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Evaluation of appropriateness of patient transfers for hand and microsurgery to a level I trauma center

Ilvy Friebe · Jonathan Isaacs · Satya Mallu · Anton Kurdin · Varatharaj Mounasamy · Harinder Dhindsa

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Abstract
Background The transfer of patients for hand and microsurgical emergencies to level I trauma centers is a common practice. Many of these transfers do not actually require a hand specialist and could be taken care of at most regional hospitals. In this study, we will evaluate the appropriateness of patient transfers for hand trauma and determine if there is a correlation between inappropriate transfers and undesirable factors, such as insurance status and off-hour's presentation.
Methods A retrospective chart review was performed in all patients transferred to a level I trauma center for hand and microsurgical trauma over a 22-month period. Collected data included indication for transfer, mode of transfer, time and day of the week, patient demographics, insurance status, and whether the transferring facilities had surgical coverage available. A synopsis, including treatment details, of each transfer was created, and a survey was sent to a review committee who rated the appropriateness of the transfers. Statistical analysis was performed to determine whether appropriateness of transfers was influenced by nonmedical variables.
Results Over a 22-month period, a total of 95 hand or microsurgical patients were transferred to a single tertiary referral center. Of these, 66 % of the transfers were considered inappropriate by the surveyed physicians. Inappropriate transfers were statistically more likely to be under insured or transferred during nonbusiness hours.
Conclusion A large percentage of patients are being transferred to tertiary care centers for reasons other than medical necessity, generating a large burden on already strained medical resources.

I. Friebe · J. Isaacs (✉) · S. Mallu · A. Kurdin · V. Mounasamy · H. Dhindsa
Division of Hand Surgery, Department of Orthopaedic Surgery, Virginia Commonwealth University Health System, 1200 E. Broad St., West Hospital, 9th Floor, 23298, Richmond, VA, USA
e-mail: jisaacs@mcvh-vcu.edu

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Introduction

Devastating hand and limb injuries, such as replants or vascular injuries, are often appropriately transferred to tertiary referral centers, as successful outcomes are dependent on an experienced team approach [5, 7, 10]. The Emergency Medical Treatment and Active Labor Act (EMTALA) was created in 1986 to facilitate such transfers and also to protect patients from being denied medical care due to lack of financial resources or insurance [1, 3, 11]. The act mandates that a patient presenting to any emergency department will be stabilized there, regardless of insurance status, but this facility can then transfer the patient to a higher level of care facility if necessary. In turn, the higher level of care facility, usually a level I trauma center, has to accept this patient, as long as capacity exists [12].

Our level 1 trauma center receives many transfers for hand and microsurgical trauma. While many of these transfers seemed appropriate for treatment at a tertiary care center and required the treatment by an experienced hand surgeon, others were easily dispositioned by the emergency room (ER) staff or handled by a junior-level resident. Noting this questionable use of resources, as well as the obvious burden placed on patients having to travel outside of their community, we questioned whether there were additional nonmedical factors prompting some of these transfers.

While other studies have looked at the demographics of patient transfers since the enactment of EMTALA, few have evaluated the appropriateness of these transfers [6, 8, 13]. Koval et. al. performed a retrospective case–control study on patients with low injury severity scores that were transferred to their level I trauma center and compared this group to patients treated at non-level I trauma hospitals. Transfer rates

were higher not only in patients with more comorbidities but also during off-hour presentations and for underinsured, male, or minority patients [6]. Conversely, Melkun et al. found no differences between the two groups in terms of patient demographics or insurance status when they compared patients that were transferred to a level I trauma center for hand trauma with patients directly presenting to the emergency department at the same institution [8]. Spain et al. evaluated all transfer requests for any trauma to their academic level I trauma center. While they found that the payer mix and need for operative interventions was similar to their primary catchment area, they did note a 20 % increase in patients requiring specialist care (suggesting a primary motivation for transfers was availability of such specialists) [13].

All of these studies compared transferred patients with patients presenting directly to their institutions' ERs. This study methodology, however, is based on the flawed assumption that the appropriateness of "walk-in" patients is comparable to the appropriateness of transfers. Having a high percentage of patients not needing the resources of the tertiary emergency center where they present because it happens to be in their community has no bearing on whether or not a non-tertiary medical center is appropriately transferring patients.

Therefore, the focus of our study was to evaluate the patients that were transferred to our level 1 trauma center for hand and microsurgical trauma, and to rate these transfers based on appropriateness independent of our local patient population. We hypothesized that inappropriate transfers would positively correlate with "undesirable" factors, such as insurance status and time of transfer.

Materials and Methods

Data Source

Our institution is a 779-bed level I trauma center and a tertiary referral center. After approval from the Institutional Review Board, the records from January 2010 to October 2011 were obtained from the hospital's electronic medical record system for all patients transferred to the emergency department for isolated hand and microsurgical "emergencies" (multi-trauma patients not included). Ninety five patients were identified and all included in the analysis.

At our institution, patient transfers are regulated by a transfer center. Although, in theory, all transfers require physician to physician communication, practically, the information is gathered by communication specialists and presented to the emergency medicine physician in charge, who in turn usually accepts the patient without further questioning.

Study Design

Data were generated by reviewing the emergency department records, all consult notes, operative and procedure notes, inpatient records, and subsequent outpatient follow-up records for all transferred patients. The transferring facilities were contacted to determine orthopedic, hand, or plastic surgery coverage at that facility at the time of transfer. Patient demographics, indications for transfer, mode of transfer, time of transfer, day of the week, insurance status, care provided, and final disposition were all recorded. Patient transfers were grouped into day, night, or weekend transfers, and un- or underinsured (indigent, Medicaid), Medicare, workman's comp, or private insurance.

A synopsis of the transfer indication, the emergency room and hospital course, final disposition, and specialty "coverage" available at the transferring facility was created and sent to an expert review panel consisting of five fellowship-trained hand surgeons (four academic surgeons and one community surgeon) and two board-certified emergency medicine physicians (both academic). The panel was blinded to patient and transferring hospital demographics, time of transfer, and insurance status. The panel members were

Table 1 Grading scale for transfers

Grade	Definition	Clarification
1	Completely inappropriate—care should have been provided by referring ED without further consultation	Something that should be within the scope of a physician working in a community ED (emergency medicine physician)
2	Appropriate for referral but on an outpatient basis	Something that needs outpatient follow-up by a specialist, but not necessarily that night
3	Needed urgent treatment, but should have been provided by referring ED's consultant coverage	Something within the scope of community hand, general ortho, or plastic surgery consultant coverage for a ED (if that ER reports having that coverage)
4	Appropriate for transfer but patient refused elevated level of care	Patient did not want the treatment recommended by our orthopedist/hand/plastic surgeon, but instead went with the treatment that could have been provided by the referring consultant
5	Appropriate	Patient required urgent treatment by a specialist not available at the referring facility

Table 2 Statistical comparison of appropriate versus inappropriate transfers

	Appropriate	Inappropriate	Appropriate vs inappropriate *p* value	Stat. significance
Day	19	32	0.0919	No
Night	13	31	0.0096	Yes
Weekday	20	29	0.2529	No
Weekend	13	33	0.0045	Yes
Uninsured/underinsured	13	35	0.0021	Yes
Medicare	3	4	1.0000	No
Workman's comp	7	8	1.0000	No
Commercial insurance	9	16	0.2295	No

asked to read the synopsis for all transferred patients and to choose from five categories regarding the appropriateness of transfer (see Table 1).

While there is no validated system to grade transfers for appropriateness, we based our rating scale on what should be within the scope of either an emergency medicine physician working in a community emergency room, or a specialist covering such a center as a consultant. This certainly takes away some subjectivity and places most patient scenarios into specific categories.

Analysis

Transfers were deemed inappropriate if the majority (four out of seven physicians in the review panel) graded them as such. Time of transfer and insurance status was correlated with the transfers based on "appropriateness," and statistical analysis performed (GraphPad Prism® La Jolla, CA) using the sign and binomial test to determine whether there were significant differences between the two groups.

Costs

An approximate total cost of all inappropriate transfers was determined based on physician charges, an average facility fee based on average charges for these types of services, the cost of ambulance or air transfer fees, and facility and physician costs.

Transportation costs were calculated based on the distance from the transferring facility to our facility, and air cost was based on the transferred patient's bill.

Results

Sixty-six percent (66 %) (n=62) of the patient transfers were considered inappropriate by the expert review panel. Fifty-one percent (51 %) (n=48) of all transfers were un- or underinsured (see Table 2), and a statistically significant difference was found between appropriate and inappropriate transfers in terms of undesirable insurance status (p<0.005)

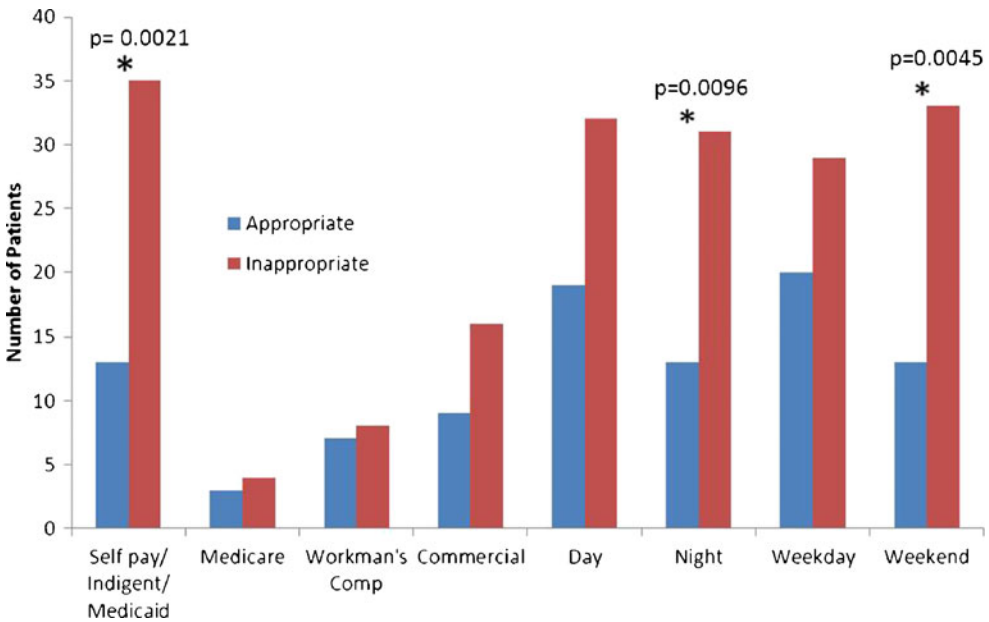

Fig. 1 Comparison of appropriate versus inappropriate transfers. The *asterisk* denotes a statistical significance with *p* value noted

and time of transfer (night $p<0.05$ and weekends $p<0.005$) (see Fig. 1).

The average emergency department charges (facility and emergency physician fees) for hand trauma ranged from $1,000 for basic hand injuries to upwards of $3,000 for more complex cases, and the average charge for an ambulance transfer was $400 plus $8–10/mile for ground transport and ranged from $20,000 to $30,000 for helicopter transport.

For inappropriate transfers, the cost of physician charges was $24,153, the total cost of facility fees was $31,800, and the total cost of transportation was $68,198. Thus, a sum of $124,151 was spent on inappropriate transfers to our institution during the 22-month period of our study.

Discussion

Our findings suggest a potential waste of medical and financial resources in our region. Every year, the number of emergency room visits for hand trauma is increasing. According to a Center for Disease Control national survey, there were 42 million injury-related emergency department (ED) visits in 2008. Of these, 11 % (4.7 million) were for hand-related trauma, and overall, 2.1 million patients were transferred [9]. Given the recent attention towards spiraling medical costs, our profession is obligated to be judicious in the use of these resources.

The burden on medical systems generated by inappropriate transfers is obvious. Two emergency room beds are taken up by one patient, ambulances and helicopters may not be available to assist in critical transfers, and increased crowding adds further stress to already busy emergency rooms. To put a dollar figure on this waste is difficult.

Our database was not capable of identifying individual charges, but our estimated cost of $124,000 to our system was only based on the transfer cost and the second ER visit of those transfers deemed inappropriate. This may not seem exorbitant, until one considers the total number of transfers across the country every year. Additionally, many of the transferred patients are underinsured, so these unnecessary medical charges must be absorbed by the hospital or patient transport systems.

This avoidable stress has a more personal aspect as well. Even for insured patients, medical transport costs may not be covered. A patient of the senior author's presented her uncovered helicopter bill for $27,000! Likewise, family members and friends must now (often unnecessarily) travel out of their community to support their loved ones. Transferring physicians often give little or no thought to these legitimate and often overwhelming downstream consequences of the transfer decision.

The main weakness of our study is the lack of a validated rating scale.

We acknowledge the difficulty in subjectively evaluating a patient transfer for appropriateness retrospectively. There is, however, no validated grading system for judging the appropriateness of medical care. Some studies [2, 4] have used a visual analog scale to assign scores to each transfer, taking into account the injuries as well as the capacity of the referring facility. Our method offered a similar linear grading progression. Recognizing the subjective nature of these judgments, we specifically included academic hand surgeons, a community hand surgeon, and ER physicians on our rating panel.

EMTALA laws, created to ensure patient safety, especially for indigent or uninsured patients, have opened the door for increasing abuse of the referral system. Studies like this one can focus attention on the issue and may act as a starting point to identifying solutions for what should be a correctable pattern.

Conflict of Interest All authors declare that they have no conflict of interest.

Statement of Human and Animal Rights This article does not contain any studies with human or animal subjects.

Statement of Informed Consent No patient-identifiable information was disclosed in this study.

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