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Moral Judgments in COVID-19 Triage Dilemmas: Does the Type of Life-Saving Resource Matter?

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Abstract

The present study explores moral judgments in COVID-19 dilemmas involving allocation of two types of resources – ventilators or beds. Utilitarian principles are opposed to random allocation and first-come, first-served. In triage dilemmas there are two patients in a critical state either needing a ventilator or a bed but only one is available. The results show different patterns of moral judgments depending on the type of the resource. If ventilators are allocated, the utilitarian principles are supported. But if the limited resource is a bed, first-come, first-served is preferred thus casting doubt on the egalitarian nature of this principle. Participants also rated their agreement with several triage principles. Four clusters of participants are identified. The first has a uniform distribution of preferences over all principles; the second favors all utilitarian principles; the third - only one utilitarian principle (higher chances of recovery); and the fourth - the first-come, first-served principle.

Keywords: moral dilemmas, triage, utilitarianism, moral judgments

Moral Judgement and Triage

Moral judgments are of interest to philosophy and psychology for years. Usually, participants are presented with the hypothetical situations that pose a moral dilemma (Foot, 1967; Cushman et al., 2006). The use of such hypothetical situations has sometimes been criticized for lacking realism and ecological validity (Bauman, 2014).

However, situations in which a choice must be made between two human lives are relatively frequent in some domains of real life, e.g., intensive care units (ICU) or organ transplantation, and recently in relation to the COVID-19 pandemic. Decisions in such cases when medical resources can be limited are complex and involve consideration of moral values and medical assessment of chances of recovery or saving more lives. Some call such decisions a "tragic compromise" as they involve sacred values like the human life (Fiske & Tetlock, 1997; Tetlock et al., 2000).

The triage rules have been considered long before the COVID-19 pandemic, but it led to their critical review and reassessment and attempts for their alignment (Christian et al., 2006; Biddison et al., 2019). The medical standards focus on utilitarian triage rules aimed at maximizing the number of lives saved (short-term survival prognosis), the life-years saved (long-term survival prognosis), the broad social value (general worth to the society), the narrow social value (special skills, qualification, and function essential to prevent a great number of deaths), providing opportunity to experience the whole life cycle, etc. (White et al., 2009). Other principles like 'first-come, first-served' or random allocation are considered egalitarian as they provide equal chance for everybody disregarding any personal characteristics like age, social status, short- and long-term prognosis, etc. (Wilkinson et al., 2020). However, these egalitarian allocation principles are controversial. In White et al. (2009) they are not recommended because they are not utilitarian and ignore the ethical principal of the greatest good for the greatest number. The withdrawal vs. withholding of a resource is also a controversial (Sulmasy & Sugarman, 1994). One line of reasoning says that if it is morally permissible to withhold a resource then it is morally permissible to withdraw it if it has been allocated. Others claim that withdrawing and withholding a therapy are not equivalent because the decision to allocate the resource has already been made and therefore there is a moral commitment.

The COVID-19 pandemic unfortunately required urgent answers to questions about the use of life-saving resources (medical staff, ventilation devices, beds in ICU, etc.) and thus has led to intensive research on real moral dilemmas related to the problem of fair distribution of life-saving medical resources. The choice between two or more patients to allocate a single ventilator is an example of the so-called 'triage' and in most cases was a choice between life and death. The answers given by scientists or medical institutions (Joebges & Biller-Adorno, 2020; Vergano et al., 2020) although varying in some respects share the principle of maximal efficacy in the resource distribution trying to save the maximal number of lives based on a short-term life expectancy. On the other hand, the 'first come, first served' rule didn't receive any support, but random choice was accepted as an additional way of selecting a patient when no choice could be made using the utilitarian principles.

All these discussions about the moral aspects of triage procedures have led to studies motivated by the beginning of the COVID-19 pandemic and carried out in the first months of the pandemic. Huang et al. (2021), for instance, considered dilemmas in which they studied the utilitarian principle of choosing the younger patient and the 'first come, first served' principle. They demonstrated that using the 'veil-of-ignorance' (people making a choice for a situation in which they do not know in which position they will be) reasoning shifts the choices towards using the utilitarian principle. Another interesting study is the one of Wilkinson et al. (2020). They studied the preferences for utilitarian principles and for random allocation. Their findings show that in general participants favor utilitarian principles, and only when the two patients are very similar, random allocation is favored.

In M. Goldwater, F. K. Anggoro, B. K. Hayes, & D. C. Ong (Eds.), *Proceedings of the 45th Annual Conference of the Cognitive Science Society.*

Goals and Hypothesis

The goal of the present study is to continue the line of research started in Hristova & Grinberg (2021) that explores moral judgment in COVID-19 related moral dilemma situations – dilemmas involving scarce resources and a conflict between several possible allocation principles. We are interested in studying moral judgments in dilemmas opposing utilitarian principles to the egalitarian principles of random allocation and 'first come, first served' principles.

Our previous study (Hristova & Grinberg, 2021) has demonstrated that people most strongly support utilitarian principles and utilitarian rules for allocating limited medical resources in hypothetical moral dilemmas arising as a result of COVID-19. This support was found while eliciting moral judgments in triage dilemmas using different types of questions: forced choice between different allocation options or agreement ratings for these options. It is also found that there is significant support for using the order of patients' admittance as a rule for allocating limited resources ('first come, first served principle'). In addition, there was low agreement with the use of random allocation.

In the present study, trying to understand in more detail these results, we manipulate the life-saving resource including the ventilators from the previous study and beds in ICU. One reason were the results for the egalitarian principles 'first come, first served' and random allocation. As discussed, they are considered egalitarian (see Winsor et al., 2014) but potentially leading to discrimination (WHO, 2020). Another important aspect of the 'first come, first served' principle is its frequent occurrence in normal everyday situation and is perceived as the natural one and it is chosen in by many people in dilemma situations (Huang et al., 2021; Hristova & Grinberg, 2021). In our previous studies, this principle was also strongly preferred to random allocation, and it was discussed that these two principles may be related to different underlying moral reasoning and are not considered by participants as instances the same type of egalitarian principle.

The utilitarian principles under investigation are: save the most human lives (limited resources are given to patients with a greater chance of recovery); save more years of life (limited resources are given to patients who are expected to live longer after recovery); save more quality-adjusted life years (limited resources are allocated to patients who are expected to have a better quality of life). Saving the most human lives is shared by most medical standards with the least controversy (British Medical Association, 2020; Emanuel et al., 2020; Massachusetts Department of Public Health, 2020; White et al., 2009). We expect this rule to receive most support by participants. The other two rules – maximization of life years and quality of life are often criticized as unethical and discriminatory (e.g., towards elderly or disabled people (Peterson et al., 2020). Thus, it was expected that these two rules will be less preferred compared to the first utilitarian rule.

As in the previous studies the influence of reallocation of resources on allocation rule preference was also investigated.

Method

Stimuli and Design

In the first part of the study, moral dilemmas are used to study moral judgment in situations where there is a shortage of life-saving medical resources. The possible choices in them contrast various utilitarian and egalitarian rules. In the present study, the type of limited medical resource to be allocated is varied – a *ventilator* (an equipment for artificial pulmonary ventilation) or a *bed* in an intensive care unit (ICU).

The study used four dilemmas, each presented in two versions – the difference being whether the limited medical resource was a ventilator or an ICU bed. Each participant rates possible allocation strategies in four dilemmas with the same limited resource (*ventilator* or *bed*). An example dilemma is presented here:

Dilemma 1: Two critically ill COVID-19 patients are admitted to a hospital in a small town. For each of them, the only chance of survival is to be [put on a ventilator]/[admitted to the ICU]. There is only one [ventilator]/[bed] available and the doctors must decide which patient will get it.

Patient A. A 49-year-old man with low chances of recovery even if [put on a ventilator]/[admitted to the ICU]. He was admitted to the hospital 20 minutes earlier than the other patient.

Patient B. A 49-year-old man with high chances of recovery if [put on a ventilator]/[admitted to the ICU].

Please rate your agreement with each of the possible decisions:

- The [ventilator]/[bed] should be given to Patient A because he was admitted to the hospital earlier.
- The [ventilator]/[bed] should be given to Patient B because he has higher chances of recovery.
- It should be chosen by a coin toss which of the patients gets the [ventilator]/[bed] because each of them has the right to treatment.

In each of the situations used, there are two patients, but only one of them can get the resource. Both patients are in serious condition due to COVID-19. The dilemma (conflict) is due to one patient being admitted earlier, while the other patient was admitted later but is in a more favorable position according to one of the utilitarian criteria.

In each of the first three dilemmas one of the utilitarian criteria (chances of recovery, life expectancy, and quality of life) is explored. The egalitarian strategies investigated are to allocate limited resources according to the order of admission of patients ('first-come, first-served') or by random selection.

The fourth dilemma describes a situation in which the redistribution of resources already provided to one of the patients is an option, and thus the aim is to investigate what the moral judgment will be as compared to straightforward allocation of resources. Due to the severe situation related to the COVID-19 pandemic at the time of data collection, the wording of the reallocation situation is in a milder form (see Dilemma 4 for details).

After reading each dilemma scenario, the participants had to rate each of the possible allocation choices – the patient who was admitted first; the one with better characteristics according to the relevant utilitarian criterion, or a randomly chosen patient. Each possible choice is presented alongside with its justification. In the fourth dilemmas there is an additional option – the resource to be allocated or not to the patient whose preparations for receiving the resource have already started (milder version of the situation where the resource is already in use).

Ratings were given on a 7-point scale anchored with two labels – '1 = completely disagree' and '7 = completely agree'.

In the second part of the study, several possible allocation principles are presented one by one, and the participants are asked to rate their agreement with each of them using the same 7-point scale. The principles rated are the following – *random allocation*, *first come, first served*, *greater chances of recovery*, *longer life expectancy*, and *better quality of life*.

We also included several questions to check if participants are paying attention to the questions and the scenarios presented.

Participants and Procedure

The study was conducted online. Data collection took place in Bulgaria in the period end of April – beginning of May 2021 (during the second big wave of COVID-19 related cases in Bulgaria).

117 participants took part in the experiment of which 26 were removed (22.2%) due to failure to correctly answer the control questions. Among the remaining 91 participants, 76 are female (15 male), 46 students (45 non-students). Their age was between 18 and 77 (M = 32.3). Forty-four of the participants are presented with dilemmas in which the limited resource is a ventilator, 41 participants – with dilemmas in which the limited resource is a bed in the ICU.

Results

Dilemma 1 – Greater chances of recovery

In the first dilemma, participants must rate the utilitarian principle of *greater chance of recovery*, the *first-come, first served* principle, and the egalitarian principle of *random* allocation. In this scenario, one of the patients has lower chances of recovery but has been admitted earlier than the other patient. The results for the agreement ratings for different allocation choices in Dilemma 1 are presented in Table 1.

Table 1: Average ratings (and standard deviation) for the agreement with each *allocation choice* in Dilemma 1 for each *resource type*.

Allocation choice	ventilators	beds
greater chances of recovery	5.2 (2.0)	4.8 (1.9)
admitted first	3.0 (1.9)	4.0 (2.0)
random	1.5 (1.1)	1.5 (1.2)

The agreement ratings were analyzed in a 3x2 repeated-measures ANOVA with *allocation choices* (*greater chances of recovery* vs. *admitted first* vs. *random allocation*) as a within-subject factor and *resource type (ventilator* vs. *bed)* as a between-subjects factor.

The analysis revealed a main effect of *allocation choice* ($F(1.386, 123.313) = 77.435$, $p < .001$, $\eta_p^2 = .465$, Greenhouse-Geisser correction applied). There was no main effect of the *resource type* ($F(1, 89) = 1.023$, $p = .315$). The interaction between *allocation choice* and *resource type* was marginally significant ($F(1.386, 123.313) = 77.435$, $p = .058$, $\eta_p^2 = .036$, Greenhouse-Geisser correction applied).

When the limited resource is a ventilator, the possibility of giving the ventilator to the patient with a greater chance of recovery is rated highest (M = 5.2); the possibility to consider the order of admission and give the ventilator to the patient who was admitted first received a lower rating (M = 3.0) and the possibility to randomly choose one of the patients received the lowest rating (M = 1.5) (all p-values $\leq .002$, post-hoc tests with a Holm correction applied).

When the limited resource was an intensive care bed, the rating of the possibility of giving the bed to the patient with a greater chance of recovery (M = 4.8) was not statistically significantly different from the rating for the option to give the bed to the patient who is admitted first (M = 4.0). Again, the lowest rating is given to the possibility to randomly choose a patient (M = 1.5), and this rating is statistically significantly lower than the other two ratings (both p-values < .001, post-hoc tests with a Holm correction applied).

Post-hoc tests also showed that the agreement for using order of admission was higher when the limited resource is an ICU bed (M = 4.0) compared to a ventilator (M = 3.0) ($p = .033$). Ratings for the other two allocation options were not statistically different between for the two limited resource types.

Dilemma 2 – Longer life expectancy

The second dilemma tested the *longer life expectancy* principle opposed to *first come, first served* principle and *random allocation*. In the scenario used, both patients have equal chances of recovery, but one of the patients is admitted earlier while the other patient is *younger* and has *longer life expectancy*. The results for the agreement ratings for allocation choices in Dilemma 2 are presented in Table 2.

Table 2: Average ratings (and SD) for the agreement with each *allocation choice* in Dilemma 2 for each *resource type*.

Allocation choice	ventilator	bed
longer life expectancy	4.9 (1.9)	4.0 (2.0)
admitted first	3.4 (1.8)	4.1 (2.0)
random	2.0 (1.5)	1.5 (1.1)

The agreement ratings were analyzed in a 3x2 repeated-measures ANOVA with *allocation choices* (*longer life expectancy* vs. *admitted first* vs. *random allocation*) as a within-subject factor and *resource type (ventilator* vs. *bed)* as a between-subjects factor.

The analysis revealed a main effect of *allocation choice* ($F(1.615, 143.765) = 46.78$, $p < .001$, $\eta_p^2 = .345$, Greenhouse-Geisser correction applied). There was no main effect of the *resource type* ($F(1, 89) = 2.15$, $p = .146$). The interaction between *allocation choice* and *resource type* was statistically significant ($F(1.615, 143.765) = 4.49$, $p = .019$, $\eta_p^2 = .048$, Greenhouse-Geisser correction applied).

When the limited resource is a ventilator, the possibility of giving the ventilator to the patient with a longer life expectancy is rated highest (M = 4.9); the possibility to

consider the order of admission and give the ventilator to the patient who was admitted first received a lower rating (M = 3.0); and the option to randomly choose one of the patients received the lowest rating (M = 1.5) (all p-values $\leq .008$, post-hoc tests with a Holm correction applied).

When the limited resource was an intensive care bed, the rating of the possibility of giving the bed to the patient with a longer life expectancy (M = 4.0) was not statistically significantly different from the rating for the option to give the bed to the patient who is admitted first (M = 4.1). Again, the lowest rating is given to the possibility to randomly choose a patient (M = 1.5), and this rating is statistically significantly lower than the other two ratings (both p-values < .001, post-hoc tests with a Holm correction applied).

Dilemma 3 – Better quality of life

The second dilemma tested the *better quality of life* principle opposed to *first come, first served* principle and *random allocation*. In the scenario used, both patients have equal chances of recovery, but one of the patients is admitted earlier but has a severe dementia while the other patient has no comorbidities and is expected to have *a better quality of life* upon recovery. The results for the agreement ratings for allocation choices in Dilemma 2 are presented in Table 3.

Table 3: Average ratings (and SD) for the agreement with each *allocation choice* in Dilemma 3 for each *resource type*.

Allocation choice	ventilator	bed
better quality of life	4.8 (1.9)	3.8 (2.3)
admitted first	2.9 (1.8)	4.1 (2.0)
random	1.8 (1.2)	1.5 (1.3)

The agreement ratings were analyzed in a 3x2 repeated-measures ANOVA with *allocation choices* (*better quality of life* vs. *admitted first* vs. *random allocation*) as a within-subject factor and *resource type (ventilator* vs. *bed)* as a between-subjects factor.

The analysis revealed a main effect of *allocation choice* ($F(1.561, 138.941) = 51.026$, $p < .001$, $\eta_p^2 = .364$, Greenhouse-Geisser correction applied). There was no main effect of the *resource type* ($F(1, 89) = 0.233$, $p = .63$). The interaction between *allocation choice* and *resource type* was statistically significant ($F(1.561, 138.941) = 3.556$, $p = .042$, $\eta_p^2 = .038$, Greenhouse-Geisser correction applied).

When the limited resource is a ventilator, the option give the ventilator to the patient with a better quality of life upon recovery is rated highest (M = 4.8); the option to use the order of admission and give the ventilator to the patient who was admitted first received a lower rating (M = 2.9); and the option to randomly choose one of the patients received the lowest rating (M = 1.8) (all p-values $\leq .05$, post-hoc tests with a Holm correction applied).

When the limited resource was an intensive care bed, the rating of the possibility of giving the bed to the patient with a longer life expectancy (M = 3.8) was not statistically significantly different from the rating for the option to give the bed to the patient who is admitted first (M = 4.1). Again, the lowest rating is given to the possibility to randomly choose a patient (M = 1.5), and this rating is statistically significantly lower than the other two ratings (both p-values < .001, post-hoc tests with a Holm correction applied).

Post-hoc tests also showed that the agreement for using order of admission was higher when the limited resource is an ICU bed (M = 4.1) compared to a ventilator (M = 2.9) ($p = .05$). Ratings for the other two allocation options were not statistically different between the two limited resource types.

Dilemma 4 – Preparation started

The fourth dilemma describes a situation like the one in Dilemma 1 but the patient who is admitted earlier is admitted 2 hours ago instead of 20 minutes ago. Additionally, and more importantly, preparations for putting him on a ventilator or admitting him to the ICU have already begun. This dilemma aimed at testing participants' agreement with the utilitarian principle of *reallocation* of resources. As the pandemic has started at the time of the study and the triage was a highly sensitive topic, the choice was made not to use a situation describing a reallocation scenario in which one of the patients is already put on a ventilator or admitted to the ICU. Instead, a milder form was used in which the possible choice is to stop the preparations for using the limited resource after its allocation to another patient. Table 4 displays the average agreement ratings for the allocation choices in Dilemma 4.

Table 4: Average ratings (and SD) for the agreement with each *allocation choice* in Dilemma 4 for each *resource type*.

Allocation choice	ventilator	bed
greater chances of recovery	4.4 (1.8)	4.0 (1.7)
preparations started	4.1 (2.1)	4.8 (1.8)
admitted first	3.1 (2.0)	4.3 (1.9)
random	1.7 (1.2)	1.5 (1.2)

The agreement ratings were analyzed in a 4x2 repeated-measures ANOVA with *allocation choices* (*greater chances of recovery* vs. *preparations started* vs. *admitted first* vs. *random allocation*) as a within-subject factor and *resource type (ventilator* vs. *bed)* as a between-subjects factor.

The analysis revealed a main effect of *allocation choice* ($F(1.946, 173.232) = 48.283$, $p < .001$, $\eta_p^2 = .352$, Greenhouse-Geisser correction applied). There was no main effect of the *resource type* ($F(1, 89) = 3.384$, $p = .069$). The interaction between *allocation choice* and *resource type* was statistically significant ($F(1.946, 173.232) = 4.017$, $p = .021$, $\eta_p^2 = .043$, Greenhouse-Geisser correction applied).

When the limited resource is a ventilator, the possibility of giving the ventilator to the patient with a greater chance of recovery is rated higher (M = 4.4) that the option to give the ventilator to the patient who was admitted first (M = 3.1) ($p < .009$). There is no statistically significant difference between the ratings for choosing the patient with greater chances of recovery or for choosing the patients for whom the

preparations had already started (M = 4.1). The option for random allocation received the lowest rating (M = 1.5) compared to all other possible allocation choices (all p-values ≤ .001, post-hoc tests with a Holm correction applied).

When the limited resource was an ICU bed, the ratings for the options to choose the patients whose preparations have already started (M = 4.8), to allocate the bed to the patient with a greater chance of recovery (M = 4.0), or to give the bed to the patient who is admitted first (M = 4.3) are not statistically different. Again, the lowest rating is given to the option to randomly choose a patient (M = 1.5), and this rating is statistically significantly lower than the other three ratings (all p-values < .001, post-hoc tests with a Holm correction applied).

Post-hoc tests also showed that the agreement for using order of admission was higher when the limited resource is an ICU bed (M = 4.3) compared to a ventilator (M = 3.1) (p = .033). Ratings for the other two allocation options were not statistically different between the 2 limited resource types.

Ratings of allocation principles

As explained earlier, in the second part of the study the allocation principles (chances of recovery; life expectancy; quality of life; first-come-first-served; random allocation) are presented for agreement ratings on a scale from '1 = completely disagree' to '7 = completely agree'.

The average ratings are presented in Table 5 and analyzed in a 5x2 repeated-measures ANOVA with *allocation principle* (*chances of recovery* vs. *life expectancy* vs. *quality of life* vs. *first-come-first-served* vs. *random allocation*) as a within-subjects factor and *resource type* (*ventilator* vs. *bed*) as a between-subjects factor.

Table 5: Average ratings (and standard deviation) for the agreement with *allocation principles* for each *resource type*.

Allocation principle	ventilator	bed
chances of recovery	5.1 (1.7)	4.2 (1.8)
life expectancy	4.3 (1.8)	3.9 (1.9)
quality of life	3.9 (2.2)	4.1 (2.0)
first-come, first served	3.4 (1.8)	4.6 (1.8)
random	1.5 (1.1)	1.6 (1.2)

The analysis revealed a main effect of *allocation principle* ($F(2.128, 189.402) = 48.339$, $p < .001$, $\eta_p^2 = .270$, Greenhouse-Geisser correction applied). There was no main effect of the *resource type* ($F(1, 89) = 0.024$, $p = .878$). The interaction between *allocation principle* and *resource type* is statistically significant ($F(2.128, 189.402) = 5.017$, $p = .006$, $\eta_p^2 = .028$, Greenhouse-Geisser correction applied).

If the limited resource is a ventilator, allocation based on *greater chances of recovery* received higher ratings (M = 5.1) than *quality of life* principle (M = 3.9) or *first-come, first served* principle (M = 3.4), (p = .013 and p < .001, post-hoc tests with a Holm correction applied). The *random allocation principle* is found to be the least supported (M = 1.5) (all p-values < .001, post-hoc tests with a Holm correction applied).

If the limited resource is a bed in the ICU, the agreement with using random allocation principle is significantly lower that the agreement with all the other allocation principles (all p-values < .001, post-hoc tests with a Holm correction).

Post-hoc comparisons of the ratings of each allocation principle between the different recourse types (ventilator or bed) showed a statistically significant difference only for the agreement ratings for *first-come, first-served principle*: this allocation principle is rated higher when the limited resource is a bed in the ICU (M = 4.6) than when it is a ventilator (M = 3.4) (p = .045).

There were statistically significant positive correlations between the ratings for the three utilitarian principles (**r** between .53 and .78, p < .001). The ratings for the *first come, first served* principle were negatively correlated with the utilitarian principles of *greater chances of recovery* (**r** = – .51, p < .001); *longer life expectancy* (**r** = – .44, p = .001), and *better quality of life* (**r** = – .20, p = .054). There were no significant correlations between the ratings of the *random allocation principle* and any of the other principles.

Clusters of participants

A hierarchical cluster analysis was carried out in JASP (JASP team, 2022) using agreement ratings for each of the allocation principles described above (chances of recovery; life expectancy; quality of life; first-come-first-served; random allocation). The analysis was based on Pierson distance metric and Ward D2 linkage method. Number of clusters was optimized according to BIC.

Four cluster of participants were found (see Table 6) which display different distribution of the relative agreement with the allocation criteria.

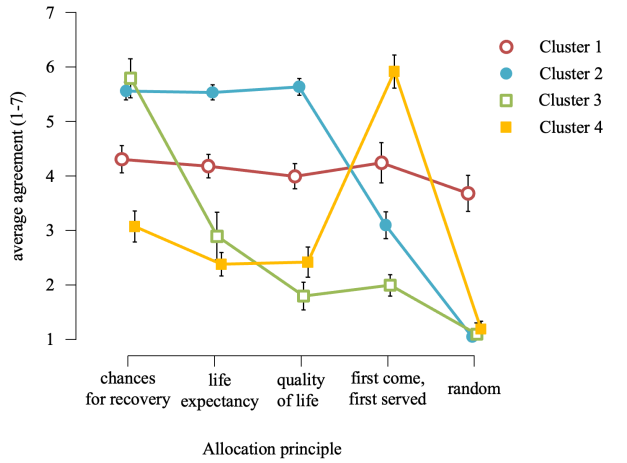
Table 6: Number of participants in each of the clusters for each resource type.

	Clusters			
Resource type	**1**	**2**	**3**	**4**
Beds	9	19	1	18
Ventilators	7	20	9	8
Total	16	39	10	26

To explore these clusters, for each cluster the average agreement rating for each of the allocation principles is computed. Data is presented on Figure 1 and is analyzed in a 5x4 repeated-measures ANOVA with *allocation principle* (*chances of recovery* vs. *life expectancy* vs. *quality of life* vs. *first-come-first-served* vs. *random allocation*) as a within-subjects factor and *cluster* (*cluster 1* vs. *cluster 2* vs. *cluster 3* vs. *cluster 4*) as a between-subjects factor.

The analysis revealed a main effect of *allocation principle* ($F(2.815, 244.906) = 63.425$, $p < .001$, $\eta_p^2 = .422$, Greenhouse-Geisser correction applied). There was also a main effect of the *cluster* ($F(3, 89) = 20.615$, $p < .001$, $\eta_p^2 = .415$). The interaction between *allocation principle* and *cluster* was statistically significant ($F(2.815, 244.906) = 38.313$, $p < .001$, $\eta_p^2 = .569$, Greenhouse-Geisser correction applied).

Figure 1: Average agreement rating for each of the allocation principles for each cluster of participants.



Cluster 1 (16 participants) is characterized with a higher mean rating for the random allocation principle compared to the other clusters (all p-values < .001). More importantly, these participants made similar agreement ratings for all of the allocation principles (all p-values = 1.0). Because of that this cluster is labeled *Uniform*.

Cluster 2 (39 participants) is the largest cluster and regroups utilitarian oriented participants with high agreement ratings for all three utilitarian allocation principles (chances of recovery, life expectancy, and quality of life). The ratings for these 3 principles are statistically undistinguishable (all p's are n.s.), but they are statistically significantly higher than the ratings for first come, first served principle (all p-values < .001) and higher than the ratings for random allocation (all p-values < .001). This cluster is labeled *Utilitarian*.

The participants in Cluster 3 (10 participants) gave highest ratings for using higher chances of recovery as an allocation principle and lower ratings for all other allocation principles (all p-values < .001). This cluster is labeled *Strict Utilitarian.*

Finally, Cluster 4 consists of 26 participants who rated higher the first come, first served allocation principle compared to all other allocation principles (all p-values < .001). This cluster is called *First come, first served*.

A chi-square test of independence found a significant relationship between cluster membership and resource type (beds vs. ventilators) ($\chi^2(1, N = 3) = 10.434$, $p = .015$). This result confirms that the different life saving resources (beds in ICU vs ventilators) used in the moral dilemmas lead to different distribution of preferences of allocation principles (Table 7). *Strict Utilitarian* cluster is comprised almost exclusively of participants presented with a ventilator as a limiter resource, while in the *First-come, first-served* cluster participants presented with dilemmas involving beds are predominant.

When the limited recourse is a bed, most of the participants belong to the *Utilitarian* and to the *First-come, first-served* clusters (Clusters 2 and 4). Only 1 participant belongs to the *Strict Utilitarian* cluster (Cluster 3). If the limited recourse is a ventilator, most of the participants belong to the *Utilitarian cluster* (Clusters 2). The rest of the participants are equally spread between the other clusters.

Discussion and conclusion

In most of the previous papers studying moral judgments in triage dilemmas, the limited resources to be allocated is a ventilator. Here we want to explore the question whether the results are specific to situations where a ventilator must be allocated or whether the effect is more general and applies to other limited medical resources. Because of that here we use 2 types of scarce resources – ventilators or beds in ICU.

In moral dilemmas, if the limited resource to be allocated is a ventilator, the greatest agreement is for using utilitarian rules (greater chance of recovery, longer life expectancy or better quality of life). The option to give the ventilator to the patient admitted first received lesser but significant support. Random allocation is rated lowest. When the resource is an ICU bed, random allocation again has the lowest rating. But now there is a similar agreement with the choice based on the order of admission and the choice based on the utilitarian rules. Probably part of the reasons are related to the application of different ethical principles and arguments. But perhaps it is also not considered that allocating beds in a critical situation cannot be done using the standard rules for allocating hospital beds. Another result is that reallocation is not perceived as equivalent to allocation for the participants.

When rating allocation principles, utilitarian principles get highest ratings when the resource is a ventilator. If the resource is a bed, the ratings of the first-come, first-served principle are as high as those for the utilitarian principles.

A cluster analysis explored the different patterns in making moral judgment is triage dilemmas related to COVID-19. Four types of participants are found. *Uniform* cluster has a uniform distribution of preferences over all principles; the *Utilitarian* cluster favors all utilitarian principles; the *Strict Utilitarian* cluster - only one utilitarian principle (higher chances of recovery); and the last cluster - *First-come, first-served principle*. Their distribution is not the same for the two types of resources. For ventilators, the predominant number of participants are *Utilitarian* or *Strict Utilitarian*. For beds, most of the participants are *Utilitarian* or *First-come, first-served principles* driven.

In summary, we explore the moral judgments process by using otherwise equivalent COVID-19 dilemma situations differing only by the life-saving resources – ventilators and beds in ICU. There is strong support for utilitarian criteria in situations of limited medical resources. At the same time, there is strong support for the allocation of medical resources on a first come, first served basis, especially when the limited resource is a bed in an ICU. There is almost no support for random allocation. Both principles (random allocation and first come, first served) are theoretically considered egalitarian but it seems that for the research participants these principles are not psychologically similar.

All these results demonstrate the importance of studying moral judgments in triage situations using various situations and various resources. First-come, first-come principle seems to be especially prone to subtle manipulations and because of that the results are hinting that this principle is not considered as an egalitarian one, but rather as a everyday rule that is generally accepted and mistakenly thought to be applicable to triage situations.

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