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Trauma surgery via distance mentoring: A model inspired by the 2020 pandemic

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Abstract

When the COVID-19 pandemic unfolded in March 2020, surgical care was impacted globally. The developing nations in the Caribbean were unprepared with fragile, resource poor healthcare systems. A series of rapid policy changes in response to the pandemic radically changed surgical care and prevented the usual oversight in the operating theatre. Attending surgeons responded utilising readily available technology for distance mentoring. Using this model, postgraduate surgical residents were able to complete 96% of trauma laparotomies safely without major complications.

Keywords

Trauma, emergency, laparotomy, Caribbean, public health, pandemic

Introduction

Healthcare workers (HCW) from specialties that were not immediately relevant to the pandemic response were re-assigned to work on the front lines.[1] As a result, surgical specialties were crippled by interruption of elective lists and limited support services.

Driven by the fear of HCW infections, instructions to work-from-home where possible were issued.[2] The already trimmed surgical teams were ordered further to subdivide to ensure that entire teams were not exposed at once and to ration scarce protective equipment stocks in this resource poor setting. Furthermore, our institution did not have access to onsite rapid antigen testing or PCR (polymerase chain reaction) to determine patients' COVID-19 status prior to trauma laparotomies. Since the usual oversight in the operating theatre was not feasible, we turned to technology using the distance mentoring technique.[3] We describe our experience in a series of trauma patients.

Methods

Trinidad and Tobago is a Caribbean nation with a population of 1,317,714 persons.[4] The Port of Spain General Hospital is a Government-funded facility serving approximately 675,000 persons. It is also a postgraduate training facility associated with a regional Medical University. The surgical department comprises five teams, each headed by one attending surgeon and a team of post-graduate residents in their first three years of training (PGY1-3) and those in their final training years (PGY4/5).

In this centre, all trauma patients are evaluated by the surgical team and taken to theatre depending on their individual need. Attending surgeons could not attend all theatre cases, as surgical services would collapse if all team members became infected. In trauma cases, the PGY4/5 resident took command of the theatre and used two devices equipped with FaceTime (Apple Inc., Cupertino, California, USA) to live stream to the attending surgeon. The first device was fixed onto the operating light to capture the surgeon's view and another was placed on the ventilator stack

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facing backwards to observe instrument handling in the operating field. When necessary, the latter device was utilised by circulating theatre staff to obtain closer views of the operating field, while maintaining strict aseptic technique. The attending surgeon was isolated in a separate room with two screens to observe and instruct PGY4/5 residents during the live operation.

We performed a prospective study of all consecutive trauma operations using this technique between 1 September and 30 December 2020.

Results

Over the study period, there were 22 trauma cases requiring laparotomies for 10 stab wounds, six gunshot wounds, five cases of blunt trauma and one impalement. After informing attending surgeons, PGY4/5 residents took these patients to theatre to perform a laparotomy by distance mentoring.

In one case, the attending surgeon was physically required in the operation room because of an equipment failure (staple mis-fire during anastomosis after bowel resection). The PGY4/5 residents were able to complete the remaining 21 (96%) operations by distance mentoring. This included eight bowel resections or primary anastomoses, four diaphragmatic repairs, three vascular repairs, three bleeding solid organ injuries, two gastric repairs, a colectomy and diversion, a distal pancreatectomy and removal of a retained blade (Figure 1). There were no deaths nor major complications recorded.

The PGY4/5 residents were satisfied that clear and adequate instructions were delivered to facilitate completion of operations in all cases. All PGY4/5 residents reported that the attending surgeon's virtual presence for support and advice reinforced their confidence intra-operatively.

In all cases, the attending surgeons were satisfied with their view of the operating field and their delivery of advice/instruction to the operating PGY4/5 residents at critical steps of the operations.

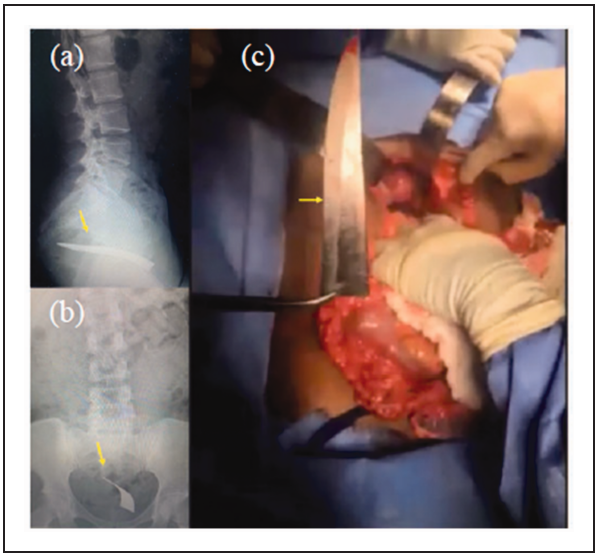

Figure 1. Distance mentoring in a patient undergoing laparotomy for a stab wound. Inset: retained blade is seen in plain radiographs on lateral (a) and antero-posterior (b) views. The operative field as seen by the mentor by videotelephony (c).

Discussion

In response to the pandemic, our surgical teams were reduced to one attending surgeon and PGY4/5 residents with competence commensurate for their training, but with limited first-surgeon experience in trauma operations. The mentoring concept is well accepted in surgical training,[5] but this report demonstrates the efficacy of a mentor's virtual presence. Admittedly, our distance mentoring technique was rapidly implemented, but it was necessary for patient care to continue amidst the rapid and unpredictable course of the pandemic.

The distance mentoring concept was suited for our resource poor setting because it used readily available, inexpensive equipment. Proprietary video-conferencing equipment used for virtual consultations and diagnostics[6,7] are unavailable in our underfunded setting. The FaceTime® high-definition video communication software was pre-installed on our electronic devices and attracted no additional expense. Since smartphones use codec software to compress audio-video streams and transmit them using Internet Protocols, a reliable high-bandwidth network connection in the theatre is critical.

In our model, there were already established working relationships, as the attending and PGY4/5 surgeons had operated together in traditional settings. The attending surgeon was aware of the residents' skill sets, capabilities and judgement. This allowed mutually clear expectations to be defined, and it also facilitated communication without non-verbal ('body language') cues often used in face-to-face interactions.

The main limitation was the inability for the attending surgeon to take control immediately in the event of an intra-operative complication.

We believe that there should be a pre-operative team meeting to discuss the procedure in detail, review the anticipated technical steps and devise a plan to deal with potential complications. We also advocate definition of threshold operating time or blood loss to trigger attending surgeons' physical presence in the theatre. Mature surgical judgment is also required to select appropriate cases and suitable trainees for distance mentoring.

We acknowledge that technical capability has outpaced the medico-legal aspect of videotelephony.[8,9]

Therefore, it is important for low-income nations to put telemedicine guidelines in place to keep pace with rapid developments.

Conclusions

In our setting, a virtual mentor could guide trainee surgeons to complete 96% of trauma laparotomies with good outcomes. This technique is evidently effective, and could be considered in many situations, but is especially convenient in the 'post-pandemic' operating scenario. Obviously, more sophisticated visualisation may in future provide even clearer views of the operative field and scene, both useful for instruction and teaching purposes.

Declaration of conflicting interests

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