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Finding Ways for Children’s Doctors to Care for Big ‘Kids’ and Save Adults in a Pandemic

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The World Health Organization declared Coronavirus disease 2019 (COVID-19) a pandemic in March of 2020. By the end of 2020, the United States (US) Centers for Disease Control demonstrated that the cumulative rate of COVID-19-associated hospitalizations for patients <18 years of age was 23.9 per 100,000 population compared to adults 18 or older at 449.9 per 100,000 population¹. A recent assessment done by the Society of Critical Care Medicine estimated that the US had 34.7 critical care beds per 100,000 population; 5% of which are pediatric critical care beds, and 24% being neonatal intensive care beds². The resultant shortage of adult intensive care unit (AICU) resources due to the surge of COVID-19 infections sparked ingenuity in a time when the world was thrust into chaos.

Amid this, Sinha et al. in this issue found creative ways for children’s doctors to care for sick adults with COVID-19 disease³. In a carefully crafted rubric, the authors show how thoughtful planning and methodical implementation in England can mobilize emergency resources in a time of crisis. As such, their success met the demand to increase adult ICU resources during the early surge of the COVID-19 pandemic while still meeting the pediatric critical care needs of the country.

At the beginning of the pandemic a number of adult and pediatric trained critical care physician experts developed recommendations on how to care clinically for adults in pediatric settings^{4,5}. As the world disaster continued to unfold, several models to implement these recommendations began to take shape in three differing models; exclusive management of adults in pediatric ICUs with a centrally located PICU regionally to care for children, a hybrid adult and pediatric ICU, or the establishment of new adult ICUs staffed by pediatric critical care physicians (summarized in Table 1). These models were aptly developed by multiple institutions across the world. Sinha et al.’s experience in England is unique due to the magnitude and coordination of their efforts across an entire country.

Early in the pandemic our institution initially adopted a model of pediatric ICU physicians caring for critically ill adults in our pediatric hospital alongside children. However, in the second wave (Fall 2020), we mobilized pediatric ICU physicians and nurses to adult

COVID-19 ICUs across our health system, as additional adult COVID-19 ICUs were developed when additional physical spaces were identified. From these experiences we were able to consider which aspects of these models worked well and further identify additional opportunities for growth. While caring for adults in our PICU, we relied on our strong well-established communication systems among familiar team members to adapt to this new patient population. However, we were persistently aware that should adult-specific procedural care be required (i.e., interventional catheterization) adult patients would need to be transported back to the adult hospital, possibly resulting in delayed care. In the second wave, as pediatric ICU providers were covering the adult COVID-19 ICUs in the adult hospital, some patients did require emergent evaluation for acute coronary syndrome and cerebrovascular accident, which was facilitated with adult-specific providers- accustomed to providing these evaluations and interventions in their familiar surroundings. However, this 'luxury' of providing care in the adult hospital by pediatric providers was in part possible because of available physical space. If capacity were reached in these locations, systems wide planning already deemed that overflow would return adults to be cared for in the pediatric ICU.

Regardless of the model for utilizing pediatric critical care physicians for adult critical care needs there are key differences in adult and pediatric critical care as children are not 'little adults', nor adults 'big kids.' Recognizing that adults can be cared for in pediatric settings or by pediatric practitioners in a different fashion than adult counterparts and acknowledge gaps in this care is paramount for success. To successfully deploy resources to a PICU repurposed for adults, a structure framework must be first undertaken to ensure success. This framework must include a fundamental understanding (or recognition where knowledge gaps exist) of potential adult diseases with complications, the availability of adult consultation services, the retraining of relevant staff, the ability to repurpose the pediatric ICU space, the ability to stock appropriate equipment and supplies, and the development of a command center that can oversee operations. These needs occur only after a strong organizational leadership is developed that can focus on these aspects while managing in times of crisis and surge. Likewise, providing transparency in the system and to patients via effective communication that standards of care may be different during a pandemic than outside of a crisis surge is prudent for any repurposed model to engage success⁴.

There are some key concerns and questions that still remain with all of these approaches that beckon the old adage "just because you can do something, should you?" First, were clinical outcomes worse or better when pediatric practitioners were caring for adult patients? Second, was standard of care for adults compromised with delays in management due to a lack of experience with diseases that require timely intervention i.e., delays to percutaneous coronary intervention in myocardial infarction or to alteplase administration in cerebrovascular accident? This may be difficult to ascertain as delays in care across all health systems were occurring with the flood of patients with COVID-19 disease. Nonetheless, these are important concerns that should be evaluated across all models to see if one method had improved outcomes. Third, did ICU workflow and ICU personnel need change in pediatric ICUs whether adult patients that were triaged were COVID-19 or non-COVID-19 i.e., in a pandemic is it prudent to triage the patient with the 'pandemic disease' to these settings or instead triage patients with known adult diseases (i.e., COPD

exacerbation, pancreatitis, DKA, HHS) to the pediatric ICU setting or for pediatric practitioners? Finally, with dual trained internal medicine-pediatrics physicians and nurses, should there be a move in physician and nurse training for more adult (or pediatric) training to develop familiarity in clinical management? This training may be crucial as we work towards future pandemics, especially as the frequency of such has seemingly increased over the past 20 years (SARS, Zika, Ebola, COVID-19). The answers to these questions with rigorous evaluation of not just ‘that we were able to do something’ but rather ‘that we were able to do so in a fashion that provided equal or even better patient outcomes’ is paramount for future considerations.

Nonetheless, the COVID-19 pandemic has undeniably shown under times of great duress to the medical profession, the best of collegiality and truthfully humanity. The ability to manage patients outside the scope of standard practice to meet the needs of a country surging after careful and thoughtful strategic planning provides hope to many other regions that need guidance for this or any future pandemics. Crisis surge and implementation planning tenants have not changed *per se* in this pandemic but rather the manner and scope by which these have been applied by necessity has altered the manner in which systems may need to approach the delivery of health care to institutions, regions, and countries. Novel methods of system and ICU simulation may further refine methodology, systems dynamics, group modeling, and improve rapid deployment to meet surge needs more expeditiously in future pandemics. Fortunately, these successful experiences with ICU repurposing are possible in a time where pediatric patients are largely unaffected in masse. However, the lessons learned from these preparations are grossly important as the potential for a future pandemic that affects *both* adults and children may present unfathomable challenges.

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Table 1:

Models of Pediatric Physicians Caring for Critically Ill Adults

	Adults in a pediatric ICU	Adults and children in a pediatric ICU	Pediatric ICU physicians covering a new AICU
Staff	<ul style="list-style-type: none"> -Pediatric trained physicians, nurses, therapists -Experienced as a team working together 	<ul style="list-style-type: none"> - Pediatric trained physicians, nurses, therapists -Experienced as a team working together 	<ul style="list-style-type: none"> -Mixed adult and pediatric training -Not experienced as a team working together
Equipment	<ul style="list-style-type: none"> -New supply chain -New space for supplies 	<ul style="list-style-type: none"> -New supply chain -New space for supplies -Burden of maintaining pediatric and adult specific supplies 	<ul style="list-style-type: none"> -Existing supply chain
Clinical care	<ul style="list-style-type: none"> -New process of patient transport and triage -Limited or no access to adult-specific specialists -Burden to pediatric- specific specialists 	<ul style="list-style-type: none"> -New process of patient transport and triage -Limited or no access to adult-specific specialists -Burden to pediatric- specific specialists 	<ul style="list-style-type: none"> -New unit but known process for patient transport and triage -Full access to adult-specific specialists
Communication	<ul style="list-style-type: none"> -Existing structure, familiarity and known processes for members of the team to maintain continuity of care 	<ul style="list-style-type: none"> -Existing structure, familiarity and known processes for members of the team to maintain continuity of care 	<ul style="list-style-type: none"> -Newly created medical team with various backgrounds in a new system

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