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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 high percentage of 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, 38.4% of which were finger injuries.^[1] 50% of hand injuries are fractures, and phalangeal or metacarpal fractures make up 41% of upper extremity fractures^[2], and 19-28% of all fractures.^[3]

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 lawsuits (the average jury verdict in finger and hand injuries is ~\$630,000^[4]). Because many hand injuries are first seen in the emergency room, it is crucial that the education emergency medicine residents are receiving includes resources focusing on hand injuries and their clinical management.

My project focused on the SELECT competency “Values-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 current literature reveals little research on resident education. Simulation, now being implemented at various institutions for emergency medicine training^[5], was shown to result in better team cooperation during rapid response training^[6], while pediatric residents in another study formed volar splints faster and more proficiently when they had viewed a tutorial video prior to splinting.^[7] However, focused observation and analysis of emergency medicine resident education appears to be lacking other than the increased use of simulation teaching methods.

Thus, I focused on determining the educational resources currently available to 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.

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Plan:

1. I informally surveyed upper-level residents and attendings in the emergency medicine, plastic surgery, and orthopedic surgery departments at my clinical site. I asked them how well they felt hand injuries were managed in the ED, whether they felt the education 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 also easily accessible to reference during their shift if necessary. 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 (Orthopedic Surgery Attending); few PGY-1 (and PGY-2) residents were comfortable assessing radiological imaging of the hand, developing a differential diagnosis base on the imaging and case study provided, and presenting the case to an attending.
2. I researched common hand injuries that presented in the ED in the United States. I then met with Dr. Talsania, Dr. Miller (Plastic Surgery Resident), and Dr. Elliott (EM Chief Resident) to discuss the injuries most commonly seen in the LVHN emergency departments. Using both sources, I narrowed down my focus to injuries occurring only in the phalangeal and metacarpal region.
3. I then spoke with Dr. Jacoby (EM Attending), Dr. Worrlow (EM Attending), and Dr. Elliott to ascertain what education resources regarding hand injuries were available to the emergency medicine residents. 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 FOAMcast, an online podcast series that covered numerous medical topics, including emergency medicine and hand injuries. Grand rounds, during which residents are presented with lectures 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 to include lectures, 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 their PGY-1 orthopedic rotation to preview, taught 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 injury management “clinical pearls” the orthopedic attending, plastics residents and EM residents/attendings felt were most important for residents to know.
3. Next, I filled in the outline with information I had received from the various physicians I had talked to, from clinical management research articles, and from Rosen's Emergency Medicine textbook. All of the information was approved by the orthopedic hand surgeon and plastic surgery resident to ensure it was the same quality information a resident specializing in hand injuries would receive during training.
4. I then organized the information from the outline onto the PPT. I aimed to organize 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 accessing 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 into the important things to note during a patient history/physical exam, with “clinical pearls” for certain injuries. Next, injuries are categorized by type (fracture, dislocation, tendon rupture, etc.), and explains how to describe each to an attending. Instructions and tips on procedures, like digital nerve blocks and laceration repairs, follow this section.

Assessing the Patient - Radiographs

Avoid over-treating based on imaging.

Fractures heal before radiographs show the healed bone. Treating the radiographs rather than the patient's Hx and PE can lead to unnecessary splinting/disuse and stiffness.

CAUTION: Beware of “bad things with normal imaging”

- Scaphoid fractures
- Flexor tendon avulsions
- Central slip injuries
- Mallet fingers

Describing an injury to an attending

“NO LOADS”	“BLT LARD”
N – neurovascular status (intact, Y/N)	B – bone (know your anatomy!)
O – open or closed (i.e. fractures)	L – location on bone (head; neck; shaft; etc)
L – location of injury (know your anatomy!)	T – type of fracture (open; closed; greenstick; etc)
O – orientation (of fractured/displaced piece)	L – lengthening
A – angulation	A – angulation
D – displacement (in mm)	R – rotation
S – shortening (in mm)	D – displacement (in mm)

Acute Paronychia

Generally caused by *Staphylococcus aureus*

In children: secondary to finger sucking and nail biting

In adults: secondary to nail trauma (including ingrown nails)

Tx: short courses of antibiotics (i.e. cephalexin, erythromycin)

• If pus is present, it should be drained

- Distal Digital Block: 0.5 mL 1% lidocaine w/o epi to a point 3 mm proximal to the junction of the proximal and lateral nail folds (medial injection is effective as well). Direct needle distally at about 45 degree angle and centered toward heaviest concentration of pus

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 taking the time to ensure all hand injuries and conditions most commonly seen in the LVH-CC and LVH-M emergency departments are included, along with advice from an orthopedic hand specialist on performing procedures such as tendon exam, splinting, 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 management rotation under the advisement of the orthopedic surgery attendings. I would like to survey residents before they attend the lecture 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 education 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 LVH-CC, as all residents are to receive 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 other resources like the standard EM textbook and the new podcasts so we can begin analyzing which educational resources translate to more efficient injury 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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