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ORIGINAL RESEARCH

Epidemiology of Penile Fractures in United States Emergency Departments: Access to Care Disparities May Lead to Suboptimal Outcomes

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ABSTRACT

Introduction: The epidemiology of penile fractures in the emergency setting is not well described.

Aim: Examine the incidence, evaluation, management, risk factors predicting surgical repair or hospital transfer, and use of financial resources in patients presenting with penile fractures to the emergency departments (ED) nationwide in the Unites States.

Methods: ED visits with a primary diagnosis of penile fractures (*International Classification of Diseases, Ninth Edition* codes) between 2010-2014 were abstracted from the Nationwide Emergency Department Sample.

Main Outcome Measure: Penile fracture incidence, disposition, hospital, and clinical factors which were associated with immediate surgical repair or transfer to another institution, and cost were investigated.

Results: 8,029 ED visits for penile fracture in the United States were observed, which represents a national incidence of 1.02 per 100,000 male subjects per year. No meaningful trends in incidence were observed over the 5-year period. 63.9% were treated non-surgically or discharged from the ED, 25.7% underwent surgical repair, and 10.3% were transferred to other institutions. Hospital factors which predicted surgical repair included Northeast region, teaching hospital status, trauma hospital status, high volume ED, and urban location. Clinical risk factors which predicted surgical repair included hypertension, smoking, alcohol dependence, drug abuse, erectile dysfunction, hematuria, urethral injury, and urinary retention. Factors leading to patient transfers included non-academic, rural and non-trauma hospitals, low economic income and low emergency department volume. In addition, weekend and spring presentation were associated with higher transfer rates, while summer presentation was associated with surgical repair.

Clinical Implications: A large proportion of penile fractures are discharged from the ED, indicating possible health care access disparity.

Strengths & Limitations: This is one of the first population-based study of penile fracture incidence, disposition, risk factors which predict surgery or transfer, and cost in the US ED setting. The unexpected high number of discharges may be a result of misdiagnosis; alternatively these data may reveal previously under-reported management patterns in the community.

Conclusion: This large retrospective study of penile fractures in the US ED setting demonstrates a stable incidence of penile fractures presenting to the US emergency departments. A quarter of patients undergo immediate surgical repair, 10% are transferred to other institutions and 63.9% of patients are discharged home. The high proportion of ED discharges may be due to access to health care disparities. **Rodriguez D, Li K, Apoj M, et al. Epidemiology of Penile Fractures in United States Emergency Departments: Access to Care Disparities May Lead to Suboptimal Outcomes. J Sex Med 2019;16:248–256.**

Key Words: Penile Rupture; Emergency Room; Access To Care; Healthcare Disparity

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INTRODUCTION

Penile fracture is defined as a rupture of the tunica albuginea of the corpus cavernosum. It is classically described as a traumatic event during rigid erection that results in a cracking sound, pain, and rapid detumescence, leading to swelling and ecchymosis.[1]

Table 1. Characteristics of men diagnosed with penile fracture in the U.S. from 2010–2014

	Total		Discharged from ED		Immediate Surgical Repair		Transferred patients		
Characteristic	(N)	%	(N)	%	(N)	%	(N)	%	*P* value
Number of patients	8,029	100.0	5,138	63.9	2,063	25.7	828	10.3	$P < .01$
Age in years (mean ± SE)	38.36 ± 0.13		37.84 ± 0.16		39.25 ± 0.25		39.41 ± 0.46		
Hospital U.S. region									$P < .01$
Northeast	1,249	15.6	682	54.6	487	39.0	80	6.4	
Midwest	1,918	23.9	1,362	71.0	349	18.2	207	10.8	
South	3,310	41.2	2,252	68.0	770	23.3	287	8.7	
West	1,552	19.3	841	54.2	457	29.4	253	16.3	
Hospital teaching status									$P < .01$
Nonteaching	3,612	45.0	2,295	44.7	665	32.2	176	21.3	
Teaching	4,417	55.0	2,844	55.3	1,397	67.7	652	78.7	
Trauma hospital status									$P < 0.01$
Non-trauma	4,319	53.8	2,734	53.2	962	46.6	624	75.4	
Trauma	3,709	46.2	2,405	46.8	1,101	53.4	204	24.6	
ED volume									
High volume	6,045	75.3	4,241	71.1	1,804	87.4	288	34.7	
Low volume	1,984	24.7	1,725	28.9	259	12.6	540	65.3	
Hospital location									$P < .01$
Rural	1,207	15.0	712	13.9	127	6.2	368	44.5	
Urban	6,821	85.0	4,426	86.1	1,935	93.8	460	55.5	
Income									$P < .01$
Low	2,431	30.3	1,501	29.2	609	29.5	321	38.8	
Not low	5,598	69.7	3,637	70.8	1,454	70.5	507	61.2	
Urethral injury	655	8.1	244	4.7	399	19.3	12	1.5	$P < .01$
Weekend presentation	2,942	36.6	1,834	35.7	771	37.4	338	40.8	$P < .01$
Season of presentation									$P < .01$
Winter	1,740	21.7	1,139	22.2	478	23.2	124	14.9	
Spring	2,111	26.3	1,326	25.8	519	25.2	265	32.1	
Summer	2,369	29.5	1,605	31.2	518	25.1	246	29.7	
Fall	1,804	22.5	1,069	20.8	542	26.3	193	23.3	

ED = emergency department; SE = standard error; U.S. = United States.

Penile fractures are a rare urologic emergency, with an estimated incidence between 0.29–1.36 per 100,000 inhabitants.[2–4] However, the true incidence may be underreported.[5] In addition, the incidence may be higher in Middle Eastern and North African countries due to "taghaandan," the forcible snapping of an erect penis.[6–10] Although uncommon, penile fracture represents a true urologic emergency and can result in significant patient morbidity if not repaired expeditiously.[11–13]

Although history and physical alone are enough to establish a diagnosis of penile fracture, imaging can help confirm the diagnosis, determine the exact location of tunica tear, and assess for urethral involvement.[11] Ultrasound and magnetic resonance imaging are the 2 most well-described imaging modalities for confirming the diagnosis and determining the location of tunica tear.[14–17] Historically, penile fractures were managed nonsurgically; however, because of ≤50% complication rates, this approach has been abandoned in favor of surgical exploration and repair.[12,13,18] Complications include erectile dysfunction, penile deformity/curvature, plaques, painful erections, and infected hematomas.[11–13,18]

The aim of this study is to investigate the incidence, time of presentation, seasonality, management, and disposition of patients presenting with penile fractures in US emergency departments (ED). We also assess how clinical and socioeconomic risk factors, as well as hospital characteristics, affect management and hospital transfers.

MATERIALS AND METHODS

Data Source & Study Design

This is a retrospective cross-sectional study of penile fracture (2010–2014) ED visits using the Nationwide Emergency Department Sample (NEDS).[19] The NEDS is the largest all-payer ED database in the US, encompassing 953 hospitals across 35 states. It represents a 20% stratified sample of US hospital–based ED and is weighted to allow population-level

estimates of the sampled observations to represent a total of nearly 143 million ED visits in the United States each year. Institutional review board approval was not necessary in accordance with institutional guidelines.

Sample Population

Data from patients >15 years old with a primary diagnosis of penile fracture (ICD-9-CM code 959.13) were abstracted and considered for analysis, resulting in the identification of 1,759 ED visits for penile fractures between January 2010−December 2014. Weighted population estimates were projected to national levels using discharge stratum weights, resulting in a weighted estimate of 8,029 visits for penile fracture. Incidences were normalized to population estimates from 2010 US Census data.

Baseline Patient and Hospital Characteristics

Several demographic variables were available (Table 1). Low income was defined as belonging to a Zip code with a median household income in the lowest quartile (<$39,999). Data regarding race and ethnicity are not captured in NEDS. The presence of multiple clinical risk factors was obtained based on ICD-9 codes (Appendix A). Low-volume hospitals were defined as those with ED visit volumes in the lowest quartile. Detailed descriptions of the definitions of hospital characteristics are available in the NEDS documentation.[19]

Statistical Analysis

All statistical analyses were weighted to allow population-level estimates of the sampled observations. Frequencies and proportions were generated to summarize categorical variables, and the Mann-Whitney and χ^2 tests were used to assess statistically significant differences. A 1-sample *t*-test of weighted proportion was used to test whether weekend admission was significant against an expected 2 of 7 (28.6%) days representing the weekend presentation group. Weighted univariate and multivariate logistic regression models were used to identify independent clinical and socioeconomic risks factors, as well as hospital characteristics associated with undergoing penile fracture repair and similarly independent socioeconomic risk factors and hospital characteristics associated with hospital transfer. Statistical analyses were performed with JMP Pro Version 14 (JMP, Cary, NC,USA) and SPSS Statistical Package Version 23.0 (SPSS, Chicago, IL,USA). $P < .05$ was considered statistically significant. All statistical tests were 2-sided.

RESULTS

Between 2010−2014, a weighted estimate of 8,029 visits to the ED for penile fractures was recorded in the United States in patients >15 years of age, which represents a national incidence of 1.02 per 100,000 male subjects per year (±0.068 SE), or 1,606 ED visits per year. No meaningful trends in incidence were observed over the 5-year study period. Penile magnetic resonance imaging and penile ultrasound scanning were only used in <2% of cases.

Patient demographics and hospital characteristics are summarized in Table 1. 63.9% of patients were evaluated and discharged from the ED, 25.7% of patients underwent immediate surgical repair and 10.3% of patients were transferred to another institution for further management. The overall mean age was 38.36 ± 0.13 years. The incidence of penile fractures was more common during the summer months ($P < .01$; Figure 1) and weekends ($P < .01$).

The largest proportion of patients was seen in hospitals located in the South (41.2%), with the Northeast region as the least represented (15.6%). However, those patients seen in the Northeast were more likely to undergo immediate surgical repair (39% vs 23%) as compared with in the South ($P < .01$). The Midwest region had the lowest percentage of patients undergoing immediate surgical repair with only 18.2% and had the largest proportion of patients being discharged from the ED (71%).

The West region of the United States had the highest transfer rate (16.3%), and the Northeast had the lowest (6.4%). Most patients were evaluated in urban areas (85%), in teaching hospitals (55%), and in trauma centers (46%). Patients were more likely to undergo immediate surgical repair in teaching institutions (67.7%), trauma centers (53.4%), and urban hospitals (93.8%) ($P < .01$).

Urethral injury was diagnosed in 8.1% of patients. Mean age of patients with concurrent urethral injury was found to be significantly greater than patients without urethral injury (37.8 vs 39.3 years, $P < .01$). Urethral evaluations consisted of cystoscopy and retrograde urethrography in 80% and 20%, respectively. Interestingly, 76.7% of patients with urethral injuries did not undergo formal urethral evaluation with cystoscopy or urethrography but were diagnosed during surgery.

Multivariate logistic regression analysis was used to determine independent clinical risk factors associated with immediate penile fracture repair (Table 2). Hypertension (odds ratio [OR] 1.85), smoking (OR 1.33), alcohol dependence (OR 4.12), drug abuse (OR 2.67), erectile dysfunction (OR 4.37), hematuria (OR 2.11), urethral injury (OR 4.42), and urinary retention (OR 3.45) were all significant independent predictors of immediate repair (all *P* values < .05). However, age, diabetes, hypercholesterolemia, and hypogonadism were not independent risk factors for immediate surgical repair (all *P* values > .05).

Multivariate logistic regression was also used to determine independent socioeconomic risk factors and hospital characteristics associated with immediate penile fracture repair (Table 3). Patient age (32−44 years old; OR 1.373; $P < .001$); geographic region (northeast; OR 2.92), teaching hospital status (OR 1.50; $P < .01$), trauma hospital status (OR 1.18; $P = .004$), non-low volume ED (OR 1.85; $P < .001$), urban location (OR 1.95; $P < .01$), summer presentation (OR 1.3; $P < 0.001$) were

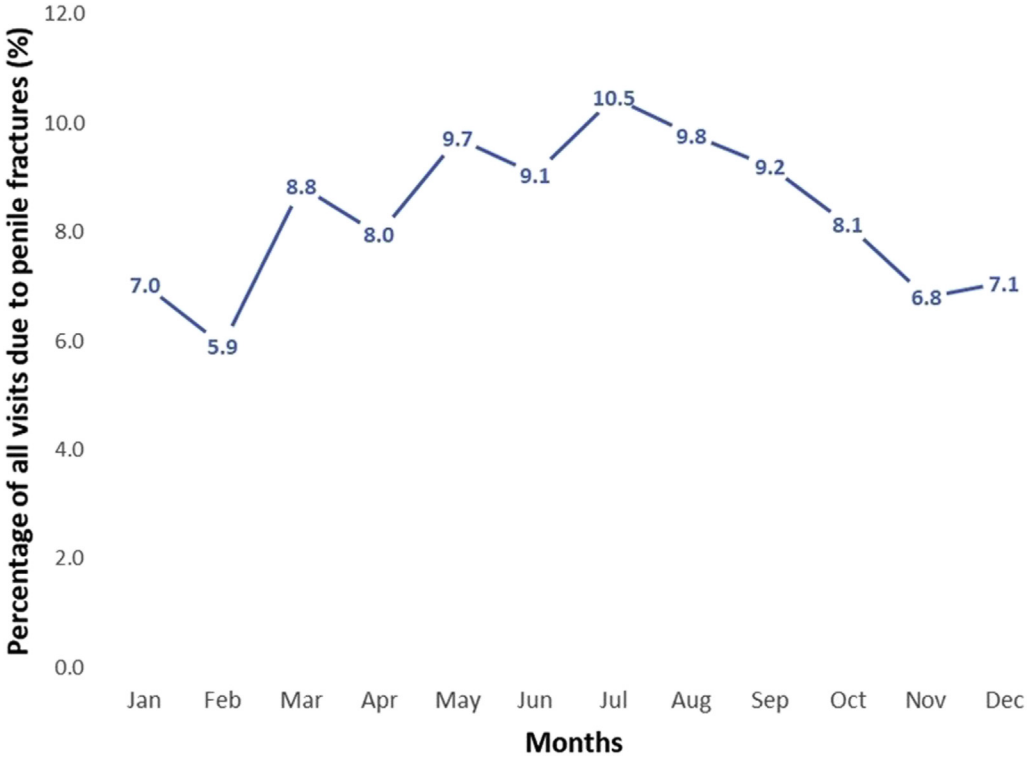

Figure 1. Percentage of penile fractures diagnosed in United States emergency departments by month. Figure 1 is available in color online at www.jsm.jsexmed.org.

independent predictors of undergoing immediate surgical repair. There was no association between immediate surgical repair with income level ($P = .38$) or weekend presentation ($P = .23$).

Multivariate logistic regression analysis determined independent socioeconomic risks factors and hospital characteristics leading to hospital transfer (Table 4). Patients age (>44 years old; OR 1.22; $P = .047$), geographic region (Midwest; OR 2.61; $P < .001$), non-teaching status (OR 2.76; $P < .001$), non-trauma center status (OR 1.92; $P < .001$), low ED volume (OR 3.72; $P < .001$), rural location (OR 4.17; $P < .001$), low income level (OR 1.62; $P < .001$), weekend presentation (OR 1.28; $P = .002$), and spring presentation (OR 1.78; $P < .001$)

Table 2. Weighted multivariate logistic regression of clinical risk factors leading to need for penile fracture repair

	Univariate analysis			Multivariate analysis		
	OR	95% CI	*P* value	OR	95% CI	*P* value
Age						
<32 yrs	Reference group			Reference group		
32–44 yrs	1.392	1.224–1.582	<.001	1.080	0.943–1.236	.269
>44 yrs	1.030	0.910–1.166	.639	0.841	0.739–0.956	.008
Diabetes	1.353	0.996–1.838	.053	1.019	0.745–1.393	.909
Hypertension	1.969	1.700–2.282	<.001	1.590	1.350–1.874	<.001
Smoking	1.484	1.316–1.675	<.001	1.339	1.182–1.517	<.001
Alcohol	8.954	3.295–24.335	<.001	3.574	1.208–10.574	.021
Drug abuse	3.457	2.598–4.600	<.001	3.430	2.567–4.582	<.001
Peyronie's disease	2.285	1.429–3.623	.001	1.651	1.101–1.875	.050
Erectile dysfunction	5.222	3.597–7.582	<.001	4.242	2.900–6.204	<.001
Hypercholesterolemia	1.792	1.403–2.288	<.001	1.439	1.105–1.875	.007
Hypogonadism	2.255	0.608–8.357	.224	3.564	0.960–13.226	.057
Hematuria	1.502	1.104–2.045	.010	1.129	0.819–1.556	.460
Urethral injury	4.805	4.059–5.688	<.001	4.421	3.745–5.416	<.001
Urinary retention	3.446	2.094–5.672	<.001	3.652	2.197–6.069	<.001

OR = odds ratio.

Table 3. Weighted multivariate logistic regression of socioeconomic risk factors and hospital characteristics leading to immediate penile fracture surgical repair

	Univariate analysis			Multivariate analysis		
	OR	95% CI	*P* value	OR	95% CI	*P* value
Age						
<32 yrs	Reference group			Reference group		
32–44 yrs	1.392	1.224–1.582	<.001	1.373	1.199–1.573	<.001
>44 yrs	1.030	0.910–1.166	.639	1.007	0.884–1.147	.916
Hospital U.S. region						
Midwest	Reference group			Reference group		
South	1.313	1.115–1.545	.001	1.282	1.083–1.516	<.001
West	2.086	1.810–2.405	<.001	1.956	1.685–2.270	<.001
Northeast	2.789	2.364–3.291	<.001	2.922	2.462–3.468	<.001
Hospital teaching status						
Non-teaching	Reference group			Reference group		
Teaching	1.694	1.522–1.887	<.001	1.503	1.331–1.696	<.001
Trauma hospital status						
Non-trauma	Reference group			Reference group		
Trauma Level 1 -3	1.301	1.175–1.445	<.001	1.184	1.056–1.329	.004
ED volume						
Low volume	Reference group			Reference group		
Not low volume	2.762	2.404–3.174	<.001	1.852	1.585–2.164	<.001
Hospital location						
Rural	Reference group			Reference group		
Urban	2.445	2.008–2.976	<.001	1.949	1.587–2.392	<.001
Income						
Low	Reference group			Reference group		
Not low	1.014	0.907–1.135	.805	1.054	0.936–1.188	.383
Weekend presentation						
No	Reference group			Reference group		
Yes	1.075	0.967–1.196	.178	1.07	0.959–1.194	.229
Season of presentation						
Winter	Reference group			Reference group		
Spring	1.210	1.042–1.403	.012	1.118	0.959–1.305	.155
Summer	1.297	1.122–1.499	<.001	1.311	1.128–1.523	<.001
Fall	1.571	1.361–1.812	<.001	1.503	1.297–1.742	.004

ED = emergency department; OR = odds ratio; U.S. = United States.

were all independent predictors of undergoing hospital transfer for further evaluation and management.

Hospital costs for patients evaluated and discharged from the ED and for those admitted (mean length of stay 1.28 days) were approximately $7,680 and $21,836, respectively, with a total combined national annual cost of $17,890,626 (patients evaluated, discharged or transferred $8,233,361 and hospitalizations $9,657,265 per year)

DISCUSSION

This retrospective observational study of penile fractures using data from NEDS is the largest study available to date. Penile fractures are a rare urologic emergency, with a previously estimated incidence of 0.29–1.36 per 100,000 inhabitants.[2–4] However, other investigators have suggested that the true incidence of penile fractures is underreported.[5] The estimated incidence of our study is 1.02 per 100,000 subjects per year, which is consistent with prior epidemiologic studies.

Interestingly, only 25.7% of the patients presenting to the ED underwent immediate surgical repair, and 10.3% were transferred to another institution for further management. This implies that approximately 64% of patients were discharged from the ED. It is unclear why patients were discharged from the ED without undergoing surgical repair, but we hypothesize that a portion of these discharges were improperly coded. It is possible that these patients sustained penile trauma without a true fracture, but the penile fracture code (International Classification of Diseases–ninth edition ([ICD-9] code 959.13) was used. Another explanation could be that some patients were discharged from the ED with urology follow-up. However, it is difficult to determine whether this took place and how many patients

Table 4. Weighted multivariate logistic regression of socioeconomic risk factors and hospital characteristics leading to hospital transfer

	Univariate analysis			Multivariate analysis		
	OR	95% CI	*P* value	OR	95% CI	*P* value
Age						
<32 yrs	Reference group			Reference group		
32–44 yrs	1.145	0.965–0.1359	.120	1.119	0.922–1.358	.254
>44 yrs	1.428	1.193–1.708	<.001	1.22	1.003–1.485	.047
Hospital U.S. region						
Midwest	Reference group			Reference group		
South	2.846	2.187–3.704	<.001	2.608	1.967–3.457	<.001
West	1.611	1.323–1.962	<.001	1.515	1.219–1.883	<.001
Northeast	2.052	1.712–2.459	<.001	2.571	2.095–3.156	<.001
Hospital teaching status						
Non-teaching	Reference group			Reference group		
Teaching	5.319	4.464–6.289	<.001	2.755	2.252–3.356	<.001
Trauma hospital status						
Non-trauma	Reference group			Reference group		
Trauma level 1–3	2.908	2.466–3.429	<.001	1.923	1.594–2.320	<.001
ED volume						
Low volume	Reference group			Reference group		
Not low volume	7.496	6.424–8.746	<.001	3.722	3.086–4.488	<.001
Hospital location						
Rural	Reference group			Reference group		
Urban	6.067	5.197–7.083	<0.001	4.170	3.494–4.976	<.001
Income						
Low	Reference group			Reference group		
Not low	1.530	1.318–1.775	<.001	1.617	1.364–1.917	<.001
Weekend presentation						
No	Reference group			Reference group		
Yes	1.214	1.049–1.406	.009	1.284	1.095–1.506	.002
Season of presentation						
Winter	Reference group			Reference group		
Spring	1.568	1.238–1.986	<.001	1.782	1.379–2.303	<.001
Summer	0.834	0.685–1.015	.07	0.862	0.695–1.071	.179
Fall	1.036	0.849–1.264	.730	1.047	0.844–1.299	.675

ED = emergency department; OR = odds ratio; U.S. = United States.

underwent subsequent surgical vs non-surgical management. Finally, some patients who presented to the ED with a true penile fracture could have been mismanaged. If this is the case, a significant number of patients could develop complications (erectile dysfunction, penile deformity/curvature, penile plaques, painful erections, infected hematomas, urethra-cutaneous fistulas, etc), which has been reported in ≤50% of cases when compared with early surgical repair (20.6%).[11,12,20] The American Urological Association recommends prompt surgical exploration and repair with a grade B recommendation.[21] This may indicate a potential knowledge gap in the appropriate management of penile fractures. A contributing factor may be that, historically, penile fractures were managed conservatively.[12] However, a contemporary large meta-analysis by Amer and colleagues[12] (n = 1,948) reported that only 4.6% of patients underwent conservative management. This highlights the selective publication of patients who undergo surgery and the potential under-representation of the patients who are managed conservatively. Because there is an inherent bias to publish patient results in accordance with standards of care, the pre-existing penile fracture literature may be skewed toward surgical repair. Because this is the first population-based report on penile fracture disposition in the ED setting, these results may represent the true practice patterns in the community.

Clinical risk factors predisposing to penile fracture have yet to be described in the literature. Logistic regression analysis indicated that patients with hematuria, urethral injury, and urethral evaluation were more likely to undergo immediate surgical repair. Other risk factors such as hypertension, drug and alcohol abuse, smoking, and erectile dysfunction were also significant. It is possible that these clinical risk factors may result in suboptimal penile rigidity and more vigorous sexual activity, which may result in higher penile fracture rates.

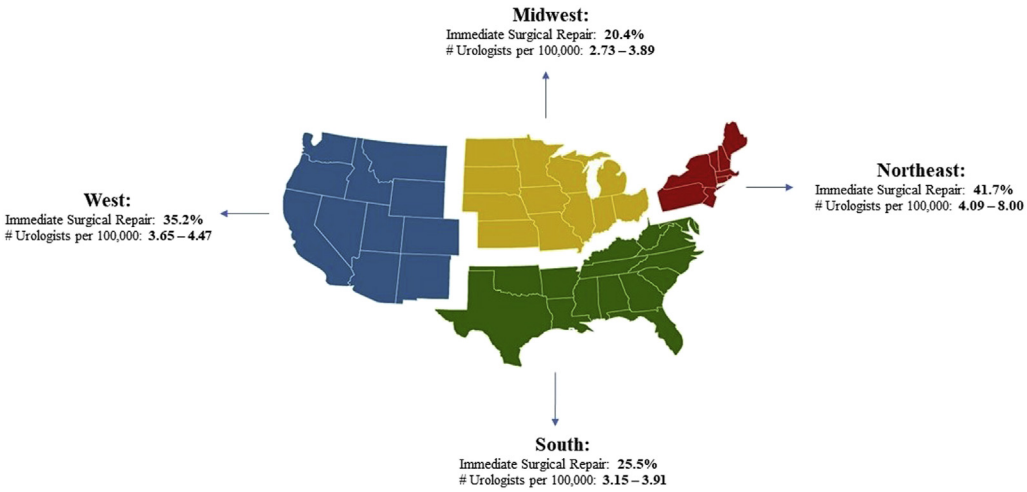

Figure 2. Rates of immediate penile surgical repair and ratio of practicing urologist to population by country region. Source: AUA Census 2016—The State of the Urology Workforce and Practice in the United States. (Data source: National Provider Identifier 09/2016 file, ABU certification records from the ABMS Directory of Board Certified Medical Specialists, AOA DO Directory.) Figure 2 is available in color online at www.jsm.jsexmed.org.

Current literature estimates urethral involvement in 6−38% of cases.[5,11,12] A large National Inpatient Sample study published by Pariser and colleagues[22] reported 21% urethral involvement. However, the NIS study only reflects the inpatient penile fracture population. Our study documents an 8% incidence of urethral injury, which we believe is more accurate, given that not all patients presenting with penile fracture in the ED result in inpatient admission. Concordantly, we found that patients with urethral injury had a much higher chance of being admitted (63.7% vs 25.8%). Another explanation for the low percentage of urethral injuries could be a factitiously larger number of penile fracture misdiagnosis.

There is also a surprisingly low percentage of magnetic resonance imaging or penile ultrasound use in our study cohort. We suspect this may be due to incomplete capturing of these radiologic evaluations in the NEDS database.

Socioeconomic risk factors and hospital characteristics leading to immediate surgical repair were also investigated using weighted multivariate logistic regression analysis. Patients from the Northeast region; admitted to urban, academic, and level 1−3 trauma hospitals; who were not low income; and who were treated in EDs that were not low volume were more likely to undergo surgical repair. In addition, presentation during the summer and fall months was also more likely to result in immediate surgical repair.

Factors leading to patient transfers included non-academic, rural, and no trauma hospitals, low income status, and low ED volume. In addition, weekend, spring presentation, and Midwest and West regions were associated with higher transfer rates.

The incidence of penile fractures was more common during the summer than winter months (29.5% vs 22.5% and 22.4%; $P < .01$; Table 1). This observation is supported by a recent study by Demir et al,[23] which documents that the frequency of sexual activity increases from 17.4 attempts/week (winter) to 28.1 during the summer. They also suggest that this may be secondary to increase levels of testosterone levels (360.2−524.2 ng/dL). In addition, penile fractures were more common during weekends ($P < .01$; Table 1). A study from Palmer et al[24] documents a higher frequency of sexual activity during weekends, with an average daily rate increased to 40.3% on Saturdays and 52.6% on Sundays. In addition, they also found that multiple copulations were more common during weekends. In consequence, it is more likely that fractures take place during periods of higher frequency of sexual activity (weekends and summer months).

The South had the highest presentation rate (41.2%) of penile fractures in the United States, followed by the Midwest, West, and Northeast (15.6%) regions of the country. However, patients from the Northeast are more likely to undergo immediate surgical repair when compared with other regions. The Midwest region had the lowest percentage (18.2 %) of patients undergoing immediate surgical repair and the largest rates of ED discharges. It is unclear why these differences exist, but 1 explanation may be that access to medical care is better in the Northeast. This hypothesis is supported by the American Urological Association census from 2016 (Figure 2), which demonstrates that the Northeast has the highest urologist-to-population ratio.

Hospital costs for patients evaluated and discharged from the ED and for those admitted (mean length of stay 1.28 days) were approximately $17,890,626. However, the high ED discharge rate and the relatively low immediate surgical and transfer rates may result in a high complication rate, which may increase the economic impact of penile fractures.

Access to care and health care disparities in urology is a well-studied phenomenon that may be responsible for many of the management patterns illustrated in this study, such as factors

leading to patient transfers (non-academic, rural, and non-trauma hospitals, low economic income, and low ED volume). Data from the 2004 United States Census demonstrated that 63% of counties in the United States lacked urologists.[25] Rural counties comprised 21.3% of all counties, but, more importantly, only 4% of rural counties had any urologists.[26] In addition, on average of there is only 1 urologist in rural vs 7 in urban areas.[27] Another alarming fact is that between 2004–2009, 24% of counties lost urologists relative to the population, whereas only 18% of counties gained urologists, which could be explained by the growing shortage of urologists in the United States.[28] The reason for these access-to-care disparities is unlikely to be limited to geography; additional factors may be involved, such as discrimination based on race/ethnicity, sexual orientation, disabilities or mental health issues, health insurance, and other socioeconomic factors. The direct impact on access to urologic care and health care disparities may explain the high proportion of patients undergoing non-surgical management or being transferred to other institutions for further management. The solutions for health care disparities are complex and multifaceted and outside the scope of this article. This study adds to a growing body of literature demonstrating health care disparities that may lead to suboptimal outcomes in certain populations.

Limitations of our study include its retrospective nature, the intrinsic limitations of the NEDS database, and the use of the ICD-9 coding system, which is not as specific as the ICD-10. In addition, many details such as diagnostic methods (physical examination vs imaging), hospitals with specialist support, types of penile fracture (unilateral vs bilateral), outcomes, and reasons for transfers are not available. Due to patient deidentification, patients were not able to be tracked across multiple encounters. Patients who were transferred to another institution are tracked under a single identifier, but patients who were discharged and possibly re-presented to another ED have the potential of being counted twice. The ultimate disposition of transferred patients could not be ascertained. We assume these patients were transferred because of a diagnosis of true penile fracture requiring surgical intervention to a center with a urologist; however, this information is unknown. It was impossible to discern whether specialists were consulted. We can safely assume that patients who underwent cystoscopy or surgical repair did so with a urologist; however, the bigger issue is whether the 64% of patients discharged had a specialist consultation or specialist access. Given the constraints of the NEDS database, this question is impossible to answer.

CONCLUSIONS

This large, retrospective, population-based study of penile fractures demonstrates a low incidence of penile fractures presenting to US EDs similar to other epidemiologic studies. Penile fractures occur more frequently during weekends and summer months. 26% of patients undergo immediate surgical repair, 10% are transferred to other institutions, and 64% of patients are discharged home. Factors leading to patient transfers included any region; non-academic, rural, and no trauma hospitals; low economic income; and low ED volume. High ED discharge rates and low immediate surgical repair rates may be due to health care disparities. These health care disparities deserve more research and attention to ensure optimal outcomes for all patients.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jsxm.2018.12.009.