Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Pediatric Neurology 110 (2020) 3–4

Contents lists available at ScienceDirect

Pediatric Neurology

journal homepage: www.elsevier.com/locate/pnu

Perspectives in Pediatric Neurology

Allocating Medical Resources During a Mass Casualty Emergency: Sometimes It Is OK to Wait

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ARTICLE INFO

Article history:
Received 15 May 2020
Accepted 30 May 2020
Available online 6 June 2020

Keywords:
SARS-CoV-2
Crisis standard of care
Crisis triage officer
Ethics committee

The severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2 or COVID-19) pandemic has overwhelmed health care systems the world over, turning the situation into a "mass casualty emergency" (MCE) in some locations. Ideally, medical resources—material and human—would be unlimited. However, as the current pandemic has made evident, such thinking is utopian—shortages and rationing are here.[1] As such, health care providers must be prepared to make critical allocation choices with life-and-death consequences.[1,2]

Under usual circumstances, health care providers' primary duties are to their patients. These duties include non-abandonment, relief of suffering, and respect for the patient's rights and preferences.[3] During MCEs, however, the paradigm becomes more complex. The duty of health care providers may be to promote equity in distribution of risks and benefits to society. Such a shift has received several monikers: *crisis standard of care*,[4] *crisis care*,[5] and *disaster care protocols*.[6]

The patient who triggered this discussion on equity in distribution of risks and benefits during an MCE was a 17-year-old with confirmed COVID-19. In the pediatric intensive care unit (PICU), he required sedation, pharmacologically induced muscle paralysis, and mechanical ventilation. While under those clinical conditions, the patient developed sustained tachycardia and hypertension. In an effort to rule out seizures associated with autonomic changes, the PICU's medical team requested that he be placed under continuous video-electroencephalographic (EEG) monitoring. Given the nonspecific nature of the vital signs' changes, and in an effort to avoid exposing an EEG technologist to COVID-19, and potentially contaminating a limited resource—EEG equipment—we opted to take a wait-and-see stance. Within 30 minutes of the PICU's medical team's request, the boy's vital signs returned to normal, making the need for electrophysiological monitoring unnecessary. This situation, however, engendered moral discomfort among the providers over the hesitance of using a resource when, before the coronavirus pandemic, it would have readily been employed.

Decisions regarding the allocation of limited medical resources among patients should consider ethically appropriate criteria relating to medical need. These include, among others, the likelihood of benefit, urgency of need, change in quality of life, duration of benefit, the resources required for successful treatment, comorbidities that may affect outcomes, and the availability of qualified personnel. In addition, decisions made during MCEs are likely to change from moment to moment. A resource that is not available at one time may be so later, and vice versa.[4] Such

Conflict of interest: The authors declare no conflict of interest.

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https://doi.org/10.1016/j.pediatrneurol.2020.05.013

instability forces providers to establish candid lines of communication with patients.

The concept of allocating scarce medical resources based on need and benefit has been addressed by several organizations including the American Medical Association,[7] the Society of Critical Care Medicine,[8] the American Academy of Pediatrics,[9] and the Child Neurology Society.[10] The former two organizations typically address the needs of adult patients, and the latter two do so for pediatric patients. And although age may play a role in the manner in which these organizations frame their advice, the principles upon which they offer recommendations are, nonetheless, aligned.

The allocation of resources during MCEs can be accomplished by considering one or more of the following:

- Based on the principle of distributive justice, priority use of scarce medical resources may need to be given to patients for whom treatment will avoid unexpected premature death and extremely poor outcomes and to those who are most likely to benefit from them.[2]
- Based on the ethical principles of veracity and transparency, allocation of scarce medical resources needs to be accomplished using objective, consistent, and transparent protocols.[2]
- Based on the ethical principles of respect for persons and veracity, clinicians need to explain to patients or their kin that decisions regarding allocation of scarce medical resources may need to be made.[1]
- Based on the principle of justice, allocation of scarce medical resources may need to be decided according to degree of benefit, likelihood of benefit, duration of benefit, and the number of people who will benefit (how rapidly can the resource be shared with or transferred to additional patients).[2]
- Based on the principles of utilitarianism, scarce resources may need to be allocated to first responders, those who care for the ill, and those who keep critical infrastructure operating.[1]
- Based on the principle of respect for persons, individuals may voluntarily forgo resources for the sake of benefiting others.
- As all patients must share a single pool of scarce resources, the principles of justice and equality require that the process of resource allocation apply to patients with and without the resource-limiting illness.[1,3]

Clinicians' aids to the allocation of limited medical resources during an MCE.

- A hospital's ethics committee. During an MCE, a hospital's ethics committee can assist high-acuity services tailor severity-of-illness scores to the realities of the MCE taking into consideration the principles of medical ethics. In addition, the ethics committee might meet with a hospital's leadership to assess the situation, monitor how decisions for the allocation of scarce medical resources are being made, suggest possible alternatives, and support the providers who are compelled to set aside patient-focused standards of care and use society-focused crisis standards of care.[1]
- A crisis triage officer (CTO). As indicated earlier, during an MCE the traditional role of the clinician as advocate for the individual patient may need to be set aside temporarily. Instead, clinicians may need to move on to a paradigm where their duty is to promote equity in distribution of risks and benefits to society. Bedside clinicians are averse to the need to make crucial decisions at the bedside in a time of crisis—the existence of advance directives proves the point. The role of the CTO is to optimize population health outcomes rather than individual health outcomes.[4] CTOs discharge their responsibility from afar, thus mitigating the impact that such momentous decisions can have on the bedside clinician.[1]
- Resource allocation protocols (RAP). Utilizing RAPs is not an option, its a forced choice.[4] Nevertheless, RAPs provide guidance to clinicians on how to allocate resources—supplies or staffing—during times of scarcity.[6] Drawn ahead of an MCE, RAPs offer ethical and equitable processes to allocate scarce medical assets when the demand exceeds supply. Adoption of RAPs may actually decrease morbidity and mortality.[4] RAPs are based both on egalitarian principles and that which a reasonable and prudent clinician would do under similar circumstances.

Some have said, in varied ways, that the silver lining of a crisis is the opportunity to learn from the mistakes that were made and prepare for the inevitable next crisis. Setting aside for a moment the terrible toll that the novel coronavirus pandemic has exacted on humankind, it has also offered an opportunity to change the way medicine is practiced, at least in the United States. To do so, however, we will need to accept that sometimes "*it is OK to wait*" and give population health outcomes equal footing with individual health outcomes.

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