

Preparation for COVID-19: lessons from simulation

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The COVID-19 pandemic has placed health services under an extraordinary degree of clinical pressure. Concomitantly, we have faced an unprecedented educational demand. In a short period, those working in anaesthesia, operating theatres and critical care needed to learn how to work in a different way, conform to ever-changing infection control guidance, and use cumbersome personal protective equipment (PPE). Translating national guidance on COVID-19 into a form that would work effectively in our institution posed an additional challenge. Furthermore, many colleagues volunteered to extend their roles to work in expanded critical care units. As a team of anaesthetists and critical care doctors working at a major teaching hospital, we followed our professional associations' advice to "think sim" in our preparatory strategy for COVID-19 [1]. In this short paper, we report our insights from using simulation in the workplace to rapidly address the educational needs of those involved in delivering critical and perioperative care to patients with COVID-19.

When the World Health Organization declared the pandemic on 11th March 2020 [2], educators (the authors) were identified in the departments of anaesthesia, cardiothoracic anaesthesia and critical care, and tasked with leading the development and delivery of simulation training. Because of the pressure of time, recruitment to these roles was pragmatic, based on prior simulation experience and subject matter expertise. Initial simulations helped to develop standard operating procedures (SOPs) based on the resources from the *icmanaesthesiacovid-19.org* and *gov.uk* websites [3,4]. These initial simulations took place in the working environment and involved 'walking through' clinical scenarios that we anticipated would be encountered during the pandemic, based on the reported experiences of colleagues internationally. Multiple stakeholders were involved, including clinicians, managers and infection prevention specialists; pauses occurred regularly, and open discussion was encouraged

so that SOP development could be informed by the views of all team members. This enabled the rapid development of COVID-19 specific procedures, including for emergency tracheal intubation and prone positioning, that were implementable at our institution using equipment and techniques with which colleagues were familiar.

Once provisional procedures were developed, in-situ simulations commenced. Again, these were initially slow-paced and involved the whole multidisciplinary team (MDT). We made it clear that all members of the MDT were welcome to voice concerns and talk through problems. This approach facilitated both the identification of issues and innovations to overcome them, one example being the addition of a closed tracheal suction system into the anaesthetic circuit used during emergency tracheal intubation (Fig. 1). Incorporating this piece of equipment at this stage avoids the need to break the circuit following intubation to insert it (as would have been done prior to the pandemic), thereby reducing the risk of staff exposure to aerosolised respiratory secretions. These learning points were integrated into the SOPs.

Fig 1 here.

Figure 1 Anaesthetic circuit with closed suction added, used for pre-oxygenation and per-oxygenation prior to emergency intubation.

One week following the declaration of the pandemic, we commenced low-fidelity, rapid-turnover simulation 'drills' for emergency tracheal intubation, prone positioning, and the use of PPE. These took place both in-situ and at our simulation centre. Although real clinical equipment was used, we eschewed scarce PPE (e.g. respirator masks, surgical gowns), instead using basic but plentiful equipment (e.g. standard facemasks, disposable aprons) that allowed the underlying principles to be simulated effectively without depleting supplies, whilst also maintaining the safety of attendees who were in close proximity during training. In the three

weeks that followed, we trained over 175 colleagues; a much larger scale of MDT simulation than had previously been attempted at our institution. The drills focused on what is different about managing COVID-19; the scenarios were otherwise straightforward, there were no surprises, colleagues were encouraged to draw on existing skills, and questions were encouraged at all stages. This approach was based on our assessment that early in the pandemic our colleagues were highly stressed. We therefore tried to minimise stresses where we could whilst still meeting the educational objectives, to support both learning and mental wellbeing [5].

Fig 2 here

Figure 2 Basic and plentiful PPE was used in order to be able to simulate the principles of infection control practice, without depleting scarce resources.

Working drafts of our SOPs were used as the basis for drills; these continue to be refined through feedback from colleagues as they encounter difficulties and find solutions in practice, and as national guidance changes [3,4]. The SOPs, together with learning points from simulations, are stored on a Dropbox account (Dropbox Inc, San Francisco, California, USA) to ensure that only the most up-to-date versions are available; an important discipline in a rapidly-changing context.

As the infection curve has flattened and the COVID-related clinical workload has diminished, simulation continues to play an important role but at a slower pace. This includes, for example, training in semi-elective procedures that become necessary at a later stage such as tracheostomy, and the education of staff returning to work following sickness absence or shielding. We remain ready to resume rapid-turnover training should the need arise.

Responding to the COVID-19 pandemic changed our approach both simulation-based education and guideline development. By trialing SOPs through in-situ simulation and incorporating the feedback of the whole MDT at an early stage we rapidly developed robust procedures at a time of extraordinary need. We have subsequently embedded in-situ simulation more widely into everyday practice, and strive to deliver this in collaboration with colleagues from other professions and specialties. Going forward, we intend to continue to use simulation in the development of 'non-COVID' guidelines. As the pandemic rapidly progressed, open and authentic discussion amongst the whole MDT was perhaps our most valuable asset in developing workable SOPs – a lesson we must not forget as normality is gradually restored.

Declaration of Conflicting Interests

The Authors declare that there is no conflict of interest.

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