Caring for Critically Ill Adults in PICUs Is Not "Child's Play"*

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In 2011, we led the Pediatric Emergency Mass Critical Care Task Force (1) which recommended that hospitals which provide care exclusively to adults be prepared to provide care for pediatric patients in a pandemic or disaster which impacts children proportionally to adults. In the 2014 Task Force for Mass Critical Care (2), we highlighted the need for a systems-level approach for the provision of critical care in pandemics or disasters where pediatric patients are not considered a "special population" but rather are entitled to an equitable share of critical care resources. These recommendations were driven by the significant lower critical care capacity for pediatric patients within the population compared to that of adults. Although these recommendations remain valid today, we did not envision a pandemic, such as the coronavirus disease 2019 (COVID-19), which so disproportionately affect adults that pediatric intensive care clinicians are being asked to accommodate critically ill adults in their ICUs (3).

In this issue of *Pediatric Critical Care Medicine*, Remy et al (4) comprised dual trained adult and pediatric intensive care physicians provide timely advice primarily aimed at pediatric intensive care physicians regarding key differences in the medical management of critically ill adults. This practical information is timely and much needed by pediatric intensivist caring for adults suffering from COVID-19. However, effective and safe care can only be delivered if a structured framework in place as an enabler. Thus, thoughtful preparation beyond the information provided by Remy et al (4) is necessary to prepare pediatric units to care for adult patients.

Issues of ethics, justice, and societal considerations are important in determining whether pediatric critical care beds should be made available for adults. It is widely accepted that there are finite critical care resources and the process to allocate these resources ethically must include considerations of equity of all patients in need (5–7). However, there is very limited practical guidance to assist providers facing the ethical challenges of considering both adults and pediatric patients together vying for a single pool of resources (8). Although there is certainly a strong basis to argue that allowing adults to die while ventilators sit unused in a PICU is unethical, healthcare systems must have a process in place for making decisions regarding the allocation of critical care resources that can address the ethical and medical complexities of allocating resources that takes into account the differences within and between these populations (9). Caring for COVID-19–infected adults in ICUs at pediatric hospitals (which do not normally care for adults) should be considered equivalent to providing adult critical care in an alternate care facility. Commensurate with published recommendations (2, 10–12), this should only occur during a crisis surge response after the strategies for conventional and contingency responses (2, 13), including maximally expanding critical care capacity within adult hospitals such as recruiting pediatric critical care staff and expertise to adult units.

In order to successfully provide the care outlined by Remy et al (4) to adults in a pediatric hospital, the enablers of care such as staff, "stuff," space, and systems must be arranged a priori. Successful delivery of care also depends on a robust "3Cs" (command, control, and communication) system (2, 11, 14).

STAFF

Providing care to critically ill adults with COVID-19 in a PICU requires staffing considerations beyond pediatric intensivists having a passing familiarity with clinical issues in adults and should include the skills and capabilities of nursing and allied healthcare workers. An inventory of the staff in the children's hospital who have recent experience in providing care to critically ill adults will be useful. Additionally, it is important to use the care team model (5) with adult intensivists

*See also p. 607.

Key Words: children; coronavirus disease 2019; critical illness; intensive care; disaster; pandemic

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providing input to the pediatric clinicians either in-person or remotely (15), daily on rounds, and in the event of complex decisions such as emergencies, resource reallocation, or end-of-life decisions.

STUFF

Remy et al (4) provides a brief list of medical supplies required to care for adult patients; however, there are logistic complexities that must be addressed for providing critical care to patients in alternate care facilities, let alone adults in pediatric hospitals (16, 17). The provision of care to adults not only requires different sizes of medical equipment, lines, tubes, and drug dosing but also has implications for all of the supplies required to support the delivery of critical care, including radiology, pharmacy, and laboratory services. In addition, a supply chain must be in place to provide these resources. Rather than a pediatric hospital attempting to source adult-specific supplies, it may be more efficient for the adult hospital in their network, or the local disaster stockpile, to send push packages of critical care supplies for adult patients to the pediatric hospital.

SPACE

Several factors regarding where to house adults within a pediatric hospital and the allocation of beds equitably must be taken into account. Staff and patient safety issues are important considerations. For instance, many of the patients routinely cared for in PICU are immunocompromised, and hence, we need to ensure that these children are protected from the nosocomial transmission of COVID-19 from adults. In adult hospitals, nosocomial transmission is decreased by cohorting non–COVID-19 patients away from COVID-19–infected patients. However, this may mean moving pediatric patients to other locations out of the purpose-built PICU, such as the anesthetic recovery room, that may have implications for their standard of care. Alternatively, consideration could be given to cohorting adult patients in areas outside of the PICU. Further considerations relating to physical space required for providing care to adults with larger beds as well as the infrastructure for caring for larger (heavier) patients such as the availability of patient lifts or sufficient space, and staff, to manually lift adults for prone positioning.

SYSTEMS

A system-level response is required to support any crisis surge response (18). This refers to both the broader healthcare system and the systems within the hospital itself. On the broader level, the pediatric hospital's response must be integrated into the overall pandemic response via the regional emergency operations center as well as engaging with local adult hospital partners not typically part of the pediatric hospital's referral pattern or local network. Within the hospital, systems such as pharmacy dispensing, physician order entry, and patient registration may all require modification to facilitate the provision of care to adults. Pediatric hospitals order entry and pharmacy dispensing software, for example, may not permit adult weights or drug doses being ordered.

COMMAND, CONTROL, AND COMMUNICATION

All three of these elements are essential for effectively managing a crisis. Command and control refer to the need for a clear chain of command and excellent leadership and support to provide the resources for safe delivery of care at the bedside. This is best delivered through the use of the Incident Management Structure, coordinated from the hospital's emergency operations center (19). Communication with staff as well as patients and the pediatric hospital community are critical. The decision to care for adult patients in hospitals will raise many questions and potential concerns among pediatric hospital staff, patients, their families, and the community. Leaders within the hospital will need to ensure that these questions are answered and concerns addressed.

Although it is an unfortunate reality of these tragic times that we must consider providing care to adults in pediatric hospitals, the ethical requirement to do all that is possible to enable best outcomes is clear. Remy et al (4) provide a timely guide for pediatric critical care physicians. Successful and safe delivery of care require careful planning and the implementation of a structured response based on the core principles of crisis surge management.

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Should Nasal Approach Be the New Routine for Nonemergent Intubation?*

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Nasotracheal intubation was first described in 1902 by Kuhn and introduced as an alternative to tracheostomy placement in children. Today, nasotracheal is most commonly used in the operating suite by anesthesiologists for dental, oropharyngeal, and maxillofacial procedures, procedures requiring prone positioning, and when postoperative intubation is likely. The nasotracheal route for intubation provides increased endotracheal tube stability and is believed to be better tolerated in nonsedated patients compared with orotracheal intubation. In adult ICUs, however, nasotracheal intubation is specifically avoided in patients expected to be intubated for prolonged time periods due to increased risk of sinusitis (1). Interestingly, Holzapfel et al (2) performed a randomized control trial on a total of 300 mechanically ventilated adults and found no difference in the occurrence rate of sinusitis in nasotracheal compared with orotracheal intubated patients, yet the Centers for Disease Control and Prevention still recommends avoiding nasotracheal intubation in the ICU setting (3). Avoiding nasotracheal intubation seems to have carried over to the pediatric setting despite the lack of studies in critically ill children.

Technological advancements in equipment and clinical research have brought into question all we thought we knew about nasotracheal intubation. Originally, nasotracheal intubation was performed blindly, leading to absolute contraindications in patients with basilar skull or maxillary facial fractures. Fiberoptic bronchoscopy, however, can visualize the entire nasotracheal passage and has been safely used to perform nasotracheal intubation in these patients (4). In addition, techniques to limit bleeding during insertion, such as using a smaller diameter endotracheal tube (5), use of a red-rubber catheter as a guide for nasotracheal intubation (6), and intranasal phenylephrine administration causing insignificant hemodynamic changes (7) have now been described in children. When bleeding does occur and obstructs the view of the fiberoptic scope, using a videolaryngoscope screen can facilitate fiberoptic placement into the trachea (8).

In this issue of *Pediatric Critical Care Medicine*, Christian et al (9) have conducted a retrospective evaluation of nasotracheal intubations in children in the PICU using the international, multi-site Virtual Pediatric Systems^{LLC} database. In the study, the authors compared 680 nasotracheal intubations (5.6% of total) to 11,408 orotracheal intubations in 121 PICUs comparing They found that the prevalence of nasotracheal intubations in U.S. PICUs remains low (5.6%) and primarily occurs in young children (< 2 yr old) that underwent cardiac surgery. The median duration of intubation was 3.5 days for both nasotracheal and orotracheal groups. Patients with nasotracheal intubations had significantly fewer unplanned extubations (0.9% vs 2.9%; $p < 0.001$) and had similar incidences of sinusitis (0.3% vs 0.9%) and ventilator-associated pneumonia

***See also p. 620.**

Key Words: critically ill children; early mobilization; intensive care unit liberation; nasotracheal intubation; pediatric intensive care unit

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