

Anaesthesia simulation training during coronavirus pandemic: an experience to share

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INTRODUCTION

Since the WHO declared covid-19 pandemic on 11 March 2020, Hamad Medical Corporation (HMC), the leading healthcare provider in Qatar, has taken unprecedented measures to streamline service provision, to prevent transmission of the virus and to protect healthcare workers (HCWs) in its participating hospitals.¹

The contagion nature of the novel coronavirus and the confirmed human-to-human transmission means that HCWs and in particular anaesthesia care providers are at enhanced risk of infection.²

Airway management is a core anaesthesia skill and is particularly hazardous as it leads to aerosolisation of large number of viral particles.

Anaesthetists are competent to perform these skills in routine practice; however, during the current pandemic, they are dealing with patients with highly contagious disease. They are required to apply strict infection control measures to combat the spread of the virus and to protect themselves while providing care for patients with covid-19. In preparation to meet these challenges, anaesthesia care providers must undergo structured training to deal with such an unfamiliar situation.

The purpose of this article is to present an experience from our Anaesthesia Department at Al Khor Hospital, HMC, to use simulation to rehearse skills training pertinent to providing general anaesthesia (GA) to patients with covid-19.

LEARNING PROCESS

A metric-based checklist was developed (table 1). Steps of induction of GA, tracheal intubation, intra-operative management, tracheal extubation and patient recovery were identified and clearly defined in the context of treating patient with covid-19. Three anaesthesia consultants reviewed available literature and best practice guidelines to form the comprehensive checklist. Steps of donning and doffing personal protective equipment (PPE) were also included.³

The checklist was then posted to all members of the department (14 anaesthesia physicians and 15 anaesthesia technicians). Members were asked to review and familiarise themselves with the individual items in the checklist. In our department, we assigned one operating room (OR) to receive all potential patients with covid-19. All non-essential equipment were removed from OR. Anaesthesia machine and related equipment were all covered in transparent plastic sheet to reduce risk of contamination. Anaesthesia station ergonomics is arranged so that infection control measures are adhered to and for easy disposal of contaminated equipment.

Subsequently, training is established so that each pair of the members, often an anaesthesia physician and an anaesthesia technician, was asked to undertake a simulated session of conducting GA for patient with covid-19 in OR.

A video (video attached online supplementary file 1) recording was acquired for entire session and subsequently scored using the checklist by the three consultants who initially developed the checklist.

The video recording was then played prior to commencing each subsequent simulation learning session to aid prebriefing. Errors in performance were identified and discussed. Candidates were given time to reflect on their own performance during debriefing, and all questions were answered. The process continued until every member of the anaesthesia team has participated in at least one session.

DISCUSSION

Simulation training is well known to the specialty of anaesthesia, and in this particular pandemic, there is little doubt that it can play an important role.⁴ It helps anaesthesia care providers to rehearse airway management skills before approaching patients with covid-19. This will minimise the chance of transmitting infection. Simulation also gives opportunity to analyse the existing system, identify weaknesses and develop solutions to these issues.

Aerosol generation during airway management is a major concern for anaesthesia care providers. During previous outbreak of coronavirus, tracheal intubation conferred a 13-fold higher relative risk ratio for acquiring respiratory infection for those who were participating in the procedure compared with those who were not.⁵ This will have huge implications for the practice of anaesthesia during the current covid-19 pandemic. Training must be provided to anaesthesia care providers including donning and doffing PPE as they do not practise these skills regularly.

We propose that anaesthesia departments develop their own local protocols and engage all members in structured training modules with objective assessment. It is important to realise that simulation is most powerful when integrated in a carefully designed curriculum. The developed checklist though not validated gives a detailed and unambiguous description of what to do and what not to do and may help prepare anaesthesia care providers to deal with the outbreak if integrated on simulated learning platform. We envisage a huge role for simulation training in the current and future potential pandemics. Anaesthesia



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Table 1 Checklist to contain descriptors of performance arranged in six subheadings

I: equipment checklist including airway	
1	Check anaesthesia machine and cover in transparent plastic sheet.
2	Check HME filters securely attached on inspiratory, expiratory and patient end.
3	Check end-tidal CO ₂ is connected.
4	Prepare correct size oral airway.
5	Prepare different sizes disposable face mask attached to filter.
6	Prepare ETT tube to be securely attached to HME filter and an alternate ready.
7	Prepare bougie and stylet.
8	Prepare syringe for ETT cuff inflation.
9	Prepare tape for ETT.
10	Prepare clamp for ETT.
11	Prepare video laryngoscope and cover in transparent plastic sheet.
12	Prepare direct laryngoscope.
13	Prepare LMA, lubricated and ready to go.
14	Prepare clear plastic sheet or an aerosol box for intubation.
15	Prepare non-rebreathing oxygen face mask for recovery.
16	Prepare closed suction system.
17	Prepare difficult airway trolley and keep just outside OR.
II: drug checklist	
1	Prepare propofol induction dose.
2	Prepare rocuronium (RSI dose).
3	Prepare vasopressors (ephedrine and phenylephrine).
4	Prepare atropine.
5	Prepare any other drugs required for case.
III: donning of PPE	
1	Put surgical scrubs with hat and shoe cover.
2	Remove all personal items including phones, hospital ID and so on.
3	Perform hand hygiene using alcohol-based sensitizer.
4	Put N95 mask (previously size fitted).
5	Put hood making sure to cover neck.
6	Put face shield.
7	Put water proof surgical gown making sure to easy tie for easy removal.
8	Put first pair gloves (long) making sure to cover sleeve of the gown.
9	Put second pair of gloves (short).
IV: induction and tracheal intubation	
1	Lock OR main door once patient in OR.
2	Signpost all doors 'COVID PATIENT'.
3	Ensure patient in surgical mask.
4	Assign one anaesthetist and one technician inside OR in full PPE.
5	Assign one runner anaesthetist and one runner technician outside OR in full PPE.
6	Performs preinduction airway assessment with PPE on.
7	Use aerosol box or transparent plastic sheet during intubation.
8	Attach standard monitoring.
9	Secure or flushes a pre-existing intravenous access.
10	Preoxygenate minimum 3–5 min, using two-handed grip.
11	Check suction is attached and turned on.
12	Inject drugs RSI.
13	Confirm time to ensure adequate paralysis prior to intubation.
14	Do not ventilate manually (BMV) unless absolutely indicated.
15	Detach mask from circuit into dirty bin after preoxygenation.
16	Intubate with videolaryngoscope.
17	Hold ETT (clamped and attached to HME filter) with right hand.
18	Drop laryngoscope into dirty bin after intubation.
19	Inflate cuff and places syringe into dirty bin.
20	Connect ETT to circuit, remove clamp.
21	Remove outer gloves into dirty bin.
22	Hand sanitise inner gloves, changes if soiled.
23	Do not ventilate manually.
24	Start mechanical ventilation only after ETT cuff is inflated.

Continued

Table 1 Continued

25	Secure ETT with tape (men: 23 cm, women: 21 cm).
26	Do not auscultate chest.
27	Confirm equal bilateral chest movement and ETCO ₂ waveform.
28	Allow sufficient time after intubation for personnel entering.
V: tracheal extubation and recovery	
1	Prepare new face mask attached to new HME filter.
2	Use aerosol box or plastic sheet to cover patient during extubation.
3	May perform suction while patient still deep.
4	Pre-oxygenate 100% O ₂ .
5	Give reversal drug.
6	Remove ETT tape to prevent from sticking to plastic sheet.
7	Remove eye tapes.
8	Detach circuit, leave HME filter attached to ETT, consider clamp and keep cuff inflated.
9	Attach circuit to new mask and HME filter.
10	Deflate cuff and remove ETT with filter into dirty bin.
11	Place face mask with filter over patient.
12	Switch to non-rebreather oxygen mask.
13	Recover patient in OR.
14	Recovery nurse don PPE and enter in OR after tracheal extubation.
VI: doffing of PPE	
1	Perform hand hygiene after each step.
2	Remove outer gloves.
3	Remove face shield.
4	Remove head cover.
5	Remove gown with inner gloves.
6	Remove N95 once outside theatre room.

BMV, bag mask ventilation; ETCO₂, end tidal carbon dioxide; ETT, endotracheal tube; HME, heat and moisture exchanger; LMA, laryngeal mask airway; OR, operating room; PPE, personal protective equipment; RSI, rapid sequence induction.

training bodies may consider including simulation-based training for pandemic as a competency requirement during training and for recertification.

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