The Utility of Multimedia in the Diagnosis and Management of Acute and Subacute Problems in Hand Surgery

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Abstract: A typical consultation is based on a phone conversation between the consulting service and the surgeon. If the description given to the surgeon misrepresents the severity of the condition, unnecessary transfer of the patient could follow. In an attempt to reduce the occurrence of unnecessary transfers, we started supplementing our consultation with video captured with a cell phone camera demonstrating specific points in clinical examination of the hand. These videos were sent to the surgeon to clarify the clinical picture. We found this method useful in some cases in ruling out the need for urgent transfer.

Key Words: multimedia, cell phone, video, videos, consultation, transfer, expense, hand trauma

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In phone-based consultation, factors that play a role in the decision making include the ability of the emergency physician to clearly describe the medical condition, the acceptance of the surgeon with the given description, and the seriousness of the condition. Possible scenarios include over- or underestimating the medical problem. While underestimating the condition could lead to serious consequences, overestimating the seriousness of the condition leads to unnecessary transportation of the patient. In addition to being a burden on the patients and their families, it could be expensive and exhaust the medical resources. Improving the quality of the medical consultation could help reduce the occurrence of such scenario. There are available methods to enhance the consultation quality that are mostly videoconferencing based. These methods are expensive and may not be easily portable. We describe our limited experience with the utility of a much cheaper multimedia device that is already an available technology—the cell phone.

METHODS

This is a multicenter, pilot study that was performed on a consecutive series of 5 patients. The study was performed in 3 centers in the same city. One of these centers is our main trauma referral center. In our centers, the plastic surgeon usually receives phone calls requesting emergency transfer for the treatment of acute hand problems from the other 2 centers.

We included consults requesting urgent transfer of acute hand problems. We modified our regular consultation system by supplementing the accepting surgeon with short video clips demonstrating specific points in the physical examination. For example, the video will demonstrate range of motion of the involved joint if there is suspicion of septic arthritis.

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The videos were taken by the hand surgery fellow using a 5-megapixel cell phone-based camera and were e-mailed to the consultant. Patients were consented for taking and sending photos and videos, and care was taken not to include any patient identifier in the video clip.

The consultant compared the clinical picture described over the phone with the clinical picture provided by the videos and was blinded to the fellow's clinical assessment. A decision was made whether or not to accept the transfer.

RESULTS

The same clinical examiner studied 5 consults, requesting urgent patient transfer to our center during a period of 2 months. One case was excluded because the patient could be identified from a tattoo on the hand dorsum. Two consults requested transfer of serious hand infections to rule out acute tenosynovitis and acute septic wrist. One consult requested urgent transfer to treat acute compartment syndrome of the hand following extravasation injury. And one consult requested an urgent transfer to revascularize an ischemic digit.

The videos were 4 seconds in length on average and were 5 to 6 MB in size. Patients were asked to actively flex and extend the affected digit or hand and rotate the hand to demonstrate an additional angle of the clinical examination, as the video is being captured.

For the first 3 consults, the videos of the clinical examination demonstrated clearly a much milder pathology than initially thought, and no urgent transfer was initiated.

In the first case, the patient was clearly able to actively flex and extend both proximal interphalangeal joint (PIP) and distal interphalangeal joint (DIP) to a great extent with no signs of tenosynovitis, apart from mild local cellulitis of the distal phalanx area. The patient was young and healthy with no history of diabetes or neuropathy that could affect the clinical examination. The patient was started on antibiotics and was examined in our clinic in the next day. His cellulitis resolved within 1 week and did not need any further treatment.

In the second case, videos demonstrated a mild cellulitis around an intravenous puncture site with good active range of motion of the wrist. The diagnosis was cellulitis, and urgent transfer was again not needed.

The patient's cellulitis revolved over 10 days of intravenous antibiotics treatment.

The third consult requested an urgent transfer to revascularize a lacerated digit that lost both digital arteries and the flexor digitorum profundus (FDP) at zone II. Physical examination video demonstrated a semicircular volar laceration of the digit, with a wide intact dorsal skin bridge. The fingertip was pink, and the patient was actually able to flex the DIP. The patient was examined in the clinic next day instead of being transferred overnight.

The fourth consults was accepted for urgent transfer to our center to rule out acute compartment syndrome of the hand that could not be ruled out depending on the video (Table 1).

TABLE 1. Comparison Between the Initial Given Diagnosis by the Consulting Physician and the Actual Diagnosis

	Requested Transfer to Rule Out	Actual Diagnosis	Management
Case I	A cute suppurative tenosynovitis	Cellulitis	No need for urgent transfer
Case 2	Wrist joint septic arthritis	No septic wrist	No need for urgent transfer
Case 3	Devascularized finger	Partial amputation with a vascularized fingertip	The patient was seen next day in the clinic
Case 4	Compartment syndrome the hand	Can not rule out compartment syndrome	Urgent surgery

DISCUSSION

Using the internet for sending photographs and radiograph to evaluate potential extremity replantation candidates was studied in our center previously and found useful in eliminating unnecessary and expensive transfer of patients who are not candidates for replantation.[1] The utility of telemedicine for acute plastic surgical trauma and burns consultations was studied as well.[2,3] In their prospective cohort study, Wallace et al were able to demonstrate a significant difference in the initial management of patients, with 10% more being booked directly to their day surgery unit.[3] However, these systems are relatively expensive, not available in some centers, and not easily portable.

Most of modern cell phones are equipped with cameras that can capture videos in resolution good enough to establish or rule out a certain diagnosis. The use of cell phone photo messaging for the assessment of hand trauma has been found useful.[4] Videos of the clinical examination can transmit even more information. This becomes important if a decision has to be made whether or not the patient needs to be transferred for an urgent surgical intervention. One of the major limitations of this article is the small number of patients.

The hand surgery fellow rather than the emergency physician took the videos in this study, which may not simulate the actual common scenario. The quality of the provided videos may become less if the physical examination was performed by a physician who had little exposure to hand surgery.

Another potential obstacle for the use of this technology is ethical. In our center, all patients sign consent to use photos and multimedia for monitoring and research purposes. For more than a decade, we have been using the Internet for rapid exchange of photographs and radiographs to evaluate potential extremity replantation candidates.[1]

We consulted our bioethics office to permit the use this new technology for research purposes and to make sure it was compliant with the Health Insurance Portability and Accountability Act (HIPAA) regulations. This new technology was used specifically for this pilot study and was not used outside that. As many centers still do not have a written policy that specifically addresses and regulates the use of this technology, surgeon should consult their bioethics office to see what are the rules and regulations.

Like any other technology with limitations, the cell phone-based videos may misrepresent the actual clinical condition, and the surgeon has to be careful not completely rely on this technology, as the legal consequences could be serious.

CONCLUSIONS

The described clinical picture on the phone can be very different from the actual condition. Videos of clinical examination offer an increased information transmittance in selected patients. The cell phone video technology is available, cheap, portable, and can be used to help improving consultation system in general and reduce the costs of unnecessary patient transfers.

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