranges. Patients with 1-30%TBSA qualified for the bromelain study and were treated according to protocol. Those deemed to have enough residual dermis were treated with ASCS, while 3rd degree areas received meshed split thickness skin patch grafts with ASCS overspray.

Results: Eleven patients were included in the study. Four patients received ASCS alone, while 7 patients received a meshed STSG on portions of their burn. Median burn size was 13% TBSA (IQR:5,20), while DPT+FT size was 9% TBSA (IQR:5,16). Patients had a median of 1067 sq cm (IQR:772,2183) of burn operatively treated with ASCS, and 351 sq cm (IQR:0,457) treated with meshed autograft. Donor site size (ASCS and STSG) was 225 sq cm (IQR:72,315), and ratio of donor site area to total treatment area was 0.0125 (IQR:0.01,0.32), suggesting an expansion.
of 80:1. Median LOS was 11 days (IQR:7,21), 0.84 days per %TBSA (IQR:0.5,1.16). Expected LOS was 14.3 days, with an O/E ratio of 0.77. Two patients developed infection; one required reoperation with STSG on half of his burned areas (5% TBSA).

Conclusions: Enzymatic debridement and ASCS can be used to treat burn injury with a “minimally invasive” approach. Donor sites were much smaller than expected had they been treated with a conventional meshed STSG on deep 2nd degree and 3rd degree areas. The data also suggests that length of stay was lower than expected. Further study is needed to determine which subsets of patients and burn wounds are optimal for this combination of technologies.

Introduction: As burn care advances, patients are surviving with larger burn injuries, that previously would have been fatal. However, the need for autologous skin coverage continues to be an unmet need for massive burn injuries. Several attempts have been made to address this with various dermal substitutes, temporary coverage, and skin substitutes. For 25 years, Cultured Epithelial Autografts (CEA) have been used to treat large burn injuries, but this was met with variable success and has a mandatory pre-requisite lab time before it is ready for use. In 2018, Biodegradable Temporizing Matrix (BTM) that can be placed immediately on excised burns was first studied in burn patients, which has led to its increased use in subsequent years. This case series seeks to examine our experience using CEA following the application and ingrafting of BTM on large burns.

Method: A retrospective review was conducted from 2017-2020 of adult burn patients admitted to an ABA verified burn center who underwent placement of both BTM and CEA. Demographics, mechanism of injury, burn characteristics, surgeries, and outcome data were collected. Surgical technique was early excision, BTM placement, a BTM integration period, repeat superficial excision, fibrin/thrombin spray, split thickness skin grafting with usually 6:1 mesh autograft, and finally CEA application. CEA was managed per manufacturer protocols. Descriptive statistics and univariate analyses were performed with Microsoft Excel.

Results: Eight patients met inclusion criteria. The average age was 29.3±5.3 years, 2nd degree TBSA 22.5±22.6%, 3rd degree TBSA 55.8±21%, and total TBSA was 78.3±4.4%. Four patients died during their hospital course and four survived to discharge. For survivors, the age length of stay was 135±23.6 days and they underwent an average of 8.5±1.5 total excision and/or grafting procedures. All patients had severe complications including severe sepsis/septic shock (n=8), gastrointestinal bleeds (n=2), acute respiratory distress syndrome (n=3), acute kidney injury or renal failure (n=4), pulmonary embolism (n=1) and myocardial infarction (n=1). The average time to 95% wound closure was 5 (79-147) days for survivors.

Conclusions: There continues to be an unmet need for autologous skin coverage in massive burn injuries when there is insufficient donor skin. In this series, we describe eight patients with massive burn injuries who underwent initial BTM placement, followed by 6:1 meshed autograft and CEA application. Although four patients died during their treatment course, the four surviving patients had acceptable wound closure rates and length of stay for their burn size.
Results: The patient demonstrated 60% closure of wounds. Dressings were taken down on post-operative day (POD) 6. Prior surface and subsequently on the posterior one week later. An anterior line. The patient was discharged on POD 16 from his initial application of ASCS to his posterior closed in a similar time-line. The patient was mechanically debrided with a water scalp hydrosurgery system to remove all devitalized tissue. A donor graft for ASCS was then obtained at standard depth from unaffected skin at the ankle and was processed to a donor graft for ASCS. His hospital course included arrest of the disease process, timely closure of the wound, and minimal wound care. To our knowledge, this is the first case of TEN treated with ASCS.

Methods: The patient was mechanically debrided with a water scalp hydrosurgery system to remove all devitalized tissue. A donor graft for ASCS was then obtained at standard depth from unaffected skin at the ankle and was processed in the standard fashion and applied to the wound. Clear plastic dressing with a non-adherent, antibiotic impregnated cloth dressing followed by dry non-shear dressing were then applied to the torso. Extremities were dressed in clear plastic dressing, antibiotic impregnated cloth dressing, zinc paste impregnated cloth, dry gauze roll, and elastic compression bandage. This was performed over the patient’s anterior surface and subsequently on the posterior one week later. Dressings were taken down on post-operative day (POD) 6 and replaced as appropriate.

Results: The patient demonstrated 60% closure of wounds on his anterior torso at POD 6. By POD 8, the patient’s anterior torso and face were completely closed. His second application of ASCS to his posterior closed in a similar timeline. The patient was discharged on POD 16 from his initial intervention with 2% total body surface area open. At POD 30, his wounds were healed with the return of a large portion of pigmentation.

Conclusions: TEN is a rare, high-mortality disease without efficacious therapy. Given that the wounds are at a similar level to a partial thickness burn, ASCS could be a new intervention which could mitigate open wounds, frequent dressing changes, prolonged hospital stays, and mortality.
Introduction: Deep partial thickness facial burns in the pediatric population present a dilemma. Standard burn treatment includes excision and split thickness sheet grafting for the face or closure which often yield sub-optimal results. Point-of-care system for autologous skin cell suspension (ASCS) can be utilized as a stand alone option for partial thickness burns. We sought to evaluate our early results from the treatment of pediatric deep partial thickness facial burns using ASCS.

Methods: This was a retrospective cohort analysis of pediatric deep partial thickness facial burns treated with early excision and application of ASCS. After assessment by two surgeons, patients underwent tangential excision with either standard surgical burn knives or dermabrasion. Depth was assessed and if dermal elements were present, then ASCS was applied. Primary outcome was time to >95% reepithelialization, and secondary outcomes were aesthetics, Vancouver Scar Scale, and application of ASCS. After assessment by two surgeons, patients were prioritized for excision and ASCS. TBSA ranged from 0.3%-24% with some having additional anatomic areas. The mean age was 2.5 years old, with a range of 1.08-5.0 years old. Burn mechanisms included flame, scald, and contact. The mean time from burn injury to initial excision and ASCS was 4.3 days, with a range of 2-7 days. Average time to complete reepithelialization was 20.3 days, with a range of 4-47 days. Average follow up duration was 218 days with a range of 98-365 days. No patients experienced complete graft loss or infection. One patient required need for reoperation with reapplication of polyactic acid skin substitute placed to a small area on the face during closure for other non-face burns. Of the 8 patients, the two patients with the longest times to complete reepithelialization required laser therapy, of which one patient also needed limited facial scar contracture release.

Conclusions: Early, single-staged ASCS application results in good aesthetic and relatively quick healing times with no complications and limited need for additional burn reconstruction. While the results are promising, there is a need for larger studies with longer term follow up before wider applicability.
Introduction: This is a systematic review which seeks to establish if immediate/ultra-early excision (immediate: < 24 hours, ultra-early: 24 - 72 hours) and grafting is better or equivalent to early excision and grafting (early: 72 hours - 6 days) in adults with major burns. The concept of early excision and grafting, as opposed to late excision (late: >7 days), was introduced by Cope et al. and later popularized by Janzekovic in the 1970s when she introduced the concept of tangential excision. Delaying excision 24 to 48 hours has previously been thought to allow resuscitation and correction of physiologic derangements to optimize outcomes. However, timing for excision and grafting is subject to debate. The outcomes of interest include mortality, length of stay, complication rates, wound healing time, infection rates, physiologic demand, blood loss, and resting energy expenditure.

Methods: In this systematic review, we searched PubMed, Embase, CINAHL, Cochrane, Web of Science, and Scopus for studies that compared outcomes and complications between burn patients with ultra-early and early excisions. From this search, we screened 4235 articles. Through our selection criteria, five articles focusing on timing of burn excision and grafting rates, wound healing time, infection rates, physiologic demand, blood loss, and resting energy expenditure.

Results: Five studies observing a total of 382 burn patients, published between 1995 and 2016, were included. All five studies are cohort studies, three were prospective studies while two were retrospective chart reviews. Two studies showed decreased length of stay with immediate/ultra-early excision (Still, Keshavarzi) and decreased time to healing with immediate/ultra-early excision (Guo, Lu). One study demonstrated decreased infection and mortality in ultra-early excision (Keshavarzi). One study demonstrated decreased resting energy expenditure in the ultra-early excision group (Gao). One study showed a decrease in blood transfusion in the immediate/ultra-early excision group (Guo). Both the Guo and Gao studies suggest that concerns over excision during the burn shock period may be unfounded provided that the patient is adequately resuscitated.

Conclusions: Studies investigating the immediate/ultra-early excision of burns tend to show improved outcomes for adults with major burns. It is difficult to attain conclusive data due to the lack in overlap of reported outcomes in modern studies. More studies are needed which compare outcomes in adults with major burns between immediate/ultra-early excision and early excision.
**802** A retrospective study: rapid removal of biofilm and necrosis with a hygroscopic chemical debriding compound.

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**Introduction:** Removing necrosis and biofilm is an essential step in the treatment of all lesions. A new debriding compound (TDA) uses a hygroscopic mechanism to reach this goal: when in contact with biofilm and necrosis this causes desiccation, with subsequent dissolution of these compounds.

**Methods:** In a retrospective proof-of-principle study the results of a one-time application of TDA in 54 serious foot and leg lesions, mainly diabetic and venous ulcers, were analyzed.

**Results:** Outcomes were positive: at study end: 50 out of 54 lesions (92.5%) showed complete granulation and in 40 out of 54 lesions (74.0%) complete reepithelialization was reached.

TDA efficacy is represented by three cases. In the first one, an 83-year-old diabetic female with severe peripheral arterial disease and status post-toes-amputation suffered from a gangrenous lesion of the left foot. A second case involved a 77-year-old female who had a non-healing, post-trauma lesion over the Achilles tendon, and the last case entails an 81-year-old male with a non-healing lesion on the left lower leg. All patients showed very rapid debridement and subsequent healing and reepithelialization.

**Conclusions:** Typically, diabetic, and venous ulcers require repeated debridement and treatment of the biofilm is notoriously difficult. It also takes a long time before the woundbed is healthy enough to start to granulate and, subsequently, epithelialize. The results, obtained in this study, indicate that a one-time application of TDA is highly effective for “jumpstarting” wound healing.

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**803** Biodegradable Temporizing Matrix as a Dermal Template in the Reconstruction of Pediatric Full-Thickness Foot Injuries

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**Introduction:** Extensive thermal or traumatic full-thickness injuries to the foot, though rare in children, can lead to severe complications. They are often associated with significant skin loss and underlying tendon or bone exposure. Timely wound closure is essential to minimize the risk of deep infection and to avoid subsequent loss of function.

Tried and tested animal- or human-derived biological dermal templates have always come with a risk of infection and subsequent scar contraction. A biodegradable temporizing matrix (BTM) consisting of a polyurethane scaffold is a synthetic alternative to cover deep defects and promote the development of neodermis.

We report on our first experience with this dermal matrix in the reconstruction of complex foot injuries in children.

**Methods:** From August 2020 to June 2021, we treated four patients with severe full-thickness injuries of the foot and need for necrectomy with BTM, as the prevalence of exposed bone or tendon prohibited primary wound closure via skin grafting. All cases were caused by contact burns or mechanical trauma. In three of these cases, we utilized a temporary negative pressure wound therapy. Wound closure was achieved by application of full-thickness (3/4) or split-thickness (1/4) skin grafts after delamination of the fully integrated BTM.

**Results:** Wound monitoring through regular outer dressing changes showed that BTM remained in place and was fully integrated after 3-6 weeks. We saw excellent dermal regeneration in all patients. Swab cultures at first patient contact detected pre-existing wound contamination with Pseudomonas aeruginosa in two children and MRSA in one case. Wound healing before and after skin grafting was unimpaired, though, under topical antimicrobial treatment with polyhexanide. There were no signs of systemic infection. The take rate of skin grafts was excellent with no graft failure, resulting in pliable, smooth scars. Long-term outcome showed minimal to no scar shrinkage without any functional impairment.

**Conclusions:** BTM is a good alternative to established dermal templates for complex foot injuries in children. In our experience, even in cases of bacterial wound contamination the synthetic material integrates well and promotes unimpaired tissue regeneration. Contraction and hypertrophic scarring is minimal with very good quality of the developing neodermis.
Introduction: Catastrophic thermal injury treatment is complex due to the lack of autologous donor site, which is imperative for permanent wound closure. Historically, our burn unit has relied on application of cultured epithelial autografts for wound closure in this patient population. Lab grown skin requires a significant time investment. Therefore, in our most recent subset of large burn injuries, we have transitioned to the use of autologous skin cell suspension over widely meshed autograft utilization almost exclusively.

Methods: A case series of four thermally injured patients with injuries greater than 75% TBSA was reviewed. Patient length of stay, operative interventions, skin coverage, mortality and cost were examined.

Results: Burn size ranged from 75-85% TBSA in four patients. Early excision was implemented for all four patients in the case study. One of the four patients was treated with a combination of lab grown skin and autologous skin cell suspension. The three other patients were treated exclusively with autologous skin cell suspension for wound coverage. All four patients survived to discharge and their initial follow up. Cost of operative interventions were less expensive for autologous skin cell suspension than for cultured epithelial autografts. Length of stay varied from 66-179 days. Discharge location varied from acute rehabilitation, to a homeless shelter, to another burn facility with inpatient psychiatric services.

Conclusions: Autologous skin cell suspension is a safe and efficient treatment modality to obtain permanent wound closure in catastrophic thermal injuries.

Introduction: Electrical injuries cause 500 to 1000 deaths per year in the United States and are the fourth leading cause of death in the workplace. Rates and types of cardiac complications secondary to electrical injuries vary widely throughout the literature. Case reports describing cardiac perforation in the setting of electrical injury are exceedingly sparse. To our knowledge, there are no documented cases of cardiac perforation as a direct result of electrical injury.

Methods: This is a case report and review of relevant literature.

Results: Case Description: We present a case of myocardial perforation in the setting of high voltage electrical injury. An otherwise healthy 46-year old male sustained a 13.8 kV electrical. Resuscitation included bystander cardiopulmonary resuscitation (CPR), defibrillation by emergency medical responders, finger thoracostomies and massive transfusion protocol in the trauma bay, and finally emergent sternotomy and repair of two injuries to the right atrial appendage. Given this patient’s pattern of injury, including a sternal fracture and bilateral upper anterior rib fractures, the etiology of his right atrial perforation is more likely due to mechanical injury from CPR instead of thermal or electrical injury to the myocardium. However, intraoperative findings confound this theory as no defects were identified in the pericardium of the mediastinal pleura during the operation. This would argue against mechanical injury during CPR. However, the presence of a left hemothorax may could indicate that a pericardial injury was missed in the operation. We argue that the most likely cause of injury is mechanical perforation of the pericardium and myocardium during CPR with a possible missed pericardiostomy during surgical exploration. An alternative hypothesis is an isolated electrical injury to the myocardium and left hemothorax from rib fractures without communication between the two cavities. This patient expired on post-operative day two due to anoxic brain injury.

Conclusions: This case highlights myocardial injury as a rare but lethal complication of high voltage electrical injury and serves as a reminder that cardiac perforation and hemodynamic collapse due to hypovolemic shock can compound and complicate the resuscitation and management of a patient with electrical injury. Further, the widely varying data regarding cardiac complications secondary to electrical injury warrants further investigation and large-scale prospective data.
Foot burns in diabetic patients: A systematic review

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Introduction: Patients with diabetes are prone to foot injuries and burns. Managing burned feet in patients with diabetes can be difficult due to multiple concomitant patient comorbidities that delay wound healing. Burn surgeons tasked with treating these complex foot burns understand that these patients are at risk of developing significant complications, such as infections and non-healing diabetic foot ulcers, which may ultimately lead to amputation. Although there are many studies that examine the causes and outcomes of diabetic foot ulcers and their management, there is a lack of consensus on how to best manage lower extremity burns in patients with diabetes.

Methods: A systematic review was performed according to PRISMA criteria and identified 18 articles addressing the management of burned feet in patients with diabetes. Means and standard deviations of scale variables and frequencies derived from nominal and ordinal variables abstracted from the literature were compared between each group. A meta-analysis was attempted but existing data was not of sufficient quality for meaningful analysis, and data aggregation was done where applicable.

Results: The three-database search identified 726 articles, which yielded 18 full text articles that met inclusion criteria. Mean age of patients was 54 years (SD 7), and 80% (n=203) were male. Most (90%, n=179) had type II diabetes, and 10% (n=20) had Type I diabetes. Mean duration of diabetic disease was 11 years (SD 4), and mean A1c at admission was 9% (SD 1). Peripheral neuropathy (64%, n=123) was the most common comorbidity. Median TBSA burned was 2% (IQR 2), and scald (56%, n=155) was the most common mechanism of injury. Full thickness burns (70%, n=102) were most common, followed by partial thickness (28%, n=41), and superficial thickness (2%, n=2). A majority (55%, n=88) had burn wound infection identified at admission. Patients had a median delay in presentation from time of injury to hospital admission of 4 days (IQR 4.5). Sixty percent of patients received surgical treatment via excision and grafting, had a median length-of-stay of 20.5 days despite a median total body surface area involvement of 2%, and experienced sequelae of impaired wound healing such as infections, graft loss, and need for further surgery. Ultimately, 23% of patients had significant wound healing issues that resulted in amputation.

Conclusions: Excision and grafting may not be the optimal approach for managing foot burns in patients with diabetes, many of whom are at high risk of amputation. Non-operative management of foot burns in patients with diabetes should be explored as a method to decrease amputations in patients with foot burns.

Translational Sciences: Wounds & Scars 2

Combination of Adipose Micro Fragments and Liquid Scaffold Improve Wound Healing Outcomes

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Introduction: In full-thickness wounds, high levels of inflammation, lack of matrix deposition and paucity of progenitor cells delays normal healing processes. One major problem with commercially available solid (sheet) scaffolds is their inability to conform to wounds of varying shapes and sizes. To overcome this, we previously generated a liquid, injectable skin substitute which can fill wounds of any shape and depth from bottom up and has all the necessary ingredients for skin cells to be nourished, proliferate, and migrate in. In combination with adipose micro fragments as a viable source of progenitor cells, a composite, in situ forming skin substitute was tested for treatment of silicon ring splinted wounds in rats.

Methods: The in vitro survival and migratory capacity of adipocytes derived from rat micro-fragmented fat when cultured in our 3D nutritional scaffold was examined with a Live/Dead assay. The efficacy of our combined liquid scaffold alone (MF) or with adipose micro fragments (MFA) in treating full thickness splinted wounds in rats was compared to a standard dressing protocol (NT). The healing process was monitored for 10 days. Following wound measurements, histological and immunofluorescent analyses were performed and compared.

Results: Adipose-derived cells migrated within the 3D nutritional liquid scaffold after 7 and 14 days. The number of red (dead) cells was negligible, indicating cell viability. In vivo, both MFA and MF showed both accelerated and ameliorated wound healing, including complete epithelialization and less immune cell infiltration, compared to the NT control. No significant differences were observed between the MF and MFA groups for any outcome.

Conclusions: Our findings show that a 3D nutritional liquid skin scaffold is a rich environment for adipocyte viability and migration and that addition of adipose micro fragments to this scaffold can be used as a rich source of cells.
Introduction: Adipose and adipose-derived stem cell therapies have met success as adjunctive treatment during burn reconstruction with well described benefit in the delayed-treatment of soft-tissue deficits. While the use of allogeneic skin is well-described, adipose tissues have typically remained autologous. Allogenic fat is not commonly used in burn care, however, in large, complex burns where autologous tissue is limited adipose may not be readily available for harvest or use. Understanding the efficacy of allogeneic tissues in this setting is critical to expand our reconstructive options. Here we describe a protocol utilizing allogeneic fat as well as examine the efficacy of this approach on burn-wound contractures, adhesions, and soft-tissue deficits.

Methods: Female, Yorkshire swine received 16, 4x4 cm full-thickness burns. After 48 hours, eschar was removed to fascia. Wounds were stratified to receive either A) No Reconstruction, B) Skin-Only, C) Fat-Only, D) Immediate-Skin, Delayed-Fat, or E) Immediate-Fat, Delayed-Skin. All fat utilized was allogeneic sourced from vendor-matched swine. At 8-weeks post-engraftment animals were sacrificed and all wounds were collected for photography, ultrasound, skin, and punch biopsies. Treatments were re-applied at each asessment (p< 0.05). Immediate use of allogeneic fat significantly improved tissue mobility vs. untreated and skin graft controls (p< 0.05). Contracture was most significantly affected by timing of skin graft placement, however, could be further mitigated under standard delayed-fat approached with allogeneic tissue.

Conclusions: Here we demonstrate use of allogeneic fat in both traditional-delayed and a fat-first approach with significant mitigation of adhesion when applied as an initial basal layer. Both immediate and delayed allogeneic fat were sufficient to improve on soft tissue deficits.

Results: Use of allogeneic fat significantly improved terminal soft-tissue thickness under both immediate and delayed administration (p< 0.05). Immediate use of allogeneic fat significantly improved tissue mobility vs. untreated and skin graft controls (p< 0.05). Contracture was most significantly affected by timing of skin graft placement, however, could be further mitigated under standard delayed-fat approached with allogeneic tissue.

810 Synthetic Platelet-Mimetics with Gentamicin: Outcomes in Deep Partial-Thickness Burns
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Introduction: Infection and prolonged inflammation in deep partial-thickness burns can lead to inadequate healing. In addition to their role in hemostasis, activated platelets also contain granules with anti-inflammatory properties which may impact wound healing. However, portability and storage of platelets remain a challenge. Synthetic platelet-mimetics (SPM) avoid these difficulties, but like natural platelets, SPM have vesicles that can transport bioactive agents, such as antibiotics. We sought to evaluate wound healing outcomes in deep partial-thickness burns treated topically with SPM.

Methods: A total of 30 circular, deep partial-thickness burns were created on the dorsum of 2 porcine models. Each wound measured 5cm in diameter and was standardized using a thermocoupled burn device. Sets of six wounds were randomized into five groups: SPM, gentamicin alone, SPM with gentamicin, a vehicle control (saline), or dry gauze (the standard of care, SOC). Additionally, two separate 5cm diameter circular areas were demarcated to serve as normal skin controls. Wounds were assessed at post-burn days 3, 7, 14, 21, 28, 60 and 90 with a variety of non-invasive imaging loads were significantly higher at 43/100 and 47/100, respectively (p = 0.27). The mean bacterial load in each group was measured only slightly less at 92% (p = 0.56). The percentage of wound contraction was 39% in the SPM group were slightly lower at 92% (p = 0.56). Moreover, superficial blood flow in the SPM group was measured to be 168% of normal skin controls, while wounds treated with SPM with gentamicin group, while in the SOC group contraction was higher at 45% (p = 0.20). In addition to their role in hemostasis, activated platelets also contain granules with anti-inflammatory properties which may impact wound healing. However, portability and storage of platelets remain a challenge. Synthetic platelet-mimetics (SPM) avoid these difficulties, but like natural platelets, SPM have vesicles that can transport bioactive agents, such as antibiotics. We sought to evaluate wound healing outcomes in deep partial-thickness burns treated topically with SPM.

Methods: A total of 30 circular, deep partial-thickness burns were created on the dorsum of 2 porcine models. Each wound measured 5cm in diameter and was standardized using a thermocoupled burn device. Sets of six wounds were randomized into five groups: SPM, gentamicin alone, SPM with gentamicin, a vehicle control (saline), or dry gauze (the standard of care, SOC). Additionally, two separate 5cm diameter circular areas were demarcated to serve as normal skin controls. Wounds were assessed at post-burn days 3, 7, 14, 21, 28, 60 and 90 with a variety of non-invasive imaging and punch biopsies. Treatments were re-applied at each assessment. The primary outcome was the amount of wound re-epithelialization, measured histologically, at post-burn day 28. Secondary outcomes consisted of the percentage of wound contraction, amount of superficial blood flow, and mean bacterial load.

Results: The amount of wound re-epithelialization in wounds treated with SPM was 96% whereas those treated with the SOC measured only slightly less at 92% (p = 0.56). The percentage of wound contraction was 39% in the SPM with gentamicin group, while in the SOC group contraction was higher at 45% (p = 0.20). In addition to their role in hemostasis, activated platelets also contain granules with anti-inflammatory properties which may impact wound healing. However, portability and storage of platelets remain a challenge. Synthetic platelet-mimetics (SPM) avoid these difficulties, but like natural platelets, SPM have vesicles that can transport bioactive agents, such as antibiotics. We sought to evaluate wound healing outcomes in deep partial-thickness burns treated topically with SPM.

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Results: The amount of wound re-epithelialization in wounds treated with SPM was 96% whereas those treated with the SOC measured only slightly less at 92% (p = 0.56). The percentage of wound contraction was 39% in the SPM with gentamicin group, while in the SOC group contraction was higher at 45% (p = 0.20). Moreover, superficial blood flow in the SPM group was measured to be 168% of normal skin controls, while wounds in the SPM with gentamicin group were slightly lower at 160%, and in wounds treated with the SOC blood flow was 110% of normal skin controls (p = 0.27). The mean bacterial load in each group was measured at post-burn day 3 and notably consisted of bacterial load being the lowest in wounds treated with gentamicin alone at 17/100, meanwhile in wounds treated with the SOC or those in the SPM with gentamicin group, mean bacterial loads were significantly higher at 43/100 and 47/100, respectively (p = 0.02).

Conclusions: SPM applied to deep partial-thickness burns did not significantly improve measured outcomes over the traditional methods.
Although numerical improvements were shown in all measured outcomes, no significant differences were noted. The theoretical and observed potential for SPM to improve wound healing deserves additional evaluation in larger pre-clinical studies.

**Statistical Analyses of Multiple Burn Wounds within an Animal**

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**Introduction:** Porcine animal models are frequently used to study the effects of various burn wound treatments and conditions. In these studies, multiple wounds are created on the dorsum of an anesthetized pig. Wounds within an animal are correlated, and the analysis of such a design should account for this dependence. Two recent studies are used as examples to illustrate the use of random effects for animal to account for the dependence of wound measurements within each pig.

**Methods:** In both studies, treatments were randomized to wound location, and neither contained repeated measurements within a wound.

Study #1 investigated the effectiveness of enzymatic debridement. Forty 3-cm diameter partial-thickness burn wounds were created on the dorsum of 5 anesthetized pigs, arranged in 4 rows and 10 columns. Dorsal quadrants with 10 wounds each were created by combinations of two conditions: wounds that were wet or dry and wounds that were treated for either 72 or 96 hours. Debridement Efficiency Scores were calculated for each wound and evaluated for differences by inferential statistical comparisons between experimental treatments and conditions. The multilevel statistical model contained Treatment Group (5 levels), Treatment Time (2 levels: 72 hour and 96 hour), and Wet/Dry Condition (2 levels) as fixed effects, which were crossed to create a 3-way block, resulting in 2 wounds per animal for each Treatment, Wet/Dry, and Time combination. Random effects of animal and treatment block within animal were included in the model.

Study #2 investigated the effectiveness of an experimental treatment applied at 3 different post-burn injury time points versus a standard of care (SOC). Up to 12 5-cm² deep partial thickness wounds were created in 2 rows and 6 columns on each dorsum of 6 anesthetized pigs. Each treated wound was compared with a SOC wound located along the same cranio-caudal axis. Paired differences for wound closure % were calculated and analyzed with time as a fixed effect with a random effect for animal.

**Results:** For Study #1, there were 200 total wounds, and for Study #2 there were 72 total wounds. These experimental units are not independent, as required by statistical testing. For both studies, there was graphical evidence that the burn wound measurements differed both within and between pigs. The statistical tests accounted for this variability by incorporating the effects due to pigs.

**Conclusions:** Matching the statistical model to the experimental design is critical for correct interpretation of the results. Failure to use the correct model by assuming wounds within a pig are independent (and thereby ignoring any effect due to the pig) will result in erroneous statistical test results and less powerful tests of treatment differences.
812 Evaluation of Dermal and Epidermal Replacement Strategies for the Treatment of Full-thickness Wounds

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Introduction: In full-thickness (FT) wounds, autologous skin cell suspension (ASCS) is used in combination with widely meshed split-thickness skin grafts (mSTSGs) to obtain definitive closure, reducing donor skin requirements compared to traditional autografting (AG) techniques. In the treatment of these wounds, dermal matrices (DMs) are also often utilized to address various challenges including need for temporization, mitigation of contour defects, covering avascular structures, and modulation of scar formation. Varying DMs exist and are composed of different biologic and synthetic materials designed to address these clinical needs. The purpose of this study was to compare outcomes obtained in FT wounds using 3 different DMs coupled with ASCS+mSTSG in immediate or delayed AG procedures.

Methods: A FT excisional porcine wound model was used. DMs evaluated included a single-layer dermal matrix composed of bovine dermal collagen and elastin (Col/E), a bilayer construct composed of a bovine collagen-glycosaminoglycan with a silicone epidermal layer (Col/GAG), and a synthetic bilayer polyurethane DM (Poly/U).

DMs were applied, managed, and grafted following manufacturer’s recommendations. AG included ASCS+mSTSG (1:80 expansion, 3:1 mesh). Wounds were evaluated for inflammation, infection, DM take, AG take, re-epithelialization, and contracture over 49 days post-excision. Additionally, biopsies were evaluated to further inform tissue generation and healing outcomes.

Results: Results related to healing outcomes are reported in the table below. Inflammation at wound margins was noted during acute phase of healing for all DMs and visual cues for infection were noted in 1 wound for Col/E, 3 wounds for Col/GAG causing partial loss of DM, and 1 wound for Poly/U. All signs of infection were resolved by day 14.

Conclusions: ASCS+mSTSG can be used successfully over DMs composed of various materials in both immediate and delayed AG procedures. No difference was observed on percent AG take between the DMs, however the data suggest that time to definitive closure is impacted based on utilized DM and AG strategy, with potential implications on contracture.

813 Histologic Changes of Skin Biopsies After Autologous Skin Cell Suspension

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Introduction: Over 10,000 cases of autologous skin cell suspension have been performed around the world for the treatment of burn and soft tissue injuries. A key component of the procedure is the harvest of skin biopsies which are exposed to enzymatic degradation. In some regions, epidermal graft harvest has been attempted manually without enzymatic degradation. Our study goal was to examine the histologic changes of the skin biopsies in manual versus enzymatic degradation.

Methods: Our study was an IRB-approved, prospective controlled analysis of residual skin harvested from 10 patients undergoing hernia repair. Two specimens from each patient were procured intraoperatively with each measuring 2x3cm. Each specimen produced two 4mm punch biopsies from three regions (control, mechanical, and enzymatic) for a total of 12 specimens per patient. Enzymatic specimens were prepared using the Avita Medical ReCell® system per manufacture instructions for use. Mechanical specimens were prepared using an abrasive pad until epidermis was macroscopically removed. Histologic analysis was performed with hematoxylin and eosin stain and whole slide scanning. Two or more investigators reviewed each biopsy concurrently with consensus agreement on the remaining epidermis and evidence of degraded reticular dermis. Descriptive statistics were used to assess the variances in the three groups.

Results: The mean residual epidermis was 9% in the enzymatic group, 35% in the mechanical, and 98% in the control. Epidermal harvest was higher in the enzymatic group relative to the mechanical group (two tailed t-test = 0.0008). Reticular dermis was degraded in 10% of the mechanical specimens and none of the enzymatic specimens.

Conclusions: Epidermal harvest was more consistent in the enzymatic group with less trauma to the dermis. Our study suggest that mechanical harvest requires larger donor sites given the decreased epidermal harvest. Further research is needed to determine impact of cell isolation technique on autograft cell suspension viability and distribution of cell types harvested.
Devices measuring transepidermal water loss of the skin: a systematic review of measurement properties
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Introduction: TEWL is a physiological property of skin which increases when the epidermis is damaged. It is, therefore, a commonly utilised measure of skin barrier integrity. Devices measuring TEWL are available as open, semi-open or closed chamber. Studies of reliability examine the consistency of measurement, and/or responsive whereas measurement error scores in absolute terms the amount of error due to sources of variation.

Methods: The search strategy aimed to locate published and unpublished studies. Databases searched included PubMed, Embase, CINAHL and Web of Science, utilising identified keywords and limited to studies in English. Grey literature sources were searched to identify any unpublished documents. Study selection using the inclusion criteria was then assessed by two reviewers for methodological quality utilising the COSMIN risk of bias tool to assess the reliability and measurement error of outcome measurement instruments.

Studies examining the reliability and/or measurement error of TEWL measurement devices were included. Studies that only report on measurement of TEWL outcomes without examination of reliability and/or measurement error were excluded.

Results: A total of 22 devices were examined in the 38 included studies. The quality of study design was on average rated as 'Adequate' however reliability and measurement error statistical methods were on average rated as 'Doubtful'.

Conclusions: TEWL measurement devices were found to demonstrate good reliability and often correlated with other devices. However, measurement error was highly variable but improves under in-vitro conditions.

Translational Research in Skin of Color Spontaneous Repigmentation of Post-Chemical Burn Leucoderma
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Introduction: After facial burn injuries to skin of color (SOC) patients, repigmentation plays a critical role in post-burn quality of life, given the acquired contrast between preserved skin and achromatic scars, and that daily concealment may be difficult. While leucoderma is a well-known side-effect of deep chemabration with phenol, phenol-croton oil, and high concentration trichloroacetic acid, mechanisms of repigmentation are still not fully understood, and the observation of spontaneous repigmentation of a deep chemical injury in SOC has not previously been described in the literature. In our study, we present the dynamics of long-term spontaneous facial repigmentation of a Fitzpatrick V chemical burn patient, with microscopic findings of a deep chemical peel SOC animal model.

Methods: We demonstrate spontaneous repigmentation in a 37-year-old female who initially presented with depigmented areas, erosions and eschars on the face, 7 days after accidental deep chemical burn, due to self-application of 70% glycolic acid to improve acne. This is juxtaposed with a SOC porcine chemical burn patient, with microscopic findings of a deep chemical peel SOC animal model.

Results: On patient presentation, epidermolysis and areas of deep dermal burns were observed over the forehead and cheeks. At 14 days, multiple leucoderma scars persisted and initial perifollicular repigmentation was noticeable. By 28 days, most of the skin was repigmented; however, many areas had only perifollicular repigmentation and still very severe leucoderma. At 6 months, the skin still had small areas of leucoderma with follicular repigmentation. At 11 months post-injury, neocollagenesis band thickness was 21 days, and skin pigmentary safety. A 6mm punch biopsy taken at 21 days underwent Herovici staining to reveal the thickness of collagen type III neocollagenesis, confirm the presence of melanin in the epidermis, and evaluate the presence of melanophages.

Discussion: DNA’s role in the repair process continues to be explored. Melanophages have a role in the degradation of extracellular matrix and melanin in the epidermis. Collagen type III is an important role in the repair process. DNA repair is a key factor in wound healing. Given the acquired contrast between preserved skin and achromatic scars, and that daily concealment may be difficult. While leucoderma is a well-known side-effect of deep chemabration with phenol, phenol-croton oil, and high concentration trichloroacetic acid, mechanisms of repigmentation are still not fully understood, and the observation of spontaneous repigmentation of a deep chemical injury in SOC has not previously been described in the literature. In our study, we present the dynamics of long-term spontaneous facial repigmentation of a Fitzpatrick V chemical burn patient, with microscopic findings of a deep chemical peel SOC animal model.
areas of melanophages, a fully recovered epidermal melanin, and a band of over 500 micra of collagen type III. Overall, on follicle-dense areas after chemical burn, we observed progressive full repigmentation over the course of 11 months on the patient, and by day 21 in the porcine SOC model.

**Conclusions:** Spontaneous repigmentation occurred both after accidental deep chemical ablation to the face of a SOC patient, and on the porcine SOC model after deep chemical peel formula application.

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**816 Up-regulation of Immune Related Key Genes in Burn Induced Cardiac Dysfunction**

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**Introduction:** The cytokine cascade is a prime factor in inflammation following burn injury, leading to cardiac dysfunction. Studies on immune-related key cardiac genes after burn injury remain limited. The TLRs act individually or as heterodimers, interacting with adaptor proteins to initiate MyD88 or TICAM1 (TRIF) dependent responses. This results in signaling cascades through NFkB, which activates downstream JNK/p38 signaling or cytokine secretion. Dysregulation of TLR and related signaling pathways has severe consequences and is implicated in autoimmune diseases and chronic inflammation. The objective of this study is to identify the immune-related key genes and explore the pathways by microarray specific to members of the TLR signaling family as well as adaptor and effector proteins, and downstream members of TLR activation including the NFkB, JNK/p38, IRF and JAK/STAT signaling pathways.

**Methods:** The microarray was applied to profile expression of 84 genes in TLR-mediated signal transduction and innate immunity. The Qiagen web-based tools in GeneGlobe Data Analysis Center was used to analyze burn-induced up-regulation of these genes. String-DB version 11.5 was employed to analyze differentially expressed gene function and interaction. Real-time qPCR was utilized to validate the data. GO enrichment analysis (FDR < 0.05) using "clusterProfiler" predicted the roles of immune-key genes in the 3 aspects of biological processes (BP), cellular components (CC), and molecular functions (MF). The biological pathway analysis was performed to obtain the pathways. The protein-protein interaction (PPI) network was built using "Multiple Protein" of the string database (http://stringdb.org/, version 15.0). The DEGs were visualized by using the qPCR.

**Results:** 32 up-regulated genes were identified. Functional enrichment analysis showed that these genes were enriched in cytokine receptor activity, immune receptor activity, and integrin family cell surface interactions. 14 of 32 genes belong to the TLR signaling pathway; 5 of 32 genes to cytokines and inflammation; 5 of 32 genes belong to apoptosis; 6 in the MARP signaling pathway; 4 genes belong to the IL-1 signaling pathway; 4 genes in the IL-6 signaling pathway); 3 genes in toIL-2 signaling pathway and 3 genes belong to oxidative stress responses. Process study demonstrated the genes are associated with regulation of cytokine production (GO:0001817), immune response (GO:0006955), and defense response (GO:0006952).

**Conclusions:** This study provides evidence that microarray plays a role in identification of burn-induced cardiac dysfunction DEGs. Deep analysis of up-regulated genes after burn injury supported the idea that the proinflammatory cascade results in cardiac inflammation.