

Hand and Microvascular Replantation Call Availability Study: A National Real-time Survey of Level 1 and 2 Trauma Centers

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ABSTRACT

Purpose: The inconsistency of subspecialty emergency call services is a growing concern as declining reimbursements, increased legal risk, and challenging social and professional issues present a deterrent to call panel participation. This study assessed call availability of hand and microvascular replantation surgery at all level I and II trauma centers in the US.

Materials and methods: Between May and December 2010, all level I (n = 137) and level II (n = 153) trauma centers across the US were contacted by telephone. Phone contact was unannounced; responders were invited to participate in our IRB-approved anonymous survey regarding hand and microvascular replantation emergency coverage specific to their hospital.

Results: *Level 1 centers:* 117 of 137 (85%) participated, of which 64 (54.7%) had immediate access for hand surgery and microvascular replantation services. Six hospitals provided services 15 to 31 days per month and 3 hospitals supported 1 to 15 days per month. Ten hospitals indicated an inconsistent coverage which was difficult to estimate and 34 hospitals reported no coverage.

Level 2 centers: 132 of 153 (86.3%) participated, of which 38 (29%) had immediate access for hand surgery and microvascular replantation services. Seven hospitals provided services 15 to 31 days per month and 3 hospitals for 1 to 15 days per month. 84 hospitals reported no specific coverage protocol.

Conclusion: Consistent on-call availability for emergency hand and microvascular replantation services remains a challenge across the US:

- 54.7% of level I trauma centers had immediate access to emergency hand and microvascular replantation services although many hospitals had intermittent coverage;
- 29% of level II trauma centers had immediate access to emergency hand and microvascular replantation services although many hospitals had intermittent coverage. Over 50% had no specific coverage protocol;
- Many hospitals indicated the presence of subspecialty hand surgery coverage, however microvascular replantation resources were not available consistently;
- While not confirmed, the current study findings suggest that a more clearly defined and coordinated system of hand surgery and microvascular replantation emergency call coverage will likely improve the efficiency of a limited resource and, ultimately, improve patient care.

Keywords: Microvascular replantation, Orthopaedic surgery call, Trauma centers, Hand surgery.

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INTRODUCTION

A growing inconsistency regarding hand surgery and microvascular replantation call coverage at level I trauma

centers across the United States (US) has been identified¹⁻⁵ such that a task force was established recently by the American Society for Surgery of the Hand (ASSH) to explore this challenging issue. Current guidelines for level I accreditation by the American College of Surgeons (ACS) stipulate that 'hand surgery...capabilities are present at level I trauma centers',^{6,7} however, the policy does not specify a requirement for microvascular replantation services and there is little consensus as to whether this technical skill must be provided as a component of hand surgery call coverage.

A survey of the membership of the ASSH in 2007 reported that declining participation in hand surgery and microvascular replantation call panels was due to several factors, including busy elective schedules, declining reimbursements, inadequate confidence in performing the replantation, and poor clinical results.⁴ The survey was completed by 561 of the 1,238 members of the ASSH at that time, representing a 45% participation rate. Almost 30% of respondents did not take emergency hand call and 44% did not perform replantation surgery or revascularization procedures. Of those who did replantations, 196/316 (62%) did fewer than five replantations per year. Many surgeons in level I centers believed that there was a need for additional local or regional call coverage, such as from level II and community centers, in order to decrease the call burden often assumed by level I or academic trauma centers.

While these studies demonstrate a trend toward decreasing resources for hand surgery call coverage and particularly for microvascular replantation services, the scope of the problem has not been confirmed. There may be an inherent bias associated with self-reporting one's participation on a surgical call panel; survey participants may overestimate their caseload or may actually provide coverage for more than one institution while on call, and those nonresponders to the surveys may be less likely to participate in the call system, implicated by their perceived lack of interest in policy and system review. Therefore, previous assessments of hand surgery and replantation call participation may underestimate the potential deficits in resources, placing the trauma system at risk.

Based on these concerns, we designed a study to evaluate the real-time availability of hand surgery and microvascular replantation call coverage at all ACS-accredited level I and II trauma centers using a phone survey communicated

directly with the ER physician or charge nurse. We believed that this methodology would improve the study participation rate and reduce a perceived hand surgeon self-reporting bias, therefore permitting a more accurate assessment of hand surgery and microvascular replantation call coverage in regional trauma centers across the US.

MATERIALS AND METHODS

Between May and December 2010, the Emergency Room attending physician or charge nurse of all ACS-accredited level I (n = 137) and level II (n = 153) trauma centers across the US were contacted by telephone by the study authors. Centers were identified through the ACS trauma systems database.⁸ Potential affiliation of each trauma center with a hand surgery fellowship approved by the Accreditation Council for Graduate Medical Education (ACGME) was recorded. Phone contact was unannounced; responders were invited to participate in our Institutional Review Board (IRB)- approved anonymous survey regarding hand and microvascular replantation emergency coverage specific to their hospital. A standardized script (Table 1) was reviewed with the responder, which included queries regarding the availability of a hand and microvascular replantation surgeon at that moment and regarding the number of days/nights covered during the course of the month. Up to three

phone calls with personal contact were made to each hospital before it was deemed 'unwilling to participate'.

Source of Funding

There was no external source of funding for this study.

RESULTS

All 290 ACS-verified level I and II trauma centers in the US were contacted by the study authors of which 249 (86%) were willing to participate. When considering both level I and II centers, 24 hour/7 day per week hand surgery and microvascular replantation call coverage was provided by 93/249 institutions (37%).

ACS Level I Trauma Centers

All 137 ACS-verified level I trauma centers in the US were contacted. Twenty of these institutions were unwilling to participate, generally due to time limitations of the responding emergency department physician or due to institutional or personal preference regarding the participation in surveys and/or phone studies. Therefore, 117 of 137 (85%) centers participated and formed the basis for the level I trauma center data. At the time of institutional contact, 64 level I trauma centers definitively had a surgeon on call that would accept a patient for the appropriate

Table 1: Telephone survey script

'Hello, my name is Dr (blinded) and I am a hand surgeon at (blinded) and a member of the American Society for Surgery of the Hand. We are conducting an anonymous and very brief study to assess the growing national concern regarding the lack of availability for emergency hand replantation and microsurgery call. The results of this nationwide study will provide a better understanding of our current call model and potentially provide useful information regarding the improvement of regional hand trauma systems. No physician names or hospital names will be recorded by this study.'

'Would you be willing to answer one or two simple questions regarding the status of your hand surgery on-call availability?' ___ Yes ___ No

If no and the subject is not willing to participate in the survey:

'Thank you for your time. Goodbye.'

If yes:

1. 'Does your hospital have a hand surgery call schedule?'
___ Yes ___ No

2. 'How many days in the current month is your hospital covered/not covered for hand surgery call (if known)? Please review your call schedule if available.'
___ covered ___ not covered
days/month coverage _____

3. 'Could you tell me if your trauma center has a hand surgeon on-call and willing to accept a hand or finger replantation at this moment?'
___ Yes ___ No

4. 'How many days in the current month is your hospital covered/not covered for hand microsurgical replantation (if known)? Please review your call schedule if available.'
___ covered ___ not covered
days/month coverage _____

At survey completion:

'Thank you again, for your cooperation with our study and for your time in answering my questions.'

indications for hand or finger replantation (54.7%). Ten ER physicians were unsure at the time of call if they had a surgeon willing to accept such a transfer, as the responder noted in some cases that there was a hand surgeon on call but he or she was unsure if patients with an isolated digital amputation would be accepted for consideration of replantation; in some institutions replantations were accepted intermittently—acceptance was determined by a call to the hand surgeon on call at the time. One physician asserted that the center would accept isolated finger amputations for replantation, but a more proximal level replantation candidate would not be accepted.

Fifty-five institutions had full-time, 24 hours/7 days coverage available for hand surgery and replantation. Four level I centers had coverage 50% of the time, and two institutions had coverage for 19 of 30 days of each month. One institution had coverage for 10 of 30 days monthly, and two institutions limited their coverage to 2 or 3 days each month. Two institutions were willing to accept replantations on a case-by-case basis.

Overall in this sampling of participating level I institutions, 47% (55/117) provide continuous replantation/microsurgical services, and 56% (66/117) offer such services at some point defined by a monthly schedule. Fifty-seven of the 117 participating centers were affiliated with an ACGME-approved hand surgery fellowship, of which 36 (63%) supported 24 hours/7 days a week microvascular replantation call services.

ACS Level II Trauma Centers

All 153 ACS-certified level II trauma centers in the US were contacted. Twenty-one centers refused to participate due to limitations in physician time at the time of contact or due to personal or institutional preference not to participate in the study. When the ER physician was the responder, there was 100% participation. In all, 132 out of 153 (86.3%) centers participated and formed the basis for the level II trauma center data. At the time of institutional contact, 47 level II trauma centers (35.6%) definitively had a surgeon on call that would accept a patient requiring a digital replantation. Six ER physicians did not know at the time of the call and/or did not have ready access to whether the institution had a surgeon willing to accept such a transfer.

Thirty-eight level II institutions had full-time, 24 hours/7 days coverage available for replantation (29%), although in one case there was a single hand surgeon available for microvascular replantation who would cover at all times except for when he was on vacation. One institution claimed to have coverage ‘most of the time’ but could not provide a defined call schedule. Another center indicated that they

had 24/7 hand surgery call coverage, however replantation coverage was surgeon-dependent. One institution could perform replantation 80% of the time while two others had coverage 50% of the month. Two institutions reported coverage 20 days out of 30; one of these could provide replantation services but usually sent them to another institution. Also, this center claimed to be a level I trauma center despite being listed by the ACS as a level II institution. One center had coverage 10 out of 30 days per month while another provided microvascular replantation coverage on fewer than 5 days out of the month. One institution had a hand surgeon that selectively took call and performed finger replantation on a case-by-case basis. Several institutions reiterated that they had hand surgery call coverage, however they were not aware if replantation candidates would be accepted for transfer to their facility and noted that typically replantation candidates were diverted to another hospital. For level II centers, 36% had hand surgery and microvascular replantation call coverage at least at some point during the month, while only 29% had definitive and continuous coverage. Four of the 132 participating centers were affiliated with an ACGME-approved hand surgery fellowship, of which three (75%) supported 24 hour/7 days a week microvascular replantation call services.

DISCUSSION

The inconsistency of subspecialty emergency call services is a growing concern as declining reimbursements, increased legal risk, and challenging social and professional issues present a deterrent to call panel participation. Hand surgery trauma call encompasses a wide spectrum of responsibility, often involving bony injury distal to and including the carpus and soft tissue injury distal to the elbow, and is considered in conjunction with the emergency responsibilities of the general orthopaedic, plastic surgery, and vascular surgery services. Often, these determinations of call responsibility are made locally at the hospital administration and department levels, although typically they are created to comply with the ACS Committee on Trauma (COT) guidelines, particularly for level I and II hospitals.^{6,7} Recently, several studies have evaluated the availability of emergency call coverage for hand surgery and have identified the decreasing numbers of hand surgeons who provide concurrent microvascular replantation coverage for the treatment of digital or upper limb amputations.^{1,2,4,5} A recent survey of the ASSH membership in 2007, unfortunately limited by a 45% participation rate, reported that 29% of respondents do not take emergency hand surgery call and that 40% do not provide microvascular replantation services.⁴

In their ASSH survey, Payatakes et al found that 74% of surgeons perceived a decrease in replantation surgeries performed over the past decade and that 79% believed that microvascular replantation was performed predominantly at ACS level I trauma centers. They noted that of those respondents who performed microvascular replantation (56%), 62% performed less than three replantation procedures per year.⁴ In a study of the national database from the Agency for Health Care Policy and Research, Chung et al, reported that of the 906 hospitals sampled, only 136 performed finger replantation, but importantly, of those, 60% performed only one procedure and only 2% performed 10 or more cases. Several conditions may have supported a diminished volume of replantation candidates including more stringent indications for surgical replantation, patient preference to limit surgical treatment to revision amputation due to employment and social pressures to return to activity more quickly, and improved occupational safety mechanisms which have resulted in fewer amputation injuries in the workplace.² The number of digital replantations performed annually declined in the state of Florida between 1997 and 2007, where 6% of the hospitals performed 68% of its replantation procedures.⁵ This same study observed an increasing proportion of patients admitted and treated outside their county of residence for both revision amputations and replantations, suggesting a relatively high rate of patient transfer during triage. Several authors have asserted that much of the replantation capacity in the US is underserved by the level I trauma centers and that there is a need to increase local and regional coverage of microvascular replantation to lessen the burden on these institutions.¹⁻⁵

Our findings that only 36% of ACS level II trauma centers had coverage for microvascular replantation services support previous observations in the literature. Chung et al described diminishing coverage at level II centers, citing decreasing reimbursement as a cause.² Chen and Naryan documented an 80% decrease in the number of replantations being performed at secondary centers from 1992 to 2002, noting that 11% of the replantations were being performed at level II centers whereas 10 years prior slightly over 50% of replantations occurred at level II centers.⁹ While our current study did not quantify the number of digital replantations performed at level I or II trauma centers, it does examine the capacity of level I and II centers to provide microvascular replantation services.

A decreasing number of centers providing microsurgical hand call may adversely impact ultimate patient outcomes and increase the cost of medical treatment. Patients with acute amputations triaged without an evaluation by a

surgeon familiar with the indications for replantation may experience less than optimal outcomes due to one or more of the following: (1) In the absence of technical expertise for replantation, a revision amputation may be the only option presented to a patient, despite the potential for microsurgical replantation, due to the inherent bias of the surgeon; (2) transfer to higher level of care for definitive management has been demonstrated to add hours to a complex procedure for which tissue ischemia time influences ultimate outcomes. Ozer et al reported a mean time of transport of 5.15 hours (range: 1-24 hours) for patients transferred for possible digital replantation,¹⁰ and Menchine and Baraff reported that 40% or more of orthopaedic or plastic surgery transfers to a higher level of care took over 3 hours;¹¹ (3) inadequate evaluation, triage, and patient education has been shown to increase the cost of medical care through the inappropriate use of expensive medical transportation, such as air transport, when transferring a patient to a higher level of care.¹⁰

Our study presents a unique trauma system survey whereby the survey participants were members of the ER staff and representatives of the trauma centers, not the subspecialist surgeons themselves. This methodology may reduce a perceived self-reporting bias and improve survey participation. The study participation rate was 86% for the combined level I and II centers, and was 85% and 86% for level I and II centers respectively. Our study participation rate exceeded previous surveys of hand surgery call systems including a 45% participation rate for the ASSH membership survey and the average participation rate of approximately 55 to 60% observed in many mailed surveys reported in the medical literature.¹² Also, the survey was administered in part as a 'real-time' survey, such that the respondents were not adversely influenced by recall bias. Importantly, our findings confirm a lack of consistent hand and microvascular replantation call coverage at both level I and II trauma centers across the US where only 55% of level I and 36% of level II participating centers had resources available at all times to support microvascular digital replantation surgery. Many institutions provided intermittent microvascular replantation call coverage whereby the center's availability was guided by a less than adequate number of qualified hand surgeons covering the hand surgery call schedule, by the preference of the individual surgeon taking call, and by a case-by-case review. There was a trend of uncertainty, although not tested for significance, as to whether hand surgery call included microvascular replantation surgery. This reflects the ambiguity in the current ACS guidelines for level I accreditation which stipulates the requirement for 'hand

surgery...capabilities are present' but does not specify such a requirement for microvascular or replantation coverage.⁶ Current guidelines for level II trauma designation do not include specific recommendations for hand surgery resources. Based on this lack of consensus, recently approved changes in the ACS/COT guidelines have attempted to clarify hand surgery call policy to make 'microvascular capability for revascularization and replantation available at level I centers 24/7/365 or have a transfer agreement in place to another institution'.¹³ personal communication, L Scott Levin, MD; AAOS Liaison Committee to ACS Chairman.

The limitations of our study are similar to studies which use a survey to gather information: Some respondents may not be adequately informed to justify their participation or may be overprotective of the hospital's triage status, thereby giving false information to the surveyor. In particular, if the trauma center did have a hand surgery call roster, it was unclear on several occasions as to whether this represented microvascular replantation call coverage; in many instances, clarification of this distinction was required. We recognize that the number of trauma centers providing emergency microvascular replantation services will be overestimated, as it is not uncommon for one hand surgeon to be providing emergency call coverage for more than one hospital at one time; this replication of service may impact a region's actual capacity to provide such services. We were unable to achieve a 100% participation rate, however, we did achieve an 86% participation rate despite multiple telephone calls at different staffing shifts. This participation rate is an improvement compared to similar studies assessing subspecialty emergency call⁴ and compared to rates of participation in similar surveys reported in the medical literature.¹² While it cannot be completely excluded, our methodology minimized the risk of nonresponder bias influencing the study results as those participants queried were not reporting data directly related to their practice.

CONCLUSION

There has been a growing concern that on-call availability for emergency hand and microvascular replantation services in the US has become inconsistent, placing patient care at risk due to inefficiencies in a trauma system whose results, specific to replantation survival, are time-dependent. The results of our study strengthen previous conclusions regarding the need for a more defined and coordinated system of emergency microvascular replantation surgery services in order to improve the efficiency of a limited resource and, ultimately, improve patient care.

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