

Editorial

Strengthening Health Systems and Improving the Capacity of Pediatric Care Centers to Respond to Epidemics Such as COVID-19 in Resource-limited Settings

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The COVID-19 pandemic has highlighted in dramatic fashion the weaknesses of health systems worldwide in responding to emerging pandemics.¹ Although many governments, nongovernment organizations (NGOs), and multinational organizations like the World Health Organization (WHO) have prioritized the strengthening of health systems, and developed pandemic preparedness plans, the world's uneven (and often belated) response to the COVID-19 pandemic suggests that many of these plans were insufficient and that the global health community will need to improve resource allocation, information-sharing, and government coordination in order to minimize the impact of future outbreaks.² We are particularly concerned that existing preparedness plans do not adequately address the special needs of children; the relatively low hospitalization and death rates of children in the COVID-19 pandemic may result in the continuation of those needs being overlooked.³ Additionally, the needs of children in low-resource settings, which differ in many ways from those of wealthier settings, may be even further at stake. As health systems begin to reassess their preparedness

plans, this pandemic gives the world the opportunity to put safety measures in place to protect children now, and in turn to prepare for future outbreaks that will, sooner or later, affect children to a greater degree than this pandemic has thus far.

An example of such a pandemic preparedness plan is the Global Health Security Agenda, which launched in 2014 and now includes 69 countries, nine multinational organizations, and over 100 private sector organizations.⁴ Partner organizations have committed to a strongly coordinated international response, utilizing a whole-of-society multi-sectoral approach based on the latest science and seeking to ensure that governmental responses to future pandemics are consistent with universal principles of human rights. Despite this ambitious program, however, its 2024 Framework and the summaries of its task forces and action packages, even those centering on immunizations, do not mention the special needs of children.⁵

The WHO's framework for monitoring and evaluating health security issues, the International Health Regulations (IHR) Joint External Evaluation Tool, is similarly intended to assess country capacity to prevent, detect, and rapidly respond to natural, deliberate, or accidental public health threats.⁶ But while this framework does consider many important factors in developing a pandemic preparedness plan, it too does not address the specific needs of children in the event of a pandemic or other catastrophic event. The WHO's 2019 Novel Coronavirus (2019-nCoV) Strategic Preparedness and Response Plan also fails to provide any specific treatment or response guidelines for children.⁷

While the overwhelming majority of information about COVID-19 in both the scientific and lay literature has focused on adult patients in middle- to upper-income countries, we must remember that humanitarian and low-resource settings face their own unique challenges.⁸ These include a wider distribution of potentially detrimental host factors and co-existing morbidities such as malnutrition and HIV which may put these populations at higher risk. Fragile health system symptoms manifest as staff shortages, limited personal protective equipment (PPE), stock-outs of medications, inadequate space, and limited lab capacity, all in addition to the structural problems that limit access to health for significant proportions of the population. Fragile social structures are marked most prominently by high rates of poverty at baseline, thereby making all work “essential”. Lower rates of health literacy affect comprehension of rapidly changing and complex situations; unintended health and economic consequences of physical distancing, and the absence of social support measures all complicate the situation as well. The effects of these challenges extend far beyond COVID-19 to profound overall societal dangers such as worsening poverty and a worrisome redirection of health care resources away from core activities such as immunization and nutrition programs. Beyond health, they also extend to large scale school closures, increases in domestic violence, and other threats to optimal childhood physical and socio-cognitive development.⁹

As with most crises, we anticipate that COVID-19 will ultimately be damaging to children. And as with most crises, we fear that this damage will be underreported, understudied, and underappreciated until far too late.

Resource-limited settings have time and again faced such challenges head-on and have managed to surprise and impress the world's public health "experts" with their successes in responding to previous pandemics such as HIV and Ebola.¹⁰ Shelter-at-home requirements, community contact tracing, close adherence to medication prescriptions, high rates of vaccine uptake, mass-drug administration at the community level, strict infection prevention protocols, novel means of handwashing (Figure), and more, are not new health concepts in resource-limited settings. Leveraging the experiences, successes, and ingenuity in the COVID-19 era to build resilient population health systems with special attention towards the needs of children will be essential.

In light of the lessons learned – and still being learned – as health systems worldwide respond to the COVID-19 pandemic, the Editorial Board of the *Journal of Tropical Pediatrics* proposes the following considerations and recommendations for strengthening health systems and improving the capacity of pediatric care centers in resource-limited settings to respond to COVID-19 which may help these systems be able to better manage future outbreaks (Table).

We are committed to highlighting programmatic work assessment and research on strengthening the health care systems in pediatric centers in resource-limited settings. We are also interested in exploring the differential aspects that pediatric COVID-19 may show in the context of highly prevalent co-morbidities, such as HIV, malaria and other diseases. Our editorial office will automatically fast-track all papers connected to the COVID-19 outbreak.

We are especially interested in contributions from frontline clinicians, community health workers, and programmatic implementers in tropical settings whose experiences and contributions to this knowledge base may be otherwise ignored.

Our publisher, Oxford University Press (OUP) will also add each accepted manuscript on the topic to the free coronavirus collection of papers available on the OUP journals homepage at <https://academic.oup.com/journals/pages/coronavirus>.

While we appreciate that some of these efforts may not directly improve patient care or health systems in the immediate term, we are hopeful that by providing this type of information in a rapid but rigorous format, we can contribute to pediatric health systems development over the longer term.

In addition, the Editorial Board also encourages everyone to support the cause of strengthening health care systems in pediatric centers, particularly in low- and middle-income countries.

Through advocacy or financial support of organizations focusing on health systems strengthening we can simultaneously address the COVID-19 response and prevent the world's children from suffering when the next epidemic hits.

Table. Considerations for health systems strengthening areas for pediatric epidemic and pandemic preparedness

Health System Area	Considerations for Pediatric Health Systems Strengthening	Comments
Vulnerable groups	Consider highly vulnerable children in the community that might require even higher levels of attention during an epidemic/pandemic: newborns, children that are immigrants, refugees, orphans, homeless, HIV-positive, immunocompromised, or impoverished.	Have a plan to secure age-appropriate medications, supplies, and support for vulnerable newborns, infants, children, and adolescents.
Physical care of children	<p>A dependent child may need more time-consuming care from healthcare workers and/or caregivers than a self-sufficient older child or adult would need, for daily activities such as feeding, bathing, and diaper care.</p> <p>Even well children in a pandemic will need supervision and care and caregiver time and attention.</p>	<p>These activities may put a healthcare worker or caregiver in close contact with a child and put either at risk of infection.</p> <p>Calculate and schedule approximate ratios of pediatric patients to pediatric caregivers that will be needed for hospitalized patients, clinic patients, children in home settings, children without parents, etc.</p> <p>Alternative plans should be implemented for childcare if a large portion of caregivers are ill and unable to care for infants and children.</p> <p>Consider task-sharing and alternative staff that might be utilized in a variety of epidemic scenarios (e.g., teenagers or grandparents might be less exposed than other age groups in certain epidemics) to serve as backup/caregivers in a medical or home setting. Maximize the role of community health workers.</p>

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Physical structures	Invest in physical buildings, isolation rooms, space to accommodate the family members of pediatric patients.	<p>If the facility does not have a negative-pressure room or isolation room, begin plans to create or build an adaptable one.</p> <p>Plan temporary structures (mobile facilities, tents, etc.) when permanent structures are not feasible.</p>
Personal protective equipment (PPE) for healthcare workers	Order, stock, and stockpile enough PPE to protect pediatric providers and staff from a variety of infectious transmission types for at least one infectious season at pediatric facilities and procure other routine and unusual supplies that might be used in excess during an epidemic/pandemic while children are infected or while they are being tested for infection.	<p>Consider disposable, washable or reusable PPE that may be needed for potential infection control; calculate a needed supply for children at each facility, and stockpile the projected amount for a potential outbreak.</p> <p>Establish if and when rationing, reuse, and recycling will be mandated.</p>
PPE for pediatric patients and caregivers	<p>Pediatric patients and caregivers should be provided an adequate supply of PPE.</p> <p>Identify sources for ordering child-sized masks, gloves, gowns, eye protection, hair coverings, shoe coverings, etc., that may be needed for all sizes of children for transport to, from, and during procedures and surgeries, and for transportation to isolation units, other facilities, or back to home.</p>	<p>Children may be asymptomatic, which may reduce vigilance of caregivers.</p> <p>Teach caregivers proper use and conservation of PPE.</p>
Health facility clinical space utilization	Plan where each facility would isolate one, several, or many newborn, pediatric, and adolescent patients.	In the case of a massive number of infections, plan where the facility would isolate a smaller number of non-infected children.
Outdoor space utilization	Consider child-safe outdoor waiting areas to avoid close-quarter exposures while also considering	Have an overflow plan utilizing alternate buildings, adult facilities, or semi-permanent (trailers) or

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	alternatives for cold or inclement weather.	temporary (tents) structures to house testing or admission facilities.
Disinfection of pediatric facilities	<p>Clean/disinfect, at least daily, pediatric waiting rooms, door handles, water fountains/dispensers, unremovable play equipment, etc.</p> <p>Remove toys from waiting areas and exam rooms.</p>	<p>Close small play areas or enclosed parks that cannot be disinfected regularly during epidemics/pandemics.</p> <p>Consider planning for pediatric murals, ceiling decorations, and other construction that make pediatric areas child-friendly yet retain low risk for contamination and transmission of disease from one child to others.</p>
Laboratory capacity	Plan for increasing lab capacity for newly available tests (like PCR, serology, or culture testing) and create a plan to handle a large or massive increase in testing volumes and a need for rapid result turn-around time.	Work with public health colleagues to plan for temporary structures for lab specimen collections near each facility or how children or their specimens could be routed to other public facilities for testing.
Screening	<p>Develop protocols for setting up symptom screening stations for patients, families, and staff at entrances.</p> <p>Set security staffing protocols, staff sick policies, and staff duty rotation policies.</p>	Develop a plan to inform the public about who they can contact for questions about symptoms, which symptoms warrant bringing children to a health facility, and which buildings or entrances children should be brought to.
Tracking persons under investigation (PUI)	Maintain a central accessible list of patients who are a PUI for the condition of concern, including, at a minimum, name, date of birth, whether diagnosis is suspected or confirmed, if patient was admitted to the facility, and if they were discharged home or deceased.	<p>Remind health care providers to report unusual cases, clusters of cases, all reportable diseases, and epidemic/pandemic cases to the public health department or ministry of health authorities.</p> <p>Plan for contact tracing.</p>
Communication with staff	Plan for when and where daily check-in meetings would likely be held in-person, or how they would be held remotely. Have contact lists	Establish where reliable clinical guidance can likely be obtained from and where clinicians and parents can

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	of the entire pediatric team or system readily available to all team members in electronic and hardcopy formats.	<p>be directed for reliable, updated information.</p> <p>Hold a mock meeting annually to review and test the preparedness plan.</p>
Communication with health departments	Each health facility should have a reliable direct line of communication with the appropriate person(s), local health department, and/or ministry of health who can confirm an appropriate plan for children in a timely manner in the setting of any public health emergency.	Assign personnel and back-up personnel from each facility who are responsible for contacting the public health authorities immediately, communicating regularly, and discussing issues whenever questions arise during an outbreak.
Communication with the public	<p>Organize public health service announcements, including media and radio messaging, that remind families to have home preparation kits, to include: a 2-week supply of food, extra water, electrolyte drinking solutions suitable for children, thermometer, masks, handkerchiefs or bandanas that can be used to comfortably cover the nose and mouth of children, liquid formulations of antipyretics, bandages for covering wounds, hygiene products, etc.</p> <p>Have ready-made announcements, posters, and handouts with clear graphics that can convey simple ideas about hand-hygiene, cough etiquette, physical distancing, etc. in pictures and words. Know how to make disease-focused signage upon short notice, about specific symptoms to report for the particular epidemic/pandemic at hand, as soon as information emerges.</p>	<p>Ensure that educational materials and timely or daily information updates are also available and appropriate for different ages of children in pediatric care locations where children, despite a limited number of care providers, can be educated or can educate themselves. These materials should be clear and factual. Messages should also address fear and provide reassurance regarding unknown factors.</p> <p>Create materials that are understandable at a grade-school reading level; know how much material will be necessary for a mass education campaign, and include messages that can be directed at children and adolescents.</p> <p>Children need to be informed of the status of their caregivers and family members as well during outbreaks.</p>

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Non-essential health visits	Determine how each facility will answer questions about managing non-essential visits and surgeries, no-shows for scheduled appointments or admissions, and tracking and retention of children with HIV, diabetes, prematurity, and other chronic, life-threatening conditions that will require visits, medication refills, or medical supplies during the time of crisis.	<p>Determine if routine visits for growth and developmental monitoring and immunizations can take place during an epidemic/pandemic, and if so, when and where.</p> <p>Decide if phone or video visits can be offered.</p> <p>Continue to promote routine vaccination against preventable diseases for children and adolescents, and other similar programs such as intermittent preventive treatment for malaria during pregnancy (IPTp). Such measures can reduce or eliminate some diseases like bacterial pneumonia in a community, which may have overlapping symptoms with emerging flu-like illnesses, or other infectious diseases.</p>
Health care seeking and health care facility contact	Implement measures that can be taken to limit the children's and parent's or caregiver's time in each health facility. Predetermine what measures healthcare providers and staff can take to focus clinical visits and provide multi-month prescriptions for medicines and medical supplies; secure the support of insurance schemes, supply chains, and/or public health or ministry of health leaders to allow for and cover these items.	Have a plan in place for triaging children not only in emergency department settings, but also in clinics, nurseries, and even daycares and schools, to transition them to the next level of care or back home, in the event of a crisis. Have a designated trained team and a back-up team to conduct this practice.
Physical distancing	Consider how best to separate people and maintain appropriate physical distancing, taking into considerations the space requirements of mothers or other	Consider prohibiting all non-essential visitors from healthcare facilities during an epidemic/pandemic, only allowing one caregiver to accompany each child, recognizing the challenges this

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	caregivers who may have more than one child with them.	could place on a family member who does not have a safe place to leave their other children.
Transportation	With stakeholders, agree on a transportation plan from homes or clinics to health care centers for children in need of assisted or public transportation. Have a set plan to accelerate clinic flow in order to get staff and patients out before public transport closes.	Be aware of changes in public transportation, such as limited hours, limited number of people permitted in each vehicle, increased costs, or a partially or completely non-functioning system.
Food security	Prepare a contingency plan for food security and implications for patients actively receiving nutritional support.	Set up a plan for age-appropriate alternatives for infants and children if the supply chain is interrupted.
Research	Advocate for or engage in research into emerging infections in children. Advocate for the development and testing of new vaccines.	For new vaccines, advocate for affordability and use in all communities, especially in low- and middle-income countries.
Other important co-morbidities	Advocate that ongoing control programs (malaria, HIV, tuberculosis, etc.) have specific response plans to guarantee that prevention and control of these potentially comorbid diseases are affected as little as possible.	Plan mass drug administration of antimalarials or other necessary medications in communities where access to healthcare may be severely hampered by an outbreak. ¹¹ Enhance the role of community health workers for the additional control of such co-morbidities.
Mental health	Discuss possible ways to manage social, psychological, and adherence counselling for those routinely and newly experiencing needs in those areas, including how services could be provided remotely to children and their families through phone or video visits.	Have an alternate plan utilizing task-shifting if these systems or personnel become overwhelmed.
Partnerships and collaborations	Consider forming a partnership in the local region, convening government, NGOs, and private sector organizations that may	Encourage your local, national, and multi-national government organizations to support funding for health systems strengthening.

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	<p>contribute time, money, and human resources to the cause of forming an epidemic/pandemic preparedness plan for children in each pediatric facility.</p> <p>Advocate for and support addressing pediatric needs through the WHO and the Global Health Security Agenda.</p>	

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Figure. Novel foot-pump-powered handwashing stations in (A) Nepal and (B) Malawi demonstrating local ingenuity and approaches to the COVID-19 pandemic. (Courtesy: WaterAid)

(A)



(B)

