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Who Should Receive Life Support During a Public Health Emergency? Using Ethical Principles to Improve Allocation Decisions

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Abstract

A public health emergency such as an influenza pandemic will lead to shortages of mechanical ventilators, critical care beds, and other potentially life saving treatments. This will raise difficult decisions about who will and will not receive these scarce resources. Existing recommendations reflect a narrow utilitarian perspective in which allocation decisions are based primarily on patients' chances of survival to hospital discharge. Certain patient groups, such as the elderly and those with functional impairment, are denied access to potentially life saving treatments based on selective application of additional allocation criteria. We analyze the ethical principles that could guide allocation and propose an allocation strategy that incorporates and balances multiple morally relevant considerations, including saving the most lives, maximizing the number of "life-years" saved, and prioritizing those who have had the least chance to live through life's stages. We also argue that these principles are relevant to all patients and that justice requires that these principles be applied evenly, rather than selectively to the aged, functionally impaired, and those with certain chronic conditions. We discuss strategies to genuinely engage the public in setting the priorities that will guide allocation of scarce life sustaining treatments during a public health emergency.

INTRODUCTION

The threat of pandemic influenza has produced large-scale federal, state, and local efforts to prepare for a public health disaster. Modeling studies suggest that a public health disaster similar in magnitude to the 1918 influenza pandemic would require 400% of current U.S. intensive care unit (ICU) beds and 200% of all mechanical ventilators.(1,2) Even a smaller epidemic could be grave because U.S. ICUs typically run at greater than 90% occupancy and have little surge capacity.(3)

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The U.S. Department of Health and Human Services acknowledges the possibility of ventilator and critical care shortages during a public health emergency, but has been silent on what principles should guide allocation decisions.(4,5) In response, several groups have recently published guidelines for allocating ventilators and other life support during a public health emergency.(6-9) Each recommends categorically excluding large groups of patients from life support, then allocating life sustaining treatments based on patients' chances of survival to hospital discharge. These efforts to achieve a transparent process of allocation are an important first step to minimize the chance of arbitrary or biased decisions during a crisis. However, we believe that these guidelines omit morally relevant considerations that should be incorporated into allocation strategies.

To date, there has not been broad engagement of professionals and the public on what ethical principles should guide these difficult allocation decisions. Such debate is needed because a successful public health response will require public trust and cooperation with restrictive measures, such as the use of police powers, social distancing, and quarantine.(10) Moreover, advance discussion is essential because in-depth deliberations will not be feasible in the midst of a public health crisis.

To foster debate, we place these issues in the context of a clinical scenario during a hypothetical influenza pandemic, analyze the ethical principles that could guide allocation, propose an allocation strategy that balances multiple morally relevant considerations, and provide recommendations for genuine public engagement in priority setting. Although we focus our discussion on the example of scarcity of mechanical ventilators during an influenza pandemic, the ethical considerations are similar for other types of public health emergencies during which there may be a scarcity of resources such as critical care beds, health care personnel, and renal replacement therapy.

DECISION MAKING DURING A PUBLIC HEALTH EMERGENCY

In ordinary clinical practice, patients who require life sustaining treatments receive them, except if they or their surrogates refuse, or in the rare circumstances in which they are deemed medically futile.(11) This reflects the primacy of respect for patients' autonomy in U.S. health care ethics and law, as well as the general availability of life support.(12,13) Physicians do not unilaterally withdraw mechanical ventilation against a patient's wishes in order to provide it to someone else.

Public health ethics differs from clinical ethics by giving priority to promoting the common good over protecting individual autonomy. The physician's primary duty in clinical medicine is to promote the well-being of individual patients (14), but a shortage of ventilators in a public health emergency may require physicians to withhold or withdraw mechanical ventilation against their own clinical intuitions and against the wishes of some patients who otherwise might survive. Public health policies, which focus primarily on population-level health outcomes, may subordinate the interests and rights of individuals to the common good.(15, 16) The clinical scenario presented in Table 2 highlights the dilemmas that may arise during a public health emergency if not all who need a mechanical ventilator to survive will be able to receive this treatment.

Although numerous allocation strategies are used for allocating scarce medical resources (Table 1), the notion that public health measures could shape life or death choices for *all* critically ill patients is foreign to most clinicians and patients. During a public health emergency, allocation decisions will be the responsibility of state public health departments, with federal guidance and support. In most states, the governor has the authority to declare a public health emergency, which then triggers public health police powers, including rationing of vaccines and medicines.(10,17). Individual healthcare systems, hospitals, and clinicians

cannot set public health policy, but will need to implement allocation decisions under the authority of public health departments. Several other groups have suggested strategies to promote collaboration between public health officials and front line clinicians, including training individual clinicians to function as triage officers under the supervision of public health officials.(7-9)

CRITIQUE OF EXISTING GUIDELINES

Historically, allocation decisions in public health have been driven by the utilitarian goal of accomplishing the "greatest good for the greatest number (15). Although this broad principle can be interpreted in numerous ways, several recent guidelines for allocating life support during a public health emergency have specified it narrowly as "maximize the number of people who survive to hospital discharge".(7-9) We believe that this allocation strategy does not adequately incorporate other morally relevant considerations.

In addition, these published guidelines deny access to life support to certain patient groups, who could potentially benefit from treatment. For example, one group advocates denying access to ventilatory support to persons who are functionally dependent from a neurologic impairment.(6) Another group recommends excluding those older than 85 years and those with New York Heart Association Class III or IV heart failure.(7,9) These exclusions are not explicitly justified. Moreover, they are ethically flawed because the criteria for exclusion (age, long-term prognosis, and functional status) are selectively applied to some types of patients, rather than to all patients who require life-sustaining interventions. Such selective application violates the principle of justice because patients who are similar in ethically relevant ways are treated differently. Categorical exclusion may also have the unintended negative effect of implying that some groups are "not worth saving", leading to perceptions of unfairness. In a public health emergency, public trust will be essential to ensure compliance with restrictive measures. Thus an allocation system should make clear that all individuals are "worth saving". One way to do this is to keep as *eligible* all patients who would receive mechanical ventilation during routine clinical circumstances, but allow the availability of ventilators to determine how many eligible patients receive it.

WHAT PRINCIPLES SHOULD GUIDE ALLOCATION?

The utilitarian rule of maximizing the number of lives saved is widely accepted during a public health emergency.(18) The Ontario and New York working groups both propose modifying a relatively simple mortality prediction model- the Sequential Organ Failure Assessment score (19)-to determine an individual's priority. There is no compelling evidence that one mortality prediction model will be more accurate than another, but the Sequential Organ Failure Assessment score is the easiest to implement and requires the fewest laboratory tests. Although existing models are imperfect, they are as accurate as physicians' prognostic estimates(20) and have the added appeal of being objective and transparent. Prioritizing individuals according to their chances for short term survival also avoids ethically irrelevant considerations-such as race or socioeconomic status. Finally, it is appealing because it balances utilitarian claims for efficiency with egalitarian claims that because all lives have equal value, the goal should be to save the most lives.(18)

However, using the probability of short term survival as the *sole* allocation principle is problematic. It is hazardous to extrapolate mortality prediction models beyond the conditions for which they have been validated. (20,21) Perhaps because of this concern, existing guidelines recommend using the Sequential Organ Failure Assessment score only to stratify people into 4 prognostic groups, rather than to make finer distinctions among patients. Based on current experience with avian influenza, it is probable that many patients with respiratory failure will

also develop multi-organ failure.(22) Thus, there likely will be large clusters of patients who are indistinguishable based on their prognoses for short term survival.

Ethically, using only chances of survival to hospital discharge is insufficient because it rests on a thin conception of "accomplishing the greatest good". Below, we discuss additional principles that have been used in other situations to allocate scarce medical resources. We argue that two of these principles should be combined with the principle of "saving the most lives" to create a multi-principle strategy to allocate scarce life saving resources during a public health emergency.

Broad Social Value

Broad social value refers to one's overall worth to society. It involves summary judgments about whether an individual's past and future contributions to society's goals merit prioritization for scarce resources.(18) When dialysis was first introduced, social value was a key consideration in allocating scarce dialysis machines. Patients who were professionals, heads of families, and caregivers received priority over "creative non-conformists who rub the bourgeoisie the wrong way".(23) The public firestorm in response to revelations that social worth was a key factor in the Seattle Dialysis Committee's deliberations partly led Congress to authorize universal coverage for hemodialysis.(24)

In our morally pluralistic society, it has not been possible to agree upon a set of criteria to assert that one individual is intrinsically more worthy of saving than another. Even if such consensus could be reached, some philosophers argue that it should not be a guiding principle for allocation decisions. These individuals defend the egalitarian view that all individuals have an equal moral claim to treatment regardless of whether they can contribute measurably to broad social goals. (25) Childress writes that one's "dignity as a person…cannot be reduced to his past or future contribution to society."(26) Given the lack of an accepted specification of broad social value and the sharp disagreement about whether it is a relevant consideration, we do not recommend using this principle to guide allocation of life support during a public health emergency.

Instrumental Value: The "Multiplier Effect"

Instrumental value refers to an individual's ability to carry out a specific function that is essential to prevent social disintegration or a great number of deaths during a time of crisis. It has also been described as "narrow social utility" and the "multiplier effect".(18,27) The National Vaccine Advisory Committee recommends this principle to allocate vaccines and anti-viral medications during a pandemic.(28) It gives first priority to workers in vaccine manufacturing and health care provider. The ethical justification is that prioritizing certain key individuals will achieve a "multiplier effect" through which many more lives are ultimately saved by their work.

Instrumental value must be distinguished from judgments about broad social worth. Individuals are prioritized not because they are judged to hold more "intrinsic worth", but because of their ability to perform a specific task that is essential to society. In this sense, instrumental value is a derivative allocation principle; it is desirable because it ensures an adequate workforce to achieve public health goals. Even critics of allocation based on broad social value accept the use of instrumental value in certain circumstances.(25)

However, using instrumental value may be ethically problematic for some public health emergencies, such as an influenza pandemic, which likely will be short in duration and leave individuals with illnesses that require a long recovery period. In general, to justify a restrictive public health measure, there must be good evidence that the measure is *necessary* and will be

effective.(17) It seems unlikely that individuals with respiratory failure from influenza would recover in time to re-enter the work force and fulfill their instrumental roles. Moreover, it is not clear which roles are truly indispensable to saving a large number of lives during a pandemic. Because of the uncertainty about which key personnel will be in short supply and whether they will recover in time to achieve their instrumental value, we do not recommend that this principle be incorporated at this stage of planning. However, this principle should be openly debated with the public and "held in reserve" if convincing evidence emerges that its use would minimize mortality in a particular public health emergency.

Several other allocation principles can be rejected without extensive discussion. "First-come, first-served" and "sickest first" are inconsistent with the public health goal of achieving the greatest good for the greatest number. Maximizing quality-adjusted life years (QALYs) or disability-adjusted life years (DALYs) would not be feasible to implement during a public health crisis.(29,30) We next turn to two principles that can and, we contend, should be combined with the principle of "saving the most lives" to allocate life saving resources during a public health emergency.

Maximizing Life-Years

A broader conceptualization of accomplishing the "greatest good" is to consider the *years of life* saved in addition to the *number of lives* saved. Assuming equal chances of short term survival, giving priority to a 60-year old woman who is otherwise healthy over a 60 year-old woman with a limited life expectancy from severe comorbidities will result in more "life years" gained. The justification for incorporating this utilitarian claim is simply that, all other things being equal, it is better to save more years of life than fewer.

The principle of maximizing life years was recently incorporated into the strategy to allocate lungs for transplantation. Rather than simply aiming to save the most lives, the lung allocation system now balances patients' medical need (prognosis without transplantation) against their expected duration of survival after transplantation.(31) We contend that explicitly adding considerations of "maximizing life-years saved" to "saving the most lives" yields a more complete specification of accomplishing the greatest good for the greatest number. Although current guidelines use this principle to exclude certain subgroups of patients from access to treatment, we think that this principle is relevant to all patients, not just those with extremely limited life expectancies. Moreover, applying it to all patients rather than an unfortunate few promotes consistency and fairness.

The Life Cycle Principle

Under the life cycle principle, the goal is to give each individual equal opportunity to live through the various phases of life.(32) This principle has been call the "fair innings" argument and "intergenerational equity".(33) In practical terms, the life cycle principle gives relative priority to younger individuals over older individuals. There is a precedent for incorporating life cycle considerations into pandemic planning. The DHHS's plan to allocate vaccines and anti-virals during an influenza pandemic prioritizes infants and children over adults.(28)The ethical justification of the life cycle principle is that it is a valuable goal to give individuals equal opportunity to pass through the stages of life-childhood, young adulthood, middle age, and old age.(32) The justification for this principle does not rely on considerations of one's intrinsic worth or social utility. Rather, younger individuals receive priority because they have had the least opportunity to live through life's stages.

Empirical data suggest that, when individuals are asked to consider situations of absolute scarcity of life sustaining resources, most believe younger patients should be prioritized over older.(34) Harris summarizes the moral argument in favor of life cycle-based allocation as

follows, “it is always a misfortune to die…it is both a misfortune and a tragedy [for life] to be cut off prematurely”.(35)

Some critics contend that the life cycle principle unjustly discriminates against older individuals. However, this principle is inherently egalitarian because it seeks to give *all individuals* equal opportunity to live a normal life span. It applies the notion of equality to individuals' *whole lifetime experiences* rather than just to their current situation.(33) Unlike prioritization based on gender or race, everyone faces the prospect of aging and everyone hopes to move through all stages of life.(32)

Can multiple principles be incorporated into an allocation strategy?

Prior success in developing multi-principle allocation systems for organ transplantation suggests that this is a feasible endeavor.(31) However, during a public health crisis, there will be little time for complex algorithms. Undoubtedly, there will be a tension between creating an allocation strategy that reflects the moral complexity of the issue and one that can be feasibly implemented. We propose an alternative to the single principle strategy proposed by previous working groups that strives to incorporate and balance saving the most lives, saving the most life-years, and giving individuals equal opportunity to live through life's stages.

Table 3 describes one example of a very basic approach to specifying and incorporating these three principles into an allocation strategy. It is meant to be illustrative rather than definitive. Each principle is assessed on a 4-point scale. Individual patients are evaluated based on their likelihood of short-term survival, presence of comorbidities that would limit the duration of benefit, and their “phase of life”. Patients with the lowest cumulative score would receive the highest priority for scarce, life sustaining technologies. We make no claim that this specific unweighted point system is the optimal way to balance and translate these three allocation principles into practice. Another approach is to treat each principle as a continuous variable and weight them according to judgments about their relative importance. There are complex value judgments that underlie decisions to weight principles differently or arrange them hierarchically. Although these value judgments ultimately must be made, the first step- which is the goal of this article- is to establish that there are *several* relevant allocation principles. Thereafter, we should engage key stakeholders to determine how to fairly balance these principles.

To illustrate how the proposed multi-principle system leads to different allocation decisions compared to the “save the most lives” approach, consider the vignette presented in Table 2. Using the “save the most lives” strategy proposed by New York State, Ontario, and the Critical Care Initiative, the 83 year-old man with a 50% chance of hospital survival, but multiple life-limiting co-morbidities (which are not on the proposed lists of categorically excluded diseases) would receive highest priority. Even though the previously healthy 44 year-old man has a much better long-term prognosis and has had the least opportunity to live through life's stages, he is ranked less favorably because of his slightly worse prognosis for survival to hospital discharge. The patient with primary pulmonary hypertension and an accidental overdose would be categorically denied ventilation because her disease is on the list of exclusion criteria which are not clearly justified.(9) The latter patient's case highlights the mistaken assertion that patients with severe comorbidities should be categorically denied life support on the grounds that they will always have poor ICU outcomes.

In contrast, the multi-principle allocation strategy we propose would result in priority going to the 32 year old patient with pulmonary hypertension with a 90% chance of short term survival. She is prioritized above the other 2 patients because of the combination of her excellent chances for short term survival and her young age (total allocation score: 5). The previously healthy 44 year old patient with no comorbidities and a 30% chance of short term survival (total allocation

score 6) is prioritized over the 83 year old with severe comorbidities and 50% chance of short-term survival (total allocation score 11) even though he has a worse prognosis for short term survival. Although not relevant in these sample cases, patients with identical allocation scores should be viewed as having equal moral claims to receive life support. In such a circumstance, a lottery is a reasonable approach to determine which patient will receive priority.

Some may criticize the proposed multi-principle system as overpenalizing older individuals, who are more likely to have more co-morbidities and to have lived through life's stages. However, the multi-principle system we propose draws an important distinction between healthy older adults and older adults with life limiting co-morbidities. This approach avoids using age as a "blunt" predictor of years of life remaining. Rather than over-penalizing older adults for the correlation between age and co-morbidities, our system avoids "penalizing" healthy older adults. Others may criticize such a system for relying on probabilities of outcomes which may not accurately predict what will happen to any one individual. We acknowledge that any probabilistic scoring system cannot perfectly predict outcomes for individual patients. This concern has limited the use of probabilistic scoring systems to make treatment decisions during routine clinical practice.(11) However, the rationale for their use is stronger during a public health emergency, when the goal is to maximize population-level outcomes. Such an objective approach may also be viewed by the public as fairer than decisions based on more subjective criteria.

Although more complex than the previously proposed single principle allocation system, we believe that this multi-principle allocation system better reflects the diverse moral considerations relevant to these difficult decisions. In addition, this approach avoids the need to categorically deny treatment to certain groups, a problem that one legal scholar calls a "political and legal minefield".(36)

THE NEED FOR MEANINGFUL PUBLIC ENGAGEMENT

In our pluralistic society, it is likely that people will disagree over which principles should guide allocation of ventilators during a pandemic. Therefore, careful attention to procedural justice becomes very important. Daniels identified several aspects of procedural justice that should be followed when allocating scarce healthcare resources: public engagement, transparency in decision making, appeals to rationales and principles that all can accept as relevant, oversight by a legitimate institution, and procedures for appealing and revising individual decisions in light of challenges to them.(37,38)

Public involvement is essential because deciding what principles will guide allocation of life saving resources during a pandemic is a *value* judgment rather than an expert scientific judgment. Citizens' values are crucial in this process because the public will bear the consequences of triage decisions.(15) Public input has been useful for developing allocation policies for influenza vaccines and organs for transplantation.(39) The public input for lung transplantation revealed fundamental differences in the attitudes of policymakers and the public, which shaped the allocation system.(31)

Striving for a fair process of decision making may also enhance public trust.(10,40) If citizens perceive the process of setting priorities as unfair, they may challenge the legitimacy of the public health response and refuse to comply with restrictive measures. Public engagement may be especially important during a public health emergency because another important aspect of procedural justice- an individual's right to a due process appeals mechanism- will be severely limited because of the urgency of individual decisions.(37)

To date, genuine public involvement in the debate over allocation of limited resources in a public health emergency has not occurred. The proposals from the Critical Care Initiative and

the Ontario working group were developed without broad public input.(7) In New York State, only after clinicians and policymakers determined their recommendations did they post the 52-page document on a website for public comment.(8) Because most individuals have not considered the possibility of ventilator scarcity during a pandemic, and may not understand the range of potential allocation strategies, simple elicitation of comments is insufficient to allow informed public participation. Moreover, involving the public *after* the bulk of work on the policy has been completed reduces the likely impact of public comments. These represent serious deficiencies in both *how* and *when* public engagement occurs.

We propose three modifications to the process of public engagement that are both feasible and methodologically rigorous. First, public engagement should occur before writing a draft policy as well as after a draft is proposed. Second, the public needs adequate background information in order to be informed. Policymakers and ethicists should first delineate the range of feasible, ethically defensible allocation strategies, then collaborate with communication experts and social scientists to explain them to the public, including those of limited English proficiency and health literacy. Third, policymakers should strive to engage a representative sample of citizens, rather than those with the knowledge and resources to seek out the draft guidelines on the internet. This can be accomplished with research techniques from clinical and market research, such as in-depth qualitative interviews and focus groups. Focusing on community members rather than political or religious leaders may minimize the likelihood that the public engagement process will be dominated or co-opted by special interest groups. Other countries, such as the United Kingdom and Canada have established procedures for public consultation on controversial health policies.(41)

CONCLUSION

Unresolved ethical and practical dilemmas about allocating ventilators and critical care resources could threaten the success of the response to a public health emergency. We contend that the previously proposed “save the most lives” allocation strategy is insufficient because it fails to incorporate morally relevant considerations such as the expected years of life saved and the importance of giving individuals equal opportunity to pass through life's stages. We propose an alternative, multi-principle allocation strategy that better reflects the moral complexity of the issue and that applies the same allocation criteria to all patients (Table 4). We hope that our proposal will stimulate a broad debate about how to ethically allocate scarce life-sustaining resources during a public health emergency.

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Table 1

Examples of existing allocation strategies

Situation	Allocation Strategy
Distribution of ICU beds during routine clinical circumstances	First-come, first-served.
Treating the wounded on battlefields	Regardless of rank, first treat the soldiers with life threatening injuries who are most likely to survive (42)
Distributing limited supplies of intravenous fluid during cholera epidemics in refugee camps	Give fluids to those with moderate dehydration who will likely recover with small amounts of fluid (rather than to those with the most advanced dehydration, who may or may not survive) (43)
Allocation of lungs for transplantation	Balance the patient's medical need, defined by how likely are they to die within a year without transplantation, with their likelihood of benefit, defined as how likely are they to be alive 1 year after transplantation.(31)*
Allocation of livers for transplantation	Prioritize those most likely to die without transplantation (using Model for End-Stage Liver Disease (MELD) score).*

* Some patients are deemed ineligible to be listed for transplantation based on medical factors (such as severe co-morbidities) and social factors (such as ongoing substance abuse or an inadequate social support structure).

Table 2

When the demand for ventilators overwhelms the supply

An influenza pandemic has caused severe shortages of ventilators and other life saving resources in the United States. All critical care beds in the hospital in question are occupied by mechanically ventilated patients, many of whom have respiratory failure from influenza. Patients are receiving mechanical ventilation in step-down units, and all non-emergency surgical cases have been cancelled. Despite these measures, all but one of the hospital's ventilators are being used by patients who would die without it. All hospitals in the region are experiencing the same shortages.
Which of the following three patients should be prioritized for the one available ventilator?:

- A 32 year old woman with primary pulmonary hypertension (PA pressures 55 mmHg) intubated after an accidental overdose of narcotics and benzodiazepines. Her predicted hospital survival by the Sequential Organ Failure Assessment score is approximately 90% (SOFA score: 4).
- A housebound 83 year old man with severe peripheral vascular disease and severe, inoperable coronary artery disease that substantially limits his long term prognosis. His SOFA score is 10, predicting a roughly 50% chance of survival to hospital discharge.
- A previously healthy 44 year-old man with sepsis and multi-organ failure. His SOFA score is 12, predicting a roughly 30% chance of survival to discharge.

Table 3

Illustration of a Multi-Principle Strategy to Allocate Ventilators during a Public Health Emergency

Principle	Specification	Point System* 1	2	3	4
Save the most lives	Prognosis for short term survival (SOFA** score)	SOFA score <6	SOFA score 6-9	SOFA score 10-12	SOFA score >12
Save the most years of life	Prognosis for long term survival (Medical assessment of comorbidities)	No comorbidities which limit long term survival	Minor comorbidities with small impact on long term survival	Major comorbidities with substantial impact on long term survival	Severe comorbidities; likely death within 1 year
Life cycle principle**	Prioritize those who have had the least chance to live through life's stages. (Age in years)	age 12-40	ages 41-60	ages 61-74	age >75

* Those with the lowest cumulative score would receive the highest priority to receive mechanical ventilation and critical care services.

** SOFA= Sequential Organ Failure Assessment

*** Pediatric populations may need to be considered separately, since their small size may require the use of different mechanical ventilators and personnel.

Table 4

Summary of Recommendations

Principles to Guide Allocation of Scare Resources in a Public Health Emergency
1. Principles guiding allocation decisions should include maximizing survival to hospital discharge, maximizing the number of life-years saved, and maximizing individuals' chances to live through each of life's stages.
2. If it appears likely that there will be a severe shortage of providers of a key service and it is likely that personnel will recover in time to be useful, it is ethically permissible to incorporate considerations of instrumental value into prioritization considerations.
Creating a Fair Process of Decision Making
3. The public should be engaged early in the process of choosing among ethically permissible allocation strategies, both to identify the most acceptable approach and also to achieve to the greatest possible extent a fair process of decision making.