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Anesthetist and pandemic: Past and present

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1. Introduction

Pandemics have ravaged human civilization at regular intervals for the past 2000 years killing millions of people worldwide [1]. With each pandemic, healthcare workers and hospital systems have borne the brunt of these outbreaks fulfilling their moral responsibility to treat and give a healing touch to already distressed situations. Each outbreak has tested the exceptionally very high level of skill, expertise as well as the professional commitment of healthcare workers. Many were exposed to infection while fighting at the frontline and some of our healthcare workers even died from the infection. Data from the Chinese center of disease control and prevention on COVID-19 showed that out of 44,672 laboratory-confirmed cases, 1716 were healthcare workers [2]. Data from Italy showed that by April 7, 2020, there were 12,680 documented cases of COVID-19 among healthcare workers, and approximately 100 physicians and 26 nurses have died from COVID -19 [3]. Pandemics have exposed the vulnerabilities of our current health care systems and governance structures but our doctors and healthcare professionals have given their best in the time of crisis. The risks faced during the pandemic by the various healthcare professionals of different specialties was not the same. Those who volunteered to work at the frontline were greatly exposed and the anaesthetist was always at the frontline dealing with the most severe cases [4]. Many anaesthetists fulfill the responsibility and assume this level of risk without any consideration for their own care, or of friends and family members. It has now become evident that anaesthetists are

the crucial component of the response against any lethal respiratory pandemic.

2. History of pandemics

During each pandemic, the major cause of death was firstly the disease itself and secondly due to the disruption of public healthcare infrastructure [5]. To understand the severity of pandemics in the past, one must go through the effect of the plague that happened during middle age. The European population was almost reduced by half following this plague [6].

John Snow was known for his systematic work on inhalational anaesthetics mainly chloroform [7]. He used the same methodology for investigating the cholera epidemic of London in 1848. He mapped the area with maximum cholera cases and found out that cases were related to a particular water company. He effectively established the waterborne transmission of cholera even before the introduction of the germ theory of the disease [8].

Spanish influenza which dates back to 1918–19 is the deadliest pandemic ever recorded in the history of mankind which had caused 40–100 million deaths worldwide within 12 months [9–12]. It was estimated that approximately 10% of young who were living then may have been killed by the virus [13].

Until 1950, poliomyelitis virus infection has ravaged the people with partial paralysis. The most serious bulbar variety affecting motor neurons resulted in breathing difficulty. The need for assisting ventilation in a large number of patients with bulbar poliomyelitis resulted in advancement in ventilatory support. But negative pressure ventilation with the help of an iron lung was largely ineffective due to irregular patterns of breathing associated with bulbar poliomyelitis with mortality as high as 90% [14]. In

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1932, anaesthetist, Arthur Guedel developed a cuffed tracheal tube, which helped in the administration of positive pressure ventilation in poliomyelitis patients. These patients who had received intermittent positive-pressure ventilation had better survival [15]. Bjorn Ibsen's contribution to managing the 1952 Copenhagen polio epidemic labeled anaesthetists as cardiorespiratory specialists. John W. Severinghaus [16] developed the first blood gas analyzer in 1957 while Henning Ruben developed a mask bag unit, which is the backbone of modern airway management in anaesthesia, intensive care medicine, and resuscitation [17].

In 2003, the outbreak of severe acute respiratory syndrome (SARS) has shocked the world. It was first reported in Asia in February 2003 and within a few months, it had spread to North America, South America, Europe, and Asia affecting more than 8000 people with approximately 10% mortality [18]. Anaesthetists were given the responsibility of airway management and sedation of SARS patients and were at high risk of getting infected because of exposure to high viral load in the patient's airway secretion. Statistical analysis of transmission rates among hospital staff in the Toronto outbreak showed that doctors and nurses performing tracheal intubation and initiating noninvasive ventilation had a greater risk of developing severe acute respiratory syndrome [19]. Experience from the SARS outbreak has guided anaesthetists for being the forerunner of airway management, critical care infrastructure development and infection prevention by proper use of personal protective equipment.

In 2009, the first case of H1N1 was reported from Mexico. Subsequently, it has spread to more than 214 countries worldwide killing over 18,000 people [20]. The WHO has classified this pandemic as *moderate* in comparison with the 1918 influenza pandemic [21].

In 2012, Middle East Respiratory Syndrome Coronavirus (MERS-CoV) was first detected in a patient living in Saudi Arabia [22]. MERS virus has significantly affected the healthcare workers. Countries like Korea, the United Kingdom, Saudi Arabia, France, and Jordan have reported a large outbreak of MERS- coronavirus among healthcare providers [23,24]. Out of 2223 cases infected by MERS-CoV up to June 2, 2018, 415 were reported as healthcare workers. 790 patients had died with a 35.5% mortality rate [25].

From 2014 to 2016, the Ebola virus has ravaged the western part of Africa with more than 28,000 reported cases and 11,325 deaths. The first case of Ebola was reported in December 2013 in Guinea and the virus quickly migrated to Liberia and Sierra Leone. The majority of the cases and fatalities were reported from these 3 countries but a small number of cases have also been reported from Nigeria, Mali, Senegal, the United States, and Europe [26]. Anaesthetists were at the frontline and played an important role while managing the complications of the Ebola virus [27]. This outbreak has shown the importance of quick control measures and safe medical practices that can minimize the transmission of the virus.

3. COVID-19 pandemic

Covid-19 was officially declared a pandemic by the World Health Organization (WHO) on March 11, 2020. At present COVID – 19 has spread to more than 200 countries. According to the WHO, the number of confirmed cases of COVID- 19 as on July 25, 2020 is around 15 million globally showing exponential growth [28]. Anaesthetists across the world have risen to the occasion of combating this COVID-19 pandemic. Their skills and training are being used in wards for monitoring mild and asymptomatic cases to intensive care units (ICU) in managing critically ill patients. Anaesthetists are managing critically ill patients in the ICU as well as non-COVID-19 patients in the operating theatre. They are participating in acute as well as critical care of COVID –19 patients

with a focus on oxygen therapy, airway, mechanical ventilation, hemodynamic, sedation, and pain control.

4. Anaesthetists - The frontline “warriors” of the COVID-19 pandemic

During the outbreak of a severe pandemic, anaesthetists are at the frontline taking care of severe cases affected by the pandemic in the operating theatre or ICU. They are at the greatest risk of acquiring the infection as they are involved in aerosol-generating procedures such as endotracheal intubation, cardiopulmonary resuscitation, and even sometimes tracheostomy in the ICU. In the COVID-19 pandemic, they are playing the role of airway expert, respiratory physician, intensivists as well as administrator.

4.1. Airway management

The Covid-19 pandemic resulted in the formation of airway teams in many hospitals around the world for intubating critically ill patients [39]. They worked in rotation, with 1–2 anaesthetists per shift as a reduced number helped in avoiding unnecessary viral exposure. The airway cart was prepared containing endotracheal tubes of different sizes, video laryngoscope with disposable blades, stellate, bougies, light wand, and laryngeal mask airway. Flexible fiberoptic bronchoscope and cricothyroidotomy kit were included in the cart for difficult intubation [38]. The Indian Society of Anaesthesiologists issued advisory and position statements to ensure the safety of patients and the anaesthetists during the COVID-19 pandemic in India on 28 March. They emphasized reducing the generation of aerosol and listed other measures of preventing transmission of infection in the operating theatre and Intensive care unit [30]. The Chinese Society of Anesthesiology on February 22, 2020 issued 'Expert Recommendations for Tracheal Intubation in Critically ill Patients with Novel Coronavirus Disease 2019'. They too focused on preventing the spread of infection while doing aerosol-generating procedures [31]. M. Sorbello et al., on behalf of the Italian Society of Anaesthesia and The European Airway Management Society issued recommendations based on the clinical experience of treating COVID-19 patients throughout Italy [32]. They focused on safe oxygen therapy, airway management, personal protection, and non-technical modalities of taking care of COVID-19 patients.

4.2. Critical care

Surgical, medical, and anaesthesia ICU are being converted for managing COVID-19 patients suffering from moderate to severe ARDS. The anaesthetist's expertise in oxygen therapy, noninvasive ventilation, intubation, invasive ventilation, extracorporeal membrane oxygenation, placing central lines, and most risky cardiopulmonary resuscitation is being used for managing most critical patients.

Ultrasound is widely used by anaesthetists for nerve blocks, for placing vascular lines, for chest and abdomen screening. This expertise of anaesthetists is being used in managing critically ill COVID-19 patients. Point of care ultrasonography is being used for diagnosing pleural effusion, pneumothorax, airway evaluation and confirmation of endotracheal tube placement and its depth.

4.3. Resuscitation team

Lessons from the SARS outbreak [33], lead to the formation of the resuscitation team in many hospitals in China and India. Anaesthetists were the main component of these teams. These teams were on call all the time and were stationed near the ward or

isolation area taking care of COVID-19 patients. Their main work was to join the first responders and help in resuscitation. From airway intervention, vascular access placement to cardiopulmonary resuscitation, their contribution is playing a major role in improving patient outcomes.

4.4. Mental health

The COVID-19 pandemic is not only affecting the physical health of the anaesthetist but it is also taking a toll on mental health. The fear of getting infected or spreading the virus to their family or dear ones, physical and emotional tiredness, long duty hours and discomfort associated with wearing personal protective equipment (PPE) are the main sources of mental stress and depression among anaesthetists affecting job performance, health and wellbeing. The daily routine of securing the difficult airway, taking a vital clinical decision, and using their expert clinical skill also generates a lot of mental stress.

Data from the SARS outbreak in 2003 showed that the pandemic significantly affected the mental health of survivors and healthcare workers. Psychiatric illness like post-traumatic stress disorder and depression was noted in 40–66% of the survivors and they remained symptomatic for as long as 30 months after recovering from the disease [33,34]. Even the healthcare workers taking care of SARS patients who were not infected by the virus witnessed a varying level of psychological impairment for a long time after the outbreak [35]. Jianbo Lai et al., in their survey on the mental health of healthcare professionals taking care of suspected and confirmed COVID-19 patients found that a significant number of healthcare professionals had symptoms of anxiety, depression, distress, and insomnia [36].

To tackle this issue, the Chinese Society of Anesthesiology established a platform to deliver psychological support to healthcare workers, especially the front-line anaesthetists and their families [29]. In India, All India Institute of Medical Sciences, New Delhi has extended its support to the physicians of the country by providing them services of psychiatric evaluation, therapy, medical management, and education [37]. But we, as anaesthetists should learn new skills so that we can not only effectively manage the current crisis but also prepare ourselves for dealing with the future pandemic.

4.5. Administrative and academic issues

Anaesthetists are part of a team involved in designing of PPE and providing training to all health workers for proper donning and doffing of PPE. They are the team leader in times of pandemic. Infusing a sense of confidence and dedication in their team members is also the duty of an anaesthetist. Since most of the frontline doctors are junior trainees, confidence and competence can be enhanced by improving their knowledge and clinical skills by regularly organizing workshops, simulation classes, and seminars.

In this digital era, the anaesthetist has added responsibility for disseminating their knowledge and experience to the healthcare provider in remote and rural areas through telemedicine, video conferencing, and internet-based webinars. Two-way communication between the frontline healthcare workers of different disciplines, supportive staff, technicians, nurses, and laboratory staff at remote locations and administration is important for effective implementation of the welfare program and treatment protocol. Anaesthetists play a central role in such communication. They have the duty to monitor the real-time situation and guide the remote healthcare workers regarding standard clinical protocol and treatment. They can also take feedback from the ground situation and forward it to the administration so that proper outbreak plans can

be chalked out according to the capabilities of medical teams at the frontline. Making an effective management strategy following an outbreak requires coordination between infection control, critical care and emergency experts. Anaesthetists act as a bridge between these medical disciplines and play an important role in enhancing effective and fast communication among them as poor communication and coordination among various medical units during an outbreak is detrimental for relief activities and may lead to a stressful environment.

5. Conclusion

Past pandemics of cholera, poliomyelitis, SARS, MERS, and Ebola have restructured the roles and responsibility of anaesthetists. Their past contribution and experiences have helped us to deal with the current pandemic. They have proved that they are an indispensable part of the teams taking care of victims of the pandemic. The COVID-19 pandemic has challenged the medical profession in countless ways. Currently, the situation may be harsh, but our specialty has a long history of confronting and overcoming epidemics. The world will need the same or more numbers of anaesthetists after the pandemic as they needed before. Anaesthetists will have to take care of themselves and stay alive so that they can provide treatment not only to victims of a pandemic but to a broader section of patients after the pandemic.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tacc.2020.07.011>.

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