

Disaster Preparedness: Meeting the Needs of the Pediatric Population

Jennifer Gillen¹

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Abstract

Purpose of Review The purpose of this review is to determine how to make the most efficient use of pediatric care resources during a disaster in the hope of minimizing the potential impact of a disaster on the pediatric population.

Recent Findings Children are known to be especially vulnerable to a disaster because of physiologic, psychologic, and developmental differences from adults. This is further complicated by the fact that most planners do not account for these differences when managing an event.

Summary Disaster response involves coordinating resources on many levels, from what is available to care for children in the home, the help a local hospital can provide, and the organization of assets across the community. The best way to respond to a disaster is to prepare before it happens, and pediatric providers have the ability to assist in the planning and response at each of these levels.

Keywords Disaster preparedness · Emergency preparedness · Pediatric · Critical care

Introduction

A disaster is defined in the medical literature as any catastrophic event that results in a demand for resources that overwhelms the local supply [1]. Disaster events can be natural,

such as an earthquake or hurricane, or man-made such as a terror attack. Events like this can result in exposure and pathology outside the typical scope of pediatric practice. However, the literature reflects that the main effort in this setting should be on expanding patient care capacity [2]. Therefore, this review will focus on ways to match the resource supply to the demand and help to minimize the impact of a disaster. For more information on the medical management of individual patients during a disaster, the following sources are recommended:

1. https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Children-and-Disasters/Documents/peds-full-eng_2012.pdf
2. <http://www1.nyc.gov/site/doh/providers/emergency-prep/hospitals.page>

Fortunately, disasters are relatively rare, but have the potential to result in a large and lasting impact on the health of children in a community. This impact is measured not only in the size of the event but also in the vulnerability of the population [3]. Children are known to be more vulnerable than adults due to physiologic differences such as higher body surface area to mass ratio, smaller airways, higher respiratory rate, and the inability to escape the danger. In addition, the psychological needs may be greater due to potential separation from caregivers and inability to understand the situation [4]. Secondary impacts such as loss of utilities like electricity, climate control, and access to clean water can pose significant risk and encompass a larger geographic area for days, or even weeks or months, following an event. Those impacts are intensified for children with special healthcare needs, especially in the setting of electricity or technology dependence, and families of these children are often even less prepared than the general population [5].

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✉ Jennifer Gillen
jennifer.gillen@mssm.edu

¹ Kravis Children's Hospital at Mount Sinai, 1184 5th Avenue, Box 1508, New York, NY 10029, USA

Emergency planners often do not account for the specific needs of children in planning for a disaster response [6], and most first responders are not pediatric trained. A nationwide survey of emergency medical service agencies found that 73% had a mass casualty response plan, but only 13% had a plan specific to pediatric needs [7]. In addition to plans for all children, disaster experts believe pediatric healthcare professionals can minimize the impact for children with special healthcare needs by developing illness-specific continuity of care mechanisms to maintain the therapies that keep children at their baseline level of health [8]. Pediatric providers have the opportunity to influence and integrate the disaster response on many different levels of care including the following: the personal preparedness of children and their families, the response of individual hospitals during and after an event, and the readiness of the network of community healthcare resources.

Personal Preparedness

Preparing for a disaster begins at home [1]. Families need to have a basic understanding of the risks they could face, a set of supplies to maintain care at home, and an evacuation and communication plan if staying at home is not an option [1]. Many families believe they will get help when they need it, but most emergency planners assume families will meet the needs of their children [8]. Families need to know that help may not arrive right away, especially if lines of communication and transportation are down [9].

Surveys in the USA have shown that families are generally not prepared to handle a disaster [10]. For children with special healthcare needs, it is even more important for healthcare providers to be involved. Previous studies have shown that hospital care teams are in an ideal position to help families because the medical plan is reviewed and often updated at the time of discharge [11].

Family emergency response plans recommended by the Federal Emergency Management Agency (FEMA) and the American Red Cross use a “3 day all hazards approach” [9–12]. This means planning to be self-sufficient for the first 72 h after an event. For most children, this includes having supplies like blankets, clean water, and non-perishable food. For children with special healthcare needs, the planning is more complex. Families must have 3 days-worth of all medications, formula, and medical supplies. For those who are technology dependent, families need to have an understanding of backup power sources for electronic medical equipment [5]. Battery life (for equipment that has it) can vary based on how the equipment is used and may not last more than a few hours. Longer alternative power sources like a car battery or generator require fuel and some technical understanding. Without a backup power source, electronic medical equipment

may not function, and children who require them may not be able to remain at home if utilities have been interrupted.

Evacuation of a child with special healthcare needs may require outside assistance and could involve separation from their family. The American Academy of Pediatrics recommends having an up-to-date emergency health information form filled out [13]. This form should include a list of the child’s health problems, allergies, and all routine and contingency interventions that are maintained when they are cared for at home. This will help transition care effectively in the event the child is separated. In addition, the American Thoracic Society guidelines for pediatric chronic home invasive ventilation discuss basic emergency response as well as the development of a plan for loss of utilities and notification of local utility and emergency medical service (EMS) agencies [14]. Planning ahead is critical to maintaining continuity of care for children with special healthcare needs in an uncertain environment.

Hospital Preparedness

Preparedness at the level of the individual hospital revolves around increasing patient care capacity to handle a surge of patients. This can be a challenge since experts recommend a 300% expansion of ICU beds in order to accommodate the maximum capacity on the surge planning spectrum [15, 16]. Critical care beds are the most likely to be overwhelmed and the most difficult to supplement [1]. This is further complicated because most tertiary care hospitals function at or near maximal capacity on a daily basis [17]. The surge is likely to involve those directly affected by the event and those who have been affected by loss of utilities. Reports following previous events show a surge in patients who remain at baseline health, especially those with home respiratory device use. These patients are often admitted to intensive care units solely because of device failure, a rare cause of admission otherwise [18, 19].

Some strategies to prepare for a surge before patients arrive include decreasing the day-to-day burden and planning for effective triage. Limitation of elective procedures ahead of time is a strategy employed in situations with some warning. In the face of an extreme increase in patient load, some experts recommend an alternate level of care including performance of only “essential” procedures, changes in the usual privacy measures such as single rooms, and relocating relatively stable patients to areas outside of the traditional intensive care unit [20]. In addition, Davis et al. surveyed hospitals and found that a third of regular census patients could be candidates for rapid discharge within 24 h [21]. In a disaster setting, typical discharge criteria may be modified through a process known as reverse triage. This allows patients who have been affected by the event to have as much consideration for a limited bed

space as someone who is already in the hospital but may not require as much acute care [22]. Since the first victims to arrive are not likely to be the most ill or most injured [1], having an effective triage strategy will allow for the sickest patients to be seen in a timely fashion. In pediatrics, JumpSTART is the most commonly used and most preferred disaster triage tool [23].

Handling the surge of patients comes down to resource management and effective organization of “staff, stuff, and structure” [2]. The management of the hospital staff in a disaster presents unique challenges. In general, more staff will be needed than usual, but some may be affected by the event themselves. Volunteerism can also present a problem with staff arriving to different areas or hospitals than they typically care for. The “stuff” required in this situation includes equipment like respiratory devices, medications, and other supplies [2]. During a disaster, children will often be sent to areas that are not used to treating children so the availability of the proper equipment sizes (i.e., intubation supplies and angiocaths) and medication doses need to be ensured. The “structure” refers to the physical structure as well as management infrastructure such as the incident command system. It is important to know how to contact the incident command center in the hospital to send and receive information throughout the patient surge.

When a hospital loses the capacity to care for its own patients, there is added stress to the regional healthcare system [24]. The decision to evacuate or not needs to balance the risks of sheltering in place with the risks of transport, and timing of that decision is critical. As the event develops, it is important to have “situational awareness,” the up-to-date information needed to make decisions about patient care. Previous planned and unplanned hospital evacuations have led to the development of tools to help track and transfer care. A hospital in Chicago recently developed several tools including a “boarding pass” system which integrated into the electronic medical record to provide planners with the most up-to-date location of each patient during a planned move [25]. In the event of an unplanned evacuation threat, King et al. recommend that an ICU leader be appointed to communicate with the incident command center and keep track of planning for (1) no imminent evacuation threat, (2) imminent threat, and (3) evacuation [26]. If an evacuation is called for, effective communication, transport, transfer of care, and patient tracking need to be maintained.

Community Preparedness

Individual intensive care units, and the hospitals they are a part of, represent a small part of the greater organization of healthcare services in a community. When a disaster strikes, the effectiveness of the response depends on the entire

organization. Braun et al. found that the coordination of resources required strong “community linkages” that provide for: a comprehensive planning process, a thorough emergency operations plan, an established response capability, and an ongoing surveillance and notification system for identifying and communicating emergencies [27]. Pediatric providers play an important role by considering the needs of children when creating a community-based plan.

The response to a disaster depends on the planning process before the event. This plan will help to create the linkages that are necessary to increase the efficiency of the response. Emergency response agencies exist in the public and private sector [6]. Most police, fire, and emergency medical services important for initial response and transport fall in the public realm, while most hospitals fall in the private realm, which makes coordination of the response more complicated [17]. In the past, there has been isolation of hospitals in the planning phase and this has created a weak spot in the overall response [27]. The isolation of individual hospitals can also lead to particular difficulty when caring for children given that pediatric intensive care beds tend to be concentrated in a few regional facilities [28]. For this reason, experts have recommended the development of inter-hospital agreements ahead of time that include specific plans for critically ill children [29]. These should include considerations for available pediatric equipment, a system of communication, patient tracking, and contingency plans in the event that a hospital is affected.

An emergency operations plan will build on the linkages created by the planning process. Immediately following an event, the healthcare resources closest to the scene are often the first to see patients and results in overcrowding [20]. The response plan must include figuring out what to do when the overcrowding happens. Communication strategies focused on effective transfer of care must be considered and tested. Disaster drills or exercises involving multiple hospitals and community resources are required by the Joint Commission [27] and can help find pitfalls and possible fixes in the plan.

Knowing the response capabilities of the resources involved in a response plan is helpful to matching those resources to the needs of the community. It is important to consider this when planning for children because few disaster planners recognize the limited supply of pediatric hospital beds in their area [6]. This may result in children being transferred out of the area to ensure they get the care they need in a large disaster. Some children will likely be cared for in a setting which is not traditionally pediatric. Consideration of which children require transport to a pediatric facility and the capacity of that facility are vital parts of the plan.

Ongoing surveillance and communication are important to maintain care in the aftermath of a disaster. Continuity of care is often a challenge as first responders and local facilities can be members of the affected community [27]. Access to

medications and durable medical equipment and supplies may be at risk [6]. Even standard preventive care like vaccinations may not be consistently available. Establishing care after a disaster can help get the patients and the community back on its feet.

Conclusions

There is no way to ever be fully prepared to handle a disaster, but the most important lesson from the literature is that preparation is the key to optimizing the response. Disasters result in an incredibly complex system of healthcare resources being thrown into chaos. Help may not arrive right away, and without mechanisms to suddenly increase care capacity at every level in the face of that chaos, the response will not be adequate.

The goal is to match the resources available to those who need them as efficiently as possible. To accomplish this, decisions made about resource management are often based on the population rather than individual patients, in order to focus on what will be the greatest good for the greatest number of people. If the needs of the pediatric population are not considered in those decisions during the preparation phase, then it will be difficult to meet their needs during and after an event.

Pediatric critical care is a limited resource during a disaster and could be one of the highest demands depending on the nature of the event. In order to expand the capacity of pediatric critical care, it is important that providers take an active role in the preparation phase, and help to integrate every level of response.

Compliance with Ethical Standards

Conflict of Interest The author declares that she has no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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