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COVID-19 and the anaesthetist: a Special Series

EDITORIALS

Revisiting safe airway management and patient care by anaesthetists during the COVID-19 pandemic

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The only mistake in life is the lesson not learned.

Albert Einstein

The number of victims from coronavirus disease 2019 (COVID-19) has been growing exponentially with more than 30 million positive cases reported across 188 countries, and almost 1 million fatalities.[1] COVID-19 is a once-in-a-century disease, adding 250 000 new cases daily, and with limited targeted and effective remedies. Billions stay at home worldwide to minimise transmission of SARS-CoV-2, as frontline healthcare workers (HCWs) do the opposite, putting themselves at a 12-fold increased risk to test positive.[2] According to Amnesty International, more than 3000 HCWs have died,[3] whereas the WHO puts the number of infected HCWs at 1 500 000 or 10% of global COVID-19 cases.[4] The figures likely represent significant underreporting, and the disease burden is expected to continue to grow.[2,3] Universal precautions alone are clearly insufficient to halt the high nosocomial transmission to and by HCWs.[2,5]

Hospitals have become incubators for infection. There has been inconsistency in policy guidance and implementation on how to avoid self-infection while performing high-risk airway and patient management. In nearly all of 63 countries surveyed, training on personal protection equipment (PPE) was minimal and PPE was scarce.[3] HCWs, hospitals, and authorities were ill prepared or trained, and inadequate lessons were applied from the previous severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and Ebola pandemics.[5–8] Lack of resilient leadership by hospital

management has resulted in HCWs, including anaesthetists, with higher infection and higher case fatality rates when compared with the general population.[5,6,9]

Eight months into the pandemic, HCWs are still becoming infected and dying despite wearing PPE,[10] raising indignation about inadequate PPE, poor understanding of the dangers of reusing PPE, and a need for a deeper understanding of practical infection control practices in hospitals and clinics.[3,4] We still lack the science regarding the minimum inoculum required at the time of SARS coronavirus 2 (SARS-CoV-2) exposure to infect humans, what constitutes appropriate PPE, and what clinical practice strategies can better protect against COVID-19 contamination. Clinicians have become frustrated in seeing the worldwide physical and emotional impact of COVID-19, and the lack of evidence-based mainstream guidance. This has led to substantial variation in recommendations for PPE usage, inconsistencies on PPE reuse, and on the order for PPE donning and doffing. The lack of preparedness for COVID-19 has caused an unprecedented existential, professional, and moral crisis that continues to put HCWs at risk. This underscores the failed (inter)national health policy and health system leadership support for frontline HCWs.

The WHO and the US Centers for Disease Control and Prevention define prolonged, close contact as less than 2 m away for more than 15 min.[11] Given the extensive clinical interactions during clinical workflow by and within perioperative teams, physical distancing is impractical. However, any duration should be considered prolonged if the exposure occurs during aerosol-generating procedures. When close physical contact between infected patients and HCWs is essential, the rules of what constitutes 'protection' need to be explicitly adapted using human factors methods to focus on more effective ways to reduce harm to HCWs. A human factors approach provides a framework to identify, analyse, and mitigate safety risks during patient care.[12] Human factors is a scientific discipline concerned with understanding the interactions among humans and system elements and applies validated social–technical methods to optimise human well-being and overall safe system performance.

The COVID-19 outbreak has underscored the danger of anaesthetists being complacent about infection prevention and control.[5,9] Anaesthetists and other acute care clinicians, and their equipment, are constantly exposed to a large inoculum of viral copies, especially the plume generated during high-risk aerosol-generating procedures during airway instrumentation and other procedures (e.g. tracheal intubation, insertion of supraglottic airway devices, noninvasive and manual ventilation, tracheostomy, bronchoscopy, and cardiopulmonary resuscitation).[10,13] The implications for disease spread to anaesthetists resulting from improper or inadequate protection is devastating, risking deadly transmission to themselves, their colleagues, families, and friends.

Furthermore, reports from medical staff from around the world describe physical and mental exhaustion, the torment of difficult triage decisions, and the pain of losing both patients and colleagues, all in addition to the high infection risk and concerns for personal and family safety.[14] Sneyd and colleagues[15] found that the pandemic significantly disrupted all aspects of structured anaesthesia teaching and training programmes across six continents, including examination cancellation or postponement, adding further stress challenges to the morale, mental health, and physical health of trainees.

Every patient interaction when caring for highly infectious patients with COVID-19, no matter how trivial, risks contagion from the virus. The 2003–4 SARS epidemic led to several inadequately protected anaesthetists becoming infected and dying from exposure during airway instrumentation of infected patients.[5,6] Protection requires a laborious process of donning personal enhanced protective equipment followed by an even more involved and stressful decontamination doffing drill, under the supportive watch of a colleague to ensure proper compliance.

Cook,[16] in a recent narrative review, has argued that anaesthetists and intensivists are likely to be at particularly high risk of exposure because of close and prolonged exposure to individuals infectious with SARS-CoV-2, promoting infection, but available evidence suggests that mitigation may have been effective for most of these individuals.[17] A recent publication from Wuhan, China, suggests that appropriate PPE may have provided effective protection against SARS-CoV-2 after the first wave, similar to when PPE was used appropriately and protected HCWs against SARS in 2003.[18,19]

In the early phases of the pandemic in Wuhan, China, ~70% of COVID-19 inpatients were HCWs and several died.[9] In April, the National Italian Civil Protection Committee reported 174 physician deaths, of which 30% were anaesthetists (Quirino Piacevioli, personal communication, 2020; president of the Italian Association of Anaesthesiologists and Intensivists [AAROI-EMAC], Rome, Italy). During the recent second wave of the pandemic in Victoria, Australia, more than 25% of positive patients were HCWs (140 of 466 on August 8, 2020) in spite of hard lockdown measures (stage 3 for Victoria and stage 4 for Melbourne) and several months of preparation, training, and stockpiling of adequate PPE.[20] Recently, one in six maternity workers were shown to be positive for SARS-CoV-2 antibodies, evidence for a previous infection.[21] Of those testing positive, one in three were asymptomatic, and 59% had not self-isolated at any point and continued to provide patient care in the hospital setting. This report suggested that there is a greater risk to patients and staff from asymptomatic SARS-CoV-2-positive HCWs than from patients to HCWs in appropriate PPE.

We recommend the following guidance to clinicans and hospital administrators to help mitigate and prevent community transmission of COVID-19 by HCWs (Fig. 1). These practices and procedures are based on our own clinical experience, extensive review of hundreds of scientific articles on COVID-19 management, and a system-based, human factors approach to identify lasting solutions to social–technical systemic challenges. Strict training in the use/reuse of PPE, including dedicated apparel (scrubs), surgical procedure mask (e.g. P2/P3/N95 respirators), eye protective goggles or face shields, sterile impermeable gown, double gloves, theatre hat, and protective footwear, may still not be adequate when dealing with aerosol-generated procedures. Frequent replacement of PPE for each patient intervention, although highly effective in limiting inhalation and contact transmission of droplets and aerosols, may not be possible because of equipment shortages. Several COVID-19-specific airway management guidelines have recommended videolaryngoscopy as the default tool for tracheal intubation of suspected or confirmed COVID-19 patients.[17,22–26] Videolaryngoscopy maximises the likelihood of successful first attempt intubation and allows an increased distance between the anaesthetist and patient's face, thus lowering the risk of infection.[27,28] It is remarkable that despite all that has been learned thus far and the aggressive workflow modifications we

Fig 1. Patient and airway management strategies during the COVID-19 pandemic. COVID-19, coronavirus disease 2019; ULPA: ultralow particulate air filter; HEPA: high efficiency particulate filter; HME: heat and moisture exchanger (ULPA-HEPA-HME).

have adopted based on lessons from colleagues around the world, that HCWs are still getting infected and dying at such high rates. Doctors and nurses around the world continue to voice concerns about shortages of basic PPE such as N95 mask respirators, being offered only surgical masks while working with COVID-19 patients.

COVID-19 should serve as a warning to prompt a radical rethink of the way we practice infection control.[7] We must review the current risk framework for airway and patient management workflow and use proven human factors-informed failure modes and effects analysis (FMEA) methods to mitigate against contaminating providers and patients. We need to better understand how to improve the effectiveness of training COVID-19 teams using simulation methods and evidence-based practices. In particular, we need to address the following: (i) are the best protocols in place to report, aggregate, and analyse emerging HCW risks?; (ii) are we adopting the best technology tools and revised workflows to protect anaesthetists?; (iii) are we using the best tools to assess the clinical and occupational risks including the adequacy of PPE supply and correct PPE fit?; (iv) when is it safe to reuse PPE?; (v) are we effectively building trust with HCWs and supporting

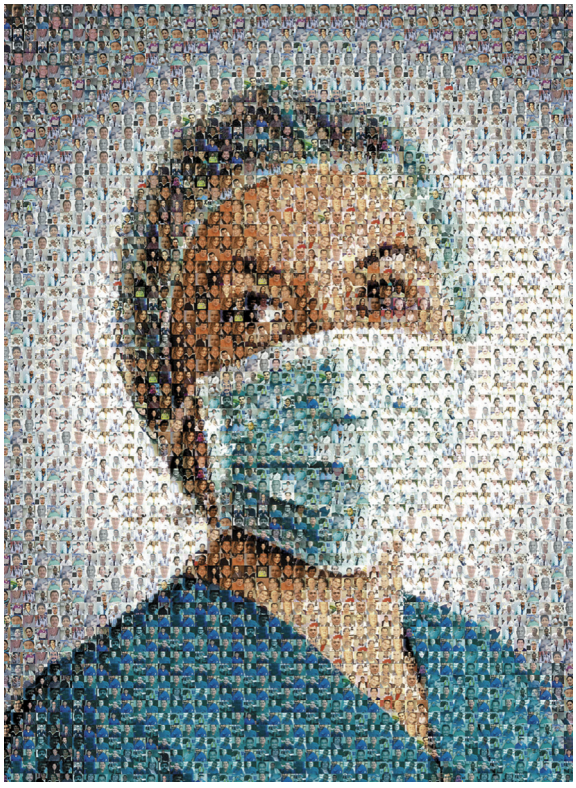

Fig 2. Collection of 198 photographs of healthcare workers who died in Mexico as a result of COVID-19 (Courtesy of MILENIO. Author: Arturo Black Fonseca).

their physical and mental state to assure that their clinical exposure will not harm them?; (vi) how can the crisis be used as an opportunity to implement better individual and organisational learning, to make it safer for patients and providers as stressed in a recent editorial in the *British Journal of Anaesthesia*.[22] We need better institutional, team, and individual preparedness that will inspire more truth telling and trust building to achieve HCW protection and mental wellness. Until a vaccine becomes available, it is vital to implement a robust and coherent preparedness policy for health systems and individual patient and staff testing policies to identify infected staff and patients. All HCWs have the right to be safe at work (Fig. 2).

Authors' contributions

Concept, design, drafting, revising and approval of final version of the manuscript: TVZ, PB, AVZ.

Declarations of interest

The authors have no conflicts of interest to declare.

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We acknowledge the risks doctors, nurses, and other healthcare workers are taking when caring for patients during the COVID-19 pandemic. Worldwide, an unknown number of them paid the ultimate price and lost their lives in the line of duty. We owe them our respect and gratitude. Figure 2 is an example of the damage this virus causes, showing a montage of 198 photographs of healthcare workers who died in Mexico because of COVID-19.

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Tracheostomy for COVID-19: business as usual?

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The novel coronavirus (severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) responsible for the coronavirus disease 2019 (COVID-19) pandemic has resulted in an unprecedented global surge of critically ill patients requiring mechanical ventilation.[1] Although there is significant variation, critically ill patients requiring invasive ventilation have up to 50% mortality, with survivors often requiring prolonged respiratory support and long hospital stays.[2–7] At the time of writing, the UK Intensive Care National Audit & Research Centre (ICNARC) has been notified of 13 379 admissions to critical care with confirmed COVID-19, with 10

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