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Investigating Weekend Effect in the Management of Upper and Lower Extremity Degloving Injuries

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Background: Weekend presentation has been associated with adverse outcomes in emergent conditions, including stroke, myocardial infarction, and critical limb ischemia. We examine whether a weekend effect exists in the management of and outcomes after extremity degloving injuries.

Methods: The cohort included adults presenting with open extremity degloving injuries to a tertiary level one trauma center between June 2018 and May 2022. We collected demographics, comorbidities, injury information, interventions, and complications. Propensity score weighting was used to minimize confounding differences between those presenting on weekends (Sat–Sun) versus weekdays (Mon–Fri). Weighted regressions were used to examine differences in interventions by day of presentation. Multivariable weighted regressions accounting for differences in interventions received were used to examine whether weekend presentation was associated with amputation risk, complications, or functional deficits.

Results: Ninety-five patients with 100 open extremity degloving injuries were included. In total, 39% of injuries were weekend-presenting. There was a higher rate of noninsulin-dependent diabetes among patients presenting on weekends ($P = 0.03$). Weekend-presenting injuries had higher median Injury Severity Scores ($P = 0.04$). Propensity-weighted regression analysis revealed differences in interventions received on weekends, including lower rates of pedicled and free flaps and bone graft, and increased rates of negative-pressure wound therapy ($P \leq 0.02$). Multivariable regression analysis revealed weekend presentation was a significant independent risk factor for amputation of the affected extremity [odds ratio 2.27, 95% CI (1.01–5.33), $P = 0.05$].

Conclusion: Weekend presentation may impact interventions received and amputation risk in patients presenting with open extremity degloving injuries. *(Plast Reconstr Surg Glob Open 2023; 11:e5345; doi: 10.1097/GOX.0000000000005345; Published online 16 October 2023.)*

INTRODUCTION

Degloving injuries occur following high-impact trauma and are caused by shearing forces that avulse skin and subcutaneous tissue off underlying muscle and bone.[1] These limb-threatening injuries are difficult to treat, can lead to loss of function, and may be complicated by infection; thus, they frequently receive multidisciplinary care.[2] Options for intervention include serial debridement, skin grafting, skin substitute use, negative-pressure wound therapy (NPWT), revascularization/replantation, flap reconstruction, and amputation in the most extensive cases.[2]

Research has previously described a "weekend effect," referring to the higher risk of morbidity and death for patients admitted to hospitals on weekends.[3,4] Weekend presentation has also been shown to increase length of stay, increase risk of readmission, and decrease likelihood of operative intervention across conditions, including stroke, heart failure, and myocardial infarction.[5–8] In patients with lower extremity vascular emergencies,

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weekend admission has been associated with increased risk of adverse outcomes, including amputation.[9] There have been documented differences in revascularization attempts for cardiac and lower extremity indications; however, the weekend effect has not been studied in the context of extremity degloving injuries.[9–11] Additionally, the broad array of treatment options available for management of degloving injuries raises questions about whether patients are equally likely to receive flap-based reconstruction or experience comparable latency to reconstructive care when admitted on a weekend versus weekday.

Here, we examine if presenting with open extremity degloving injuries on a weekend affects the types of interventions that patients receive, as well as outcomes and complication rates in these patients. We hypothesized that weekend-presenting injuries may experience increased latency to reconstructive consult, decreased likelihood of flap reconstruction, and higher rates of adverse outcomes, including amputation.

Takeaways

Question: Weekend effect refers to the elevated risk of morbidity and complications in patients presenting to hospitals on weekends. Here we consider: does a weekend effect exist in the management of open extremity degloving injuries, considering differences in interventions, outcomes, and complications?

Findings: This retrospective cohort study used propensity score-weighted regression analysis to show that weekend presentation is associated with lower rates of pedicled and free flap reconstruction and bone grafts, and higher rates of negative-pressure wound therapy. Weekend presentation was a predictor of amputation risk upon multivariable regression.

Meaning: Weekend presentation may impact interventions and amputation risk in patients with open extremity degloving injuries.

METHODS

After institutional review board approval, we retrospectively reviewed all patients presenting to our tertiary level one trauma center emergency department (ED) with open extremity soft tissue degloving injuries from May 2018 to May 2022. Demographics, comorbidities, injury characteristics, interventions, and outcomes were collected from the electronic medical record.

Baseline Characteristics

Demographic data collected included age, sex, and race. Comorbidities included obesity, nicotine use, hypertension, insulin- and noninsulin-dependent diabetes, congestive heart failure (CHF), and chronic obstructive pulmonary disease (COPD). Injury characteristics included affected extremity; laterality; mechanism of injury; injury severity score (ISS); mangled extremity severity score (MESS); and involvement of bone, vasculature, nerves, and tendons. Mechanisms of injury considered high-energy included motor vehicle/motorcycle accidents, pedestrians struck by motor vehicles, falls from height, ballistic injuries (fireworks, firearms), or occupational injuries with power-tools (log splitter, power saw, etc.).[12] Low-energy mechanisms included all ground-level falls. We additionally collected date and time of presentation to the ED, and information on whether patients arrived from an outside hospital.

Interventions

We examined whether the following interventions were performed: irrigation and debridement, revision amputation, replantation, vascular reconstruction, vascular ligation, vascular repair (primary or graft), bony fixation, bone graft, nerve repair, nerve transfer, nerve graft, fasciotomy, tendon repair, tendon transfer, tendon graft, skin graft, skin substitute use, NPWT, pedicled flap reconstruction, free flap reconstruction, and local tissue rearrangement. We collected information on the date and time of the first reconstructive consult, consulting service (plastic or orthopedic surgery), whether primary closure was achieved during the first intervention, number of interventions until and date of definitive closure, and use of regional anesthesia during the first intervention.

Outcomes/Complications

Outcomes of interest were amputation of the affected limb, any-cause complications, and functional deficits. Any-cause complication was a binary outcome variable indicating whether any of the following were recorded: skin necrosis, infection, hematoma, neuroma, and dehiscence. Functional deficits were defined by weight bearing capacity and limitations to range of motion of the affected extremity on the most recent reconstructive service (eg, plastic surgery) examination, considering baseline level of function. We collected length of admission, number of operations, and functional deficits at the most recent reconstructive service visit.

Statistical Analysis

Demographics and comorbidities were analyzed per patient. For bilateral and multi-site degloving injuries, each injury was treated independently in subsequent analysis. We divided our cohort into two groups: injuries presenting on weekends versus weekdays. Numerical data were assessed for normality using Shapiro-Wilk tests. Baseline characteristics and injury characteristics between groups were compared using Mann-Whitney U tests and Student *t* tests as appropriate for continuous data, and Fisher exact tests or chi-square tests for categorical data.

Propensity weighting was used to account for differences in comorbidities/injury characteristics between groups.[13] Characteristics were considered in the calculation of propensity scores based on their unweighted standardized mean differences (SMDs) and their a priori likelihood of affecting outcomes. Candidate variables included age, body mass index greater than 25, race, hypertension, insulin- and noninsulin-dependent diabetes, CHF, COPD, nicotine use, MESS category, ISS category, tendon

Table 1. Demographics and Comorbidities of All Patients (n = 95)

Characteristic		Overall	Weekday	Weekend	P
n		95	59	36	
Age, mean (SD)		46.7 (19.4)	45.9 (19.2)	47.9 (20.0)	0.67
Sex	Female	28 (29.5)	15 (25.4)	13 (36.1)	0.38
	Male	67 (70.5)	44 (74.6)	23 (63.9)	
BMI	<25	32 (33.7)	21 (35.6)	11 (30.6)	0.78
	≥25	63 (66.3)	38 (64.4)	25 (69.4)	
Race	White	70 (73.7)	42 (71.2)	28 (77.8)	0.64
Comorbidities	Hypertension	35 (36.8)	21 (35.6)	14 (38.9)	0.92
	Insulin-dependent diabetes	6 (6.3)	2 (3.4)	4 (11.1)	0.20
	Noninsulin-dependent diabetes	6 (6.3)	1 (1.7)	5 (13.9)	**0.03**
	Congestive heart failure	3 (3.2)	2 (3.4)	1 (2.8)	1
	Chronic obstructive pulmonary disease	4 (4.2)	3 (5.1)	1 (2.8)	1
Nicotine use	Never	48 (50.5)	27 (45.8)	21 (58.3)	0.49
	Current	26 (27.4)	18 (30.5)	8 (22.2)	
	Former	21 (22.1)	14 (23.7)	7 (19.4)	

All values are n (%) unless otherwise specified.

injury, bony injury, nerve injury, and vascular injury. We assessed candidate variables for collinearity in the model. Hypertension and COPD were removed due to low baseline SMD (<0.05) and collinearity with CHF. Weights were calculated using an inverse probability of treatment weights algorithm using a logistic regression model with weekend versus weekday presentation as the dependent variable.[14–17] Performance of the score in balancing the baseline differences between groups was assessed by calculating postweighting SMD, confirming that no individual covariate had an SMD of more than 0.2, and the average SMD across covariates was less than 0.1.[18,19]

We conducted bivariate regressions to understand which interventions significantly differed based on weekend presentation, implementing weighted Firth logistic regression to account for low sample sizes.[20] For ordinal, interval, or continuous outcome variables, we used weighted Mann-Whitney *U* tests for bivariate analysis to assess weekend effects. We also conducted bivariate weighted Firth logistic regressions to examine differences in specific complications based on day of presentation. Then, we constructed three multivariable logistic regression models, including only interventions that significantly differed on bivariate analyses and day of presentation as predictors, to examine whether weekend presentation was predictive of amputation, any-cause complications, and functional deficits. We used backward selection with a threshold of $P = 0.1$. To minimize bias, we ensured that there were at least five outcome events per predictor variable in the final models.[21] Finally, to account for the possible contribution of bilaterality of injuries to outcomes, we repeated the three multivariable logistic regression models in the sample of unilateral injuries. The α value was set at 0.05 for all analyses. Statistical analysis was performed using R for Mac version 4.0.3.[22]

RESULTS

Ninty-five patients presenting with 100 open extremity degloving injuries from 2018 to 2022 were included. Mean patient age was 46.7 years (SD 19.4). In total, 39.0% of injuries presented on a weekend. There was a higher rate of noninsulin-dependent diabetes among patients presenting on weekends (weekend: 13.9%, weekday: 1.7%, $P = 0.03$) (Table 1). Weekend-presenting injuries more frequently resulted from high-energy mechanisms [weekday, n(%): 34 (55.7), weekend: 32 (82.1), $P = 0.01$; Table 2], and had a higher ISS than weekday injuries [weekend median (IQR): 24 (10–26), weekday: 16 (9–24), $P = 0.04$; Fig. 1], but had a comparable MESS [weekend median (IQR): 5 (4.5–6), weekday: 5 (4–7), $P = 0.95$]. On evaluation of covariates that could influence outcomes of interest, several covariates had high SMD, indicating imbalance of potential confounds. The preweighting average SMD across covariates was 0.22. Among the most imbalanced covariates were tendon injury, bony injury, ISS, and diabetes (SMD ≥ 0.28). Weighting achieved good balance across all covariates, with an average SMD of 0.08. (**See table 1, Supplemental Digital Content 1,** which displays standardized mean differences for covariates included in propensity score weighting. Data shown are count (%) unless otherwise specified. **http://links.lww.com/PRSGO/C819**.)

Interventions

Median time from presentation to definitive closure was 0.7 days (IQR 0.3–5.1 days), with 50% of injuries undergoing primary closure. There were no differences between groups in incidence of primary closure or latency to definitive closure ($P \geq 0.80$). The median number of interventions until definitive closure was one (IQR 1–3), which did not differ significantly between groups ($P = 0.73$). The covering reconstructive consult service did not differ for weekends versus weekdays ($P = 0.27$). There were no significant differences in time to first reconstructive consult [weekday median (IQR): 2.95 hours (1.38–4.92), weekend: 2.96 hours (1.54–5.19); $P = 0.88$]. Weekend-presenting injuries were more frequently treated with NPWT than weekday injuries {odds ratio [OR] 2.19, 95% confidence interval [CI] (1.21–3.99), $P = 0.01$; Table 3}. Free flaps were the most common reconstructive option, used in 16% of cases, with local tissue rearrangements in 15% of cases, and pedicled flaps in

Table 2. Injury/Presentation Characteristics (n = 100)

Characteristic		Overall (n = 100)	Weekday (n = 61)	Weekend (n = 39)	P
From outside hospital		41 (41.0)	27 (44.3)	14 (35.9)	0.54
Reconstructive consult service	Orthopedic surgery	50 (50.0)	28 (45.9)	22 (56.4)	0.27
	Plastic surgery	45 (45.0)	31 (50.8)	14 (35.9)	
	None (trauma)	5 (5.0)	2 (3.3)	3 (7.7)	
High-energy mechanism of injury		66 (66.0)	34 (55.7)	32 (82.1)	0.01
Injury severity score	1–8 (minor)	15 (15.0)	11 (18.0)	4 (10.3)	0.04
	9–15 (moderate)	15 (15.0)	8 (13.1)	7 (17.9)	
	16–24 (severe)	36 (36.0)	27 (44.3)	9 (23.1)	
	25 + (very severe)	34 (34.0)	15 (24.6)	19 (48.7)	
Mangled extremity severity score	<7	76 (76.0)	45 (73.8)	31 (79.5)	0.68
	≥7	24 (24.0)	16 (26.2)	8 (20.5)	
Laterality	Left	44 (44.0)	27 (44.3)	17 (43.6)	0.09
	Right	48 (48.0)	32 (52.5)	16 (41.0)	
	Bilateral	8 (8.0)	2 (3.3)	6 (15.4)	
Extremity	Upper	74 (74.0)	48 (78.7)	26 (66.7)	0.27
	Lower	26 (26.0)	13 (21.3)	13 (33.3)	
Injured structures	Bony injury	69 (69.0)	39 (63.9)	30 (76.9)	0.25
	Vascular injury	42 (42.0)	24 (39.3)	18 (46.2)	0.64
	Nerve injury	41 (41.0)	24 (39.3)	17 (43.6)	0.83
	Tendon injury	48 (48.0)	34 (55.7)	14 (35.9)	0.08

All values are n (%).

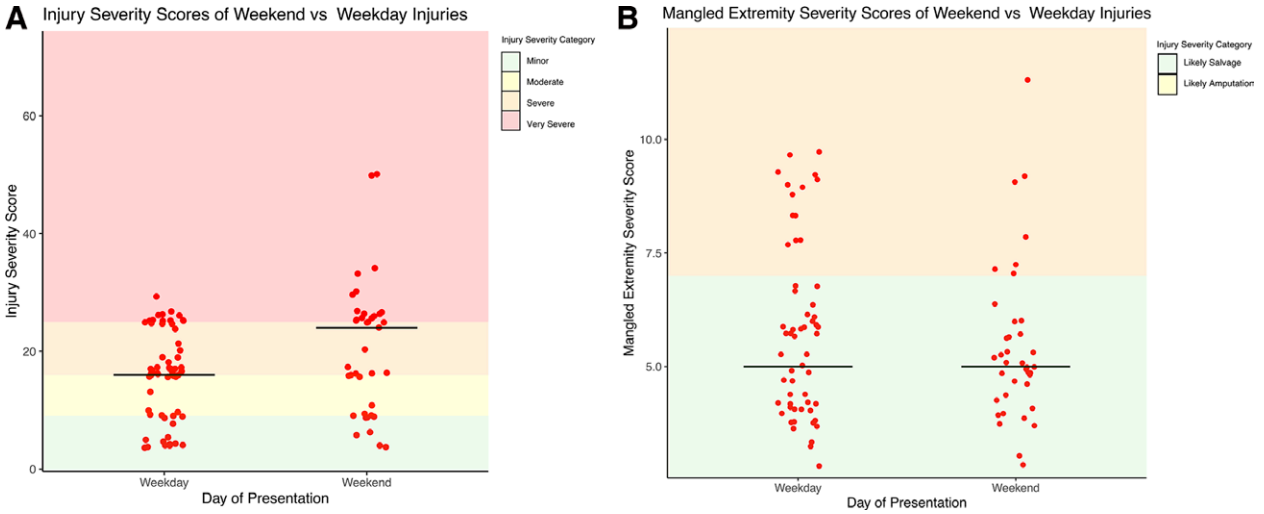

Fig. 1. Severity scores based on day of presentation. Distribution of (A) ISS and (B) MESS for injuries presenting on weekdays vs weekends. Black crossbars represent median score.

5%. Weekend-presenting injuries were less likely to receive pedicled flaps [OR 0.08, 95% CI (0.00–0.69), $P = 0.02$] or free flap reconstruction [OR 0.39, 95% CI (0.15–0.88), $P = 0.02$]; however, they were equally likely to receive a local tissue rearrangement or revision amputation ($P \geq 0.45$). Weekend presentation was associated with decreased likelihood of bone graft [OR 0.03, 95% CI (0.00–0.20), $P < 0.01$], with no differences in other bone, vascular, nerve, or tendon-related interventions ($P \geq 0.08$; Table 3).

Outcomes and Complications

There were no significant differences between groups in number of operations, with an overall median of two operations (IQR 1–4) per injury ($P = 0.37$). Length of stay and length of follow-up were comparable between groups, with a median length of stay of five days (IQR 2–11 days; $P = 0.68$), and follow-up of 3.37 months (IQR 1.43–8.28 months, $P = 0.51$). On bivariate analysis, weekend presentation was associated with comparable rates of all complications ($P \geq 0.10$; Table 4). Upon multivariable regression, weekend presentation was a significant independent risk factor for amputation of the affected extremity [weekend: 23%, weekday: 13%; OR 2.27, 95% CI (1.01–5.33), $P = 0.05$]. Pedicled flap reconstruction was associated with increased odds of amputation [OR 12.1, 95% CI (2.50–66.86), $P < 0.01$]. Weekend presentation was not a significant risk factor for any-cause complications in multivariable regression analysis (weekend: 64%,

Table 3. Interventions Received

Intervention	Overall (n = 100)	Weekday (n = 61)	Weekend (n = 39)	P
Primary closure	50 (50.0)	31 (50.8)	19 (48.7)	0.96
Negative-pressure wound therapy	34 (34.0)	17 (27.9)	17 (43.6)	0.01
Revision amputation	33 (33.3)	19 (31.1)	14 (35.9)	0.66
Regional anesthesia	31 (31.0)	19 (31.1)	12 (30.8)	0.92
Skin substitute	12 (12.0)	7 (11.5)	5 (12.8)	0.29
Skin graft	45 (45.0)	25 (41.0)	20 (51.3)	0.10
Local tissue rearrangement	15 (15.0)	9 (14.8)	6 (15.4)	0.45
Pedicled flap	5 (5.0)	5 (8.2)	0 (0.0)	0.02
Free flap	16 (16.0)	12 (19.7)	4 (10.3)	0.02
Replantation	6 (6.0)	4 (6.6)	2 (5.1)	0.95
Vascular reconstruction	10 (10.0)	8 (13.1)	2 (5.1)	0.08
Graft	9 (9.0)	7 (11.5)	2 (5.1)	
Primary	2 (2.0)	1 (1.6)	1 (2.6)	
Vascular ligation	16 (16.0)	8 (13.1)	8 (20.5)	0.28
Bony fixation	42 (42.0)	26 (42.6)	16 (41.0)	0.20
Bone graft	6 (6.0)	6 (9.8)	0 (0.0)	<0.01
Nerve repair	20 (20.0)	14 (23.0)	6 (15.4)	0.26
Nerve transfer	5 (5.0)	3 (4.9)	2 (5.1)	0.60
Nerve graft	7 (7.0)	4 (6.6)	3 (7.7)	0.99
Fasciotomy	8 (8.0)	6 (9.8)	2 (5.1)	0.43
Tendon repair	28 (28.0)	20 (32.8)	8 (20.5)	0.10
Tendon transfer	2 (2.0)	1 (1.6)	1 (2.6)	0.81
Tendon graft	1 (1.0)	1 (1.6)	0 (0.0)	0.52

P values are from weighted univariate Firth logistic regressions. All values are in n (%).

Table 4. Complications

Complication	Overall (n = 100)	Weekday (n = 61)	Weekend (n = 39)	P
Skin necrosis (%)	29 (29.0)	20 (32.8)	9 (23.1)	0.26
Infection (%)	28 (28.0)	15 (24.6)	13 (33.3)	0.12
Hematoma (%)	6 (6.0)	5 (8.2)	1 (2.6)	0.17
Neuroma (%)	7 (7.0)	3 (4.9)	4 (10.3)	0.26
Dehiscence (%)	13 (13.0)	9 (14.8)	4 (10.3)	0.10

P values are from weighted univariate Firth logistic regressions. All values are in n (%).

weekday: 70%; $P = 0.28$). NPWT, free flap reconstruction, and bone graft were associated with increased risk of complications in the multivariable model ($P < 0.01$). (**See table 2, Supplemental Digital Content 2,** which displays multivariable logistic regression for any-cause complications. **http://links.lww.com/PRSGO/C820**.)

Weekend presentation was also not associated with functional deficits (weekend: 39%, weekday: 48%; $P = 0.84$), though both free flap reconstruction and bone graft use were associated with functional deficits ($P \leq 0.02$). (**See table 3, Supplemental Digital Content 3,** which displays multivariable logistic regression for functional deficits. **http://links.lww.com/PRSGO/C821**.) Analyzing unilateral cases (n = 92), the association between weekend presentation and amputation did not reach statistical significance [OR 2.29 (0.97–5.70), $P = 0.06$], but relationships between all other predictors and outcomes in all multivariate models were unchanged. (**See table 4, Supplemental Digital Content 4,** which displays multivariate logistic regressions excluding bilateral cases. **http://links.lww.com/PRSGO/C822**.)

DISCUSSION

This study investigated whether a weekend effect exists in management of open extremity degloving injuries. We found that weekend presentation was associated with increased likelihood of NPWT, and decreased likelihood of pedicled or free flap reconstruction and bone grafts. Weekend presentation was a significant risk factor for amputation in multivariable regression adjusting for interventions, injury severity, and comorbidities.

Our finding that weekend presentation was a significant risk factor for amputation mirrors prior findings that patients presenting on weekends with critical limb ischemia of the lower extremity have an elevated risk of amputation.[9] Although this was not significant when excluding bilateral cases, a trend toward increased odds of amputation on weekends was noted. Further study in a sample with more bilateral cases will allow for balanced analysis of this effect. Differences in staffing, operating room availability, and diagnostic/imaging services have been proposed as contributors to observed weekend effects.[5,9,23] Some of these factors may have contributed to observed differences in management of degloving injuries; however, our findings (including comparable time to reconstructive consult and definitive closure) between groups points to decision-making factors rather than to simply delays in care contributing to observed outcomes. Possible contributors include differences in overall ED volume on weekends, including more nonemergency visits and a higher volume of pages to surgical subspecialty services, which together may impact quality of care received by patients experiencing degloving injuries on weekends.[24,25] Increased cognitive load, which physicians may experience in a busy weekend

ED, is associated with differences in decision-making.[26] In high-demand clinical situations, the use of simulation training, mobile clinical support tools, and standardized protocols have been useful in decreasing cognitive load and increasing accuracy and efficiency of treatment decisions.[27–29] Devising care pathways for assessment and triage of extremity degloving injuries based on injury severity/characteristics may help combat differences in observed outcomes and interventions.

Pedicled flap reconstruction was independently associated with amputations, and free flap reconstruction was associated with complication risk and functional deficits. Historically, functional outcomes years after traumatic extremity injury are comparable between patients who undergo limb salvage efforts, including flap reconstruction and patients who undergo amputation, with high rates of disability in both groups.[30–32] Our examination of functional deficits was limited to several months postoperatively. With longer follow-up, flap reconstruction might not be associated with increased risk of deficits. Both pedicled and free flaps have been described as successful coverage options for degloving injuries, and choice of coverage often depends on nuances of injury patterns and surrounding anatomy.[33–35] Comparisons of outcomes of different flap options for degloving injuries have not been reported, likely due to the diversity of flaps considered based on injury location, but further study may contribute to our understanding of optimal flap choice.

Weekend presentation was associated with decreased likelihood of pedicled or free flaps. Though differences in flap reconstruction may be expected based on covering service, weekend presentation was not associated with differences in covering subspecialty, and extremity trauma call is shared between orthopedic and plastic surgery at our institution. Increased latency to assessment by plastic surgeons has been associated with prolonged hospitalization and increased number of operations for patients with trunk or limb degloving injuries.[36] However, in our cohort, weekend presentation was not associated with differences in latency from presentation to reconstructive consult.

Bony injury rates were similar between weekend and weekday groups; however, injuries presenting on weekends were less likely to be managed using bone grafts, suggesting differential management of bony injury by day of presentation. When degloving injuries are accompanied by fractures, patients have been shown to be at risk of poor outcomes.[2,37] Our findings that bone grafts are significantly associated with functional deficits and complication risk align with this observation, as patients receiving bone grafts may have more severe bony injury than patients with bony injury not receiving grafts. Existing studies on outcomes of vascularized and nonvascularized bone grafts in upper and lower extremity reconstruction have reported mixed functional outcomes, noting improvements in upper but not lower extremity functional scores, and reporting high rates of graft hypertrophy, especially in the lower extremity.[38–41] Graft choice may affect risk of poor functional outcomes[40]; however, existing findings are limited to small cohorts. Studies in larger samples can inform optimal graft choice to improve functional outcomes in patients with bony extremity trauma.

We observed that weekend presentation was associated with increased rates of NPWT use. Reports on outcomes after NPWT use in the management of degloving injuries are mixed, suggesting improved skin graft take and wound healing, but possible risk of skin necrosis and increased costs.[42,43] Results of a Cochrane meta-analysis show considerable uncertainty regarding the value of NPWT in reducing dehiscence and seroma.[44] Further work in a large cohort exploring the value of NPWT in the management of open extremity degloving injuries is warranted.

Our goal is for these findings to inform changes to weekend practice patterns to improve outcomes in patients with extremity degloving injuries. Changes in weekend ED staffing have previously been suggested as a method to adapt to differences in ED volume on weekends.[24] In an attempt to alleviate the risks of adverse outcomes with weekend presentation, the National Health Service of the United Kingdom enacted their "National Health Service Services, Seven Days a Week" program, which sought to expand access to diagnostic, urgent, and emergent healthcare resources throughout the week. After three years of implementation, hospitals enacting these changes saw improvements in errors and adverse events across all admissions, but did not see improvements in weekend adverse outcomes (including mortality), suggesting that large-scale changes to hospital staffing may not resolve all existing disparities between weekend and weekday admissions.[45,46] Quality improvement initiatives at the single-institution level may have an impact, as some weekend effects seem to differ based on institutional coverage policies.[47] Existing quality improvement work has focused on error-prone points of care.[48] One study used video analysis of handoffs and found that surgeon handoffs are actually better on nights and weekends than on weekdays.[49] Unobtrusive methods like video analysis may inform targeted changes to care protocols that alleviate observed weekend effects.

Weekend effects are less prevalent at high volume centers in the management of stroke and myocardial infarction.[50–52] Limb salvage rates after critical limb ischemia are also higher at high volume centers.[53,54] Further study of the schedules, size, and availability of limb salvage teams at both high and low volume centers may inform changes to alleviate weekend effects in management of degloving injuries. Increased utilization of advanced practice providers on weekends may also alleviate coverage deficits.[55] Additionally, telemedicine consultations with limb salvage specialists on weekends or at hospitals with limited limb salvage teams may help deliver expedient care and improve outcomes.[56]

Limitations of this study include a limited sample from a single academic, tertiary care center. This may restrict generalizability; however, most of the literature on open degloving injuries consist of case reports, with few cohort studies available. This cohort of open extremity degloving injuries represents one of the largest to date.[2,37,42,43,57] Studying these injuries in national databases is difficult, given the lack of specific diagnostic codes. Multi-institutional cohorts may provide insights to extend

our findings and optimize care. Additionally, we used MESS to characterize degloving injury severity, which has received criticism for poor correlations with limb salvage rates and mixed prediction of amputation risk based on injury type.[58–61] However, in combination with ISS, MESS may have higher predictive value for amputation, and both scores were considered in this study.[62] Additionally, injury severity informs choice of interventions; so it was important to balance injury severity across groups to examine true effects of weekend presentation on interventions and outcomes. Further work optimizing risk prediction scores for extremity injury is necessary and may provide a more accurate picture of risk factors for amputation after degloving injuries in the future.

CONCLUSIONS

Weekend presentation may impact interventions received and amputation risk in patients with open extremity degloving injuries. Further work exploring weekend availability of limb salvage services may contribute to improvements in outcomes for patients presenting on weekends with these complex injuries. Large-scale studies of management of degloving injuries are necessary to understand optimal treatment algorithms.

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DISCLOSURES

Dr. Sacks is a co-founder and equity holder of LifeSprout, and a consultant for 3M. All the other authors have no financial interest to declare in relation to the content of this article.

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