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Original Research

A Comparison of 30-Day Perioperative Complications for Open Operative Care of Distal Upper-Extremity Fractures Treated by Orthopedic Versus Plastic Surgeons: A Study of the National Surgical Quality Improvement (NSQIP) Database

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A R T I C L E I N F O

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Purpose: To determine whether surgeon specialty affects complications after open operative care of distal upper-extremity fractures.
Methods: We performed a retrospective cross-sectional study using the American College of Surgeons National Surgical Quality Improvement Database from 2005 to 2016. Patients were included if they received open operative treatment by an orthopedic or a plastic surgeon for distal radius/ulna, carpal, metacarpal, or phalangeal fracture. Univariate analysis and multivariable analysis of perioperative complications were performed to identify differences between the 2 specialties. Major complications assessed were 30-day reoperation and mortality. We also assessed transfusion, thromboembolic, surgical site infections, cardiac, pulmonary, and renal complications.
Results: A total of 20,512 patients were included. Most cases performed by orthopedic surgeons (71.2%) were for distal radius/ulna fractures, whereas the majority of cases performed by plastic surgeons were for metacarpal (41.0%) and phalangeal (37.9%) fractures. No difference was identified in most perioperative complications between specialties. Plastic surgeons had a higher incidence of surgical site infections (1.2% vs 0.5%) on univariate analysis. However, when controlling for variables such as patient demographics and comorbidities in multivariable analysis, surgical specialty was not significantly associated with surgical site infection. Rather, surgery on phalangeal bones (adjusted odds ratio [aOR] = 2.745; 95% confidence interval [CI], 1.559–4.833), higher wound class (wound class 3 aOR = 3.630; 95% CI, 2.003–6.577), and smoking (aOR = 1.970; 95% CI, 1.279–3.032) were independent risk factors for surgical site infection. Plastic surgeons were found to operate on proportionally more smokers, patients with higher wound class, and phalangeal fractures (37.9% of all fracture cases) compared with orthopedic surgeons
Conclusions: Orthopedic and plastic surgeons achieve equivalent outcomes from a safety perspective after open operative treatment of upper-extremity fractures in terms of mortality and 30-day reoperation, which suggests that both specialties can safely perform call-related operative upper-extremity fracture care. Plastic surgeons operated on more smokers, patients with higher wound class, and phalangeal fractures, all of which were associated with increased incidence of surgical site infection, revealing differences in practice composition from their orthopedic colleagues.
Type of study/level of evidence: Therapeutic III.

Hand surgery is a highly heterogeneous field, drawing surgeons from orthopedic surgery, plastic surgery, and general surgery. Within the field, management of the clinical problems themselves requires a wide range of skills including fracture fixation, wound reconstruction, microsurgery, and arthroscopy. Most hand fellowships in the

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country are sponsored by orthopedic surgery or plastic surgery departments. Previous studies showed that trainees in orthopedic hand fellowships have more experience with bone and joint surgery, arthroscopy, and issues proximal to the wrist, whereas plastic surgery hand fellowships have more exposure to soft tissue reconstruction, microsurgery, and congenital hand issues.[1,2] Among all fellowships, trainees experience considerable variability in exposure to pathology proximal to the forearm, shoulder arthroscopy, and congenital cases.[2,3] A survey of hand surgery fellowship directors confirms this heterogeneity. In identifying clinical entities essential to hand surgery training, orthopedic surgery program directors favored forearm fractures and pathology more proximal, whereas plastic surgery programs directors favored management of burns, soft tissue reconstruction, and microsurgery.[4,5]

These differences in training throughout residency and fellowship manifest in posttraining practice variability between orthopedic-trained and plastics-trained hand surgeons. Whereas phalanx and metacarpal fractures were repaired equally by both groups, plastic surgeons are more likely to treat nail bed and tendon injuries and perform replantations, free tissue transfer, and general microvascular surgery.[6] Orthopedic surgeons are more likely to treat carpal, radius, and ulna fractures.[6]

Studies in other fields have shown notable differences in clinical outcomes depending on training background. Vascular surgeons achieve lower rates of mortality than general surgeons when operating on abdominal aortic aneurysm,[7] and surgeons are associated with lower mortality rates than interventionalists such as cardiologists and radiologists[8] in endovascular repair of abdominal aortic aneurysms. With such heterogeneity in hand surgery, it is interesting to determine whether there are differences in clinical outcomes between specialties in the treatment of distal radius/ulna, carpal, metacarpal, and phalangeal fractures. The purpose of this study was to investigate the null hypothesis that there would be no difference in patient perioperative complications between orthopedic surgeons and plastic surgeons performing open operative treatment of fractures of the distal upper extremity. For the purposes of this investigation, we defined surgical specialty based on surgeons' residency background, and no distinction was made with regard to fellowship training.

Materials and Methods

Case selection

There was no source of funding for this research. A retrospective cross-sectional study was performed using the American College of Surgeons National Surgical Quality Improvement Database (NSQIP) from 2005 to 2016. The NSQIP database collects data on more than 130 variables on surgical patients at participating hospitals. Demographic information, comorbidities, perioperative events, and 30-day postoperative complication outcome data were collected. Patients were included for analysis if they were provided open operative treatment by an orthopedic surgeon or a plastic surgeon for an upper-extremity fracture on either an inpatient or outpatient basis as indicated by the following Current Procedural Terminology codes: distal radius/ulna (25607, 25608, 25609, 25652, and 25676), carpal bones (25628, 25645, 25670, 25685, and 25695), metacarpals (26615, 26665, 26685, and 26686), and phalangeal bones (26715, 26735, 26746, 26765, and 26785). Patients treated with percutaneous pinning of fractures were not included in this study.

Outcomes

Our primary outcomes were mortality and return to the operating room within 30 days after the index procedure. Secondary outcomes assessed include the following complications within 30 days after the index procedure: perioperative blood transfusion (during or after surgery within 72 hours from the time of operation), deep vein thrombosis, pulmonary embolism, sepsis, septic shock, surgical site infection (superficial, deep, or organ/space infection), wound dehiscence, unplanned reintubation, ventilator dependence for greater than 48 hours, peripheral nerve injury, pneumonia, urinary tract infection, acute renal failure requiring dialysis, progressive renal insufficiency not requiring dialysis, stroke, coma lasting greater than 24 hours, myocardial infarct, and cardiac arrest.

We performed univariate analysis of primary and secondary outcomes between orthopedic surgeons and plastics surgeons. For outcomes that met Bonferroni-adjusted significance ($P < .002$), multivariable analysis was performed to assess independent risk-adjusted associations attributable to surgeon specialty.

We used multivariable analysis to assess surgeon specialty, operative details, patient demographics, and patient comorbidities as potential confounders for differences in complications between surgical specialties. Operative details assessed include region of surgery (distal radius/ulna, carpal bones, metacarpals, phalangeal bones), operative time, emergency cases, inpatient status, and wound class as defined by the Centers for Disease Control and Prevention[9] (Table 1). Patient demographics assessed include age and sex. Comorbidities assessed include body mass index, American Society of Anesthesiologists physical status classification, diabetes, hypertension requiring medication, smoking status, cardiac, pulmonary disease, renal disease, bleeding disorders, and chronic corticosteroid use.

Statistical analysis

Continuous variables are expressed as mean ± SD. Univariate analysis was performed using 2-tailed Student *t* tests or chi-square/Fisher exact tests as appropriate. Because 20 perioperative outcomes were assessed, a Bonferroni adjusted α value of 0.002 was set as statistically significant to address the problem of multiple comparisons. Otherwise, an α value of 0.05 was set as statistically significant. Missing data were not adjusted using multiple imputation methods. We performed multivariable regression analysis on perioperative outcomes with significant differences in surgeon specialty and completion percentage over 90%. Statistical analysis was performed using SPSS software (version 25.0, IBM, Armonk, NY).

Results

A total of 20,512 patients receiving open operative treatment of upper-extremity fractures of the distal radius/ulna, carpal bones, metacarpals, and phalangeals by an orthopedic surgeon or plastic surgeon were identified in the NSQIP database between 2005 and 2016 (Table 2). Orthopedic surgeons performed 87.0% of cases whereas plastic surgeons performed 13.0%. Surgical treatment of the distal radius/ulna region comprised most cases included in this study (63.7%).

The relative proportions of distal radius/ulna, carpal, metacarpal, and phalangeal fracture surgery revealed different practice patterns between orthopedic and plastic surgeons. Orthopedic surgeons perform more proximal fracture surgery, whereas plastic surgeons perform more distal fracture surgery. Most orthopedic fracture cases performed were for distal radius and ulna fractures (71.2%). Distal radius/ulna fracture surgery comprised only 14.1% of plastic surgery cases. For plastic surgeons, most cases performed were for metacarpal (41.0%) and phalangeal (37.9%) fractures,

Table 1
Surgical Wound Class as Defined by the Centers for Disease Control and Infection

Wound Class	Definition
Class 1/clean	An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tract is not entered. In addition, clean wounds are primarily closed and drained with closed drainage, if necessary. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet the criteria.
Class II/clean-contaminated	An operative wound in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.
Class III/contaminated	Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (eg, open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered are included in this category.
Class IV/dirty-infected	Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that organisms causing postoperative infection were present in the operative field before the operation.

whereas metacarpal and phalangeal surgery comprised only 12.2% and 11.2%, respectively, of cases performed by orthopedists.

Evaluation of operative characteristics (Table 3) demonstrated that the mean operative time was longer for orthopedic surgeons (74.0 vs 68.1 minutes; $P < .001$). Orthopedists performed emergency surgery a smaller proportion of the time compared with plastic surgeons (10.4% vs 12.2%; $P = .006$), and plastic surgeons performed surgery on a higher wound class ($P < .001$). There were no differences in terms of inpatient status.

Analysis of the demographics and comorbidities of patients demonstrated that orthopedic surgeons treated older patients (50.8 vs 41.2 years; $P < .001$), more females (58.7% vs 33.2%; $P < .001$), more Caucasians (82.9% vs 70.8%; $P < .001$), patients with higher body mass index ($P < .001$), higher American Society of Anesthesiologists class ($P < .001$), and more comorbidities (diabetes: $P < .001$; hypertension: $P < .001$; pulmonary disease: $P < .001$; and bleeding disorder: $P < .001$). Plastic surgeons treated more smokers (28.8% vs 22.5%; $P < .001$) (Table 4).

Despite these differences in practice patterns, patient demographics, and patient comorbidities, there were no differences in most clinical outcomes after Bonferroni correction ($P < .002$ significance) (Table 5). With regard to the primary outcomes, there were no differences in 30-day return to the operating room (1.0% of orthopedic cases vs 1.6% of plastics cases; $P = .014$) or death (0.1% of orthopedic cases vs 0% of plastics cases; $P = .244$). In the analyzed secondary outcomes, orthopedic surgeons were found to have a lower incidence of surgical site infection (0.5% of orthopedic cases vs 1.2% of plastics cases; $P < .001$) on univariate analysis.

Multivariable analysis of surgical site infection identified several independent risk and protective factors (Table 6).

Table 2
Orthopedic Surgeons Tend to Treat More Proximal Fractures Whereas Plastic Surgeons Tend to Treat More Distal Fractures

Current Procedural Terminology Code, n (%)			Orthopedics	Plastics	*P* Value
Distal radius/ulna, n (%)	25607	Open treatment of extra-articular distal radial fracture or epiphyseal separation, with or without fracture of ulnar styloid, with or without internal or external fixation	12,692/17,836 (71.2%)	377/2,676 (14.1%)	< .001
	25608	Open treatment of intra-articular distal radial fracture or epiphyseal separation with internal fixation of 2 fragments			
	25609	Open treatment of intra-articular distal radial fracture or epiphyseal separation with internal fixation of ≥ 3 fragments			
	25652	Open treatment ulnar styloid fracture			
	25676	Open treatment of distal radioulnar dislocation, acute or chronic			
Carpal bones, n (%)	25628	Open treatment of carpal scaphoid navicular fracture, with or without internal or external fixation	964/17,836 (5.4%)	188/2,676 (7.0%)	
	25645	Open treatment of carpal fracture (excluding carpal scaphoid navicular), each bone			
	25670	Open treatment of radiocarpal or intercarpal dislocation, ≥ 1 bones			
	25685	Open treatment of transscaphoperilunar type of fracture dislocation			
	25695	Open treatment of lunate dislocation			
Metacarpals, n (%)	26615	Open treatment of metacarpal fracture, single, with or without internal or external fixation, each bone	2,174/17,836 (12.2%)	1,098/2,676 (41.0%)	
	26665	Open treatment of CMC fracture dislocation, thumb Bennett fracture, with or without internal or external fixation			
	26685	Open treatment of CMC dislocation, other than thumb Bennett fracture; single, with or without internal or external fixation			
	26686	Open treatment of CMC dislocation, other than thumb Bennett fracture; complex, multiple, or delayed reduction			
Phalangeal bones, n (%)	26715	Open treatment of metacarpophalangeal dislocation, single, with or without internal or external fixation	2,006/17,836 (11.2%)	1,013/2,676 (37.9%)	
	26735	Open treatment of phalangeal shaft fracture, proximal or middle phalanx, finger or thumb, with or without internal or external fixation, each			
	26746	Open treatment of articular fracture, involving metacarpophalangeal or proximal interphalangeal joint, with or without internal or external fixation, each			
	26765	Open treatment of distal phalangeal fracture, finger or thumb, with or without internal or external fixation, each			
	26785	Open treatment of interphalangeal joint dislocation, with or without internal or external fixation, single			

CMC, carpometacarpal.

Table 3
Operative Characteristics by Surgeon Specialty

Characteristic	Data Available, n (%)	Orthopedics (n = 17,836)	Plastics (n = 2,676)	*P* Value
Operative time, min	20,494 (99.9)	74.0 ± 43.5	68.1 ± 41.8	**< .001**
Emergency surgery, n (%)	20,512 (100)	1,863 (10.4%)	327 (12.2%)	**.006**
Inpatient, n (%)	20,512 (100)	2,567 (14.4%)	384 (14.3%)	.953
Wound class, n (%)				
1	20,512 (100)	16,812 (94.3%)	2,323 (86.8%)	**< .001**
2		390 (2.2%)	102 (3.8%)	
3		418 (2.3%)	183 (6.8%)	
4		216 (1.2%)	68 (2.5%)	

Bolded values highlight results that are statistically significant.

Surgical specialty was not a significant independent risk factor for surgical site infection upon adjusting for confounding variables (P = .166). Surgery on phalanges (adjusted odds ratio [aOR] = 2.745; 95% confidence interval [CI], 1.559−4.833; P < .001) relative to surgery on the distal radius/ulna, wound class 3 (aOR = 3.630; 95% CI, 2.003−6.577; P < .001) relative to wound class 1, and smoking (aOR = 1.970; 95% CI, 1.279−3.032; P = .002) were independent risk factors for surgical site infection. Female gender (aOR = 0.439; 95% CI, 0.266−0.726; P = .001) and hypertension requiring medications (aOR = 0.500; 95% CI, 0.268−0.934; P = .030) were independent protective factors against surgical site infection.

Table 4
Comparison of Demographics and Comorbidities of Patients Treated by Orthopedic Surgeons Versus Plastic Surgeons

Characteristic	Data Available, n (%)	Orthopedics	Plastics	*P* Value
Age, y (n [%])				
Mean ± SD	20,396 (99.4%)	50.8 ± 18.6	41.2 ± 17.0	**< .001**
< 60		11,161 (63.0%)	2,223 (83.2%)	**< .001**
60−70		3,863 (21.8%)	286 (10.7%)	
71−80		1,191 (10.8%)	112 (4.2%)	
> 80		790 (4.5%)	50 (1.9%)	
Sex, n (%)				
Male	20,506 (100%)	7,368 (41.3%)	1,788 (66.8%)	**< .001**
Female		10,463 (58.7%)	887 (33.2%)	
Ethnicity, n (%)				
Caucasian	15,993 (78.0%)	11,984 (82.9%)	1,088 (70.8%)	**< .001**
African American		968 (6.7%)	245 (15.9%)	
Hispanic		925 (6.4%)	136 (8.8%)	
Asian/Pacific Islander		563 (3.9%)	67 (4.4%)	
Native American		16 (0.1%)	1 (0.1%)	
Body mass index, n (%)				
< 18.5	19,444 (94.8%)	333 (2.0%)	33 (1.4%)	**< .001**
18.5−24		5,847 (34.3%)	893 (36.9%)	
25−29		5,729 (33.7%)	874 (36.1%)	
30−34		3,010 (17.7%)	387 (16.0%)	
35−39		1,206 (7.1%)	141 (5.8%)	
≥ 40		898 (5.3%)	93 (3.8%)	
American Society of Anesthesiologists Class, n (%)				
1	20,411 (99.5%)	4,487 (25.3%)	1,053 (39.8%)	**< .001**
2		9,338 (52.6%)	1,271 (48.0%)	
3		3,731 (21.0%)	306 (11.6%)	
4		209 (1.2%)	16 (0.6%)	
Specific comorbidities, n (%)				
Diabetes	20,470 (99.8%)	1,294 (7.3%)	128 (4.8%)	**< .001**
Hypertension	20,512 (100%)	4,889 (27.4%)	411 (15.4%)	**< .001**
Smoking	20,512 (100%)	4,013 (22.5%)	770 (28.8%)	**< .001**
Cardiac disease	20,512 (100%)	115 (0.6%)	17 (0.6%)	.954
Pulmonary disease	20,512 (100%)	511 (2.9%)	32 (1.2%)	**< .001**
Neurologic disease	3,525 (17.2%)	50 (1.8%)	10 (1.4%)	.489
Renal disease	20,512 (100%)	38 (0.2%)	7 (0.3%)	.617
Bleeding disorder	20,512 (100%)	369 (2.1%)	26 (1.0%)	**< .001**
Corticosteroid	20,512 (100%)	286 (1.6%)	32 (1.2%)	.111

Bolded values highlight results that are statistically significant.

Discussion

Most practicing hand surgeons in the United States are orthopedic surgeons, but the makeup of this distribution has been shifting. There is evidence that there has been a steady decline in the proportion of plastics-trained surgeons applying to a hand fellowship, obtaining subspecialty certification, and actively practicing with subspecialty certification.[10] In our study, orthopedic surgeons performed 87% of the distal upper-extremity fracture cases nationally compared with only 13% performed by plastic surgeons. This roughly correlates with the estimation that in the United States, 72.1% of hand surgeons are orthopedic-trained and 18.3% are plastics-trained,[11] indicating that treatment of upper-extremity fractures is appropriately distributed among orthopedic and plastic surgeons nationally.

Previous studies evaluated differences in exposure to various clinical problems and surgical techniques experienced by plastics versus orthopedic surgery trainees.[2,6,12] These training dissimilarities might translate to differences in distribution of cases performed and perioperative complications after training with regard to fracture treatment. Our findings demonstrated that practice composition varied by specialty and appeared to reflect previously reported differences in training: orthopedic surgeons tended to treat more proximal fractures and plastic surgeons tended to treat more distal fractures. Despite the variations in practice composition, there were no statistically significant differences in any reviewed clinical perioperative primary outcome measures (30-day mortality and return to operating room rate) between orthopedic surgeons and plastics surgeons. Although plastic surgeons had higher surgical site infection rates, multivariable analysis suggested that this was due to different patient factors such as wound class, smoking, and surgery on phalangeal bones, not surgical specialty itself. These differences in practice patterns should be further explored.

The overall 30-day surgical site infection rate after distal upper-extremity fracture was low (0.6%) and comparable to rates reported in the prior literature.[13,14] The 3 independent risk factors for surgical site infection identified on multivariable analysis were more frequently encountered in plastic surgery patients (smokers, higher wound class, and phalangeal fractures). Associations between smoking and wound class with surgical site infections were reported in prior literature.[15−17] However, there is a paucity of research on surgical site infections after open operative treatment for fractures of the distal upper extremity. Our results suggest that surgical site infections occur more frequently after open operative fixation of phalangeal fractures compared with forearm and wrist fractures. Phalangeal fracture surgery comprises a small proportion (11.2%) of distal upper-extremity fracture cases performed by orthopedic surgeons compared with plastic surgeons (37.9%). No independent association was seen between surgical specialty itself and infection rate. All of this suggests that the different incidence of surgical site infection between specialties is likely related to practice composition and patient-related factors.

Our findings suggest that there are no notable differences in perioperative complications after surgery of the distal upper extremity between orthopedic and plastic surgeons. This finding supports the way in which upper extremity call responsibilities are divided at many major academic centers where they are often shared between the 2 specialties. Our findings argue that both

Table 5
Univariate Analysis of Primary and Secondary Perioperative Complications for Orthopedic Surgeons Versus Plastic Surgeons Operatively Treating Distal Upper-Extremity Fractures

Characteristic	Data Available	Orthopedics	Plastics	P Value*
Primary outcome, n (%)				
30-d return to operating room	20,512 (100%)	185 (1.0%)	42 (1.6%)	.014
Death	20,512 (100%)	15 (0.1%)	0	.244
Secondary outcomes, n (%)				
Perioperative blood transfusion	20,512 (100%)	38 (0.2%)	3 (0.1%)	.357
Deep vein thrombosis	20,512 (100%)	10 (0.1%)	0	.379
Pulmonary embolism	20,512 (100%)	5 (0%)	0	> .999
Sepsis	20,512 (100%)	13 (0.1%)	0	.398
Septic shock	20,512 (100%)	3 (0%)	0	> .999
Surgical site infection	20,512 (100%)	81 (0.5%)	32 (1.2%)	**< .001**
Wound dehiscence	20,512 (100%)	3 (0%)	2 (0.1%)	.130
Unplanned reintubation	20,512 (100%)	9 (0.1%)	1 (0%)	> .999
Ventilator > 48 h	20,512 (100%)	3 (0%)	0	> .999
Peripheral nerve injury	7,319 (35.7%)	1 (0%)	0	> .999
Pneumonia	20,512 (100%)	21 (0.1%)	1 (0%)	.348
Urinary infection	20,512 (100%)	51 (0.3%)	1 (0%)	.017
Acute renal failure	20,512 (100%)	2 (0%)	0	> .999
Progressive renal insufficiency	20,512 (100%)	6 (0%)	0	> .999
Stroke	20,512 (100%)	7 (0%)	0	.605
Coma	7,460 (36.4%)	0	0	
Myocardial infarct	20,512 (100%)	5 (0%)	0	> .999
Cardiac arrest	20,512 (100%)	4 (0%)	0	> .999

Bolded values highlight results that are statistically significant.
* Bonferroni adjusted *P* value set at .002 for statistical significance.

Table 6
Multivariable Analysis Identifies Several Independent Risk and Protective Factors for Surgical Site Infection

Characteristic	Odds Ratio	SE	95% Confidence Interval	P Value
Surgical specialty, n (%)				
Orthopedics	1 (reference)			
Plastics	1.407	0.247	0.868–2.281	.166
Procedure, n (%)				
Distal radius/ulna	1 (reference)			
Carpal bones	1.531	0.440	0.647–3.623	.333
Metacarpals	1.237	0.333	0.644–2.375	.523
Phalangeal bones	2.745	0.289	1.559–4.833	**< .001**
Operative time, min	1.002	0.002	0.999–1.006	.233
Emergency surgery, n (%)	1.393	0.285	0.797–2.433	.245
Wound class, n (%)				
1	1 (reference)			
2	0.876	0.602	0.269–2.853	.826
3	3.630	0.303	2.003–6.577	**< .001**
4	0.829	0.735	0.196–3.504	.799
Age, y (n [%])				
< 60	1 (reference)			
60–70	1.693	0.290	0.959–2.987	.069
71–80	0.815	0.555	0.274–2.420	.712
> 80	1.092	0.774	0.239–4.981	.909
Sex, n (%)				
Male	1 (reference)			
Female	0.439	0.257	0.266–0.726	**.001**
Body mass index, n (%)				
< 18.5	1 (reference)			
18.5–24	1.299	1.026	0.174–9.703	.799
25–29	2.027	1.020	0.274–14.970	.489
30–34	1.244	1.047	0.160–9.691	.835
35–39	2.975	1.054	0.377–23.484	.302
≥ 40	2.059	1.097	0.240–17.689	.510
American Society of Anesthesiologists class, n (%)				
1	1 (reference)			
2	1.274	0.261	0.763–2.119	.357
3	1.916	0.365	0.938–3.916	.074
4	3.013	0.828	0.594–15.281	.183
Specific comorbidities, n (%)				
Diabetes	1.816	0.369	0.881–3.740	.106
Hypertension	0.500	0.319	0.268–0.934	**.030**
Smoking	1.970	0.220	1.279–3.032	**.002**
Pulmonary disease	0.786	0.747	0.182–3.398	.747
Bleeding disorder	0.478	1.049	0.061–3.732	.481

Bolded values highlight results that are statistically significant.

surgical specialties are able to perform call-related fracture care without differences from a safety perspective.

There were several limitations to this study. As with any database study, we were restricted by the available data. The NSQIP database is limited to perioperative outcomes within 30 days of the index procedure, and longer-term outcomes, such as successful healing of the fracture site, avoidance of nonunion, and functional outcomes, could not be evaluated. The NSQIP is a database that does not necessarily include procedures at ambulatory surgery centers that are not affiliated with hospitals; therefore, the data from surgeries performed in this setting are not captured in this study. The structure of the database and the use of Current Procedural Terminology coding limited the amount of surgical detail that could be assessed, and evaluation of soft tissue procedures such as tendon, nerve, and vascular surgery was not included. Confounding factors potentially affecting our finding of increased surgical site infection rates among plastic surgeons, such as antibiotic use, also could not be evaluated. Although we were able to identify smoking status as an independent risk factor for surgical site infection, the database did not allow us to discern whether this included alternative forms of tobacco use such as chewing tobacco. Although most of our data had good completion (greater than 90%), there were several potential confounding variables with a low completion percentage. Although we adjusted our model accordingly, this may have led to unaccounted bias in the findings. Finally, we were unable to evaluate potential outcomes further related to the level of surgical training. Both orthopedic and plastic surgeons are exposed to hand surgery during residency; however, we could not assess whether surgeons included in this study had completed a hand fellowship or received a subspecialty certificate in surgery of the hand.

Despite these limitations, this study used a large patient population to compare perioperative complications of fracture care between orthopedic surgeons and plastic surgeons. It demonstrated that orthopedic and plastic surgeons achieved equivalently low complications and showed there was no difference from a safety perspective between the specialties. This suggests that both surgical specialties can safely perform call-related, operative upper-extremity fracture management.

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