

Effect of Policy Change on the Use of Long-Distance Transport and Follow-Up Care for Patients With Traumatic Finger Amputations

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Purpose In January 2006, the American College of Emergency Physicians released updated guidelines for air transfer. Digit amputation and near-amputation were no longer an indication for this costly service. We analyzed the effect of this update on the use of air transport and associated care outcomes for finger amputation patients and examined factors involved in providing follow-up care for these patients.

Methods A retrospective chart review identified all patients treated for traumatic finger amputation between 1995 and 2012 at a major hand trauma referral center. Analysis of available outcome measures was conducted using multiple logistic and linear regression models. Analysis of factors affecting frequency of return visits was performed via negative binomial regression.

Results We identified 724 patients with isolated traumatic finger amputations. A total of 267 patients (37%) were transferred from an outside hospital. Patients injured after 2006 were less likely to be transferred via air, with a decrease from 29.5% pre-2006 to 14.9% post-2006. There was no difference in likelihood of replantation success, length of hospital stay, or number of return visits pre- versus post-2006. Patients transferred via helicopter after 2006 were more likely to be younger than 20 years of age and injured in a winter month. Following successful replantation, work-relatedness was associated with a higher number of return visits, whereas increasing age and transfer from farther than 100 miles away were associated with fewer.

Conclusions After the American College of Emergency Physicians policy update, decreased use of emergency air transport to a hand trauma referral center for patients with traumatic finger amputations did not adversely affect care delivery and outcomes. These changes may be successfully implemented on a center-by-center basis to reduce costs without detriment to patient care; however, coordination of follow-up care for long-distance transport patients may require special focus when designing policy around referral centers. (*J Hand Surg Am.* 2017; ■(■): ■–■. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Therapeutic IV.

Key words Amputation, helicopter, policy change, transfer, transport.

 Additional Material
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TIME CONSTRAINTS MAY LIMIT SUCCESSFUL revascularization for traumatic hand injuries with vascular compromise.^{1,2} Therefore, emergency physicians and hand surgeons strive to ensure efficient and timely transfer to a tertiary care center equipped to perform revascularization, when indicated. One such option is to use emergency air services. Emergency air services are available for patients with a finger amputation in at least 14 different countries and are supported by over 30 private air transport organizations.³ However, this transfer modality can carry an enormous cost.⁴ In 2010, it was estimated that transfer via helicopter cost \$6,000 more than a transfer via traditional ground ambulance.⁵ Therefore, this service has been frequently cited as overused and unnecessary, especially in regard to hand injuries resulting in finger amputation.^{6–9} In 2006, these suggestions were reflected in the release of the *Guidelines for Air Medical Dispatch*, published by the American College of Emergency Physicians (ACEP).¹⁰ This updated statement provided greater detail and specific indications for the use of air transport and stated that the amputation or near-amputation of a finger or thumb is not an indication for transfer via this service.¹¹ The protocol applied to both adult and pediatric populations.

Despite these updates to the written guidelines, it is unclear whether real changes in the use of this costly service for finger amputations have occurred. It is estimated that up to one-third of all transfers via emergency air services do not adhere, in one or more ways, to the current transfer and triage guidelines.¹² Furthermore, if these guidelines were to be successfully administered in a particular region, it is unknown how they would affect care delivery and outcomes. Issues surrounding patient transfer are important because efforts to understand the value and quality of regionalized care, in which a central hospital is responsible for providing a specialized service to the surrounding area, is an area of interest for clinicians, hospital administrators, and health care purchasers.^{13–15} This is especially true considering the Affordable Care Act and a growing emphasis on cost savings as well as high-quality care delivery.^{16,17}

By compiling a database of all patients treated for traumatic finger amputations at a single tertiary care center over a 16-year period, spanning 8 years before the 2006 protocol update to 8 years afterward, our aim was to determine if such guideline changes can result in decreased use of emergency air transportation, and if so, what effect these changes have on outcomes. We also analyzed factors that

influenced the continued use of emergency air transport after the 2006 guideline change. Lastly, we evaluated factors related to long-term follow-up for these patients, especially as related to long-distance transport. In analyzing a single major referral center that provides a specialized service for a large region, we aimed to discern how these changes may affect the quality of care on a center-by-center basis and to identify factors that may affect postdischarge follow-up for patients transferred to a specialized care center.

MATERIALS AND METHODS

Patient database

A retrospective chart review was performed to identify all patients treated for traumatic finger amputation between 1995 and 2012 at a major hand trauma referral center. An initial screen was performed using International Classification of Diseases, Ninth Edition, codes specific to finger amputations. Because Current Procedural Terminology codes are often inadequate to reflect the details of the patient encounter and surgery performed, as well as the success of the revascularization, we reviewed the medical record for each patient identified by International Classification of Diseases, Ninth Edition, code. Inclusion criteria for this study were all patients with amputations distal to the metacarpophalangeal (MCP) joint of any digit, including the thumb, regardless of age. Patients with nontraumatic amputations were excluded from the study. In addition, patients described as having a “tip laceration” or “deep laceration” not resulting in amputation or need for revascularization were excluded from the study. If the patient had a major injury, such as an open long bone fracture or vascular compromise of the extremity proximal to the MCP joint, or any other condition that influenced the method of transfer, they were excluded. We did not exclude bony or soft tissue injuries at or distal to the MCP joints, whether in the amputated digit(s) or other digits.

Comprehensive demographic information was collected for each patient. Data unique to the traumatic episode included age at time of injury, work-relatedness, method of transfer and transfer distance (when available), ischemia time from injury to presentation at the tertiary care center, season of year, and date of injury, pre- versus post-2006. Transfer distance was calculated in miles using a straight-line calculation between the outside hospital and the destination trauma center. Summer season was identified based on the 3 months (June, July, August) with the highest average temperature in the region of

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