A cross-sectional survey of Australian and New Zealand public opinion on methods to triage intensive care patients in an influenza pandemic

Winston Cheung, John Myburgh, Shay McGuinness, Debra Chalmers, Rachael Parke, Fiona Blyth, Ian Seppelt, Michael Parr, Claire Hooker, Nikki Blackwell, Shannon DeMonte, Kalpesh Gandhi, Mark Kol, Ian Kerridge, Priya Nair, Nicholas M Saunders, Manoj K Saxena, Govindasamy Thanakrishnan and Vasi Naganathan on behalf of the Influenza Pandemic ICU Triage 3 study investigators and the Australian and New Zealand Intensive Care Society Clinical Trials Group

ABSTRACT

Background and objective: An influenza pandemic has the potential to overwhelm intensive care resources, but the views of the general public on how resources should be allocated in such a scenario were unknown. We aimed to determine Australian and New Zealand public opinion on how intensive care unit beds should be allocated during an influenza pandemic.

Design, setting, and participants: A postal questionnaire was sent to 4000 randomly selected registered voters; 2000 people each from the Australian Electoral Commission and New Zealand Electoral Commission rolls.

Main outcome measure: The respondents’ preferred method to triage ICU patients in an influenza pandemic. Respondents chose from six methods: use a “first in, first served” approach; allow a senior doctor to decide; use predetermined health department criteria; use random selection; use the patient’s ability to pay; use the importance of the patient to decide. Respondents also rated each of the triage methods for fairness.

Results: Australian respondents preferred that patients be triaged to the ICU either by a senior doctor (43.2%) or by predetermined health department criteria (38.7%). New Zealand respondents preferred that triage be performed by a senior doctor (45.9%). Respondents from both countries perceived triage by a senior doctor and by predetermined health department criteria to be fair, and the other four methods of triage to be unfair.

Conclusion: In an influenza pandemic, when ICU resources would be overwhelmed, survey respondents preferred that ICU triage be performed by a senior doctor, but also perceived the use of predetermined triage criteria to be fair.

Crit Care Resusc 2017; 19: 254-265
most pragmatic and generalisable representation of the adult population in Australia and New Zealand.\textsuperscript{15,16}

Approval to conduct the study was obtained from the Sydney Local Health District Human Research Ethics Committee (CH62/6/2013-205) and the Auckland District Health Board Research Review Committee (6271). Permission was granted to access the electoral rolls in accordance with local legislation. The study was coordinated from Concord Repatriation General Hospital in Australia and Auckland City Hospital in New Zealand.

**Questionnaire**

A specific high-fidelity questionnaire was developed for the study and is shown in the Appendix (online at ccm.org.au/Resources/Publications/Journal). Participants were sent a pre-notification letter 4 weeks before the questionnaire was posted. No incentives were offered to participants. Questionnaires were returned using a reply-paid envelope.

The six-page questionnaire contained a scenario adapted for an Australian or New Zealand participant (Box 1). The primary question asked respondents which of six triage methods they preferred (Box 2) and required a single multiple choice answer. The six secondary questions asked respondents to rate each of the triage methods for fairness using a horizontal, seven-point, category rating scale with qualifiers.\textsuperscript{17-19} Three additional questions using the same rating scale asked respondents to rate for fairness the use of age, predicted mortality and chronic comorbidity as selection criteria. Respondents could also provide their own comment using optional free text.

To mitigate order bias, participants were randomly allocated one of 12 versions of the questionnaire with the order of the six triage methods and secondary questions randomised so that they appeared first and last in the same proportions.

The questionnaire was refined after pilot testing with consenting volunteers. To mitigate participant distress associated with receiving the questionnaire, an initial batch of 200 questionnaires was sent in both countries to determine safety. The returns over 4 weeks were reviewed.
and approved by an independent safety monitor before the remaining 1800 questionnaires were posted. All returned questionnaires were included in the final analysis.

In Australia, the AEC does not allow personal information to be retained, for privacy reasons, so participants were not contacted to follow up for non-completion. Only questionnaires returned within 10 weeks after being sent were included in the study. In New Zealand, the NZEC allowed participant-identifying information to be kept, and reminder questionnaires were sent to non-completing participants after 8 weeks. An additional 6 weeks was allowed for these returning questionnaires to be included in the study. To avoid potential contamination, the 4-week safety phase and main 10-week study period ran concurrently in both countries, between October 2015 and February 2016.

**Statistical analysis**

The response rate was defined as the number of questionnaires returned divided by the number of questionnaires sent.²⁰ Our literature review of studies using the AEC electoral roll for mail-out surveys found that the best response rate was 21%.²¹ Assuming that the least popular answer was chosen by 5% of the respondents, it was estimated that 1800 questionnaires would need to be sent to obtain a 95% confidence interval (CI) of ±10% for the least popular answer. Rounding up, we set the mail-out size at 2000.

Expected population figures were derived from Australian Bureau of Statistics data from June 2015 and New Zealand Census data from 2013.²²⁻²⁵ In a planned analysis, 95% CIs were calculated for the primary question.

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**Box 2. Methods used in questionnaire to triage ICU patients (Australian version)**

<table>
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| **A** Use a first come, first served approach to decide  
*What does this mean?* The first patients to arrive at the hospital get to be transferred to the intensive care unit (ICU). Once the intensive care unit (ICU) is full, those arriving later miss out. |
| **B** Let a senior doctor decide  
*What does this mean?* A senior doctor will decide which patients get transferred to the intensive care unit (ICU), and which patients don’t. The senior doctor would take into account a patient’s health and chances of surviving when deciding. |
| **C** Use a set of criteria or rules that have been determined by the Health Department to decide  
*What does this mean?* A set of criteria or rules is used to decide which patients can be transferred to the intensive care unit (ICU). Patients who do not meet the criteria set out in the rules will not be transferred to the intensive care unit (ICU). |
| **D** Use random selection to decide  
*What does this mean?* Patients are picked at random to be transferred to the intensive care unit (ICU), such as drawing a person’s name from a hat. |
| **E** Use a patient’s ability to pay to decide  
*What does this mean?* Patients who can afford to pay for their treatment, or who have private insurance will be transferred to the intensive care unit (ICU). Those who cannot afford to pay, or who do not have insurance will miss out. |
| **F** Use the importance of the patient to decide  
*What does this mean?* Patients who are thought to be more important to the functioning of society will be transferred to the intensive care unit (ICU). Those who are thought to be not as important will miss out. For example, an engineer who maintains the city’s water supply may be more likely to be transferred to the intensive care unit than a person who does not work. |
We use histograms, means, standard deviations, medians and interquartile ranges to describe the secondary answers. Analysis was performed by an independent statistician using Excel 2010 (Microsoft).

**Results**

The response rate in the main 10-week study period was 15.1% (301 replies) in Australia and 18.0% (359 replies) in New Zealand. In New Zealand, a further 181 replies were received in the 6 weeks after the reminder questionnaire mail-out for non-completing participants, giving a final response rate in New Zealand of 27.0%.

The residing state, territory or province of respondents is shown in Figure 1, with expected population figures. The age of respondents is shown in Figure 2, with expected population figures.

The proportion of male respondents was 44.4% (132 respondents) in Australia and 42.7% (228 respondents) in New Zealand. The population proportion of men in Australia was 49.3% and 48.5% in New Zealand.24,25

The preferred method chosen by respondents to triage patients to the ICU in a major influenza pandemic is shown in Figure 3. Allowing a senior doctor to decide was the most preferred method (43.2%; 95% CI, 37.5%–48.8%) among Australian respondents, but the next most preferred method of using triage criteria predetermined by the Health Department to decide (38.7%; 95% CI, 33.1%–44.3%) was not statistically different.

Among New Zealand respondents, the most preferred method was to allow a senior doctor to decide (45.9%; 95% CI, 41.7%–50.2%). This was statistically higher than the second most preferred method of using triage criteria predetermined by a Health Department to decide (33.1%; 95% CI, 29.1%–37.1%).

Respondents’ perceptions of fairness for each of the six methods that could be used to triage ICU patients in a major influenza pandemic are shown in Figure 4. Respondents in both countries considered that both allowing a senior doctor to decide (Figure 4B) and using triage criteria predetermined by a Health Department (Figure 4C) to decide were fair (rated as greater than four on the rating scale). A large

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* According to Australian Bureau of Statistics data from June 2015.22
** According to New Zealand Census data from 2013.21
Figure 2. Age of questionnaire respondents, and actual age distribution of the population

Figure 3. Respondent preferences for questionnaire, question 1: “Which of the 6 methods do you think is the best way to decide which patients get to be transferred to the intensive care unit (ICU) in a major influenza pandemic disaster, when there are not enough resources to treat everyone? (Choose only 1 option)”
Figure 4. Respondent views on fairness for methods listed in questionnaire to triage of intensive care unit (ICU) patients during an influenza pandemic; questions 2, 3 and 4
Figure 4 (continued). Respondent views on fairness for methods listed in questionnaire to triage of intensive care unit (ICU) patients during an influenza pandemic; questions 5, 6 and 7.
The proportion of respondents considered that triage decisions based on a “first come, first served” method (Figure 4A), random selection (Figure 4D), ability to pay (Figure 4E), or a person’s importance (Figure 4F), were unfair (rated as less than four on the rating scale).

Respondents’ perceptions of fairness for three additional selection criteria that could be used to triage patients in a major influenza pandemic are shown in Figure 5. Most respondents in both countries considered using a person’s chance of survival (Figure 5B) as a basis for triage decisions to be fair. A smaller majority of respondents in both countries also considered treating younger people ahead of older people (Figure 5A) and on the basis of chronic comorbidity (Figure 5C) to be fair.

Free-text comments regarding the use of age as a selection criterion reflected that this distinction diminished as the age gap narrowed. Some comments from older respondents were critical of modern medicine prolonging life unnecessarily. Some older respondents indicated that they had lived fulfilling lives, and that they would be happy for a younger person to take their place in the ICU in such a scenario.

Comments suggested that respondents in New Zealand were more trusting of senior doctors and less trusting of government and health departments to look after their best interests in a pandemic scenario. However, respondents who favoured the use of pre-determined criteria ahead of allowing senior doctors to triage cited several reasons. One reason was that placing the burden of decision-making in such a difficult circumstance on one or several individuals would be unfair and potentially psychologically traumatic to those individuals. A second reason was that potential bias, prejudice or nepotism could occur if individuals made decisions based on sole discretion. A third reason was that pre-determined selection criteria were more transparent and accountable if they were ever to be legally contested.

**Discussion**

Our binational survey addressed one of the ethical challenges that would present if an influenza pandemic disaster were to occur and the demand for intensive care resources significantly exceeded capacity, in Australia and New Zealand. This study showed that in Australia, most respondents preferred that triage to an ICU in a pandemic scenario be performed by either a senior doctor or by using pre-determined health department criteria. In New Zealand, triage by a senior doctor was the most preferred method. Most respondents in both countries considered both these methods to be fair overall, and perceived the other four triage methods as being unfair.

The reason for the difference between Australia and New Zealand is unknown. Both countries have predominantly universal-access public health care systems, but Australia has a larger coexisting user-pays system. Recent political history in both countries, and comments from the survey, suggest that there may be differences in the trust that the public have in government.

The major benefit of allowing senior doctors to allocate resources using sole discretion, during a resourcing crisis, is the ability to quickly respond to constantly changing supply and demand. However, potential problems with accountability and perception of bias remain using this method. Given that respondents in this study perceived the use of triage criteria also to be fair, we propose that, during an influenza pandemic, when resources are overwhelmed, ICU triage should be performed using pre-determined criteria to provide a basic framework, with a senior doctor making the final decisions. We propose that this method is acceptable to the general public and provides a degree of transparency and accountability.

The questionnaire contained three questions to specifically gauge the public’s view on the use of age, predicted mortality and chronic comorbidity as selection criteria, because these criteria are used in current ICU triage protocols. As respondents considered all three criteria as being fair, we propose that it is reasonable to continue the use of these criteria in such protocols.

There are no large cross-sectional studies surveying the views of the general public on methods to triage ICU patients in an influenza pandemic. A small Massachusetts study used focus groups involving 30 members of the public to obtain opinions on scenarios related to pandemic planning. These consumers were strongly opposed to any model of limiting critical care.

**Strengths and limitations**

The limitation of our study is non-response bias due to the small sample size and low response rate. A low response rate was expected, based on results of previous studies, the variable willingness of the general public to complete written questionnaires, and the large geographical spread of the populations. Many of the randomly selected, invited participants lived in rural areas with limited access to postal services. Privacy concerns by the AEC prevented follow-up questionnaires being sent in Australia to non-responders. In New Zealand, sending a second questionnaire to non-responders improved the response rate by 50%, but the overall response rate remained low, although consistent with similar studies.

Our study used strategies to mitigate bias and to maximise the generalisability of the results. We performed an extensive literature search and consulted design experts to determine the optimal questionnaire design, specifically...
Figure 5. Respondent views on fairness for methods listed in questionnaire on triage of intensive care unit (ICU) patients during an influenza pandemic; questions 8, 9 and 10
using a horizontal, seven-point rating scale with qualifiers, that provides the most accurate results.\textsuperscript{18,19} The use of qualifiers, such as “neither unfair or fair” resulted in anchoring effects, especially as seen in Figures 4A and 4D, but these effects did not significantly influence the final interpretation.

Order bias was mitigated by the use of different versions of the study questionnaires with the order of the six triage methods and secondary questions randomised. The questionnaire was extensively tested and potential harm was minimised with the use of an initial safety-phase mail out. Attempts to improve the response rate were made through the use of pre-notification letters, reply-paid envelopes, minimising questionnaire content and the use of design experts to improve the questionnaire’s attractiveness.

The sampling frame was representative of the general adult population in both Australia and New Zealand, because registration on the electoral roll is compulsory. The geographical spread of respondents was consistent with the expected populations, but the higher proportions of women and older respondents in both countries may be a potential source of bias. The reason for this observation is not known, but the age bias was observed in a previous study using the AEC database.\textsuperscript{21} The study did not sample people aged under 18 years of age, nor those not enrolled on the electoral rolls, so our results cannot be generalised to these groups.

During the study’s conception, other potential sampling frames were considered, such as internet and telephone databases, but these were discounted due to their lack of generalisability to the overall adult populations of both countries, as well as cost. Internet databases had the potential to generate a large sample size, but were not well established in both countries, and were potentially biased by respondents being financially remunerated, or belonging to specific niche consumer groups.

A comprehensive ethical discussion on triage is beyond the scope of this article. Our study did not invite the public to make an ethical judgment, nor does it offer an ethical analysis of the choices presented in the survey. We merely asked respondents to choose between six different methods of triage, all of which could be said to have a reasonable ethical basis, and to rate these for a single ethical criterion of fairness.

We conducted our study in two developed countries with universal-access public health care systems. Future studies should survey public opinion in other countries, particularly those with user-pays or resource-limited health care systems. The views and needs of disadvantaged groups, such as indigenous populations, were not examined in this study, but should be addressed in future studies, as these groups are likely to be disproportionately affected by influenza pandemics, and may lack trust in senior doctors, health policy makers and the ethical judgments of the mainstream public.\textsuperscript{27,8} Future studies should refine triage methods by generating robust data on short-term and long-term mortality and on functional outcomes. Future studies should also examine how triage should be performed for critically ill children.

**Conclusion**

In Australia, respondents preferred to allow either a senior doctor or pre-determined health department criteria to triage ICU patients in an influenza pandemic, but in New Zealand, more respondents preferred a senior doctor to decide. Respondents in both countries considered both these methods to be fair, and also considered it fair to base triage criteria on age, chance of survival, and chronic comorbidity.

**Author contributions**

Winston Cheung and John Myburgh designed the study. Winston Cheung coordinated the study in Australia. Shay McGuinness coordinated the study in New Zealand. Winston Cheung and Rachael Parke collated the data. Winston Cheung analysed and interpreted the data. Winston Cheung, John Myburgh and Vasi Naganathan drafted the manuscript. All authors had access to the datasets, contributed to the writing and review of the manuscript, and approved the final version.

**Acknowledgements**

We thank Jennifer Peat, Helen Wong, Tim Lambert (Concord Repatriation General Hospital, Sydney, Australia); Mario D’Souza (Sydney Local Health District, Sydney, Australia); and Eileen Gilder, Stephnie Long, Keri-Anne Cowdrey, Jane Dalton, Aimee Blakemore, Magda Butler (Cardiovascular ICU Research, Auckland City Hospital, Auckland, New Zealand) for their help with our study. We thank especially Lillian Hou for the questionnaire graphic design, and the volunteers who helped with the development of the questionnaire.

**Competing interests**

Shay McGuinness and Rachael Parke received competitive research grants from The A+ Charitable Trust. All other authors declare no conflicts of interest.

The New Zealand arm of this study was supported by the A+ Charitable Trust. The study sponsor had no role in the study’s design, conduct, data collection, data analysis, data interpretation, manuscript preparation or the decision to submit it for publication.
Author details

Winston Cheung, Intensivist,1 Clinical Associate Professor2 and Honorary Senior Fellow4
John Myburgh, Director,3 Professor of Critical Care Medicine4 and Intensivist5
Shay McGuinness, Intensivist and Director of Research,6 Honorary Specialist7 and Adjunct Senior Research Fellow8
Debra Chalmers, Intensivist9 and Fellow6
Rachael Parke, Nurse Senior Research Fellow,6 Honorary Senior Medical Research Fellow,7 Adjunct Senior Research Fellow8 and Senior Lecturer10
Fiona Blyth, Professor2
Ian Seppelt, Intensivist,11 Associate Professor12,13 and Honorary Senior Fellow9
Michael Parr, Professor,4 Director14 and Intensivist14
Claire Hooker, Senior Lecturer15
Nikki Blackwell, Intensivist,16 Associate Professor17 and Medical Consultant18
Shannon DeMonte, Quality and Safety Clinical Nurse16
Kalpesh Gandhi, Intensivist19
Mark Kol, Director,1 Intensivist1 and Clinical Senior Lecturer2
Ian Kerridge, Professor15
Priya Nair, Director,20 Intensivist,20 Honorary Senior Fellow3 and Conjoint Senior Lecturer6
Nicholas M Saunders, Anaesthetist21
Manoj K Saxena, Intensivist,5 Research Fellow3 and Conjoint Lecturer4
Govindasamy Thanakrishnan, Intensivist1
Vasi Naganathan, Associate Professor2,22 and Consultant Geriatrician23
on behalf of the Influenza Pandemic ICU Triage 3 study investigators and the Australian and New Zealand Intensive Care Society Clinical Trials Group

1 Intensive Care Unit, Concord Repatriation General Hospital, Sydney, NSW, Australia.
2 Sydney Medical School, Concord, University of Sydney, Sydney, NSW, Australia.
3 Critical Care and Trauma Division, The George Institute for Global Health, Sydney, NSW, Australia.
4 University of New South Wales, Sydney, NSW, Australia.
5 Department of Intensive Care Medicine, St. George Hospital, Sydney, NSW, Australia.
6 Cardiothoracic and Vascular Intensive Care Unit, Auckland City Hospital, Auckland, New Zealand.
7 Medical Research Institute of New Zealand, Wellington, New Zealand.
8 Australian and New Zealand Intensive Care Research Centre, Monash University, Melbourne, VIC, Australia.
9 Intensive Care Unit, Hawke's Bay Fallen Soldiers' Memorial Hospital, Hastings, New Zealand.
10 University of Auckland, Auckland, New Zealand.
11 Department of Intensive Care, Nepean Hospital, Sydney, NSW, Australia.
12 Australian School of Advanced Medicine, Macquarie University, Sydney, NSW, Australia.
13 Sydney Medical School, University of Sydney, Sydney, NSW, Australia.
14 Department of Intensive Care, Liverpool Hospital, Sydney, NSW, Australia.
15 Centre for Values, Ethics and the Law in Medicine, University of Sydney, Sydney, NSW, Australia.
16 Prince Charles Hospital, Brisbane, QLD, Australia.
17 University of Queensland, Brisbane, QLD, Australia.
18 The Alliance for International Medical Action, Dakar, Senegal.
19 Department of Intensive Care, Blacktown Hospital, Sydney, NSW, Australia.
20 St. Vincent's Hospital, Sydney, NSW, Australia.
21 Norfolk and Norwich University Hospital National Health Service Foundation Trust, Norfolk, United Kingdom.
22 Centre for Education and Research on Ageing, University of Sydney, Sydney, NSW, Australia.
23 Ageing and Alzheimer's Institute, Concord Repatriation General Hospital, Sydney, NSW, Australia.

Correspondence: winston.cheung@sswhs.nsw.gov.au

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ORIGINAL ARTICLES