Increasing the survival rate is the singular priority of practitioners providing care to critically ill patients during the SARS-CoV-2 pandemic in the face of ventilator scarcity. However, as Fig 1 demonstrates, the overall mortality with shared ventilation may exceed ventilator allocation with standard-of-care treatment. It is important for practitioners to acknowledge that shared ventilation is an unproved medical treatment that may cause more harm than good, and its benefit should be demonstrated in a scientific and ethical manner. Physicians of any hospital proceeding with shared ventilation should, at a minimum, (i) obtain informed consent that acknowledges its unproved benefit, (ii) offer non-invasive respiratory therapies or palliative treatments as an alternative, (iii) diligently record and analyse outcomes before and after implementation of shared ventilation, (iv) expeditiously disseminate the conclusions of their analysis publicly, and (v) develop an ethical protocol to discontinue shared ventilation if pre-specified evaluations show harm. It is incumbent upon the first practitioners offering shared ventilation to demonstrate its benefit. Without undertaking such measures, implementation of shared ventilation diminishes the ethical and scientific basis of our care and risks an increased rate of death in the patients we are desperately trying to save.

Declaration of interest

The author declares that they have no conflict of interest.

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Considerations for resuscitation and transfer of paediatric patients with COVID-19

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Keywords: COVID-19; infection control; negative pressure room; paediatric; resuscitation; transport

Editor—We read with great interest the article by Odor and colleagues[1] entitled Anaesthesia and COVID-19: infection control. We would like to describe the current measures implemented at a tertiary university hospital in Singapore for the safe resuscitation and transfer of paediatric patients with coronavirus disease 2019 (COVID-19).

The novel COVID-19 caused by the severe acute respiratory syndrome coronavirus 2 first emerged in Wuhan, China in December 2019.[2] Viral transmission primarily occurs through respiratory droplet spread and touching of contaminated surfaces.[3,4] Children appear to be less affected than adults.[5] Most children are asymptomatic or have mild-to-moderate symptoms, with severe and critical disease being more prevalent in younger children.[6] New information is emerging on a daily basis that may change our initial understanding of paediatric COVID-19. As the pandemic spreads, we will encounter more paediatric patients with COVID-19 disease who require resuscitation and transfer.

All suspected patients at our hospital are admitted to a designated COVID-19 ward. Where possible, all high-risk patients are admitted to a negative-pressure isolation room. Early identification of deteriorating patients is essential to allow for intervention and resuscitation in a controlled setting. Aerosol-generating procedures, such as

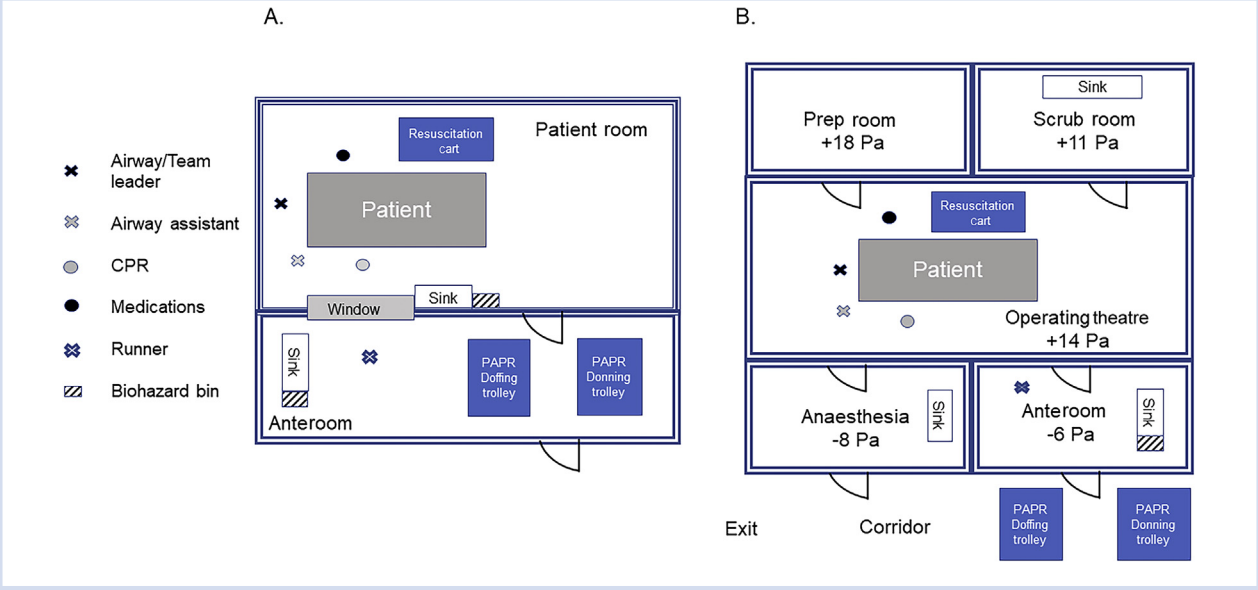

Fig 1. Suggested layout of (a) a negative-pressure room and (b) an operating theatre and positioning of resuscitation team members during an emergency code resuscitation. CPR, cardiopulmonary resuscitation; PAPR, powered air-purifying respirator.

tracheal intubation, cardiopulmonary resuscitation, bronchoscopy, open suctioning, noninvasive ventilation, and tracheostomy care, pose a risk of nosocomial transmission, and it is vital that all healthcare workers involved in these procedures wear proper personal protective equipment (PPE). Training on appropriate PPE and powered air-purifying respirator (PAPR) use, correct donning and doffing procedures, and institutional infection control measures for resuscitation are regularly undertaken. Donning and doffing of PPE are supervised to prevent lapses in infection control practices.

A dedicated resuscitation trolley for COVID-19 patients is used to prevent contamination of equipment and nosocomial spread. A prepared airway bag containing a paediatric videolaryngoscope with disposable blades, a disposable bag valve mask (BVM), high-efficiency particulate air (HEPA) filter, in-line suction catheters, and an end-tidal carbon dioxide detector is kept within easy reach. All COVID-19 wards have donning and doffing trolleys that are kept in separate areas. Our PPE/PAPR donning trolley contains four PAPR sets and PPE (N95 respirators or equivalent, goggles, shoe covers, gloves, and fluid-resistant gowns). The doffing trolley is located next to a biohazard bin to prevent contamination of equipment once used (Fig. 1).

When an emergency code is activated, the resuscitation trolley is brought inside the patient's room and the PPE/PAPR donning trolley is kept outside. Role delegation is performed before entry, as PPE and PAPR make communication difficult.[7] The number of healthcare workers entering the room to assist in resuscitation is kept to a minimum and opening of the patient's room door is minimised. A runner in full PPE waits outside the room to coordinate with the resuscitation team inside and obtain additional equipment as required. Communication with the runner in the anteroom should be done via a two-way communication device or a whiteboard.

The airway is managed by the most experienced team member. Bag valve mask ventilation is minimised; if required, small tidal volumes are given with a good mask seal. A HEPA filter is placed between the mask and the manual resuscitator. Micro-cuffed tracheal tubes and in-line tracheal suctioning are used to minimise disconnections and aerosolisation. Wearing PAPR impairs chest auscultation; thus, capnography and visual confirmation of chest expansion become important to assess tracheal tube placement. After resuscitation, all disposable equipment must be safely discarded. All surfaces and reusable equipment are disinfected based on institutional guidelines. *In situ* resuscitation simulations are organised to familiarise all healthcare workers with the resuscitation workflow, infection control measures, and clinical management. These also allow healthcare workers to identify and overcome the limitations of resuscitating in smaller teams whilst wearing full PPE and PAPR.[8]

A critically ill paediatric patient may require transfer to a different location within the hospital. Preparation for such a transfer should be done as for any critically ill child with consideration of the current clinical needs. There are some additional precautions that should be undertaken for a paediatric patient with COVID-19, with the main focus on infection control and the safety of the patient, transferring team, and general public. Before transfer, the nurse in charge informs the security department about the transfer, who then clears the route in advance. The most direct route with least human traffic is used. The number of healthcare workers accompanying the child is kept to a minimum, and only one parent wearing a surgical face mask is allowed. We avoid

transferring infected children on high-flow oxygen therapy because of the risk of aerosolisation. A closed-circuit transport ventilator with a HEPA filter attached is used instead of BVM to transfer an intubated child to reduce the risk of aerosolisation. The patient should be adequately sedated and paralysed to prevent coughing or dislodgement of the tracheal tube en route. The receiving team should be aware of the patient's arrival and have donned full PPE before handover. After transfer, the route taken and lifts used are disinfected immediately.

Declaration of interest

The authors declare that they have no conflict of interest.

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Percutaneous tracheostomy in patients with COVID-19: sealing the bronchoscope with an in-line suction sheath

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Keywords: aerosol-generating procedure; bronchoscopy; COVID-19; percutaneous tracheostomy; tracheostomy

Editor—Tracheostomy represents a particular challenge during the coronavirus disease 2019 (COVID-19) pandemic in patients infected with SARS-CoV-2. It is an aerosol-generating procedure with significant infection risk to surgeons, anaesthetists, and theatre staff. Open surgical tracheostomy and percutaneous dilation tracheostomy have differences in terms of aerosol generation. While the choice of technique is beyond the scope of this letter, the surgeon or intensivist performing the tracheostomy should use the technique with which they are most accustomed to reduce risk.

Early on percutaneous dilation tracheostomy was performed using multiple sequential dilators over a guidewire. Over the years, two major advances were introduced: use of a single dilator and use of an intubating bronchoscope down the tracheal tube.[1] The latter is, in our view, an indispensable tool to allow safe percutaneous dilation tracheostomy. The bronchoscope allows visualisation of the needle, its correct positioning in the midline, and avoidance of the posterior tracheal wall, injury of which can lead to false passages and tracheoesophageal fistula with potentially disastrous consequences.[2] The main drawback to using a bronchoscope in COVID-19 patients is the increased risk of aerosolisation from the insertion point of the bronchoscope at the tracheal tube connection (catheter mount with suction window). We describe a closed, in-line suction system to seal the bronchoscope and reduce the risk to operators and staff.