Development of Supplemental Educational Resource of Hand Injury Clinical Management for Emergency Medicine Residents

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Background / Introduction: Upper extremity injuries, and hand injuries in particular, account for a significant percentage of trauma visits to the Emergency Department (ED) visits in the United States. In 2009, the National Electronic Injury Surveillance System (NEISS) showed 92,601 records of upper extremity injuries treated in the ED, 34.4% of which were finger injuries. 50% of hand injuries are fractures, and phalangeal or metacarpal fractures make up 4% of upper extremity fractures,7 and 18-23% of all fractures.71 There is a lot of pressure on emergency physicians and hand specialists to quickly and accurately diagnose and treat hand injuries, as they can be debilitating to the patient if not effectively treated, as well as costly, both in terms of healthcare (i.e. repeat surgeries, hand rehabilitation, etc.) and lost productivity. In 2013, the cost of injuries in the United States is $300,000.50. Because many hand injuries are first seen in the Emergency Room, many of which cannot be surgically repaired, many hand injuries are resulting in the development of emergency medicine residents who are highly focused on hand injuries and their clinical management. My project focused on the SELECT competency “Value-Based Patient-Centered Care”. Hand injuries can have devastating impacts on patients if they are not treated properly. Since many patients go to the ED following an injury, it is imperative the quality of the clinical management they receive is as close to the quality they would receive from an orthopedic or plastic hand specialist, especially for more complicated cases.

Review of the literature reveals little research on resident education. Simulation, now being implemented at various institutions for emergency medicine training,9 was shown as being effective in improving critical thinking response training, while pediatric residents in another study showed improvement in knowledge and changes in practice when they viewed a tutorial video prior to splitting.72 However, the focus of the literature on the management of hand injuries in emergency medicine is lacking compared to the increased use of simulation teaching methods. Thus, I focused on determining the educational resources currently available in PGY-1 emergency medicine residents at my clinical site, and developing a supplemental resource that would properly prepare them for the assessment and clinical management of various types of hand injuries seen in the ED.

Plan: I formally surveyed upper-level residents and attendings in the emergency medicine, plastic surgery, and orthopedic surgery departments to determine how well they feel hand injuries were managed in the ED, so they could ascertain all resources currently available were sufficient in teaching the PGY-1 EM residents, and what they believed would be an effective resource to teach residents about hand injury management that would be easily accessible to reference during their shift if necessary. I used the results of the new residents’ knowledge and comfort level regarding hand injury management during a grand rounds session presented by Dr. Talsania (Orthopaedic Surgery Attending); few PGY-1 (and PGY-2) residents were comfortable assessing radiological imaging of the hand, developing a differential diagnosis based on the imaging and case study provided, and presenting the case to the attending. I researched common hand injuries that presented in the ED in the United States. I then met with Dr. Talsania, Dr. Miller (Plastic Surgery Residency Program Director), and Dr. Brennan (Orthopedic Residency Program Director) to determine the injuries most commonly seen in the ED. Therefore, I was able to get an idea of the new residents’ knowledge and comfort level regarding hand injury management during a grand rounds session presented by Dr. Talsania (Orthopaedic Surgery Attending); few PGY-1 (and PGY-2) residents were comfortable assessing radiological imaging of the hand, developing a differential diagnosis based on the imaging and case study provided, and presenting the case to the attending. I researched common hand injuries that presented in the ED in the United States. I then met with Dr. Talsania, Dr. Miller (Plastic Surgery Residency Program Director), and Dr. Brennan (Orthopedic Residency Program Director) to determine the injuries most commonly seen in the ED. In addition to their standard textbooks (Rosen’s Emergency Medicine: Concepts and Clinical Practice), and Tintinalli’s Emergency Medicine: A Comprehensive Study Guide, the residents also had access to FDMcast, an online podcast series that covered numerous medical topics, including emergency medicine and hand injuries. Despite the number of resources available, a large percentage of ED residents do not have access to the digital library and most ED residents present with hand injuries on various topics, take place once a week for five hours, along with a two-hour monthly guest lecture. Additional resources include splint and suture clinics, journal club meetings, and simulations. Residents also learn how to a variety of procedures such as wound/burn care, incision/drainage, and fracture reduction at a local simulation center.

Do:

1. After speaking with the residents and attendings, it was decided that print material, such as a booklet or laminated cards, would be less utilized than an electronic resource, which could be easily accessed by the residents via tablets and smartphones. The EM residency curriculum is already organized into lecture series, so it was determined the best way to provide a concise review of pertinent information regarding hand injury clinical management would be with an updated power point (PPT) lecture. This PPT could be given to residents prior to the clinical shift to aid their preparation for potential hand fractures seen during a grand rounds session during the rotation, and accessed by residents during and after their rotation.

2. To organize all of the information I obtained, I created an outline that included the injuries, procedures, and hand management “clinical pearls” that I thought would be the most beneficial to their clinical management of various types of hand injuries seen in the ED. I then organized the information on the PPT in a way that would be easily taught via a lecture, while also grouping information together in categories so it’s easier for residents to go through when assessing it during a shift or a study session. For example, the PPT begins with a review of relevant hand anatomy (skin surfaces, bones, tendons, nerves), then goes on to list the important things to note during a patient/hand physical exam, with “clinical pearls” for certain injuries. Next, injuries are categorized by type (fracture, dislocation, tendon rupture, etc.), and explains how to treat each to an attending. Instructions and tips on procedures, like digital nerve blocks and laceration repairs, follow this section.

Assessing the Patient - Radiographs

1. Evaluate the most recent/previous radiographs (if available)。

2. Look for clues where normal anatomy is seen.

3. Identify any greenstick fractures.

4. If unsure of a diagnosis, refer to a hand specialist.

Describing an injury to attending

1. Initial description of the injury:

   - Mechanism

   - Clinical presentation

   - Imaging findings

   - Specific location

   - Associated injuries

   - Pain level

   - Edema level

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   - Prognosis

   - Management

   - Complications

Acute Paronychia

1. Generalized version of hand infections (inflammation of the soft tissues surrounding the nail). Usually due to Staphylococcus aureus (S. aureus). Can be treated with oral antibiotics (e.g., amoxicillin-clavulanate). Requires bed rest and elevation.

Examples of slides from the hand injury clinical management PPT

Study:

As of poster publication time, we are still in the process of developing the hand injury clinical management PPT. We are currently trialing a variety of formats, including CME credit, online series, and digital nerve blocks that are done on a variety of injuries.

Act / Conclusions:

The next step of this project is to provide the PPT lecture to PGY-1 Emergency Medicine residents before they begin their hand clinical rotation under the advisement of the orthopedic surgery attendings. I would like to survey residents before they attend the class to ascertain their knowledge of hand injuries and clinical management, as well as their comfort level in providing effective care to a variety of hand injuries that could present in the emergency department. Once the residents have attended the lecture and have the PPT at their disposal, I would again like to survey them for the same criteria. At the end of their rotation, I would like to survey the residents to determine how confident they felt in managing various hand injuries, how often they referred back to the PPT during the rotation period, how often they asked an upper-level resident or attending for advice/help while managing hand injury, and whether they felt the PPT was a useful tool compared to the other educational resources available to them (textbooks, podcasts, etc.).

Ideally, I would like to have a control group (which does not receive the PPT) and an experimental group (which does receive the PPT), and see which group of residents is more comfortable providing treatment to various hand injuries and which group provides the most effective care. However, I do not feel this would be a feasible study to undergo at LHC-V, as all residents have access to the same education resources throughout their residency training. Therefore, I would survey upper-level residents instead, determining how confident PGY-2, PGY-3, and PGY-4 residents are in managing hand injuries, their knowledge regarding the various types of injuries and their clinical management, and whether they feel the education resources available to them are sufficient in providing all the information they need prior to and during an ED shift, for comparison. My goal is to ultimately compare this supplemental resource against online videos, the standard textbooks and the new podcasts we use to begin analyzing which educational resources translate to more efficient hand management and, subsequently, better patient outcomes.

In the future, if this PPT receives favorable feedback from the residents and the lecturing attendings, I would like to convert the PPT into an App. The PPT can be accessed via smartphone, but unless it is saved directly onto the phone, physicians would need internet access to view the PPT. I would like to create an application that has the same information as the PPT but does not require internet access, enabling physicians to access the PPT from all areas of the hospital or medical facility, while the phone is in airplane mode, and/or when the phone’s mobile data is turned off.

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