

RESEARCH ARTICLE

90-day Return to the Emergency Department Following Shoulder Arthroscopy: Prevalence, Risk Factors, and Reasons

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Abstract

Objectives: Return to the Emergency Department (ED) within 90-days following arthroscopic shoulder surgery represents a potential source of increased healthcare expenditures. Understanding the risk factors could bring about interventions aimed at reducing its prevalence.

Methods: A retrospective review of all shoulder arthroscopies undertaken at a single academic institution from February 2016 through November 2023 was performed. Patient demographics and surgical data, including age, diagnosis of mental health disorder, history of prior ipsi- and/or contralateral shoulder arthroscopy, body mass index (BMI), smoking status, age-adjusted Charlson Comorbidity Index (ACCI), operative time and nature of the surgical procedure was collected. Patient visits to the ED within 12 months prior to surgery were recorded. Regression analysis was utilized to determine the independent predictors for 90-day postoperative ED return.

Results: There were 584 total cases included in this study, of which 303 (52%) were women. The median age of the cohort was 57 years (IQR 51,62). There were 60 (10.3%) patients who experienced at least one unplanned 90-day ED return visit. A diagnosis of mental health disorder (OR 2.67, 95% CI 1.50-4.75, P=0.001), an ED visit within 3 months of surgery (OR 2.63, 95% CI 1.28-5.40, P=0.009), an ED visit between 3-6 months of surgery (OR 2.79, 95% CI 1.41-5.54, P=0.003), and an ED visit between 6-12 months of surgery (OR 1.98, 95% CI 1.07-3.66, P=0.029) was significantly associated with a 90-day unplanned postoperative ED visit. Finally, having >3 preoperative ED visits was significantly associated with a 90-day postoperative ED visit (OR 9.41, 95% CI 3.68-24.06, P<0.001).

Conclusion: Patients with a history of mental health disorder and those with a visit to the ED within 12 months prior to the planned shoulder arthroscopy should be counseled preoperatively regarding appropriate direct contact with the treating surgical team following discharge to minimize postoperative 90-day ED visits.

Level of evidence: III

Keywords: Postoperative surgical complications, Return to emergency room, Risk factors, Rotator cuff, Shoulder arthroscopy

Introduction

The incidence of rotator cuff repairs (RCR) has been rapidly rising in the United States.^{1,2} Notably, Colvin et al. reported an increase of 600% between 1996 and 2006 amongst arthroscopic rotator cuff surgeries with a concomitant shift to ambulatory centers.¹ Koolmees et al. calculated the bundled cost-of-care for RCR from day-of-surgery to 90 days postoperatively to be \$10,569 with the

largest proportion arising from the fixed costs on the surgical day.³ Much of the existing orthopedic literature regarding rotator cuff surgery and healthcare costs has focused on the risk for readmission.⁴⁻⁶ The readmission risk within 30-days of rotator cuff surgery, however, has been reported to be quite low, with a reported rate of just over 1%.^{6,7} In light of the low prevalence of readmissions from the ED, the total costs related to the perioperative

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episode of care following rotator cuff surgery may be greatly underestimated.⁸ Williams *et al.* determined a mean reimbursement of \$678 for ED or UC 30-day return following arthroscopy.⁹ Short-term postoperative visits to the emergency department (ED) with or without a discharge home, therefore, may represent a potentially more significant economic burden for healthcare systems.

While prior studies have examined the prevalence and risk factors for ED return and readmission following shoulder arthroplasty,^{10,11} the literature regarding return to the ED following non-arthroplasty ambulatory orthopaedic procedures remains scant.^{8,9,12-14} Navarro *et al.* evaluated unplanned ED and urgent care (UC) visits in a 7-day postoperative period following outpatient RCR and found a 6.9% prevalence, of which nearly 40% were considered to be avoidable.¹² The authors reported that the most common avoidable diagnosis was post-surgical pain followed by urinary retention. Raji *et al.*, using 2 state-level databases, found that the 7- and 30-day ED return prevalence was 3.1% and 5.1%, respectively. Furthermore, they found that post-surgical pain was the most common reason for 7-day ED returns, and that African American/Hispanic race, hypertension, diabetes and schizophrenia were independent risk factors for 30-day ED return visits.⁸ Prior studies on primary shoulder arthroplasty examining 30-, 60- and 90-day readmissions found that a significant number of implant-related readmissions would be missed by truncating the postoperative follow-up to a 30-day period.^{15,16} To our knowledge, there are no existing studies evaluating the 90-day return to ED following elective shoulder arthroscopy. Investigation into the prevalence and reasons for 90-day postoperative ED visits following shoulder arthroscopy could shed light on additional opportunities for healthcare savings and guide the direction for future research into this clinical topic.

The primary objectives of the current study were to determine: 1) the prevalence of all-cause 90-day ED visits; 2) the independent patient- and surgery-related risk factors for all-cause 90-day ED visits; and 3) the reasons for 90-day ED visits following elective shoulder arthroscopy. A secondary objective for the study was to determine the rate and reasons for postoperative ED visits within the 7-, 30- and 90-day periods. We hypothesized that patients with a history of recent preoperative ED visits, a clinical diagnosis of depression and/or anxiety, and those who missed preoperative outpatient appointments with the surgeon were more likely to have a postoperative 90-day ED visit.

Materials and Methods

We performed a retrospective cohort study evaluating all elective arthroscopic shoulder procedures conducted by a fellowship-trained orthopedic surgeon from February 2016 through November 2023 at a single academic institution-affiliated ambulatory surgery center. This study was approved by our institutional review board [#2024-15694]. Inclusion criteria included all patients who underwent an elective non-instability-related shoulder arthroscopy with or without rotator cuff repair with a minimum 90-day follow-up period. Any patient who underwent a shoulder arthroscopy for infection or instability, or who was <18 years of age at the time of surgery, was excluded.

We analyzed our institution's internal electronic health record (EHR) to gather patient demographic data including

age, sex, body mass index (BMI), marital status, preferred language, insurance type, self-identified race, smoking status, age-adjusted Charlson Comorbidity Index (ACCI), the distance from home-to-clinic, diagnosed mental health disorder (depression and/or anxiety), and 12-month preoperative and 90-day postoperative ED visits along with presentation diagnoses. To establish sociodemographic status, we implemented the Area Deprivation Index (ADI), a tool that encompasses a multitude of measures including quality of housing, access to food, and education level, and then stratifies neighborhoods by socioeconomic disadvantage at the state and national levels.^{17,18} State-level data is broken down into deciles, whereas national-level data is represented as percentiles. In both instances, a lower value indicates less socioeconomic disadvantage. The ACCI is a well-established tool used to predict mortality based on underlying patient comorbid disease states including malignancy, renal disease, diabetes with end-organ disease, and is an updated version of the original CCI that adjusted risk by age.¹⁹

With regards to surgical data, we obtained the specific nature of the shoulder arthroscopy performed, American Society of Anesthesiologists (ASA) score, history of prior non-rotator cuff related shoulder surgery, prior ipsilateral or contralateral shoulder arthroscopy, operative time, and number of implants used. We also recorded the total number of preoperative outpatient visits with the treating surgeon and the number of missed visits. With regards to return to the ED, each visit was categorized as medical or surgical, and the specific reason was recorded. Surgically-related reasons for return to the ED included any surgical site complications and intractable surgical pain. Medical reasons were categorized based on the major organ system involved and those deemed unclassifiable were listed as "other". One of the medical categories was termed "musculoskeletal" and referred to musculoskeletal pain other than postsurgical shoulder pain. The number and reasons for the ED visits were then sub-categorized as those that occurred within three time periods: ≤ 7 days, 8-30 days and 31-90 days. We categorized the nature of the procedure as follows: type 1 – RTC debridement with distal clavicle resection (DCR) and/or biceps tenodesis (BT); type 2 – RTC repair with decompression alone; type 3 – RTC repair with decompression and DCR and/or BT. Finally, we grouped the number of preoperative ED visits as 0, 1-2, or ≥ 3 .

Statistical analysis

Continuous data was given as a median and associated inter-quartile range (IQR). Differences in demographic characteristics between patients with and without unplanned 90-day ED return visits following shoulder arthroscopy were compared using the Wilcoxon rank-sum or Kruskal Wallis tests for continuous variables and chi-squared or Fisher's exact tests for categorical variables. Logistic regression analysis was utilized to identify factors independently associated with 90-day ED return visits. The results were presented as an odds ratio (OR) with 95% confidence intervals (CI). Variables with *P-value* <0.25 in initial analyses were included in regression analysis. A *P-value* <0.05 was considered statistically significant. All statistical analyses were performed using SAS version 9.4 (SAS, Inc., Cary, North Carolina).

Results

A total of 584 cases were included in this study, of which 29 (5%) were type 1, 159 (27%) were type 2, and 396 (68%) were type 3. There were 303 (52%) women included with a median age of 57 years (IQR 51, 62). The median number of implants utilized was 3 (IQR 2, 4). There was a significantly higher median number of implants used for type 3 cases (4, IQR 3, 4) compared to the type 2 (2, IQR 2, 4) and type 1 (1, IQR 0, 1) procedures ($P<0.001$). Select baseline patient- and

surgical-related demographics are provided [Table 1]. Within the 12 months prior to surgery, 200 (34.2%) patients had been to the ED for at least one evaluation with a total of 327 visits. Of these, 75 (23%) visits occurred within three months of surgery, 84 (26%) within three to six months of surgery and 168 (51%) within six to twelve months of surgery.

Table 1. Baseline demographic and clinical data	
Clinical Parameters	Median (IQR) or No. (%) (n=584)
Age, yrs	57 (51,62)
Gender, n (%)	
Male	281 (48%)
Female	303 (52%)
BMI, kg/m²	30.5 (27.0,34.4)
Marital status	
Yes	237 (41%)
No	347 (59%)
ASA	
1,2	389 (67%)
≥3	195 (33%)
Insurance status	
Medicare	142 (24%)
Medicaid	190 (33%)
Commercial	199 (34%)
Worker's Compensation	53 (9%)
ADI, state (decile)	6 (4,6)
ADI, national (%)	24 (16,29)
Preferred language	
English	484 (83%)
Spanish	90 (15%)
Other	10 (2%)
Self-identified race	
Caucasian	88 (15%)
Hispanic	208 (36%)
Black	252 (43%)
Asian	22 (4%)
Other	14 (2%)
Number of preoperative visits	3 (2,4)
Missed preoperative visits	
Yes	300 (51%)
No	284 (49%)
Prior ipsilateral shoulder arthroscopy	
Yes	72 (12%)
No	512 (88%)

Table 1. Continued	
Prior contralateral shoulder arthroscopy	
Yes	100 (17%)
No	484 (83%)
Age-adjusted Charlson Comorbidity Index (ACCI)	
	2 (1,3)
Smoking status	
Current	112 (19%)
Former	137 (24%)
Never	335 (57%)

IQR: inter-quartile range; BMI: body mass index; Age-adjusted Charlson Comorbidity Index (ACCI); ADI: Area Deprivation Index

90-day return to ED

There were 60 (10.3%) patients who experienced at least one unplanned return visit to the ED during the 90-day postoperative period for a total of 75 visits. Of these, 52 (86.7%) had a single ED visit, 7 (11.7%) had two visits each, and 1 (1.6%) had nine ED visits. There were 56 (93.3%) patients who returned either for a medical or surgical reason and 4 patients who presented for both a medical and surgical

visit. Specifically, 11 (18.3%) patients initially returned to the ED for a surgically-related reason and 49 (81.7%) initially returned for a medically-related reason. From the perspective of total 90-day ED return visits, 63 (84%) were medically-related. The most common medical reason was atraumatic musculoskeletal pain (25%), followed by respiratory issues (21%) [Figure 1].

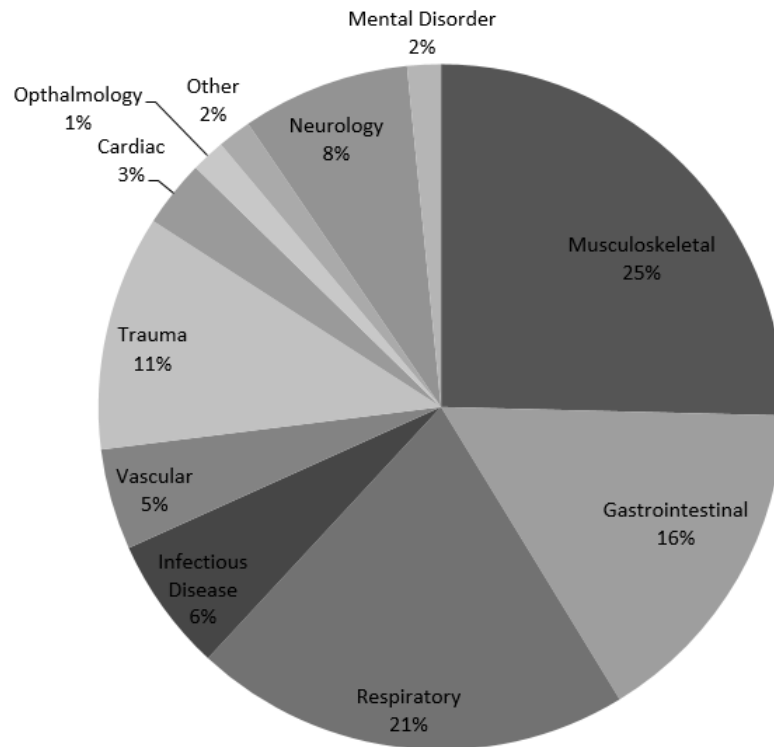


Figure 1. Reasons for 90-day return to ED (n=75)

Following univariate analysis, the presence of a mental health diagnosis ($P<0.001$), the number of preoperative outpatient visits ($P=0.032$), an ED visit within 3 months of surgery ($P=0.002$), an ED visit within 3-6 months of surgery ($P<0.001$), and an ED visit within 6-12 months of surgery ($P=0.002$) were found to be significantly associated with a

90-day postoperative ED visit [Table 2]. On logistic regression, a diagnosis of mental health disorder (OR 2.67, 95% CI 1.50-4.75, $P=0.001$), an ED visit within 3 months of surgery (OR 2.63, 95% CI 1.28-5.40, $P=0.009$), an ED visit between 3-6 months of surgery (OR 2.79, 95% CI 1.41-5.54, $P=0.003$), and an ED visit between 6-12 months of surgery

(OR 1.98, 95% CI 1.07-3.66, P=0.029) remained independently associated with 90-day ED return visit. Finally, having >3 preoperative ED visits was significantly

associated with a 90-day postoperative ED visit (OR 9.41, 95% CI 3.68-24.06, P<0.001) [Table 3].

Table 2. Characteristics and clinical variables for 90-day return to ED

	No ED return (N = 524)	ED return (N = 60)	P-values
Affected side, n (%)			
<i>Left</i>	198 (37.8)	22 (36.7)	0.865
<i>Right</i>	326 (62.2)	38 (63.3)	
Procedure type, n (%)			
<i>Type 1</i>	28 (5.3)	1 (1.6)	0.558
<i>Type 2</i>	143 (27.3)	16 (26.7)	
<i>Type 3</i>	353 (67.4)	43 (71.7)	
Gender, n (%)			
<i>Female</i>	272 (51.9)	31 (51.7)	0.972
<i>Male</i>	252 (48.1)	29 (48.3)	
Marital status, n (%)			
<i>No</i>	305 (58.2)	42 (70.0)	0.078
<i>Yes</i>	219 (41.8)	18 (30.0)	
Preferred language, n (%)			
<i>English</i>	438 (83.6)	46 (76.7)	0.277
<i>Spanish</i>	77 (14.7)	13 (21.7)	
<i>Other</i>	9 (1.7)	1 (1.6)	
Ethnicity, n (%)			
<i>White</i>	83 (15.8)	5 (8.3)	0.107
<i>Black</i>	191 (36.5)	17 (28.3)	
<i>Hispanic</i>	219 (41.8)	33 (55.0)	
<i>Asian</i>	20 (3.8)	2 (3.3)	
<i>Other</i>	11 (2.1)	3 (5.0)	
Depression/anxiety, n (%)			
<i>No</i>	419 (80.0)	33 (55.9)	< 0.001
<i>Yes</i>	105 (20.0)	26 (44.1)	
Work status, n (%)			
<i>Unemployed</i>	122 (23.3)	21 (35.0)	0.251
<i>Physical Laborer</i>	162 (30.9)	12 (20.0)	
<i>Office Worker</i>	83 (15.8)	9 (15.0)	
<i>Disabled</i>	78 (14.9)	10 (16.7)	
<i>Retired</i>	79 (15.1)	8 (13.3)	
Worker's compensation, n (%)			
<i>No</i>	473 (90.6)	56 (93.3)	0.638
<i>Yes</i>	49 (9.4)	4 (6.7)	
ASA, n (%)			
<i>1,2</i>	354 (67.6)	35 (58.3)	0.151
<i>≥3</i>	170 (32.4)	25 (41.7)	
Smoking, n (%)			
<i>None</i>	298 (56.9)	37 (61.7)	0.478
<i>Former</i>	122 (23.3)	15 (25.0)	
<i>Current</i>	104 (19.9)	8 (13.3)	
Prior non-RTC shoulder surgery, n (%)			
<i>No</i>	504 (96.2)	55 (91.7)	0.165
<i>Yes</i>	20 (3.8)	5 (8.3)	

Table 2. Continued			
Insurance type, n (%)			
Medicare	127 (24.2)	15 (25.0)	
Medicaid	164 (31.3)	26 (43.3)	0.215
Commercial	183 (34.9)	16 (26.7)	
Worker's compensation	50 (9.5)	3 (5.0)	
Missed preop visits prior to OR, n (%)			
No	261 (49.8)	23 (38.3)	0.092
Yes	263 (50.2)	37 (61.7)	
Prior contralateral shoulder arthroscopy, n (%)			
No	433 (82.6)	51 (85.0)	0.645
Yes	91 (17.4)	9 (15.0)	
Prior ipsilateral shoulder arthroscopy, n (%)			
No	461 (88.0)	51 (85.0)	0.506
Yes	63 (12.0)	9 (15.0)	
ED visit within 1 year prior to surgery, n (%)			
No	359 (68.5)	24 (40.0)	< 0.001
Yes	165 (31.5)	36 (60.0)	
Number of ED visits in 1 year prior to surgery, n (%)			
0	359 (68.5)	24 (40.0)	< 0.001
1-2	151 (28.8)	26 (43.3)	
3 or more	14 (2.7)	10 (16.7)	
ED visit in 3 months prior to surgery, n (%)			
No	478 (91.2)	47 (78.3)	0.002
Yes	46 (8.8)	13 (21.7)	
ED visit 3 to 6 months prior to surgery, n (%)			
No	473 (90.3)	44 (73.3)	< 0.001
Yes	51 (9.7)	16 (26.7)	
ED visit 6 to 12 months prior to surgery, n (%)			
No	428 (81.7)	39 (65.0)	0.002
Yes	96 (18.3)	21 (35.0)	
Number of implants, median (IQR)			
	3 (2, 4)	3 (2, 4)	0.898
Operative time, median (IQR)			
	96 (79, 116)	93.5 (75, 110)	0.354
Age, median (IQR)			
	57 (51, 62)	56.5 (50, 61.5)	0.779
BMI, median (IQR)			
	30.4 (26.9, 34.4)	30.4 (26.9, 34.2)	0.857
ACCI, median (IQR)			
	2 (1, 3)	2 (1, 3)	0.559
Distance from hospital, median (IQR)			
	2.9 (1.9, 4.2)	2.7 (1.9, 3.6)	0.137
ADI state decile, median (IQR)			
	6 (4, 6)	6 (4, 6)	0.732
ADI national %, median (IQR)			
	24 (16, 29)	24 (17, 28)	0.682
Number of preop visits attended, median (IQR)			
	3 (2, 4)	4 (3, 5)	0.032

ASA: American Society of Anesthesiologists; ED: Emergency Department; ADI: Area Deprivation Index; IQR: interquartile range; BMI: body mass index; ACCI: age-adjusted Charlson Comorbidity Index

Table 3. Factors associated with return to ED within 90 days postoperatively on multivariable logistic regression		
Characteristic	Adjusted Odds Ratio (95% CI)	P-value
Depression/Anxiety		
Yes	2.67 (1.50 – 4.75)	0.001
No (reference)	1	
ED visit 3 months prior to surgery		
Yes	2.63 (1.28 – 5.40)	0.009
No (reference)	1	

Table 3. Continued		
ED visit 3 to 6 months prior to surgery		
Yes	2.79 (1.41 – 5.54)	0.003
No (reference)	1	
ED visit 6 to 12 months prior to surgery		
Yes	1.98 (1.07 – 3.66)	0.029
No (reference)	1	

ED: Emergency Department

Timing of return: surgical versus medical reasons

At the ≤7 day postoperative period, 18 patients accounted for 18 visits, of which 11 were surgically-related and 7 were medically-related. All of the surgery-related visits were for intractable surgical site pain. Within the 8-30 day postoperative period, 12 patients accounted for 14 visits, of which 1 was surgically-related and 13 were medically-related. Finally, at the 31-90 day postoperative period, 37 patients accounted for 43 visits, all of which were deemed

medically-related [Figure 2]. The prevalence of postoperative ED visits within ≤7 days was 3.1%, within ≤30 days was 5.1%, and within ≤90 days was 10.3%.

Of the 75 unplanned postoperative ED visits, 57% occurred after the 30-day mark. There were significantly more surgically-related ED visits in the ≤7 day postoperative period compared with the 31-90 day postoperative period (P<0.00001).

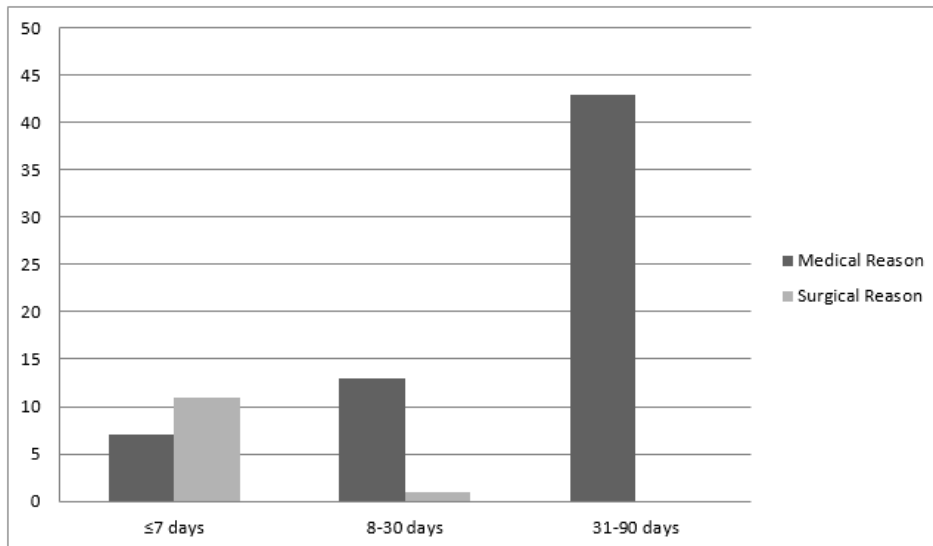


Figure 2. Reasons for 90-day ED visit by postoperative time

Discussion

This retrospective study at a single institution aimed to determine the independent risk factors for 90-day postoperative ED visits following elective shoulder arthroscopy. The main findings of this study were that amongst patients who underwent elective shoulder arthroscopy, a clinically diagnosed mental health disorder and a preoperative visit to the ED within 12 months of surgery were independently predictive of a postoperative 90-day ED visit. The likelihood of a 90-day postoperative ED visit also increased with the number of preoperative ED visits, in addition to the proximity of the preoperative visit to the surgical date. On the other hand, neither the complexity of the shoulder arthroscopic procedure nor a history of prior shoulder arthroscopy was significantly associated with 90-

day ED returns. Finally, >50% of the postoperative ED visits occurred after the 30-day follow-up period.

We found that the prevalence of postoperative ED visits within seven days of surgery was 3.1% and within thirty days was 5.1%. Our prevalence for both time periods was similar to that reported previously by Raji et al. following arthroscopic rotator cuff repair (3.2% and 5.0%, respectively),⁸ though our ≤7 day prevalence was lower than that previously reported by Navarro et al (6.9%).¹² The difference from the latter study likely stems from their inclusion of postoperative visits to both the ED, as well as to UC centers. Our results are also comparable to those reported following elective hip arthroscopy and outpatient hand surgery.^{13,20} Furthermore, we found that the 90-day postoperative ED visit prevalence was 10.3% and that 57%

of ED visits would be missed by studies if the follow-up time were limited to 30 days postoperatively. We would, therefore, recommend that future studies extend their follow-up to 90-days postoperatively to more accurately reflect postoperative ED use following shoulder arthroscopy. Overall, nearly 85% of the 90-day ED visits were medical in nature with all of the ED visits after 30 days being for medical reasons. The prevalence of medically-related visits within 7 and 30 days was 39% and 62.5%, respectively. Our prevalence within 30 days was similar to that reported by Raji et al. who found a prevalence of 72.6%.⁸ the most common medical reason within 7 days and 30 days in our study was non-surgery-related musculoskeletal pain and respiratory issues, respectively. Both Raji et al. and Navarro et al. reported that genitourinary issues predominated as a medical reason during the first week after surgery and postulated that this was the result of an older, mostly male cohort.^{8,12} Our median age was lower than both of those studies and our cohort was >50% female which might explain the differences. There were significantly more surgically-related visits within the first 7 days than either of the other 2 subsequent time periods, and all of these were for surgical-site pain. These findings were consistent with those of Raji et al. though our prevalence for postoperative pain within 7 days (61.1% vs. 29.0%, respectively) and within 30 days (37.5% vs. 20.7%, respectively) were both higher than they reported.⁸

In the current study, patients who visited the ED preoperatively within 12 months of shoulder arthroscopy were significantly more likely to experience a 90-day postoperative ED return visit. While this association has previously been shown in the setting of primary anatomic total shoulder arthroplasty,²¹ to our knowledge, this has not previously been reported in the setting of shoulder arthroscopy. Similar to the findings by Werner et al., we also identified a relationship between the number of preoperative ED visits and the risk for 90-day postoperative ED visits.²¹ In contrast to their study, however, we identified an association between the timing of the preoperative ED visit and the risk for a 90-day postoperative visit. Specifically, patients seen preoperatively in the ED within 3 months of surgery had a 163% higher risk for postoperative 90-day ED visit, whereas patients seen between 6–12 months preoperatively had a 98% higher likelihood. Interventions such as case management to target those individuals who disproportionately utilize the ED have demonstrated some success in reducing ED use and associated costs.^{21,22} Other potential mitigation strategies include an improvement in patient awareness and education preoperatively regarding appropriate use of emergency services, in addition to increasing outpatient clinic access for postoperative patients and shortening the time between discharge and the initial outpatient follow-up.

We found that a mental health diagnosis resulted in a nearly 3-fold increased risk for 90-day postoperative ED visit. Sivasundaram et al. reported a 23% higher likelihood of 30-day ED return in patients with depression who underwent outpatient hand surgery.¹³ Raji et al. reported an 80% higher

likelihood of ED return at ≤ 7 days and 62% higher likelihood of ED return at ≤ 30 days in patients with depression.⁸ Vinton et al., using data from the annual U.S. National Health Interview Survey (NHIS), found that a mental healthcare evaluation in the prior 12 months was associated with increased ED use.²³ These authors also reported that patients who viewed the ED as the place to go when they were ill were also more likely to demonstrate increasing ED use. Johnson et al., in a single institution retrospective study, found that patients diagnosed with depression and/or anxiety were significantly more likely to experience a postoperative 90-day ED visit.²⁴ However, following multivariable regression analysis, a mental health disorder was independently associated with postoperative complications and persistent pain, though the relationship with 90-day ED visit (OR 1.8) was not statistically significant suggesting too small of a sample size for that outcome variable. While the Patient-Reported Outcomes Measurement Information System (PROMIS) has been increasingly utilized for preoperative depression and/or anxiety screening,^{25,26} its ability to accurately identify those patients with symptoms consistent with criteria outlined by the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) has not been definitively established.²⁶ As such, the use of screening tools, in addition to preoperative referrals to specialists in the evaluation mental health disorders, may be useful to maximize clinical outcomes while minimizing the risk for postoperative ED visits.

Interestingly, we could not establish a significant association between the complexity of the shoulder procedure performed or the number of implants utilized and the need for 90-day postoperative ED visit. Even when focusing only on 90-day ED visits related to postsurgical pain, there was no significant difference between the arthroscopy types. This finding was likely a result of the perioperative multimodal pain protocol utilized during this study which involved the use of regional anesthesia coupled with either general anesthesia or intravenous sedation in all cases.²⁷ We found a trend of patients who were unmarried being more likely to present to the ED postoperatively following shoulder arthroscopy. Abuzeyad et al., in a study examining return to the ED following a discharge against medical advice from a university hospital ED, found that being divorced was significantly associated with a 72-hour return to the ED.²⁸ In contrast to our study, however, patients were categorized as single, divorced or married. Finally, we did not find a significant association between either the state or national ADI and 90-day return to the ED. This result stands in discordance to Raji et al. who found that higher median household income was associated with reduced 30-day ED return and that lower median household income resulted in a 27% increased risk for 30-day ED return.⁸ The ADI comprises multiple measures of socioeconomic status apart from income, including employment, housing status, and education,¹⁷ and may, therefore, be a more appropriate measure for social deprivation. Cheng et al. advocated for the use of both insurance classification and national ADI levels to capture the most variability in social deprivation amongst

orthopaedic patients.²⁹

There were limitations to the current study related to the retrospective study design, in addition to the fact that it was performed at a single institution. Furthermore, all of the arthroscopic procedures were performed by a shoulder fellowship-trained orthopaedic surgeon and, therefore, the findings may not be generalizable to other surgeons or practice settings. The diagnosis of a mental health disorder was based on existing documentation within the EHR as opposed to the prospective use of validated tools such as the PROMIS instrument or an assessment by a mental health specialist. We also did not categorize patients as having either depression or anxiety, and instead used a single grouping of mental health disorders. Strengths of the study include the number and breadth of clinical predictive factors included in the analysis. Furthermore, we included a validated assessment of a patient's socioeconomic status. We also assessed the prevalence and reasons for ED return within 90 days after surgery, a longer time period than that presented within the existing literature. This allowed for the identification of a significant number of ED return visits which would otherwise have been missed with a shorter study follow-up period. Finally, by using institutional data as opposed to a national database, we were able to garner more granular information regarding the pre- and postoperative ED visits.

Conclusion

Return to the ED within 90-days following shoulder arthroscopy represents a significant ongoing cost to the healthcare system. The majority of reasons were surgical within the first 7 days postoperatively. Patients with multiple preoperative ED visits, particularly those close in proximity to the shoulder arthroscopy, and those with mental health disorders should be counseled preoperatively as to efficient means of reaching their orthopaedic treatment team to determine the need for appropriate ED use in the face of potential postsurgical emergencies.

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Authors Contribution:

Cameron Smith: Data curation; Investigation

Emmanuel Mbamalu: Data curation; Methodology

Savino Stallone: Data curation; Investigation

Yungtai Lo: Data analysis

Konrad I. Gruson: Writing original draft, review and editing

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