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SPECIAL ARTICLE

A framework for critical care triage during a major surge in critical illness

Un algorithme pour le triage aux soins intensifs lors d'une augmentation majeure des maladies graves

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Abstract *During the COVID-19 pandemic, many jurisdictions experienced surges in demand for critical care that strained or overwhelmed their healthcare system's ability to respond. A major surge necessitates a deviation from usual practices, including difficult decisions about how to allocate critical care resources. We present a framework to guide these decisions in the hope of saving the most lives as ethically as possible, while concurrently respecting, protecting, and fulfilling legal and human rights obligations. It was developed in Ontario in 2020–2021 through an iterative consultation process with diverse participants, but was adopted in other jurisdictions with some modifications. The framework features three levels of triage depending on the degree of the surge, and a system for prioritizing patients based on their short-term mortality risk following the onset of critical illness. It also*

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includes processes aimed at promoting consistency and fairness across a region where many hospitals are expected to apply the same framework. No triage framework should ever be considered "final," and there is a need for further research to examine ethical issues related to critical care triage and to increase the extent and quality of evidence to inform critical care triage.

Résumé *Pendant la pandémie de COVID-19, de nombreuses régions ont connu une augmentation de la demande de soins intensifs qui a mis à rude épreuve ou dépassé la capacité de réponse du système de santé existant. Lors de toute augmentation importante de cette demande, un écart par rapport aux pratiques habituelles est nécessaire, y compris la prise de décisions difficiles sur la façon d'allouer les ressources en soins intensifs. Nous présentons un algorithme pour guider ces décisions dans l'espoir de sauver le plus de vies possibles et ce, de la manière la plus éthique possible, tout en respectant, en protégeant et en remplissant les obligations légales et en matière de droits de l'homme. Cet algorithme a été élaboré en Ontario en 2020-2021 dans le cadre d'un processus de consultation itératif avec divers participants, mais a été adopté dans d'autres juridictions avec quelques modifications. L'algorithme comprend trois niveaux de triage en fonction du degré d'augmentation de la demande, ainsi qu'un système permettant de prioriser les patients en fonction de leur risque de mortalité à court terme après l'apparition d'une maladie grave. Il comporte également des processus visant à promouvoir l'uniformité et l'équité dans une région où de nombreux hôpitaux vont appliquer le même algorithme. Aucun algorithme de triage ne devrait jamais être considéré comme « définitif », et il est nécessaire d'approfondir les recherches pour examiner les questions éthiques liées au triage aux soins intensifs et accroître l'étendue et la qualité des données probantes afin d'éclairer le triage aux soins intensifs.*

Keywords critical care · guideline · pandemics · resource allocation · triage

During the COVID-19 pandemic, many jurisdictions experienced surges in demand for critical care that strained or overwhelmed their healthcare system's ability to respond.[1] In Canada, critical care units are well prepared to manage minor and moderate surges in demand for critical care,[2] but have no previous experience with wide-scale major surges. In a major surge, people who may have otherwise benefited from critical care will not receive it, and may die as a result. A major surge necessitates a deviation from usual practices, including difficult decisions about how to allocate critical care resources. These decisions require careful consideration of core values and an approach that balances those values.

The framework outlined herein is one possible approach for decision-making during a major surge. It was developed by members of the Ontario COVID-19 Bioethics Table (the "Bioethics Table")[A] based on an iterative review of the academic literature and published policy statements on critical care triage in a pandemic; consultation with clinical, legal, and other experts; and feedback from health system stakeholders. An initial draft framework was developed in March 2020 in response to an urgent need for the Ontario healthcare system to prepare for the possibility of a major surge in demand for critical care as was then being observed in Italy, Spain, and New York State. Extensive feedback on the initial draft framework was received in April 2020 through written submissions from diverse organizations and groups. The Bioethics Table solicited additional feedback from bioethics, health law, health equity, and clinical experts. An updated draft framework was developed in May 2020, and the Bioethics Table undertook expanded stakeholder consultation to seek input from Indigenous health leaders, Black and other racialized groups, older adults, and

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[A] Available from https://jcb.utoronto.ca/bioethics-in-action/ontario-covid-19-bioethics-table/ (accessed February 2022).

disability rights experts. The Bioethics Table submitted a revised Framework with a set of recommendations for next steps to Ontario's Ministry of Health and Ontario Health in September 2020.[B]

Subsequently, the Bioethics Table convened further stakeholder roundtables to review and elicit feedback on the Framework and sought input from the Ontario Human Rights Commission from November 2020 to March 2021. This manuscript is based on the most current version of the Framework, which was provided to the Ministry of Health in April 2021. This Framework was never used in Ontario, and although a modified version of our initial framework was adopted for use in other jurisdictions such as Quebec[3] and Israel,[4] to the best of our knowledge, it was never implemented in these jurisdictions. This is neither a consensus document nor a final product. Further engagement with a broad variety of stakeholders through a publicly supported process is a necessary next step. It should be emphasized that implementation of critical care triage should be understood as a *last resort* after all other reasonable options have been exhausted.

Identifying and balancing core ethical and legal principles

There are a number of published frameworks outlining principles to guide the prioritization of critical care resources.[5–7] Recent studies of Canadian perspectives on priority setting of critical care resources in a pandemic indicate a preference for saving the most lives,[6, 8] followed by the application of a fair procedure that prioritizes people with similar likelihood of benefit.[6, 8, 9] Approaches to critical care triage should attempt to minimize death; however, against a backdrop of a health system where there are known biases and discrimination, it is imperative that any approach to allocating critical care resources ensures least impairment of human rights and strives to not perpetuate or exacerbate health and social inequities to the greatest degree possible. Triage frameworks can help to reduce the risk of some forms of discrimination;[10–12] however, they may also unintentionally reproduce systemic discrimination given the disproportionate risk of transmission, hospitalization, intensive care unit admission, and death experienced by Indigenous, racialized, and other structurally disadvantaged groups during a pandemic.[13, 14]

Governments and healthcare agencies in Canada have a legal obligation to treat people without discrimination, comply with existing human rights protections to the greatest extent possible,[15] and ensure that any restrictions of individual rights are strictly necessary and proportional.[16] They also have obligations to proactively address social determinants of health and take upstream measures (e.g., prioritization of personal protective equipment and vaccination) to minimize the risk of vulnerable populations becoming infected in the first place and to mitigate the potential for critical care triage to have a disproportionate impact on already disadvantaged populations.[17]

The overarching objective of this framework is to save the most lives as ethically as possible, while concurrently respecting, protecting, and fulfilling legal and human rights obligations. The framework aims to prioritize critical care resources for those with the highest likelihood of surviving their critical illness, interpreted here as a prognostic estimation of the probability that an individual will be alive twelve months from the onset of critical illness (see Electronic Supplementary Material [ESM], eAppendix A). Patients who have a greater likelihood of dying within twelve months from the onset of critical illness based on an individualized clinical assessment of short-term mortality risk (STMR) would be assigned a lower priority for critical care resources. The ethical application of an STMR assessment must entail a commitment to upholding human rights and other core ethical principles as outlined below. These principles provide a foundation upon which to make decisions about access to critical care in the context of a major surge.

- *Nondiscrimination*—Factors that are protected under prohibited grounds (e.g., gender, race, disability) are not used to determine eligibility for critical care. Any restrictions that may affect people protected under prohibited grounds are strictly limited to those that are reasonably necessary, minimally impairing, and proportional.[18, 19]
- *Equity and fairness*—The risk of perpetuating or exacerbating the effects of individual and systemic discrimination on access to critical care services are minimized and avoided.[20, 21] Promoting equity is a positive obligation that must be enacted in practice. Where no clinically relevant differences exist between patients being considered for access to critical care, triage decisions should treat those patients similarly.
- *Proportionality*—The number of individuals who are negatively affected by the use of triage is limited to the absolute minimum required to accommodate the surge in demand.
- *Beneficence*—Alternative forms of care appropriate to the clinical circumstances provided to ensure that no patient is abandoned from care even if they do not receive critical care.
- *Respect for dignity and autonomy*—Patients are respected for their equal value and inherent dignity.

[B] During the course of consultation, drafts and early versions of this framework were posted online without permission of the authors.

Table Eligibility and prioritization criteria for critical care admission (adapted from Christian *et al.*[22])

Variable	Eligibility criteria for critical care admission
Requirement for invasive ventilatory support	Refractory hypoxemia (SpO_2 < 90% on F_IO_2 0.85) OR
	Respiratory acidosis with pH < 7.2 OR
	Clinical evidence of respiratory failure OR
	Inability to protect or maintain airway
Hypotension	Low systolic BP (e.g., SBP < 90 mm Hg for most adults) OR
	Relative hypotension with clinical evidence of shock (altered level of consciousness, decreased urine output, end-organ hypoperfusion), refractory to volume resuscitation requiring vasopressor/inotrope support that cannot be managed on a medical ward

BP = blood pressure; F_IO_2 = fraction of inspired oxygen; SBP = systolic blood pressure; SpO_2 = oxygen saturation as measured by pulse oximetry

Treatment is individualized and provided in a respectful and culturally safe way and in alignment with patient goals and wishes to the greatest extent possible. Required accommodations are provided to ensure effective communication and informed decision-making.

- *Accountability*—Those making decisions in the context of triage are answerable for their decisions through transparent communication; an appeals process; and collection, analysis, and review of data.

In the context of scarcity, there may be a tension between some of these ethical principles. These tensions may be difficult if not impossible to reconcile fully. A criteria-based triage approach that focuses on an *individualized clinical assessment* of predicted STMR, and not on any other factors (e.g., demographics, quality of life, need for disability-related accommodations, diagnosis, socioeconomic status), offers a defensible way to reconcile some of the tensions between, for instance, the principle of prioritizing those with the greatest likelihood of survival and the principles of equity and fairness in the context of known structural and systemic factors associated with increased risk of illness of socially disadvantaged people in a pandemic.

Triage criteria for critical care in a major surge

Use of explicit criteria for access to critical care fosters consistency, reduces clinician bias, and advances the aims of minimizing deaths, protecting human rights, enhancing fairness, and supporting accountability. It may also alleviate some of the emotional burden experienced by clinicians in a time of high stress.[7] In this framework, a patient must first meet one of the **eligibility criteria**. Second, the **prioritization criteria** are used to determine an eligible patient's priority for access to critical care.

Eligibility criteria outlined in the Table identify those patients who may benefit from admission to critical care.[22] **Prioritization criteria** identify an eligible patient's likelihood of dying within twelve months from the onset of critical illness. Physicians would conduct an individualized clinical assessment of STMR for each patient based on clinical, expert-informed guidance or published evidence to mitigate bias, enhance consistency, and ensure equitable access for all patient populations. Electronic Supplementary Material eAppendix B includes a justification for avoiding measures of acute illness severity (e.g., SOFA), which is a criterion included in other published critical care triage frameworks.[22] Electronic Supplementary Material eAppendix C includes suggested clinical factors and tools for assessing STMR. Consultation with experts may be used to augment STMR assessment.

Critical care triage approach

Triage should be well-coordinated, system-wide, consistent, predictable, and responsive to a major surge in demand within an evolving context.[23] The framework proposes an approach comprising three essential elements: 1) defined levels of triage proportional to demand for critical care; 2) explicit clinical triage criteria based on predicted STMR; and 3) key structures and processes to support the fair, consistent, and accountable application of critical care triage.

Prior to major surge and initiation of critical care triage

The prospect of triage will be known in advance through situational awareness. The possibility of an impending major surge in demand for critical care should prompt discussions with patients or their substitute decision-

makers (SDMs) about the current context and the possible limits on availability of critical care. Patient wishes, values, and goals of care should be explored. When critical care is not consistent with a patient's goals of care, it should not be provided. To maximize patient participation in decision-making, accommodations required by patients should be identified and provided.

Initiating critical care triage

The decision to initiate critical care triage should be made by the appropriate regional authority who has full awareness of resources and demands across the health system. Hospitals would be accountable for reporting the precise number of critically ill and mechanically ventilated patients they can accommodate at any given time. In health systems with multiple critical care facilities, there should be a whole-system collaborative response to address a major surge and minimize adverse impacts on patients. Given that the timing and degree of local major surges may vary across hospitals and regions, as one hospital or region approaches their maximum capacity, every effort should be taken to safely transfer patients to, or resources from, hospitals with greater resource availability. When all hospitals in a region are nearing capacity or when transport resources to transfer patients are no longer available, the regional authority would inform hospitals that a critical care triage scenario is impending. The need for triage should be regularly reviewed based on real-time capacity and occupancy data (e.g., every 12 hrs). There should be public notification about the imminent risk of critical care triage, and regular updates about the status of critical triage once initiated.

In accordance with the principle of proportionality, three levels of triage are proposed. A patient's individualized clinical assessment of STMR would be used to categorize them into one of three groups. The STMR ranges reflect meaningful clinical differences that are broad enough to account for a reasonable degree of uncertainty or imprecision with respect to prognosis. Classification into the highest risk group (those with $> 80\%$ STMR) is based on the criteria proposed by Christian and colleagues;[22] those in the lowest risk group (those with $< 30\%$ STMR) are effectively those with no underlying conditions that would elevate mortality risk. The rationale for choosing three levels over an ordinal ranking system is explained in ESM eAppendix D. As system pressures increase, the threshold of predicted STMR used for prioritization would become proportionately more stringent as outlined below:

- In a level 1 triage scenario, patients with an estimated $<$ 80% STMR are prioritized for access to critical care.
- In a level 2 triage scenario, patients with an estimated $<$ 50% STMR are prioritized for access to critical care.
- In a level 3 triage scenario, patients with an estimated $<$ 30% STMR are prioritized for access to critical care.

Withholding life-sustaining measures from new patients

When critical care triage is initiated, any patient with critical illness who wishes to receive critical care would be assessed, first, to determine whether they meet an **eligibility** criterion, and if eligible, whether they meet **prioritization** criteria for the current level of triage. This assessment should be verified by a second physician to confirm clinical accuracy and to minimize the effects of conscious or unconscious bias in clinical judgment. If both physicians agree that the patient does not meet eligibility and prioritization criteria at the current level of triage, the patient would not be offered critical care. All other medical treatments, such as palliative care, psychosocial support, or other medical care, would be offered to patients not admitted to critical care.

Withdrawal of life-sustaining treatment for patients already admitted to critical care

In accordance with the principle of fairness, triage prioritization should apply to both patients seeking admission to critical care and those already admitted. If a major surge is imminent (but before level 1 triage is initiated), all patients currently receiving critical care resources would be re-assessed, and those with $>$ 80% STMR would be identified. Patients or their SDMs would be informed that level 1 triage may be initiated in order that they may prepare for the possibility of repare withdrawal of life-sustaining treatment (WLST) and alternative treatments options (e.g., palliative care). An interprofessional team will be needed to support the patient and family's psychological social and spiritual needs throughout this process. When level 1 triage is initiated, patients with $>$ 80% STMR would begin to have critical care withdrawn and be transferred to noncritical care beds.

In some jurisdictions (including Ontario), WLST requires consent. Consequently, modifications or suspension (under emergency measures) of this consent requirement may be required in order to implement this aspect of the proposed approach. Not all patients would necessarily have life-sustaining measures withdrawn concurrently. Withdrawal of life-sustaining treatment should be carried out in proportion to demand and operational capacities, starting with patients who are deteriorating or responding poorly to critical care, and

then proceeding to all others with a > 80% STMR. Within each of these two groups of patients (i.e., those with a > 80% STMR who are deteriorating or responding poorly and others with a > 80% STMR), random selection would be used to determine the order of withdrawal. Random selection mitigates conscious or unconscious bias in decision-making and demonstrates clinical humility when uncertainty is high.[24]

Regional authorities would continue to coordinate transportation of patients to optimize the utilization of all critical care resources before initiating level 2 or level 3 triage. If level 2 or level 3 triage is initiated, hospitals would proceed in a similar manner to the steps described for level 1 triage. In level 2 triage, all patients in critical care beds who have been assessed as having a > 50% STMR would be identified and they or their SDMs would be informed and prepared for possible WLST. In level 3 triage, all patients in critical care beds who have been assessed as having a > 30% STMR would be identified and they or their SDMs would be informed that level 3 triage is imminent.

Additional considerations following level 3 triage

At level 3 triage, only patients with the lowest STMR (< 30%) are prioritized for critical care. Nevertheless, if demand for critical care continues to exceed available resources, there may be little clinical evidence to further guide triage decisions on the basis of STMR. At that point, fairness would suggest that patients who are already receiving critical care and appear to be benefiting from it should continue to receive it. In other words, demand for critical care for a new patient does not justify WLST from an admitted patient who has a similar prospect of benefit. Each admitted patient should be assessed daily (and following any significant clinical changes) by the clinical team for any indication that they are no longer responding to treatment or that their predicted STMR has worsened such that they no longer meet prioritization criteria.

Fairness would also suggest that, when an opportunity emerges to admit a new patient into critical care and a triage decision must be made between multiple patients who cannot be distinguished on the basis of STMR, random selection should be implemented.

Clinical dispute resolution and appeals

Disagreement may arise among clinicians regarding the eligibility and prioritization of a patient for critical care. Consensus-based decision-making is ideal. If consensus cannot be reached, the decision should be based on the more optimistic of the two prognostic assessments.

While appeals are a critical requirement of due process, the implementation of a meaningful appeals process is difficult to envision in the context of a major surge. In the event that this practical challenge can be resolved and an appeals process is available, patients or their SDMs who disagree with a triage decision should be informed of the process for making an appeal. Other important elements to be considered in an appeals process are identified in ESM eAppendix E.

Clinician supports

Critical care triage in a major surge will entail a substantial cognitive, psychological, and moral burden on clinicians and underlines the need to prepare clinicians for a major surge, including those in critical care, emergency settings, and other affected clinical areas. Clinical guidance and tools including explicit triage criteria, interprofessional training and simulation of triage processes, opportunities to debrief, and assurance of legal protection were identified by clinician stakeholders as important supports during and after critical care triage.[25]

Mitigating the perpetuation or exacerbation of existing health and social inequities

Any approach to triage that relies on prognosis, including predicted STMR, has the potential to perpetuate or exacerbate existing health and social inequities. The risk of becoming critically ill, and the risk of having an underlying illness that results in a poorer prognosis, is higher among those who are disproportionately negatively affected by social determinants of health and systemic and other forms of discrimination (e.g., racism).[13, 14] People do not start on an even playing field.

There are a number of ways to respond to this challenge. One is to reject any consideration of prognosis when prioritizing critical care and use a purely procedural approach such as first-come, first-served or random selection. These approaches were rejected because they do not align well with the overarching principle of trying to save the most lives as ethically as possible; it was not clear that either approach would address health and social inequities more effectively or fairly than this framework and there was a concern that these approaches could lead to greater overall mortality and exacerbate existing inequities. For instance, a first-come, first-served approach would disadvantage those who delay seeking healthcare (particularly those patient groups who may have historical mistrust of the healthcare system) and those who happen to be at a greater geographical distance from tertiary care hospitals.

A second way is to augment the triage framework outlined here with an additional mechanism that would give greater priority to patients belonging to populations who experience systemic or structural disadvantage. This has been explored in some health systems during the COVID-19 pandemic[26] but there is not yet an accepted mechanism to reliably identify or adjudicate between competing and intersecting forms of disadvantage at the level of an individual in a consistent and defensible manner. This would be an area for future inquiry and engagement in the next phase of pandemic framework development.

A third way is to take proactive measures "upstream" in the community and across the health system to mitigate the effect of existing health and social inequities and importantly, to prevent populations who face systemic or structural disadvantage from being disproportionately exposed to infectious risk and ultimately becoming critically ill with COVID-19. This may include measures such as priority access to testing, vaccination and personal protective equipment, paid sick or quarantine days for precariously employed essential workers,[27, 28] and equity-based data collection and monitoring to aid mid-course correction in the pandemic response.

Conclusion

A major surge in critical illness can lead to scenarios that are tragic and morally distressing for all involved—patients who cannot receive critical care, families who may lose loved ones, and clinicians forced to make heartbreaking decisions in a time-pressured situation. No framework can eliminate this distress, but this framework offers an approach that may help by reducing the number of deaths overall in a fair and equitable manner and supporting decision-making by providing a standardized and evidence-informed approach. The framework attempts to save the most lives as ethically as possible, while concurrently respecting, protecting, and fulfilling legal and human rights obligations to the greatest extent possible. The logistical challenges of implementing this framework are substantial and would require significant administrative, clinical, informatics, and data management supports.

No triage framework should ever be considered "final." This approach builds on previous triage frameworks, incorporating newer data and concepts that were not available at the time of their original development, and places greater emphasis on issues related to equity, nondiscrimination, and human rights. Going forward, there is a need for targeted research funding to examine ethical issues related to critical care triage and to increase the extent and quality of evidence to inform critical care triage, including reducing uncertainty about estimations of mortality risk. Robust public and stakeholder consultation, led by government, is also necessary to establish legitimacy. It is unrealistic to expect that this issue will never arise again, and it is inappropriate to wait until a crisis occurs to develop an approach for critical care triage.

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