Factors associated with emergency room visits within 30 days of outpatient foot and ankle surgeries

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ABSTRACT

The number of emergency department (ED) visits within 30 days after elective surgery has been utilized as a quality measure by many institutions. The significance of the measure as a postoperative complication in foot and ankle surgery, and risk factors for it, are unknown. We conducted a retrospective cohort study involving 386 patients to determine risk factors associated with ED visits after outpatient foot and ankle surgeries. After adjusting for clinically relevant covariates, we found that previous ED visits within 6 months of surgery, and nonelective surgeries were associated with the postoperative ED visit. Having private insurance was protective against postoperative ED visits. Though these risk factors may not be easily modifiable by surgeons, understanding them may improve patient education and transitional care to prevent overcrowding of the ED.

KEYWORDS Emergency department; insurance; readmission; surgical complications

Foot and ankle surgeries have a low complication rate, but certain patients are predisposed to such events. These complications include surgical site infections, venous thrombotic events, acute blood loss causing anemia, nerve injury, and pain unresponsive to oral analgesics. Complications are devastating for patients and costly for health care institutions.¹ They may require additional office and emergency department (ED) visits, admission to a hospital, or further surgery.² ED visits after elective surgery have recently been utilized as a quality measure by many institutions.³ Readmission after ED presentation may represent major complications after surgery, but many complications present to an ED without subsequent admission. Presentation to an ED is common even after elective surgeries,^{4,5} and some of these unplanned visits can be preventable with good postsurgical as well as physician-patient coordination.⁶ The occurrence of unplanned postoperative ED visits is significant in terms of ED crowding and increased health care costs and spending.⁷ To the authors' knowledge, no studies have evaluated postoperative ED visits after foot and ankle surgery. Therefore, the significance of this quality measure relative to actual postsurgical complications is unknown in foot and ankle surgeries.

The purpose of the study was to identify risk factors associated with ED visits within 30 days after foot and ankle surgeries.

METHODS

We enrolled adult patients 18 years or older who had foot and ankle surgery from January 2015 to December 2016 at the Baylor Scott and White Health Central Division campuses in Temple, Round Rock, Marble Falls, Waco, and College Station. Patients who presented to the ED after foot/ankle surgeries were identified from our department's quality measure data. To act as controls, we randomly selected an equal number of patients who did not present to the ED within 30 days after surgery. No matching was performed. We excluded (1) in-house surgical cases, (2) patients with any record of relocation within 30 days of the surgery who no longer utilized the Scott and White System, and (3) patients who were not established in the Scott and White System until the period of surgery (and who therefore had no previous records in our medical records).

After enrolling patients according to our inclusion and exclusion criteria, demographic data and data on comorbidities, type of surgery within the foot and ankle, insurance type, and past visits to ED were recorded. The data were analyzed to

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identify factors associated with ED visits within 30 days after surgery in terms of odds ratios (ORs) and confidence intervals (CIs).

For the purposes of the study, *previous visit to ED* was defined as a visit to the Scott and White ED ≤ 6 months before the surgery date, regardless of the reason. The number of previous ED visits within the last 6 months was also recorded.

For the demographic data, age, gender, and insurance type were recorded. Age was defined as the age of a patient on the day of surgery. Insurance type was categorized into private, government (including government-subsidized charity programs), self-pay, and none. Self-pay was distinguished from none if the patient paid for the service.

For medical history, data on the presence of diabetes, depression, anxiety, smoking, and allergy history were collected. A patient was considered to have diabetes, depression, or anxiety if he or she was taking medication(s) for the particular medical issue. Smoking was categorized into current, never, or quit. Allergy was categorized into no allergy, one allergy, and more than one allergy.

For the surgical data, information on type of surgery, location of surgery, and surgery time was recorded. The type of surgery was categorized into elective and nonelective. Nonelective surgeries included treatment of trauma and infection. In addition, surgeries were categorized into soft tissue and osseous procedures. Typical soft tissue surgeries in the foot and ankle are debridement, soft tissue mass excision, ligament repair, and plantar fasciotomy. If a patient underwent both osseous and soft tissue procedures, he or she was categorized into the osseous group. Most of the osseous procedures were arthrodesis, osteotomy, or open reduction and internal fixation. Location of surgery was categorized into forefoot, rearfoot or ankle. Examples of forefoot surgeries are bunion and hammertoe corrections, and examples of a rearfoot procedure include flatfoot or cavus reconstruction. Surgery time was calculated from surgery start and end times in the nursing operating room record.

For outcome variables, whether a patient presented to the ED within 30 days of the surgery day, the reason for that visit, and whether the visit was related to the surgery were recorded.

To evaluate the effect of the above variables on ED visits within 30 days, we first utilized bivariate analyses to identify factors that were potentially associated with the final outcome. The chi-square test of independence or Fisher's exact test were utilized for this task for the categorical variables. Student's *t* test was used for continuous variables. A *P* value < 0.2 on bivariate analyses was used to identify variables to be included in the final regression model; a logistic regression model including these variables was then analyzed.

All statistical analyses were carried out using the R statistical package by the primary author (NS; <http://www.R-project.org>). The associations were presented in terms of odds ratio and was considered significant when the 95% confidence

interval did not include 1, after adjusting for potential covariates using the final regression model.

RESULTS

Out of 513 surgeries reviewed (254 did and 259 did not present to the ED within 30 days after surgery), 386 were outpatient cases. Of those 386 cases, 158 did and 228 did not present to the ED within 30 days from the day of surgery. Eighty-three (53%) of the 158 patients visited the ED within 30 days of surgery for reasons unrelated to the surgery.

After bivariate analyses, we identified allergy, diabetes, depression, anxiety, smoking, ED visits prior to surgery, elective vs nonelective surgery, and insurance type for inclusion in the final regression model (*Table 1*) in accordance with our study protocol. After adjusting for the covariates, having one or more visits to the ED prior to surgery (OR = 3.3, 95% CI, 1.96–5.64), and nonelective surgery (OR = 2.7, 95% CI, 1.39–5.48) were significantly associated with postoperative ED visit within 30 days (*Table 2*).

Table 1. Bivariate analyses of association between ED visit and potential confounders

Variable		Visited ED		<i>P</i> value
		Yes (<i>n</i> = 158)	No (<i>n</i> = 228)	
Mean age (years)		53.9	53.2	0.518
Male		45	67	0.937
Allergy ^a	None	51	96	0.100
	1 allergy	45	63	
	> 1 allergy	62	69	
Diabetes mellitus ^a	Yes	46	41	0.014
Depression ^a	Yes	62	51	0.001
Anxiety ^a	Yes	57	49	0.002
Smoker ^a	Yes	39	30	0.014
	Quit	45	71	
	Never	74	127	
ED visit ≤ 6 months before surgery ^a	Yes	75	40	0.001
Surgery duration (min)		88	92	0.464
Elective surgery ^a	Yes	120	207	0.001
Location	Forefoot	100	151	0.627
	Mid/rearfoot/ankle	58	77	
Surgery type	Soft tissue	39	61	0.735
	Bone	119	167	
Insurance ^a	Government	82	89	0.001
	None	16	0	
	Private	60	129	
	Self	0	10	

ED indicates emergency department.

^aVariables included in the final analysis, with *P* < 0.2.

Table 2. Results of logistic regression on risk factors for emergency department visit ≤ 6 months after foot and ankle surgery

Variable	Odds ratio	95% Confidence interval	P value
Private insurance	0.6	0.35–0.91	0.018
ED visit ≤ 6 months before surgery	3.3	1.96–5.64	0.001
Nonelective case	2.7	1.39–5.48	0.004

ED indicates emergency department.

Having private insurance was protective against ED visit (OR = 0.6, 95% CI, 0.35–0.91).

In a post hoc analysis, the same analyses were done to determine the effect of having two or more preoperative ED visits on the occurrence of postoperative ED visit. After adjusting for the same covariates, the association of having two or more visits to the ED prior to surgery with postoperative ED visit was stronger (OR = 6.0, 95% CI, 2.85–13.67). Eighty-five percent (49/59) of the patients who visited the ED more than once prior to surgery presented to the ED after the surgery.

DISCUSSION

In the current study, more than the half of postoperative ED visits were unrelated to the surgery. Yet, we found that if a patient visited the ED more than once before the surgery, there was a good chance that the patient would present to the ED after surgery. We also found that surgical factors, such as location, duration, and type (bone vs soft tissue) of surgery, were not associated with postoperative visits to the ED. Though some of the medical factors such as diabetes, depression, anxiety, and smoking seemed to be associated with the ED visit in our bivariate analyses, they were no longer significant after adjusting for other covariates.

On the other hand, we found variables such as insurance type, elective vs nonelective surgery, and prior ED visits to be associated with the occurrence of a postoperative ED visit. These factors do not necessarily directly relate to patients' preexisting medical conditions or actual surgical procedures. Additionally, these factors are often unmodifiable by surgeons. Surgeons may not be able to discriminate against nonelective surgery, certain insurance types, or patients with prior ED visits.

Interestingly, in our bivariate analysis, we found that none of the self-pay patients (0/10) visited the ED after surgery, whereas all of the patients (16/16) without any form of insurance presented to the ED within 30 days of surgery. Those with government-subsidized insurance, including charity programs, had a higher proportion of ED visits (82/171, 48%) than those with private insurance (60/189, 32%). This pattern suggests that higher out-of-pocket expense may correlate with fewer visits to the ED. In addition, patients with federal subsidies tended to have more ED visits. Perhaps this is because of the home environment, patient support structures, or other socioeconomic factors.

ED usage in relation to insurance type has been studied in the past. Disruption of insurance coverage, Medicaid or Medicare coverage, public insurance, and uninsured status have all been identified as being associated with ED visits.^{1,8,9} Specifically for ED visits after elective procedures, Finnegan et al evaluated patients who underwent total hip and knee arthroplasties.¹⁰ They found that having Medicaid as primary insurance was statistically significantly associated with postoperative ED visits. Medicare was also a risk factor for ED visits compared to private insurance. They also discovered a racial disparity in postoperative ED visits, though this may be confounded by underlying socioeconomic status.¹¹ The finding was also consistent with studies evaluating risk factors associated with ED visits after thyroidectomy and parathyroidectomy¹: Fitzgerald et al found that Medicare insurance was associated with ED visits.¹

Our study has several limitations. The applicability of our results to other facilities that do not have transitional care protocols similar to ours may be limited. It has been shown that good transitional care is an important factor in preventing ED visits and readmission to the hospital.¹² Many of our patients are operated on in an ambulatory surgical center setting, where they receive a written postoperative instruction sheet prior to discharge. The instruction sheet includes a phone number to call for any questions or concerns. There is also always a surgeon on call and an established secure messaging system where patients can directly contact the primary surgeon. Most of the patients have a surgical consultation in each surgeon's clinic 1 to 2 weeks prior to surgery.

Further, it should be noted that the current study included visits to the ED regardless of the reason. This included many ED visits unrelated to surgery. We included all visits regardless of the reason because the quality measure program often does not make the distinction. Though the number of ED visits does not truly represent surgical complications, institutionally it can still result in ED crowding and long wait times in the ED. Whether these patients would have presented to the ED if they did not have surgery is unknown, but we did identify that a large proportion of postoperative patients presented to the ED in our cohort. Brownlee et al showed that complication rates were significantly higher in patients experiencing posthospital syndrome in an ambulatory elective surgery setting.¹³ The syndrome is unrelated to the acute illness being treated while admitted; therefore, it is often neglected during the transition period. Specifically, due to stress, inadequate pain control, change in diet, sleep cycle, deconditioning, etc., patients can suffer from posthospital syndrome after hospital or surgical discharge.¹⁴

Finally, it is unknown how many patients presented to EDs in other institutions outside of our network, and were not captured in our study. Using the Medicare data from 2009 to 2011, Tsei et al showed that 25% of readmissions after surgery took place in outside facilities.¹⁵ Our institution is a level 1, primary teaching hospital for a health science center in a suburb of Central Texas where there are no other major health care systems. Many of our patients tend to stay within the

network due to location convenience and the ability to have all medical records in one place; therefore, we expect that the ED visit capture rate is much greater than it would be in an urban setting where patients have multiple options within short distances.

In conclusion, though factors associated with postoperative ED visits in our cohort may not be easily adjustable by surgeons, awareness of these risk factors may help better educate patients and improve transitional care, especially for certain groups of patients undergoing ambulatory foot and ankle surgeries. We found that patients with previous ED visits within 6 months of the surgery and patients undergoing nonelective surgery were more likely to visit the ED after surgery. Having private insurance was protective against ED visits after surgery.

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