Hand Surgeons and Orthopedic Trauma Surgeons Call Coverage of Acute Upper Extremity Injuries: Where Should the Line Be Drawn?

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Abstract

Background: There is a lack of consensus as to which subspecialty service should cover acute upper extremity injuries in the emergency department (ED). The purpose of the present study is to understand how upper extremity injuries are currently triaged to specialists and to assess the current opinion among hand and orthopedic trauma specialists as to how these injuries should be best triaged based on injury location and severity. **Methods:** The American Association for Hand Surgery (AAHS) membership and Orthopaedic Trauma Association (OTA) membership were surveyed using a 28-item online questionnaire. **Results:** A total of 103 responses from the AAHS and 114 responses from the OTA were received. Nearly 50% of the respondents report no formal anatomic line as to how upper extremity injuries are triaged to specialists from the ED. Approximately 57% of the AAHS respondents feel that hand call should begin at the distal radius or proximal, while 71% of the OTA respondents feel that hand call should begin at the radiocarpal joint or distal. There was increasing agreement that more complex injuries be assigned to the hand surgeon. **Conclusions:** There is agreement that proximal to the elbow, the trauma consultant should be called, and distal to the distal radius, the hand consultant should be called. However, there is a lack of agreement as to who should be responsible for call between the elbow and the hand. To optimize patient care, better allocate consultant resources, and minimize conflict between consultants, establishing anatomic guidelines for consultation should be considered.

Keywords: upper extremity, hand, call, emergency department

Introduction

Hand and upper extremity injuries are among the most common presenting problems to emergency departments (EDs).^{3,4,6} Currently, there is no clear consensus as to which consulting service should provide care for these patients with common consultants including general orthopedic surgeons as well as hand surgeons and orthopedic trauma surgeons.

Recent literature reports a deficit of on-call orthopedic surgeons and hand surgeons to EDs citing multiple factors including financial, medicolegal, and disruption of elective patient schedules.^{1-5,7} This has resulted in an increased financial burden to the health care system and inferior care for patients with upper extremity injuries due to delay in care associated with unnecessary and inappropriate transfers^{1,2,7} as well as an inability to obtain proper follow-up.⁶ Furthermore, when appropriate on-call specialists are available, the overlap of provider care engenders debate and

often conflict as to which group of specialists should receive the initial or definitive consultation.

Given the ever-increasing subspecialist nature of our health care system, defining referral patterns for patients with upper extremity injuries has the potential to improve patient care, lower health care costs, and aid in optimizing utilization of on-call specialists to EDs. The purpose of the present study is to determine how upper extremity complaints in the ED are currently triaged to on-call specialists and also to understand the current opinion among hand and orthopedic trauma specialists about how these complaints should be distributed based on injury location and severity.

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Materials and Methods

Institutional review board waiver was received. A 28-item online questionnaire was developed and published on Survey Monkey (Survey Monkey Inc, Palo Alto, California). The questionnaire included 16 demographic questions and 12 clinical scenarios designed to elicit opinion on how upper extremity injuries should be triaged to specialists based on injury location, type, and severity. Injuries ranged from “simple” fractures to more complex injuries that included nerve injury, vascular injury, and infection.

The survey was approved by both the American Association for Hand Surgery (AAHS) and the Orthopaedic Trauma Association (OTA) and sent by email blast to their respective membership for a 2-month period. The AAHS membership represents orthopedic, plastics, or general surgeons who are either fellowship trained in hand surgery and/or maintain a practice that regularly involves hand and upper extremity surgery. The OTA membership represents orthopedic surgeons either fellowship trained in orthopedic trauma and/or maintains a practice regularly involving fracture surgery. The AAHS represented the hand surgeon cohort. The OTA represented the orthopedic trauma cohort.

Statistical Methods

Descriptive statistics, kappa agreement statistics, and odds ratios were used to analyze the survey data. We calculated agreement between OTA and AAHS for each clinical scenario by comparing the number of times each organization agreed with respect to which group should take call for a given clinical scenario. We also calculated a Cohen's kappa coefficient to measure the amount of agreement within each organization for all clinical scenarios.

We performed odds ratio calculations comparing the likelihood of selecting hand surgery for call assignment when a participant described their affiliation as either OTA or AAHS. We then calculated 95% confidence intervals and *P* values using a significance level of .05.

Results

We received 103 responses out of 1054 members of the AAHS, yielding a 10% response rate, and 114 responses out of 1975 members of the OTA, yielding a 6% response rate. There were 15 responders who identified themselves as members of both organizations. Most respondents were affiliated with an academic hospital or affiliate (54%). In terms of respondents' training backgrounds, the majority completed an orthopaedic surgery residency (77%) and 95% of all respondents were fellowship trained (43% hand fellowship, 43% orthopaedic trauma fellowship, 5% both hand and trauma fellowship, 5% other) (Figures 1 and 2).

Figure 1. Training background of respondents.

Figure 2. Current position of respondents.

Most respondents (91%) report currently taking call, with 71% of those covering both adult and pediatric call. Approximately 22% of those who take call report an inadequate number of physicians in their call pool.

In terms of the anatomic level in the upper extremity used to differentiate what is the domain of the hand surgeon versus the trauma surgeon, 50% of the respondents report having no formal anatomic guideline as to how upper extremity injuries are currently triaged to specialists from the ED at their center. For those who report having a formal anatomic level, the most common location at which hand call begins is the radiocarpal joint (39%), followed by the distal radius (24%), and then the carpometacarpal joints (12%).

When asked where the anatomic level in the upper extremity ought to be, the greatest agreement between members of the AAHS and the OTA occurred at the level of the elbow (eg, distal humerus and olecranon fractures) with a majority of both the AAHS and the OTA participants indicating the call assignment should be trauma. The most disagreement occurred at the level of the forearm and distal

Table 1. Clinical Scenario Agreements.

Anatomic location	Agreement (%)	OR	95% CI	P value
Distal humerus	76	2.93	0.28-8.94	.596
Olecranon	76	4.10	0.47-7.21	.378
Both bone	59	13.35	0.88-10.80	.078
Distal radius	41	14.41	1.54-6.59	.002*
Clavicle and radius	71	4.52	0.71-5.19	.195
Distal humerus with radial nerve palsy	83	1.45	0.61-2.26	.631
Olecranon with soft tissue compromise	71	6.38	0.71-7.05	.170
Forearm with radial artery injury	61	4.85	1.04-3.80	.039*
Distal radius with acute carpal tunnel	45	11.43	1.43-5.82	.003*
Compartment syndrome forearm	49	14.53	1.31-7.79	.011*
Necrotizing fasciitis of forearm	48	9.75	1.35-5.36	.005*

Note. OR = odds ratio; CI = confidence interval. *Statistically significant values at $p < 0.05$.

Figure 3. Number of responses to the question “In your opinion, at what anatomic level of the upper extremity should Hand call begin?” by organization at select anatomic levels. Note. AAHS = American Association for Hand Surgery; OTA = Orthopaedic Trauma Association; CMC = carpometacarpal joints; RC = radiocarpal joint; DR = distal radius

radius, where both groups felt that they should be responsible for that region.

As the “simple” cases gained a more complex component, there was generally more agreement among respondents. For instance, when a distal humerus fracture was complicated by a radial nerve injury, a forearm fracture complicated by a radial artery injury, and a distal radius fracture complicated by an acute median nerve compression, more members of both organizations assigned the case to hand call. Despite the increase in agreement in the more complex scenarios, the majority of respondents of each organization still assigned call to themselves (Table 1).

When queried about where hand call should begin, 31% of the AAHS participants stated that hand call should begin

at the level of the distal radius, 20% indicated that call should begin at the level of the forearm, and 14% indicated call should begin at the level of the radiocarpal joint. This compares to 51% of the OTA indicating hand call should begin at the radiocarpal joint, 20% at the carpometacarpal joint, and 18% at the distal radius (Figure 3).

When looking at respondents with dual membership of both organizations, 36% indicated hand call should begin at the level of the distal radius, and 27% indicated call should begin at the level of the radiocarpal joint. When evaluating intragroup agreement levels within the AAHS and the OTA, we found poor agreement for both organizations. The AAHS kappa value was found to be 0.184 while the OTA kappa value was found to be 0.125. This indicates poor agreement based on the Landis-Koch agreement scale.

Discussion

Despite hand injuries representing the most common presenting complaints to EDs, there remains a significant shortage of hand specialists available for consultation. Rao et al⁷ recently surveyed a national sample of ED directors and found that 80% of the respondents noted inadequate hand surgery coverage. Due to the shortage, nearly 50% of the respondents reported an increased number of outgoing transfers from the ED, and 22% reported an increase in the number of patients leaving the ED prior to being seen by a subspecialist.

Caffee and Rudnick² examined regional access to on-call hand surgery specialists in North Florida. They found that 8 of 13 (62%) hospitals that accept trauma cases either have no hand coverage or incomplete hand coverage. Each of the 8 hospitals reported that patients would be transferred to another ED in cases that needed hand subspecialty care.

This result was corroborated by Mueller et al⁴ when they reported that just 7% of 111 hospitals surveyed in Tennessee had a hand specialist on call at all times. They found that 42% of the hospitals had no coverage for hand emergencies.

In the current study, we found that even among orthopedic subspecialists, nearly one-quarter of all respondents felt that there are an inadequate number of physicians in their call pool. When analyzing just responses from those who take hand call, nearly 30% report an inadequate number of physicians in the call pool. Given that most of the literature concerning the shortage of hand specialists has been from the perspective of the ED, this further highlights the issue. The lack of coverage has been shown to lead to a misuse of emergency room services,⁶ inappropriate transfers,¹ and an inability for patients to obtain appropriate follow-up.⁶ Multiple solutions for this challenge have been proposed, including increased compensation for hand call, establishing a direct hand surgery training pathway in an effort to increase the number of specialists, forming multihospital coordinated call schedules, and creating a means for ED personnel to access remote consultation with subspecialists.

When subspecialists are available, the overlap of provider care often engenders debate as to which group should receive the consultation. Just 50% of the respondents in the current study report that a formal guideline exists at their institution that dictates how upper extremity injuries are triaged to specialists. Write-in responses included comments such as that the process was “attending dependent” or that many injuries fall into a “gray zone.” A formal guideline has the opportunity to improve patient care by eliminating confusion among ED providers as to which subspecialist is covering, providing more defined follow-up for the patient, and ensuring that the covering physician feels adequately trained to cover certain injuries.

In those respondents who currently report a formal guideline, the most common location at which hand call begins is the radiocarpal joint (39%), followed by the distal radius (24%) and the carpometacarpal joints (12%). However, considerable discrepancy exists among subspecialists as to where they believe hand call should begin. Nearly 57% of the AAHS respondents feel that hand call should begin at the distal radius or proximal. This is in contrast to OTA respondents in which 71% felt that hand call should begin at the radiocarpal joint or distal.

We saw in the clinical scenarios that, as the “simple” cases were complicated with a neurovascular injury, agreement increased between the 2 groups. This was due to an increase in both groups assigning call to hand. The trend did not continue to an olecranon fracture complicated by a soft tissue compromise in which the overall agreement decreased; however, a preponderance of respondents in both groups assigned call to trauma. This may reflect either trauma surgeons’ comfort level with performing tissue transfer or the fact that a multidisciplinary team is utilized which may include plastic surgery.

Several limitations of this study exist. The response rate of 10% of the AAHS and 6% of the OTA is low and may not accurately reflect the views of the entire membership.

Furthermore, nearly 54% of the respondents report an academic appointment, which may not reflect the current practice environment on the whole.

In conclusion, there is a lack of agreement between members of the AAHS and OTA as to who should be responsible for call for injuries between the elbow and the hand. There is excellent agreement that proximal to the elbow the trauma consultant should be called, and distal to the distal radius the hand consultant should be called. To optimize patient care, better allocate consultant resources, and minimize conflict between consultants, establishing anatomic guidelines for consultation should be considered while also taking into account available consultant resources and expertise.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

This article does not contain any studies with human or animal subjects.

Statement of Informed Consent

No informed consent was obtained as this article does not contain any studies with human or animal subjects.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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