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## SHORT REPORT

# Considerations and strategies in the organisation of obstetric anaesthesia care during the 2019 COVID-19 outbreak in Singapore

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### ABSTRACT

The provision of safe obstetric anaesthesia services is essential during the COVID-19 global outbreak. The identification of the 'high-infection risk' parturient can be challenging especially with the rapidly changing risk criteria for COVID-19 'cases'. A multidisciplinary taskforce is required to review the infection control protocols and workflows for managing the parturient for labour analgesia and for caesarean section in order to minimize infection risk to healthcare staff and other parturients. A constant review of such processes is needed to enhance efficiency and to optimise use of finite resources. Good communication between health officials, institutional leadership and ground staff is essential for the dissemination of information.

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**Keywords:** COVID-19; Obstetric anaesthesia; Labour analgesia; Caesarean section; Protocol; Resource management

## Introduction

Since the outbreak of the coronavirus disease in 2019 (COVID-19), Singapore has seen the emergence of 1309 cases with six mortalities (as of 5 April 2020).<sup>1</sup> The 'Disease Outbreak Response System Condition' (DORSCON) Orange alert was declared by our local health authorities in early February, signifying a severe disease of limited community spread.<sup>2</sup>

The KK Women's and Children's Hospital provides tertiary obstetric care for approximately 11 000 deliveries a year. Even in a global pandemic, we need to maintain essential obstetric services at our institution. Here we share our experience in the provision of an obstetric anaesthesia and analgesia service, through careful re-organisation and resource planning, aimed to prevent disease transmission amongst our patients and healthcare staff.

A multidisciplinary task force comprising obstetricians, obstetric anaesthesiologists, neonatologists, infectious disease physicians and operating theatre and delivery suite nursing managers was formed before the first COVID-19 case was identified in Singapore. There

was an urgent need to review pre-existing institutional infection control protocols that were established during the outbreaks of SARS and MERS-CoV, in keeping with emerging evidence from the current global outbreak.<sup>3</sup> As the epidemiologic and infectious characteristics of the virus were initially unknown, the task force reviewed and revised infection control protocols based on emerging information.

Specific challenges were, firstly, the problem associated with making evidence-based clinical decisions given the lack of published information. Secondly, there was a need to establish communication channels with staff to facilitate frequent updates. Good communication among medical staff, taskforce stakeholders, institutional senior leadership and health ministry officials is pivotal if ground staff are to obtain timely information, updates and clarifications in a rapidly-evolving situation.

Our major considerations included: 1. Identification of the 'high infection-risk' parturient. 2. Clinical management of the 'high infection-risk' parturient, presenting for labour epidural and delivery. 3. Organisational changes to respond to the crisis.

## Identification of the 'high infection-risk' parturient

Because of the rapidly changing risk criteria for COVID-19 cases, identifying the 'high infection-risk'

Accepted April 2020

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parturient was a challenge. Prompt identification was needed so that these women could be isolated and treated appropriately, minimising the infection risk to healthcare staff and other patients. This problem arose for several reasons. Firstly, infected patients may be infectious during the incubation period but do not exhibit symptoms or signs of acute infection.<sup>4</sup> Secondly, viral shedding can occur 8–37 days from the onset of symptoms in infected patients.<sup>5</sup> Thirdly, patients may have nonspecific symptoms that are similar to the ‘common flu’.<sup>6</sup> These characteristics limit the usefulness of temperature screening prior to admission for labour or caesarean delivery. Screening for travel history may also be unreliable, not only because of under-reporting in some countries, but because as the infection spreads globally, local community transmission occurs. Consequently, all parturients with an acute respiratory tract infection or a positive travel or contact history were considered of high infection-risk and isolated until they tested negative for the virus.

It is in this context that local health authorities mandated that healthcare staff performing aerosol-generating procedures (AGP) such as tracheal intubation and extubation, bag-mask ventilation, orogastric tube insertion and bronchoscopy, don full personal protective equipment (PPE) regardless of risk status. Protective equipment includes a splash-resistant gown, double-gloves, goggles or face shield with National Institute for Occupational and Safety Health (NIOSH) N95 mask, with or without a powered air purifying respirator (PAPR).<sup>7</sup>

### **Clinical management of the ‘high infection-risk’ parturient, presenting for labour epidural and delivery**

#### **Management in the labour ward**

‘High infection-risk’ parturients are placed in negative pressure (–2.5 Pa) rooms and are asked to wear a surgical mask. To minimise infection risk, no visitors are allowed. Early labour epidural analgesia is encouraged to reduce the use of nitrous oxide/oxygen inhalation analgesia and also general anaesthesia with airway instrumentation for intrapartum caesarean delivery, both of which are associated with aerosolisation of the virus. High-flow oxygen administration via face mask was identified as a factor causing hospital ward outbreaks during the SARS epidemic and should be avoided.<sup>8</sup> However, nitrous oxide/oxygen inhalation, where appropriate, is provided to the parturient while awaiting epidural catheter insertion. An experienced anaesthesiologist, donned in PPE against possible aerosol generation from nitrous oxide/oxygen use, should perform the neuraxial procedure to improve the chances of success. Goggle design may limit peripheral vision

and visual acuity, hampering the ability to successfully perform the procedure to a greater degree in a novice anaesthesiologist. The decision whether to provide combined spinal-epidural analgesia or epidural analgesia is at the discretion of the anaesthesiologist.

#### **Management of caesarean delivery**

When possible, we prefer to proceed with caesarean delivery in the ‘high infection-risk’ patient only after she has been de-isolated or has tested ‘negative’ for COVID-19 from the first nasopharyngeal swab. However, should an emergency caesarean delivery be required, it is performed in a dedicated negative-pressure operating room with staff donning full PPE. Should this type of room be in use, we proceed with surgery in another operating room, adopting the necessary precautionary measures when accommodating a patient with COVID-19.<sup>9</sup> For caesarean delivery the anaesthetic technique of choice remains neuraxial anaesthesia as this minimises the risk of aerosolisation associated with airway intervention.<sup>10</sup> The authors also prefer a combined spinal-epidural technique if surgery is expected to be prolonged, in order to minimise the risk of a mid-procedure conversion to general anaesthesia.

If the risk of a failed neuraxial anaesthetic is anticipated to be high or general anaesthesia is planned, the PAPR should be worn over the N95 mask from the outset. After rapid-sequence induction, intubation by an experienced anaesthesiologist is performed with a video-laryngoscope to maximise the chances of rapid successful intubation. Face mask-ventilation is avoided when possible, and if rescue mask-ventilation is needed in the setting of failed intubation, small tidal volumes are used until the cuff on the tracheal tube has been inflated. We advocate the use of disposable equipment (e.g. disposable laryngoscope blades) and consumables. An anaesthetic nurse runner is stationed in the anteroom should further drugs or equipment be required. A difficult airway cart is placed either in the operating room or anteroom. Depending on the pathological lung changes present, patients with pneumonia may need sophisticated ventilators capable of delivering varied ventilatory settings and lung recruitment manoeuvres.

After delivery, the neonate should be isolated as a precautionary measure. In order to minimise risk, no skin-to-skin contact with the mother is allowed, to minimise infection risk. After surgery, patients are monitored in the operating room until ready for discharge to the postpartum ward, with the patient wearing a surgical mask en route. The operating room and the transportation route to the ward are disinfected. Patients who need the postoperative intensive care unit (ICU) for indications such as ventilatory support and/or management of obstetric-related complications should be transferred there directly, accompanied by healthcare staff

donned in full PPE. All soiled consumables, used gloves, masks and gowns should be discarded in biohazard bags and sealed.

We generally avoid activating a category 1 caesarean delivery in 'high infection-risk' parturients by encouraging our obstetric colleagues to perform frequent surveillance of their fetal status and cardiotocography tracings, and to forewarn operating theatre staff of impending likely caesarean delivery. This allows the operating room team to prepare in advance, to allow expedient delivery having undertaken precautionary measures for staff protection. With collaborative teamwork and communication, we believe it is possible to achieve decision-to-delivery intervals of 30 min, even for category 1 cases.

Since the implementation of this workflow pattern in early February 2020, we have managed 11 'high infection-risk' parturients for caesarean delivery as of 25 Mar 2020. Although none eventually tested positive for the COVID-19 virus, the surgeries were still performed in a negative pressure operating room with staff dressed in full PPE. Two patients had general anaesthesia and were transported postoperatively to the ICU while still intubated; spinal anaesthesia was initiated for eight patients, and one patient had extension of labour epidural analgesia.

### Resource management

To increase the availability of isolation beds, all elective surgical procedures were postponed and only operations deemed essential or urgent allowed to continue. A prudent approach to the use of protective face masks is necessary to balance the need to conserve a finite resource against the overwhelming need to protect healthcare staff from the disease. While staff are advised to wear surgical masks in all clinical areas, only frontline staff who come into close contact with 'high infection-risk' patients (e.g. screeners and those who perform AGPs) need to wear N95 masks. All staff should undergo training in N95 mask fitting. Guidance on the use of PPE was formulated and disseminated.

### Organisational changes to respond to the crisis

#### Reorganisation of work and work teams

All leave applications were rescinded and approved only on an 'as needs' basis, to ensure everyone is available to deal with the crisis at hand. To mitigate the risk of service disruption due to disease transmission among staff, we organised the department into modular teams segregated by physical location. Bedside handovers are done via focused clinical summaries, with the staff donning the appropriate protection. As the SARS-CoV-2 virus is transmitted through close contact, good hand hygiene and social distancing are reinforced. Advances in information technology are fully exploited, with department meetings and educational activities being conducted

via video-conferencing platforms. We also use secure communication applications on mobile devices to build channels of communication among working teams for the rapid dissemination of information.

### Management of staff welfare and morale

All healthcare staff monitor and log their temperatures twice daily. A staff clinic manages staff with fever ( $>37.5^{\circ}\text{C}$ ) and/or respiratory symptoms and facilitates the prompt identification of institutional nests of outbreaks. With the implementation of modular teams and the consequent increase in overnight duties, we recognise that more staff may experience acute stress, fear of infection and burn-out.<sup>11,12</sup> Hence, we are working with hospital support groups to provide further support and feedback channels.

### Summary of lessons learned

In order to provide sustainable and safe obstetric anaesthesia during an infectious disease pandemic, a collaborative effort among anaesthesiologists, intensivists, obstetricians, neonatologists, nursing, infectious disease physicians and environmental services is required to minimise infection risks to both patients and healthcare workers. Constant review of the criteria of the 'high infection-risk' patient, aligned to the evolving global situation, facilitates effective screening, isolation, and management. Protocols and workflows for the management of such patients in labour and operative deliveries also need frequent revision to enhance efficiency while optimising the use of finite resources. Lastly, establishing good communication channels among health officials, institutional leadership and ground staff is pivotal for the timely dissemination of updated information and obtaining feedback.

### Declarations of interest

None.

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