Admission to ICU “solely for possible organ donation”—audit of current New Zealand practice

Stephen Streat, Annette Flanagan, Joanne Ritchie

ABSTRACT

AIM: Admission of patients with likely fatal illness to ICU “solely for possible organ donation” has been a long-standing practice in New Zealand. This is advocated as a means of increasing the availability of organs for transplant. We sought to determine the extent and characteristics of current clinical practice.

METHOD: We identified patients admitted “solely for possible organ donation” from a total of 2,686 patients who died in the 24 public hospital ICUs in New Zealand between 1 July 2017 and 30 June 2019. We determined their characteristics, resource utilisation and organ and tissue donation outcomes.

RESULTS: There were 49 patients (26, M23; age range 9 days to 79 years, median 57 years, European 36, Māori 11, Pacific 1, Asian 1). On 26 occasions (57%) ICU admission was preceded by a “preliminary family discussion about donation”. Eighteen of the 24 ICUs admitted at least one patient (range 1 to 13, median 2) over the two-year period. All 49 patients had evidence of catastrophic brain damage at the time of ICU admission; they used a total of 60 ICU days, including 15.5 days for one patient who was actively treated after spontaneous improvement. Death occurred between 5 minutes and 15 days, median 18.7 hours after ICU admission; all but one death occurred by 82 hours. Distribution of ICU stay was similar for the 20 patients who donated and for those 29 who did not. Brain death developed in 22 patients, 20 of whom donated 63 organs, 15% of the total 430 organs donated by all deceased donors over the period. Organs from 20 donors were transplanted into 58 recipients, 14% of the total 417 recipients of deceased-donor organs over the period. Nine of the 49 patients also donated tissues for transplantation.

CONCLUSION: There are already a small number of patients being admitted to ICUs in New Zealand “solely for possible organ donation”, the majority following prior family discussion of donation. These patients occupy a small number of ICU bed-days and contribute ~15% of the deceased donation activity. Organ Donation New Zealand has developed and recently promulgated recommended best practice guidelines for clinicians in the ICU and emergency departments and is supporting expansion of the practice within the scope of these guidelines.

The practice of admitting patients with likely fatal acute illness to ICU “solely for possible organ donation” is increasingly being advocated for as a potential source of additional organs for transplantation. This practice has a comparatively favourable cost-utility when compared to ICU admission for other indications. Some intensive care clinicians have expressed concerns about the boundaries of moral rectitude of this practice, its impact on the families of dying patients and the effect that it might have on the ability of the ICU to provide for the needs of other critically ill patients. In 2014 Organ Donation New Zealand (ODNZ), in collaboration with clinicians in intensive care medicine and emergency medicine, began developing best practice clinical guidelines on this practice. In 2017 ODNZ began prospectively collecting additional data about the practice as part of our confidential national registry of deaths in public hospital ICUs. In June 2019 our best practice guidelines were released to clinicians. More recently the Australian and New Zealand Intensive Care Society...
(ANZICS) recommended that “intensivists, in collaboration with donation staff, should develop local pathways so that patients with potential for organ donation who are near the end of life in other hospital departments or remote centres are referred to an intensive care unit for exploration of the possibility of organ donation.” The ODNZ best practice guidelines are consistent with this recommendation.

We sought to determine the existing extent of the practice in New Zealand including the incidence, patient circumstances, use of ICU resource, organ (and tissue) donation outcomes and the extent to which these donation outcomes contributed to transplantation. We used these data along with other reported sources to make estimates of the costs and benefits of the practice and place these in a broader context.

Method

ODNZ has maintained a confidential voluntary registry of all deaths in the 24 New Zealand public hospital ICUs since 2008. The registry is used by ODNZ as part of a comprehensive quality improvement programme to ensure that opportunities for deceased organ (and tissue) donation are recognised and appropriately supported. The registry is hosted by a private provider and includes detailed clinical information relevant to possible organ donation. Data are entered online, soon after a patient’s death by authorised nurses with individual passwords in every ICU (ICU Donation Link Nurses’). Each patient is assigned a unique identifier by the data hosting company for the purposes of communication between the ICUs and ODNZ. Data are anonymised, encrypted, securely maintained and made available to ODNZ. Two additional data elements have been collected since July 2017: “Was the patient admitted to ICU solely for possible organ donation?” and “Did a preliminary family discussion about donation take place before ICU admission?”

ODNZ maintains a separate confidential registry of all deceased organ donors since 1993. This includes which organs from each donor were actually transplanted.

This study was a two-year (1 July 2017 to 30 June 2019) retrospective audit of these two registries, which sought to establish the current extent and nature of the clinical practice of admitting critically ill patients to ICU “solely for possible organ donation”. Data of interest were analysed within an Excel spreadsheet which included demographics, clinical details, whether a preliminary family discussion about donation had taken place before ICU admission, the ICU length of stay, organ (and tissue) donation outcomes, and the organs and tissues actually transplanted. The extent of donation from these actual donors was reported in the context of donation from all other deceased donors over the same time period. Estimates of the costs and benefits of the practice of admission “solely for possible organ donation” were made from these data and other reported sources. Simple parametric statistics were used as appropriate.

Results

There were a total 2,686 deaths in the 24 public hospital ICUs over the two-year study period (1 July 2017 to 30 June 2019), including 49 deaths of patients who had been admitted to ICU “solely for possible organ donation”. On 26/49 occasions (57%) the ICU admission occurred after a “preliminary family discussion about donation”. On 26/49 occasions (57%) the ICU admission occurred after a “preliminary family discussion about donation”. Table 1 shows demographic and clinical details of the 49 patients, and Table 2 shows the cause of death for those who did [n=22] and did not [n=27] become brain dead.

<table>
<thead>
<tr>
<th>Gender</th>
<th>26 F, 23 M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Range 9 days to 79 years, median 57 years</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>European 36, Māori 11, Pacific 1, Asian 1</td>
</tr>
</tbody>
</table>

Sixteen of the 24 ICUs had admitted at least one patient (range 1 to 13, median 2). Prior “preliminary family discussion about donation” was no more common in the three ICUs who admitted six or more such patients than in the other 13 ICUs (15/27 vs 11/22, Fishers exact test value = 0.9, NS). The 49 patients used a total of 60 ICU days, including 15.5 days for one patient who was actively treated after spontaneous
improvement before deteriorating due to late re-bleeding from a cerebral artery aneurysm. Death occurred between five minutes and 15 days, median 18.7 hours after ICU admission; all but one death occurred by 82 hours. Distribution of ICU stay was similar for the 20 patients who donated and for those 29 who did not. Brain death was determined to have developed in 22 patients, 20 of whom donated organs. Table 3 shows the organs donated and transplanted from these donors, along with organs transplanted from all other deceased donors over the same two years.

These 20 donors (15% of the 136 total deceased donors over the period) donated 63 organs, 15% of the total 430 organs donated by deceased-donors. The 63 organs were transplanted into 58 recipients, 14% of the 417 recipients of organs from deceased-donors. Nine patients, including four who donated organs, also donated tissues (eight donated eyes and two donated heart valves).

Discussion
This is the first study to accurately quantify the existing practice in New Zealand of admitting patients to the ICU “solely for possible organ donation”. The practice is established in New Zealand, with two thirds of the ICUs having admitted at least one patient solely for possible organ donation over the two years of the study. There is considerable variability between ICUs in the frequency with which this occurs. This is likely to reflect both hospital size and services, and also aspects of both ICU and ED culture and communication around patients at the end of life. There is also variability in the frequency in which ICU admission is preceded by a preliminary discussion of organ donation, although such discussion did occur on 57% of occasions.

Admission policies in New Zealand ICUs, in line with worldwide consensus recommendations, prioritise admission

Table 2: Cause of death in 49 patients admitted to ICU “solely for possible organ donation”.

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Brain dead [n=22]</th>
<th>Not brain dead [n=27]</th>
<th>Total [n=49]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intracerebral haemorrhage</td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Subarachnoid haemorrhage</td>
<td>6</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>6</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Hypoxic-ischaemic encephalopathy</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Spontaneous subdural haemorrhage</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Cerebral infarct</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Brain tumour</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3: Organs donated and transplanted from donors admitted solely for possible organ donation, and from all other deceased donors, together with the number of corresponding transplanted recipients* over two years 1 July 2017 to 30 June 2019.

<table>
<thead>
<tr>
<th>“Admitted for possible organ donation” (DBD, n=20)</th>
<th>All other donors (DBD 101, DCD 15)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearts</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>Lungs</td>
<td>7</td>
<td>48 (DCD 4)</td>
</tr>
<tr>
<td>Livers</td>
<td>16</td>
<td>79 (DCD 1)</td>
</tr>
<tr>
<td>Kidneys</td>
<td>31</td>
<td>199 (DCD 25)</td>
</tr>
<tr>
<td>Pancreas</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Organs</td>
<td>63</td>
<td>367</td>
</tr>
<tr>
<td>Recipients*</td>
<td>58</td>
<td>359</td>
</tr>
</tbody>
</table>

*Note: Some recipients received multiple organ transplants.
to patients who are most likely to derive benefit from that admission. These patients have a potentially reversible acute illness which is too severe to be managed in a ward setting, and not so severe that death is extremely likely irrespective of ICU admission. In that context however, there are some situations where end-of-life care is probably best provided in an ICU setting (e.g., lethal-extent burn injury). Sometimes space, time, privacy and personnel may not be available to provide for the end-of-life care needs of a ventilated patient or their family in the emergency department and ICU may have the necessary capabilities. These issues are complex and vary between hospitals, reflecting locally available hospital resources and the services that the ICU provides to each hospital. A combined Australian and New Zealand report from a large but incomplete set of ICUs found that 3,700 (0.4% of the total 1,024,203 patients admitted to the 177 ICUs over a 10-year period between 1 January 2007 and 31 December 2016) were admitted for “palliative care of a dying patient” and that these 3,700 patients had a mortality of 86.6%. We have tried to exclude patients admitted to ICUs for these reasons from this report, by restricting inclusion to patients “admitted to ICU solely for possible organ donation”, implying that they would not have been admitted for any other reason.

It is possible that there might have been other patients who were also “admitted solely for possible organ donation” who did not die in the ICU (and therefore would not appear in the ODNZ registry of ICU deaths). These are likely to be very few, although there was one patient in this study who did improve and receive active treatment for 15 days before dying of a late complication. The Australasian report found that 1,115 (0.1% of the total ICU admissions) were admitted for “potential organ donation” and that these 1,115 patients had a mortality of 95.9%. Donation outcomes were not reported for this cohort.

All except one of the 49 patients in this study died in the ICU within a few days; 22/49 (45%) of them became brain dead; with a similar time to death as those 29 who did not become brain dead. Assuming a representative cost of an ICU day in New Zealand at $NZD5,500, the total cost of the ICU stay of all 49 patients would be $330,000 ($6,735 per admitted patient) or $244,750 for 48 patients ($5,099 per patient) if the actively treated patient is excluded. Attributing these costs to the 58 recipients of donated organs would result in an additional cost per recipient of $5,690 [all 49 ICU admissions] or $4,220 [48 ICU admissions not actively treated]. This is approximately 2.5% of the cost of an (adult) liver transplant or 6% of the cost of a renal transplant (Professor Stephen Munn, personal communication). ICU admission solely for possible organ donation does not currently result in any additional reimbursement to ICUs and can be seen as of lesser priority than admission of a critically ill patient for active treatment. This view is particularly held if ICUs resources, including staff with specific expertise in organ donation are limited or unavailable. The contribution of this ICU admission practice to national transplantation activity is already significant (~15%), similar to what was found in seven hospitals in the Netherlands in 2013–2014 where 8/72 (11%) of donors had been admitted to ICU solely for possible donation. Very recently these researchers have shown a decrease in such potential donors not being referred from the ED following implementation of a protocol to support the practice. In that report of 55 patients admitted to ICU solely for possible organ donation (clinically similar to the 49 patients in this report), there were 20 actual donors (26% of the 69 total donors in the participating hospitals). In a nested-cohort report within the Australasian study of 177 ICUs, 116 of the 1,115 (10.4%) patients admitted “for potential organ donation” over a 10-year period were from a single large Australian tertiary centre. In that centre, donation was discussed with families before ICU admission on 59/116 occasions (51%), brain death was determined in 75 patients (65%) and there were 61 donors (63%), broadly similar to the national New Zealand findings in this study.

The mean number of organs transplanted per donor in this study was 3.15, similar to the 3.33 organs per donor transplanted from the other 101 DBD donors over the two-year period. There were no DCD donors from among the patients admitted solely for possible organ donation; there were 15 DCD
donors over the period from whom a mean of 2.0 organs per donor were transplanted.

The extent of benefit attributable to organ transplantation, as measured by Quality Adjusted Life Years (QALYs) has been calculated from transplant recipient data published between 2002 and 2014. Derived QALYS were 8.9 for liver, 8.8 for heart, 2.8 for lungs, 2.6 for kidney and 2.1 for pancreas transplantation. These values will be conservative, as long-term survival for transplant recipients is generally continuing to improve. Applying these values of QALYs to the organs donated by the 20 DBD donors in this report results in a total of 313.5 QALYs from 63 organs. Assuming that the QALY effects of multiple organ transplants would not be strictly additive, we have conservatively reduced the number of QALYs to 58/63 of its value, ie, to 308.4 QALYs or 15.4 QALYs per DBD donor. The theoretical analysis by Nunnink estimated the maximum number of QALYs at 30.6 “when all possible organs were medically suitable for transplantation” (heart, lungs, liver, kidneys and pancreas), implying five or more transplant recipients per DBD donor, compared with the actual value of 2.9 recipients per donor that we found in this report.

An estimate of cost per QALY, (where cost is based only on ICU length of stay for the 49 patients admitted to ICU solely for possible organ donation), is therefore not more than $1,070. Such a value represents very high cost-utility for a healthcare intervention. For example, care in a stroke unit rather than a general ward setting costs $7,960/QALY, water fluoridation between $12,821 and $20,000/QALY, population-based screening for abdominal aortic aneurysms $15,300/QALY and stockpiling of antivirals in anticipation of a future influenza epidemic $33,200/QALY.

Guidelines for best practice in New Zealand have been developed by ODNZ by a process of wide consultation among clinicians in ICUs and emergency departments with principle-based consensus. They are in accord with the relevant position statement of the Australian and New Zealand Intensive Care Society. ODNZ recommends that if the only reason for ICU admission is “solely for possible organ donation” and would otherwise not take place, such admission should be preceded by an explicit discussion of the reasons for it with the family, if that is possible.

Summary and conclusion

This study provides a national ‘baseline measure’ of admission to ICU solely for possible organ donation. This practice currently contributes ~15% to transplantation activity. ODNZ now has an ongoing program to encourage expansion of this practice, within the bounds of what is considered best practice and is acceptable to families and clinicians.

Competing interests:
Nil.

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