Admission to Intensive Care for Palliative Care or Potential Organ Donation: Demographics, Circumstances, Outcomes, and Resource Use

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Objectives: To describe the characteristics, circumstances, change over time, resource use, and outcomes of patients admitted to ICUs in Australia and New Zealand for the purposes of "palliative care of a dying patient" or "potential organ donation," and compare with actively managed ICU patients.

Design: A retrospective study of data from the Australian and New Zealand Intensive Care Society Adult Patient Database and a nested cohort analysis of a single center.

Setting: One hundred seventy-seven ICUs in Australia and New Zealand and a nested analysis of one university-affiliated hospital ICU in Melbourne, VIC, Australia.

Patients: Three thousand seven hundred "palliative care of a dying patient" and 1,115 "potential organ donation" patients from 2007 to 2016. The nested cohort included 192 patients.

Interventions: No interventions. Data extracted included patient demographics, diagnoses, length of stay, circumstances, and outcome of admission.

Measurements and Main Results: ICU admissions for "palliative care of a dying patient" and "potential organ donation" increased from 179 in 2007 to 551 in 2016 and from 44 in 2007 to 174 in 2016 in each respective group, though only the "potential organ donation" cohort showed an increase in proportion of total ICU admissions. Lengths of stay in ICU were a mean of 33.8 hours (median, 17.5; interquartile range, 6.4–38.8) and 44.7 hours (26.6; 16.0–44.6), respectively, compared with 74.2 hours (41.5; 21.7–77.0) in actively managed patients. Hospital mortality was 86.6% and 95.9%, respectively. In the nested cohort of 192 patients, facilitating family discussions about goals of treatment and organ donation represented the most common reason for ICU admission.

Conclusions: Patients admitted to ICU to manage end-of-life care represent a small proportion of overall ICU admissions, with an increasing proportion of "potential organ donation" admissions. They have shorter ICU lengths of stay than actively managed patients, suggesting resource use for these patients is not disproportionate. (*Crit Care Med* 2017; 45:e1050–e1059)

Key Words: critical care; intensive care unit; organ donation; palliative care; resource allocation

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Admission to the ICU usually occurs in the setting of acute illness with organ dysfunction or for monitoring in the perioperative period, with the aim of preventing or reversing acute deterioration and increasing chances of survival (1). Although some patients have treatment limitations in place on admission (2), survival remains the aim of treatment. For those who die, end-of-life care in ICU typically occurs after a trial of active treatment has failed, with the majority of deaths preceded by a decision to withhold or withdraw therapy (3–6).

In contrast, some patients may be admitted to ICU with the known expectation of imminent death. Reasons for such admissions may include facilitation of organ donation (7–10)

and provision of palliative care to patients unable to be managed elsewhere. Even though resources may be limited, facilities uniquely available in ICUs may offer benefits to patients at the end of life (11) and may provide a better environment for difficult discussions with families (12).

There is little published information about these patients. Our aim was to determine the characteristics, resource use, and outcomes of patients admitted to Australian and New Zealand ICUs with the intention of managing end-of-life care, including organ donation. We hypothesized that the numbers of patients admitted for "palliative care of a dying patient" or "potential organ donation" had increased over recent years and that these patients consumed a disproportionate amount of resources as measured by mean days in ICU compared with actively managed ICU admissions.

MATERIALS AND METHODS

We conducted a retrospective analysis of prospectively collected binational registry data from the Australian and New Zealand Intensive Care Society (ANZICS) Adult Patient Database (APD) with a nested cohort analysis of patients admitted to one major tertiary metropolitan hospital to further investigate causes and circumstances for ICU admission.

Data Source 1–ANZICS APD

The ANZICS APD is one of four clinical quality registries run by the ANZICS Centre for Outcome and Resource Evaluation (13) and collects patient level data on admissions to adult ICUs in Australia and New Zealand. Since January 2007, the ANZICS APD has recorded treatment goals on admission to ICU in four categories as follows: "full active management," "treatment limitation order," "palliative care of a dying patient", and "potential organ donation". All ICU admissions between January 1, 2007, and December 31, 2016, were examined. Those without recorded treatment goals on admission to ICU were excluded. All patients whose primary admission was for "palliative care of a dying patient" or for "potential organ donation" were extracted. If the palliative admission to ICU was a readmission episode, this was included but only if the original ICU admission had been for active treatment. Otherwise all readmission episodes were excluded.

Variables extracted included age, diagnosis on admission, comorbidities, Acute Physiology and Chronic Health Evaluation II and III scores, source of hospital and ICU admission, length of ICU and hospital stay, and discharge destination. Outcomes considered included in-hospital mortality rates and the proportion of patients discharged home or to a rehabilitation facility. Length of stay in ICU was the outcome examined for consideration of resource use.

Data Source 2–The Alfred Hospital, Melbourne, VIC, Australia

To obtain additional information about the context and reasons for admission, a nested cohort analysis was undertaken of patients admitted for "palliative care of a dying patient" or "potential organ donation" to the ICU at The Alfred Hospital.

The Alfred Hospital is a tertiary-level, university-affiliated hospital in metropolitan Melbourne. The 45-bed ICU facility admits approximately 3,000 patients per year and is the regional referral center for heart and lung transplantation, mechanical circulatory assist devices, burns, cystic fibrosis, HIV, and one of two adult trauma and bone marrow transplantation centers in the state of Victoria. Medical notes, charts, hospital administrative, and ICU databases were examined using a prespecified data abstraction template. Reasons and circumstances for admission to ICU (which were not mutually exclusive) were grouped and reported as number and proportion.

Statistical Analysis

The annual prevalence of patients admitted for "palliative care of a dying patient" or "potential organ donation" as a proportion of overall admissions listed in the ANZICS APD over the study period was examined. Characteristics and outcomes of these two groups were compared. Second, a composite group containing both "palliative care of a dying patient" and "potential organ donation" patients was compared with actively managed ICU admissions. Comparison of patients admitted for "palliative care of a dying patient" with those admitted for "potential organ donation" at The Alfred Hospital is also provided in **Appendix Table 1** (Supplemental Digital Content 1, http://links.lww.com/CCM/C777).

All data were assessed for normality. Categorical, parametric, and nonparametric data were reported as number (%), mean (SD), or median (interquartile range [IQR]), respectively. Comparisons were undertaken with chi-square, t, or Wilcoxon tests as appropriate depending on distribution of data. Changes over time were assessed by fitting a linear regression line to annual proportions and further verified using the trend modification of the Wilcoxon test. Two-sided p values less than 0.05 were considered statistically significant. All analyses were performed using STATA SE, Version 14 (StataCorp, College Station, TX).

The study was approved by the Alfred Hospital Ethics Committee (number 471/13).

RESULTS

ICU Admissions Throughout Australia and New Zealand (Data Source 1–ANZICS APD)

Between January 1, 2007, and December 31, 2016, there were 1,205,153 admissions to 179 ICUs submitted to the ANZICS APD (**Appendix Figure 1**, Supplemental Digital Content 1, http://links.lww.com/CCM/C777). After exclusion of actively managed readmission episodes, and patients with no treatment goals or hospital outcome listed, there were 1,024,203 ICU admission episodes at 177 ICUs, of whom 3,700 (0.4%) were admitted for "palliative care of a dying patient" and 1,115 (0.1%) for "potential organ donation". Of these 4,815 patients, 230 (4.8%) had previously had an active admission to ICU. Mortality in each group was 86.6% and 95.9%, respectively, compared to 8.4% in those admitted with active intent. Overall, patients admitted for "palliative care of a dying patient" or for "potential organ donation" had shorter durations of ICU

stay (mean hours, 36.3; median, 20.0; IQR, 7.9–40.8) than those admitted with active intent (mean hours, 74.2; median, 41.5; IQR, 21.7–77.0), although survivors in all groups had similar lengths of stay in ICU (**Table 1**).

Although there was an increase in absolute numbers, the proportion of all ICU patients admitted for "palliative care of a dying patient" showed no change over the study period (179 [0.34%] in 2007, 551 [0.40%] in 2016; *p* = 0.75). However, there was an increase in both absolute number and proportion of ICU patients admitted for "potential organ donation" (44 [0.08%] in 2007, 174 [0.13%] in 2016; *p* < 0.001) (**Fig. 1**). Patients admitted for "potential organ donation" were younger, had fewer comorbidities, and were more commonly admitted due to neurologic conditions compared with the "palliative care of a dying patient" cohort (**Table 2**). Although inhospital mortality was high, 305 (8.2%) and 21 (1.9%) patients were recorded as discharged home in the "palliative care of a dying patient" and "potential organ donation" groups, respectively, as well as 96 (2.6%) and six (0.54%) patients transferred to a chronic care/rehabilitation facility, respectively.

ICU Admissions at The Alfred Hospital, Melbourne, VIC, Australia (Data Source 2)

Two hundred twenty patients at The Alfred Hospital were listed as having been admitted for "palliative care of a dying patient" or "potential organ donation". Two patients initially coded as "potential organ donation" were considered to have had active treatment, although organ donation was later considered in both cases. Both subsequently died in ICU. Twenty-six admissions initially coded as "palliative care of a dying patient" were considered to have had full active treatment (nine patients) or active treatment with limitations (17 patients). Of these, 77% (20/26) subsequently died. This left 192 patients in whom circumstances and reasons for admission were examined.

Patients admitted to The Alfred ICU for "potential organ donation" were younger and more commonly admitted from the emergency department when compared with those admitted for "palliative care of a dying patient". Median duration of stay in ICU was less than 24 hours in both groups. All 116 patients admitted for "potential organ donation" died in ICU. One (1.3%) of the 76 admissions for "palliative care of a dying patient" was discharged alive to an aged care facility (Appendix Table 1, Supplemental Digital Content 2, http://links.lww.com/CCM/C778).

Reasons for and Circumstances of Admission to The Alfred Hospital ICU

The most common reason for admission to ICU for palliative care of a dying patient was to allow time for arrival of family members or to facilitate further discussions about goals of treatment (**Table 3**). A common factor was the requirement for ongoing management of invasive mechanical ventilation

TABLE 1. Comparison of "Active Intent"[a] and "All Palliative Intent"[b] Cohorts From the Australian and New Zealand Intensive Care Society Adult Patient Database

Patients' Demographics and Outcomes	Active Intent (*n* = 1,019,388)	Palliative Intent (*n* = 4,815)	*p*
Age, mean (SD)	60.5 (19.3)	65.7 (17.6)	< 0.001
Comorbidities, *n* (%)			
Chronic respiratory disease	72,115 (7.1)	466 (9.7)	
Chronic cardiovascular disease	90,932 (8.9)	552 (11.5)	
Chronic liver disease	16,665 (1.6)	160 (3.3)	< 0.001
Chronic kidney disease (on dialysis)	31,422 (3.1)	227 (4.7)	
Immunocompromised	16,155 (1.6)	139 (2.9)	
AIDS	474 (0.05)	4 (0.08)	
Lymphoma	7,881 (0.8)	64 (1.3)	
Leukemia/myeloma	9,929 (1.0)	114 (2.4)	
Metastatic cancer	34,221 (3.4)	486 (10.1)	
Hospital admission source, *n* (%)			
Home	779,394 (76.5)	3,355 (69.7)	
Other acute hospital	173,167 (17.0)	1,029 (21.4)	< 0.001
Chronic care hospital[c]	8,711 (0.9)	109 (2.3)	
Other hospital ICU	8,870 (0.9)	78 (1.6)	
Unknown or not stated	49,060 (4.8)	244 (5.1)	

(*Continued*)

TABLE 1. (*Continued*). Comparison of "Active Intent"ᵃ and "All Palliative Intent"ᵇ Cohorts From the Australian and New Zealand Intensive Care Society Adult Patient Database

Patients' Demographics and Outcomes	Active Intent (*n* = 1,019,388)	Palliative Intent (*n* = 4,815)	*p*
ICU admission source, *n* (%)			
Operating theater	530,055 (52.0)	662 (13.7)	
Emergency department	279,592 (27.4)	2,689 (55.8)	
Ward	135,593 (13.3)	1,045 (21.7)	< 0.001
Another hospital	63,856 (6.3)	336 (7.0)	
Another hospital ICU	7,712 (0.76)	67 (1.4)	
Another ICU, same hospital	1,906 (0.19)	12 (0.25)	
Unknown or not stated	674 (0.07)	4 (0.08)	
Hours in hospital prior to ICU admission, median (IQR)			
All admission sources	9.8 (4.3–28.7)	4.5 (1.8–21)	< 0.001
Admitted from emergency department	4.3 (2.1–7.4)	3.3 (1.6–5.3)	
Admitted from operating theater/recovery	20.7 (7.8–36.5)	11.6 (4.8–78.4)	
Admitted from ward	41.8 (16.3–109.8)	91.2 (25.2–253)	
APACHE II score, mean (sd)	15.5 (7.9)	25.9 (8.7)	< 0.001
APACHE III score, mean (sd)	53.3 (26.3)	92.6 (31.0)	< 0.001
APACHE III predicted risk of death (%), mean, median (IQR)	13.9, 5.0 (1.7–15.7)	57.3, 64.9 (32.5–82.5)	< 0.001
Ventilated during first 24 hr of ICU admission, *n* (%)	379,781 (37.3)	2,680 (55.7)	< 0.001
Outcomes			
ICU length of stay (hr), mean, median (IQR)			
All patients	74.2, 41.5 (21.7–77.0)	36.3, 20.0 (7.9–40.8)	< 0.001
Survivors only	71.7, 40.5 (21.6–73.0)	68.1, 40.3 (22.5–72.9)	0.52
Deaths only	119.2, 62.0 (24.0–140.7)	32.2, 17.9 (7.0–37.2)	< 0.001
Hospital length of stay (d), mean, median (IQR)	13.8, 8.0 (4.4–14.3)	8.1, 1.7 (0.68–5.7)	< 0.001
Discharge destination, *n* (%)			
Died in hospital	85,843 (8.4)	4,272 (88.7)	
Discharged home	739,279 (72.5)	326 (6.8)	< 0.001
Transferred to chronic care/rehabilitation facility	84,523 (8.3)	102 (2.1)	
Transferred to another hospital ICU	14,036 (1.4)	13 (0.27)	
Transferred to another acute hospital	95,656 (9.4)	102 (2.0)	

APACHE = Acute Physiology and Chronic Health Evaluation, IQR = interquartile range.
ᵃActive intent: "full active management" (*n* = 976,784) and "treatment limitation order" (*n* = 42,604).
ᵇAll palliative intent: "palliative care of a dying patient" (*n* = 3,700) and "potential organ donation" (*n* = 1,115).
ᶜChronic care hospital (including nursing homes).

initiated outside ICU (68 patients, 89.5%). Of the 116 admissions for "potential organ donation", successful organ donation occurred in 61 patients (52.6%) (**Table 4**). The most common reason that donation did not eventuate was that family declined to proceed, though in four cases, the patient's condition improved so that organ donation was no longer considered appropriate. All these patients subsequently died in ICU.

DISCUSSION

Patients whose goal of admission to ICU was to facilitate end-of-life care comprised a small proportion of all ICU admissions. They had shorter ICU stays than actively managed patients suggesting that ICU resource use was not disproportionate, as initially hypothesized. Although mortality was expectedly high, survivors were occasionally identified. Over
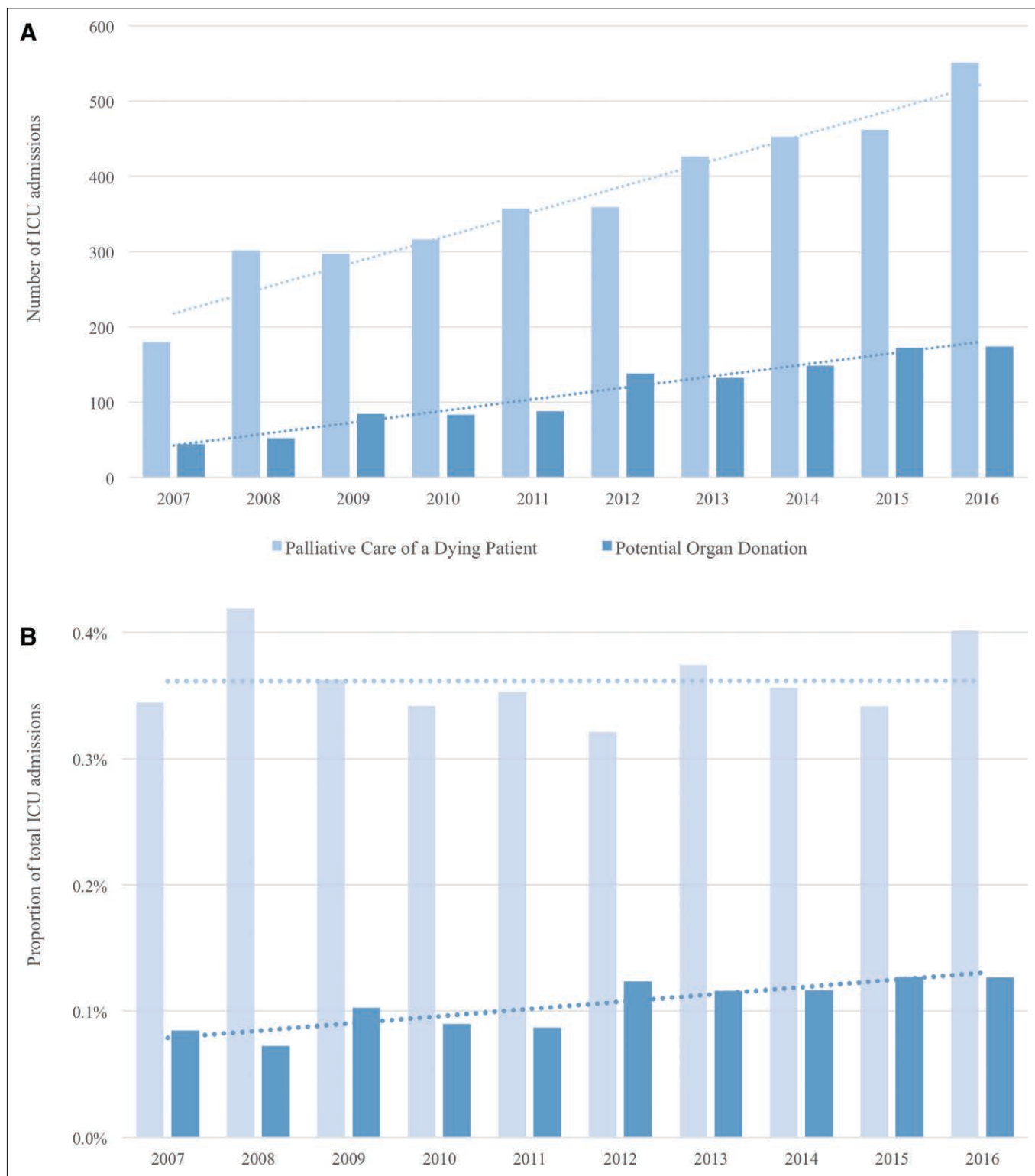
Figure 1. Annual prevalence (**A**) and proportion (**B**) of "palliative care of a dying patient" and "potential organ donation" admissions to ICU per year, 2007–2016 in the Australian and New Zealand Intensive Care Society Adult Patient Database. *p* value less than 0.001 for change in proportion over time in "potential organ donation" cohort. *p* value 0.75 for change in proportion over time in "palliative care of a dying patient" cohort.

the 10-year period, there was an increasing proportion of ICU admissions admitted for "potential organ donation", although the proportion admitted specifically for "palliative care of a dying patient" remained constant.

Relationship to Previous Studies and Implications of Study Findings

Palliative care is recognized as an essential component of intensive care medicine (11, 14, 15). ICU may be a more

TABLE 2. Comparison of "Palliative Care of a Dying Patient" and "Potential Organ Donation" Cohorts–Demographics and Outcomes from the Australian and New Zealand Intensive Care Society Adult Patient Database

Patients' Demographics and Outcomes	Palliative Care of a Dying Patient (n = 3,700)	Potential Organ Donation (n = 1,115)	p
Age (yr), mean (SD)	69.1 (16.3)	54.7 (17.5)	< 0.001
Comorbidities, n (%)			
Chronic respiratory disease	446 (12.1)	20 (1.8)	
Chronic cardiovascular disease	520 (14.1)	32 (2.9)	< 0.001
Chronic liver disease	136 (3.7)	24 (2.2)	
Chronic kidney disease (on dialysis)	213 (5.8)	14 (1.3)	
Immunocompromised	134 (3.6)	5 (0.4)	
AIDS	4 (0.1)	0 (0)	
Lymphoma	62 (1.7)	2 (0.2)	
Leukemia/myeloma	113 (3.1)	1 (0.1)	
Metastatic cancer	483 (13.1)	3 (0.3)	
Hospital admission source, n (%)			
Home	2,576 (69.6)	779 (69.9)	0.002
Another acute hospital	785 (21.2)	244 (21.9)	
Chronic care hospital[a]	99 (2.7)	10 (0.9)	
Another ICU	61 (1.6)	17 (1.5)	
Unknown or not stated	179 (4.8)	65 (5.8)	
Diagnosis, n (%)[b]			
Intracerebral hemorrhage (nonoperative)	509 (13.8)	391 (35.1)	
Head trauma ± multitrauma (nonoperative)	149 (4.0)	200 (17.9)	< 0.001
Subarachnoid hemorrhage (nonoperative)	129 (3.5)	162 (14.5)	
Cardiac arrest	403 (10.9)	128 (11.5)	
Ischemic stroke	163 (4.4)	46 (4.1)	
Chronic obstructive pulmonary disease	135 (3.6)	1 (0.1)	
Sepsis with shock (non-urinary source)	128 (3.5)	2 (0.2)	
ICU admission source, n (%)			
Emergency department	1,822 (49.2)	867 (77.8)	
Operating theater/recovery	589 (15.9)	73 (6.5)	< 0.001
Ward	996 (26.9)	49 (4.4)	
Another hospital	226 (6.1)	110 (9.9)	
Another hospital ICU	53 (1.4)	14 (1.3)	
Another ICU, same hospital	11 (0.3)	1 (0.1)	
Unknown or not stated	3 (0.1)	1 (0.1)	

(Continued)

TABLE 2. (*Continued*). Comparison of "Palliative Care of a Dying Patient" and "Potential Organ Donation" Cohorts–Demographics and Outcomes from the Australian and New Zealand Intensive Care Society Adult Patient Database

Patients' Demographics and Outcomes	Palliative Care of a Dying Patient (*n* = 3,700)	Potential Organ Donation (*n* = 1,115)	*p*
Hours in hospital prior to ICU admission, median (IQR)			
All admission sources	5.7 (2.2–41.8)	3.0 (1.0–4.8)	< 0.001
Admitted from emergency department	3.4 (1.7–5.7)	3.0 (1.5–4.6)	
Admitted from operating theater/recovery	14.9 (5.2–85.3)	5.9 (2.8–10.1)	
Admitted from ward	94.1 (26.2–255.8)	47.5 (18.9–192.5)	
APACHE II score, mean (SD)	25.2 (9.1)	28.0 (7.0)	< 0.001
APACHE III score, mean (SD)	90.3 (32.5)	100.4 (24.1)	< 0.001
APACHE III predicted risk of death %, mean, median (IQR)	53.8, 58.6 (26.2–80.7)	69.0, 75.2 (58.3–85.6)	< 0.001
Ventilated during first 24 hr of ICU admission, *n* (%)	1,701 (46.0)	979 (87.8)	< 0.001
Outcomes			
ICU length of stay (hr), mean, median (IQR)			
All patients	33.8, 17.5 (6.4–38.8)	44.7, 26.6 (16.0–44.6)	< 0.001
Survivors only	66.0, 40.1 (22.5–73.3)	90.6, 41.8 (21.9–71.6)	0.83
Deaths only	28.7, 14.6 (5.7–32.0)	42.7, 26.5 (15.8–43.7)	< 0.001
Hospital length of stay (d), mean, median (IQR)	7.9, 2.2 (0.7–7.9)	8.9, 1.2 (0.63–2.1)	< 0.001
Discharge destination outcome, *n* (%)			
Died in hospital	3,203 (86.6)	1,069 (95.9)	
Discharged home	305 (8.2)	21 (1.9)	< 0.001
Transferred to chronic care/rehabilitation facility	96 (2.6)	6 (0.54)	
Transferred to another acute hospital	91 (2.5)	11 (0.99)	
Transferred to another ICU	5 (0.14)	8 (0.72)	

APACHE = Acute Physiology and Chronic Health Evaluation, IQR = interquartile range.
[a]Chronic care hospital (including nursing homes).
[b]Sample includes seven of the most prevalent diagnoses from both groups.

appropriate setting for palliative care in certain cases, for example, where aggressive symptom control is required during withdrawal of mechanical ventilation (16), aided by higher nurse-to-patient ratios (11), or for family considerations (12). However, there is limited literature describing patients admitted to ICU specifically for palliative care, with current literature more focused on palliative management following failed active treatment.

In the nested cohort study, the most common reason for ICU admission for "palliative care of a dying patient" was to enable communication with the patient's family about goals of care, after ICU therapies had already been initiated. Family communication is considered a vital aspect of ICU and end-of-life care, and is rated as one of the most important aspects of ICU care by families (15, 17–20). When life-sustaining treatments are withdrawn, most patients die quickly (21–23). Their continuation affords family members an opportunity to be with loved ones and facilitates discussion about end-of-life

care (12, 14). The ICU may be a better environment to provide this care than emergency departments which are potentially busy, lack privacy, comfort, and space for family members, and have competing time pressures for staff (12, 24).

In our study, patients admitted for "palliative care of a dying patient" or "potential organ donation" had shorter ICU and hospital stays than those admitted for active management. Although information on therapies provided in the ICU were not available, it is possible that they also required less costly treatment, through lower use of antibiotics, infusions, and organ supports such as renal replacement therapy (25). Although we cannot determine whether clinicians could have managed these patients outside the ICU, the infrequent but consistent occurrence of ICU admission over the 10 years examined suggests clinicians may consider it an appropriate use of resources in certain situations. It may also reflect existing local practices shaped by available resources inside and outside the ICU.

TABLE 3. Reasons for and Circumstances of Admission for "Palliative Care of a Dying Patient" to the ICU at The Alfred Hospital (75 Patients[a])

Reasons for and Circumstances of Admissions to ICU for "Palliative Care of a Dying Patient" (Reasons/Circumstances Not Mutually Exclusive) (n = 75)	n (%)
Patient admitted pending arrival of family or for further discussion with family about end-of-life care, e.g., "Pre-hospital intubation following acute loss of consciousness subsequently diagnosed as an unsurvivable intracranial haemorrhage on arrival in the emergency department"	51 (68.0)
Patient admitted for discussion with family about potential organ donation (but coded as admissions primarily for palliative care), e.g., "Intubated patient with severe traumatic brain injury where prognosis had been discussed prior to ICU admission but organ donation not yet raised with family"	16 (21.3)
Patient admitted from theater following surgery which was performed despite an extremely poor preoperative prognosis, e.g., "Rescue craniotomy following massive intracranial hemorrhage"	10 (13.3)
Patient admitted following an unexpected acute deterioration on the ward, e.g., "Prolonged cardiac arrest in previously actively managed patient with anticipated hypoxic brain injury"	9 (12.0)
Patient admitted following an unexpected acute intraoperative deterioration, e.g., "Intraoperative shock failing to respond to inotropes and vasopressors"	8 (10.7)
Emergency department was considered an inappropriate setting for palliative care, e.g., "ICU admission to optimize titration of sedation/analgesia during palliative extubation following awake intubation for malignant upper airway obstruction in the emergency department"	2 (2.7)
Patient admitted for management and withdrawal of therapies commenced in the emergency department, e.g., "Ongoing management of a patient in whom extracorporeal membrane oxygenation had commenced for initially active but subsequently deemed futile resuscitation in the emergency department"	2 (2.7)
Patient admitted following being mistakenly intubated due to misplacement of treatment limitation documentation	1 (1.3)
No apparent reason for ICU admission documented	4 (5.3)

[a]One history was unavailable for review.

In our study, admissions for "potential organ donation" increased as a proportion of overall ICU admissions. The study period coincided with improved funding and legislative support for the donation sector in Australia (26) which likely increased awareness among clinicians and the community, leading to improved identification of potential donors. ICU admission of potential organ donors may yield more quality-adjusted life-years per ICU bed-day for the community compared with expected benefits for ICU patients expected to survive (10). A significant group of unrealized potential organ donors in Australia are those with imminent brain death who have treatment withdrawn outside the ICU (27). Our study demonstrated that most families were supportive of potential organ donation when it was discussed prior to admission and that admission to ICU for "palliative care of a dying patient" also facilitated discussion about organ donation in over 20% of patients. Thus, our study potentially supports ICU admission for consideration of organ donation as an effective use of scarce resources.

Survival following withdrawal of life-sustaining treatments in ICU (3, 21, 28, 29) and following referral from the emergency department for organ donation (30) have been previously reported. Initial predictions about prognosis may be unclear, evolve, change, and subsequently be proven wrong, which highlights the potential difficulty of making such decisions at a single point in time (12). In our study, approximately 10% and 2.4% of patients in the "palliative care of a dying patient" and "potential organ donation" groups were listed

as either discharged home or to a chronic care/rehabilitation facility, although only one survivor was noted in the nested cohort study from The Alfred Hospital. Survivors spent the same time in ICU as patients admitted for active management. Thus, although there was no evidence of disproportionate resource use in ICU as measured by length of stay, no conclusions about ongoing healthcare requirements for survivors can be determined from this study.

In only one patient from the nested cohort study was there a mistaken intubation with a treatment limitation order in place. Other than this case, the number of avoidable ICU admissions, and potential resources saved, could not be determined. Most patients were admitted following a new diagnosis, often made after institution of ICU therapies, and unrelated to preexisting comorbidities.

Strengths and Limitations

The strengths of our study were the large international database used with a wide sampling of patients over a lengthy period of time, and supplementary in-depth data from a nested cohort study. It is likely representative of and relevant to intensive care practice in Australia and New Zealand. To our knowledge, this is the first study to provide this objective data about admissions for end-of-life care in ICU.

Study limitations include its retrospective nature. The extent and impact of data inaccuracy are unknown. Ten percent of total eligible ICU admissions were excluded due to absence of listed treatment goals. Outcome data were limited, and functional

TABLE 4. Circumstances and Outcomes of Admissions for "Potential Organ Donation" to the ICU at The Alfred Hospital (116 Patients)

Circumstances and Outcomes of Admissions to ICU for "Potential Organ Donation" (*n* = 116)	*n* (%)
Brain death diagnosed	75 (64.7)
Organ donation occurred	
Donation after brain death	52 (44.8)
DCD	9 (7.8)
Location of organ donation discussion[a]	
Discussion about organ donation initiated prior to ICU admission and family were supportive	49 (42.2)
Discussion about organ donation initiated prior to ICU admission but no final decision at time	10 (8.6)
Discussion about organ donation in ICU following discussion of prognosis before ICU admission	21 (18.1)
Discussion about organ donation in ICU—no family available in emergency department	23 (19.8)
Discussion about organ donation in ICU following direct admission from operating theater or ward	8 (6.9)
No discussion about organ donation (one family overseas, one not medically suitable, one coronial objection, one outside local DCD guidelines)	4 (3.4)
Consent for organ donation	
Overall consent rate (only patients where documentation that organ donation was discussed)	78/112 (69.6)
Discussion about organ donation after ICU admission, then declined	23 (19.8)
Discussion about organ donation prior to ICU admission, no final decision at time, then declined	5 (4.3)
Discussion about organ donation prior to ICU admission, initially supportive, then declined	4 (3.4)
Reasons donation did not occur	
Donation declined by family or no discussion (see details above)	36 (31.0)
Not medically suitable due to comorbidities identified after ICU admission	10 (8.6)
Condition improved and prognosis no longer considered appropriate for consideration of organ donation	4 (3.4)
Donation abandoned intraoperatively due to finding of malignancy	2 (1.7)
Cardiac arrest prior to donation	1 (0.9)
Death beyond time frame for DCD following controlled withdrawal of cardiorespiratory support	1 (0.9)
No suitable recipients	1 (0.9)

DCD = donation after circulatory death.
[a]Location of discussion not recorded for one patient.

status of survivors was unknown. The extent to which survivors may be explained by miscoding was unknown. It was not possible to determine whether a decision to avoid intubation contributed to the low rate in the "palliative care of a dying patient" cohort. Our nested cohort demonstrated higher rates of intubation, suggesting this may have been a function of the ANZICS data collection method where ventilation status was known only if an arterial blood gas was available. In addition, the greater proportion of ICU admissions coded as "potential organ donation" compared with "palliative care of a dying patient" may limit wider applicability of the findings from the nested cohort.

Although ICU length of stay is strongly correlated with ICU costs (31), no specific information was available about therapies provided in or available outside of the ICU. No inferences can be made about institutions' potential ability to deliver end-of-life care to patients in whom invasive therapies have already been

commenced outside ICU. No information about advanced directives was available. The Alfred Hospital is a trauma, neurosurgical, cardiothoracic transplant, and burns center which may limit generalizability to other ICUs. Lack of definitive criteria for classification is also a limitation. Application of strict criteria within the nested single-center cohort resulted in exclusion of 28 patients in whom we determined active treatment had been provided. High mortality in excluded patients suggested concerns about futility were present at ICU admission. Overlap also appeared to exist between "palliative care of a dying patient" and "potential organ donation" cohorts. Separation into distinct groups was dependent on arbitrary classification by the treating doctor.

Future Studies
Potential areas of future study should consider therapies needed to care for these patients, functional and dependency status of

survivors, as well as whether the ICU is best suited to deliver this care from humanistic and economic perspectives, or if therapies already initiated can be delivered in non-ICU settings.

CONCLUSIONS

Patients admitted to ICU for "palliative care of a dying patient" or "potential organ donation" represent a small proportion of ICU admissions. Despite increases in absolute numbers, only the "potential organ donation" cohort showed an increasing proportion of total ICU admissions. Both groups have short lengths of stay in ICU and do not appear to use more ICU resources than actively managed patients. Facilitating family discussion about goals of treatment and organ donation represented the most common need for intensive care admission.

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