Winning the Ventilator Lottery:
A comparison of five scarce resource allocation protocols in the midst of the COVID-19 pandemic.

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Introduction

During the COVID-19 pandemic hospitals have been faced with an overwhelming, unprecedented influx of critically ill patients. When the need for life saving resources surpasses the supply available, scarce resource allocation (SRA) protocols come into effect. SRA protocols provide an objective, ethical framework to help standardize and guide difficult decisions. We have conducted a comparison study using mock COVID-19 patients in a resource-limited scenario using various protocols from across the country.

Our goal was to simulate the variable results of different resource allocation protocols in times of crisis.

Methods

SRA protocols from Maryland (CHEST), University of Pittsburgh Medical Center (UPMC), Baptist Health System (FL), New York, and Utah, were reviewed and used to run the simulation. These protocols were chosen as representation of various part of the country. Fifteen mock COVID-19 patient profiles (table 1) were created based on real patient demographics and ran through the protocols above in a resource-limited scenario with only 10 ventilators available. The characteristics of the patients who were reallocated scarce resources was analyzed and compared across the different protocols.

Results

The simulation found that 10 (66%) of the patients were allocated definitive ventilators and 5 were denied ventilation under the CHEST and UPMC protocols, and none were put in a lottery system. However, under Baptist Health, New York, and Utah protocols designated 8 (53%) of the patient's definitive priority for resource allocation and left the other 47% to a lottery system for ventilator allocation based on pure chance.

Table 1: Mock Patient Charts

Patient #	Age	Sex	PMHx
1	79	M	CKD stage 3, CAD s/p CABG, AF on NOAC, hypothyroidism, HTN, Crohn's disease on immunosuppressants
2	35	M	Cerebral Palsy
3	35	M	None
4	29	M	Metastatic small cell carcinoma
5	53	M	Rheumatic heart disease
6	24	M	ALL
7	47	F	Chronic renal disease, DMII, HTN, asplenia
8	68	M	DMII, HTN, HLD
9	60	F	End stage lung disease, COPD, CAD, HTN, MI, HLD, hypothyroidism, DMII, PAD, tobacco usage, obesity
10	72	F	IPF
11	85	F	HTN, HLD, idiopathic cardiomyopathy with ejection fraction 25%
12	32	F	None; pregnant
13	79	F	Advanced dementia, DMII
14	55	F	Metastatic breast disease
15	93	F	Mild cognitive impairment, HTN, HLD

Table 1: Mock patient charts. 15 mock patient profiles were created. Age range 24-93, mean: 56.4 Male and female sex, various past medical histories.

Table 2: Ventilator Allocation Outcomes

Patient #	Initial SOFA Score	CHEST	UPMC	Baptist	New York	Utah
2	1					
4	4					
3	6					
6	8					
7	8					
9	8					
13	8					
14	8					
15	9					
10	9					
5	9					
12	11					
8	15					
11	15					
1	20					

Table 2: Patient Allocation Outcomes for the 15 mock patients from Table 1. Patient's ranked by initial SOFA score, calculated based on mock data. SOFA scores range: 1-20, mean: 9.26.
Green: Allocated Ventilator
Red: Ventilator Reallocated
Orange: Lottery or exclusion

Discussion

The results shows that basing ventilator allocation on SOFA score is ambiguous because patients with widely differing SOFA scores are all placed in the same lottery system, without any further triaging. Furthermore, protocol analysis shows inconsistencies regarding pregnancy, healthcare workers, long term survival assessment, pre-hospital functional status and ambiguous exclusion criteria.

Our study showed that protocols who focused on a score and with an ambiguous lottery system left an unnecessary burden on both physician and patient. This comparison serves to highlight the significant variation in protocols and their outcomes, and the need for a gold standard SRA.

This study was limited by having a few protocols, small sample size, and an arbitrary ventilator count. Three of the protocols reviewed placed several patients into a lottery system without further triage and grouped patients with different health status together. Future implications would be to create SRA protocols that address the lottery system and inconsistencies found in our comparison and the ethical issues addressed in other recently published works (Pathak AP, et al., April 2020). Even in times of crisis, medicine should be more than a lottery and humanistic medicine more than just a number.

References

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