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Research paper

End-of-life care and intensive care unit clinician involvement in a private acute care hospital: A retrospective descriptive medical record audit

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ABSTRACT

Introduction: More Australians die in the hospital than in any other setting. This study aimed to (i) evaluate the quality of end-of-life (EOL) care in the hospital against an Australian National Standard, (ii) describe the characteristics of intensive care unit (ICU) clinician involvement in EOL care, and (iii) explore the demographic and clinical factors associated with quality of EOL care.
Method: A retrospective descriptive medical record audit was conducted on 297 adult inpatients who died in 2017 in a private acute care hospital in Melbourne, Australia. Data collected related to 20 'Processes of Care', considered to contribute to the quality of EOL care. The decedent sample was separated into three cohorts as per ICU clinician involvement.
Results: The median age of the sample was 81 (25th–75th percentile = 72–88) years. The median tally for EOL care quality was 16 (25th–75th percentile = 13–17) of 20 care processes. ICU clinicians were involved in 65.7% ($n = 195$) of cases; however, contact with the ICU outreach team or an ICU admission during the final inpatient stay was negatively associated with quality of EOL care (coefficient = −1.51 and −2.07, respectively). Longer length of stay was positively associated with EOL care (coefficient = .05). Specialist palliative care was involved in 53% of cases, but this was less likely for those admitted to the ICU ($p < .001$). Evidence of social support, bereavement follow-up, and religious support were low across all cohorts.
Conclusion: Statistically significant differences in the quality of EOL care and a negative association between ICU involvement and EOL care quality suggest opportunities for ICU outreach clinicians to facilitate discussion of care goals and the appropriateness of ICU admission. Advocating for inclusion of specialist palliative care and nonclinical support personnel in EOL care has merit. Future research is necessary to investigate the relationship between ICU intervention and EOL care quality.

1. Introduction

Despite most people expressing a preference to die at home,[1] the majority of Australians die in an acute hospital setting.[2] The importance of high-quality end-of-life (EOL) care in hospital

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settings is recognised as a significant contemporary issue in the second edition of the Australian National Safety and Quality Health Service Standards.[3]

Evidence from two recent Australian studies suggests that 12–30% of people who die in an acute hospital setting had received care in an intensive care unit (ICU).[2,4] Although ICU clinicians provide expert care to those admitted to the ICU, their expertise is also applied beyond the ICU in Code Blue or Medical Emergency Teams (METs).[4,5] Furthermore, at least 30% of MET reviews involve elements of EOL care.[5] Given that the involvement of ICU clinicians in EOL care is multifaceted,[6] the Australian Commission on Safety and Quality in Health Care (ACSQHC)[7] recommends the examination of ICU clinician involvement as part of any evaluation of EOL care in acute hospitals. To assist with this process, the ACSQHC published an EOL care audit tool in which 'Processes of Care' that contribute to understanding and evaluating the quality of EOL care were identified, but to date, there is scant research that evaluates the role of ICU clinicians in the quality of EOL care. The aims of this study were to (i) evaluate the quality of EOL care against an Australian National Standard; (ii) describe the characteristics of ICU clinician involvement in EOL care; and (iii) explore the demographic and clinical factors associated with quality of EOL care.

2. Methods

After ethical review and approval (EH2018-359 and 2018-90), a retrospective descriptive medical record audit was used to address the aims.

2.1. Setting

This study was conducted in a university-affiliated, private, not-for-profit, acute care hospital in metropolitan Melbourne, Australia. The 700-bed hospital provides care for a variety of surgical and medical patients such as those of cardiac, cardiothoracic, neurosurgical, oncological, orthopaedic, and respiratory specialities, totalling just more than 55,000 admissions annually. The 26-bed ICU provides for 2500 admissions annually. An ICU outreach team has been in operation at this site since 2012, comprising the Intensive Care Liaison Nurse Consultant (ICLNC), MET, and the Code Blue response team, is in operation 24 h per day, and responds to patient deterioration as per the hospital's critical review and MET criteria. The ICLNC service is staffed by a critical care specialist ICU nurse and operates 24 h per day on a referral basis. The ICLNC service provides routine follow-up of patients recently discharged from the ICU as well as reviews patients of concern. MET calls are attended by a ward hospital medical officer, whereas Code Blue calls include an ICU registrar as part of the response. Code Blue calls are not limited to cardiac/respiratory arrest but are also triggered by episodes of serious acute deterioration, wherein an ICU consultation is desired. A specialist palliative care team is available for consultation across the hospital after a referral from a member of a patient's treating team, but there are no dedicated inpatient palliative care beds.

2.2. Sample

All adult inpatient deaths between January 1, 2017, and December 31, 2017, were included, excluding deaths that occurred in the emergency department or operating theatre. The sample was separated into three cohorts, based on the type of exposure to ICU clinicians (specialist critical care trained doctors and nurses) during their final admission: (i) *No ICU Involvement*, (ii) *ICU Admission*, and (iii) *ICU Outreach Only* (MET, Code Blue, ICLNC review).

2.3. Data collection

In considering EOL care quality in acute hospital settings, the ACSQHC produced an End-of-Life Care Audit Toolkit,[8] in which 20 'Processes of Care' are identified, aligning with Standard 5: Comprehensive Care of the National Safety and Quality Health Service Standards.[3] The 20 'Processes of Care' were identified as the key elements of care that guide healthcare services' care delivery processes and evaluation of the quality of EOL care. A case report form (CRF) was developed to capture data of these 20 'Processes of Care' from the medical records of the entire deceased patient sample. To enhance reliability of the CRF, three members of the research team independently collected data from the medical records of the first 10 deceased patients in the sample. These data were examined for inconsistencies and ambiguity, and where necessary, items on the CRF were refined, or explanatory notes were added to ensure consistency in data collection. Subsequent to this, all remaining data collection was carried out by one member of the research team who is an experienced specialist ICU nurse, with additional spot checks of data collection performed to ensure the accuracy of data; inter-rater reliability was not considered a significant threat in this study and hence was not measured.

2.4. Statistical analysis

Descriptive statistics such as medians, interquartile ranges, frequencies, and percentages were used to summarise the characteristics of the three cohorts of the sample. Individual 'Processes of Care' were summarised using frequencies and percentages. The primary end point, quality of EOL care, was evaluated using the tally of the 20 'Processes of Care' items. Age, length of hospital stay, and tally of items were compared using median quantile regression.[9] The number of admissions was found to be highly skewed, and thus, it was analysed using negative binomial regression[10,11]. Comparison of the frequency of individual 'Processes of Care' between the three ICU involvement cohorts was conducted using the chi-square test. To reduce the possibility of type 1 errors associated with comparisons on a comparatively large number of items (20), a sequential Holm–Bonferroni procedure was used,[12,13] and statistical significance was reported at the adjusted level. The process of involvement of specialist palliative care clinicians in EOL care was identified *a priori* as an independent variable for analysis as it is a clear expectation of the ACSQHC that dying patients will have specialist input.[7] As such, a secondary analysis was performed using a tally of 19 'Processes of Care', excluding specialist palliative care referral from the tally.

Multivariable quantile regression was undertaken to adjust any cohort differences on the tally of 'Processes of Care' for potential confounders. Such cofounders were chosen on theoretical grounds and consisted of patient demographic characteristics (age, sex, number of admissions in the last 12 months, and source of admission to the hospital), clinical characteristics (diagnosis of dementia, diagnosis of cancer), and organisational factors (involvement of ICU personnel, type of admission). Analyses of demographics were confined to overall comparisons. For the other analyses, however, the No ICU Involvement cohort was defined as the reference group, with planned comparisons consisting of (i) ICU Admission versus No ICU Involvement and (ii) ICU Outreach Only versus No ICU Involvement. All statistical analyses were conducted using Stata 16 (StataCorp. 2019. *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC.).[14]

3. Results

Of the 55,193 admissions to the study site in 2017, the hospital mortality rate was 0.55% ($n = 301$). The eligible sample comprised

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297 adult inpatients who died during the audit period. The median (P50) age was 81 (range = 31–104, interquartile range [IQR] = 16, 25th–75th percentile [P25–P75] = 72–88) years. Deceased inpatients were more often males ($n = 158$, 53.2%) and more likely to be admitted from home (71.4%, $n = 212$). An active diagnosis of cancer was present in 45.1% ($n = 134$) of cases, and 11.1% ($n = 33$) had a diagnosis of dementia. Most were admitted under a medical speciality (77.1%, $n = 229$) such as medical oncology (29.0%, $n = 86$), general medicine (13.5%, $n = 40$), cardiology (10.4%, $n = 31$), and geriatric medicine (8.1%, $n = 24$). Fifty-eight (19.5%) patients died in the ICU (Table 1).

3.1. Demographic differences based on the type of ICU clinician involvement

When separated into three cohorts based on the nature of ICU clinician involvement, 34.3% ($n = 102$) had No *ICU Involvement* in their care, 30.0% (n = 89) were seen by the *ICU* Outreach only, and 35.7% (n = 106) had an *ICU* Admission (and may also have been seen by the ICU outreach team). There was a statistically significant overall difference in median age between the three cohorts ($p < .001$). The three cohorts were also significantly different overall in terms of the presence of dementia ($p = .006$), type of admission ($p < .001$), source of admission ($p \leq .001$), number of readmissions ($p = .014$), and LOS ($p = .034$).

The *ICU Admission* cohort had a lower median age than the *No ICU Involvement and ICU Outreach* cohorts. In addition, being younger, decedents in the *ICU Admission* cohort appeared less likely to have a dementia diagnosis, more likely to have a primary surgical diagnosis, and to have had fewer previous admissions to the hospital than the other two cohorts. The *ICU Admission* cohort was also less likely to have been admitted from home or residential care, but more likely to have been transferred from another health facility than the other two cohorts. The *ICU Admission* cohort had a shorter LOS than the *ICU Outreach,* but not the *No ICU Involvement* cohort (Table 1).

3.2. Quality of EOL care

The prevalence of individual 'Processes of Care' items is presented in Table 2. An emergency contact person was documented in the medical record for every case. High-prevalence processes of care included documentation in the progress notes that the patient was dying or that this was discussed with the patient/family (87.9%, $n = 261$), the presence of a valid and completed resuscitation plan (87.5%, $n = 260$), and evidence of revision of the nursing care plan (85.5%, $n = 254$). Specialist palliative care consultation was documented in 52.5% ($n = 156$) of cases; however, evidence of questioning relating to an advance care directive or medical enduring power of attorney was found in only 25.8% ($n = 74$) of cases. Evidence in the medical record of bereavement follow-up, such as a pastoral care worker offering family members an opportunity for a follow-up phone call from a pastoral care worker or provision of the ward phone number to ask questions later, was the least common 'Process of Care' documented, which was identified in only 11.5% ($n = 34$) of cases.

With regard to the 'Processes of Care' items for which the overall Holm critical *p* value was statistically significant, patients in the *ICU Outreach Only* cohort were significantly less likely to have documented evidence that they were dying ($p < .001$) than those in the *No ICU Involvement* cohort or that their dying was discussed with them or their family ($p < .001$). There were no statistically significant differences between the *ICU Admission* and *No ICU involvement* cohorts with regard to these two items ($p = .174$ and $p = .262$, respectively).

Patients in the *ICU Outreach Only* cohort were also significantly less likely to have opiates prescribed and nonessential medications ceased than those in the *No ICU Involvement* cohort ($p < .001$ in both cases), as were *ICU Admission* patients compared with the latter cohort ($p < .001$ and $p = .002$, respectively). Evidence that the nursing care plan was revised, that other nonessential care ceased, or of discussion about the most appropriate venue of care was also least likely for the *ICU Outreach Only* cohort compared with the *No ICU Involvement* cohort ($p < .001$ in all cases). Similarly, these items were less likely for *ICU Admission* patients than for *No ICU Involvement* cohort $p = .004$, $p = .017$, and $p = .006$, respectively). A not-for-resuscitation order was less likely in the *ICU Outreach only* ($p < .001$) and *ICU Admission* ($p < .001$) cohorts than in the *No ICU involvement* cohort (Table 2).

The median tally of 'Processes of Care' for the entire sample was 16 (IQR = 4, P25–P75 = 13–17). As illustrated in the box plots shown in Fig. 1, the three cohorts appeared to differ not only in median but also in IQR. The *No ICU Involvement* (IQR = 3) and *ICU Admission* (IQR = 4) cohorts exhibited much narrower IQRs than

Table 1
Demographic characteristics based on the type of ICU involvement.

Characteristics	Entire sample, P50 (IQR, 25th–75th)	No ICU Involvement, P50 (IQR, 25th–75th)	ICU Admission, P50 (IQR, 25th–75th)	ICU Outreach only, P50 (IQR, 25th–75th)	*p*-value
Age (years)	81 (16, 72–88)	85 (17, 72–89)	77.5 (13, 69–82)	81 (18, 70–88)	**<.001**
Admissions in the last 12 months	2 (3, 1–4)	2 (3, 1–4)	1 (2, 1–3)	2 (3, 1–4)	**.014**
Length of stay (LOS) (days)	8 (14, 5–19)	6 (10, 3–13)	9.5 (16, 3–19)	11 (16, 5–21)	**.034**
	n (%)	*n* (%)	*n* (%)	*n* (%)	
Gender					
Male	158 (53.2)	48 (47.1)	65 (61.3)	45 (51.7)	.110
Female	139 (46.8)	54 (52.9)	41 (38.7)	44 (49.4)	.380
Cancer diagnosis	134 (45.1)	50 (49.0)	38 (35.9)	46 (51.7)	.050
Dementia diagnosis	33 (11.1)	19 (18.6)	5 (4.7)	9 (10.1)	**.006**
Type of admission					**<.001**
Surgical, emergency	51 (17.2)	10 (9.8)	31 (29.3)	10 (11.2)	
Surgical, elective	17 (5.7)	0 (.0)	13 (12.3)	4 (4.5)	
Medical	229 (77.1)	92 (90.2)	62 (58.5)	75 (84.3)	
Admission source					**.001**
Home	212 (71.4)	64 (62.8)	79 (74.5)	69 (77.5)	
Residential care	46 (15.5)	31 (30.4)	3 (2.8)	12 (13.5)	
Acute health facility	24 (8.1)	2 (2.0)	18 (17.0)	4 (4.5)	
Other	15 (5.0)	5 (4.9)	6 (5.7)	4 (4.5)	

ICU = intensive care unit; IQR = interquartile range.
The bold text refers to statistical significance.

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Table 2
Prevalence of individual 'Processes of Care' items based on ICU involvement.

Processes of Care	Entire cohort (N = 297)	No ICU Involvement (n = 102)	ICU Admission (n = 106)	ICU Outreach Only (n = 89)	χ^2	Holm critical p value	Obtained p value
	n (%)	*n* (%)	*n* (%)	*n* (%)			
Documented that the patient is dying	261 (87.9)	98 (96.1)	97 (91.5)	66 (74.2)	23.48	.003	**<.001**
Discussed with the patient/family that the patient is dying	261 (87.9)	98 (96.1)	98 (92.5)	65 (73.0)	26.93	.003	**<.001**
Opiate prescribed	262 (88.2)	101 (99.0)	93 (87.7)	68 (76.4)	23.42	.003	**<.001**
Most appropriate venue of care discussed	255 (85.9)	99 (97.1)	91 (85.9)	65 (73.0)	22.59	.003	**<.001**
Nursing care plan revised	254 (85.5)	98 (96.1)	92 (86.8)	64 (71.9)	22.64	.003	**<.001**
Other nonessential care ceased	242 (81.5)	95 (93.1)	85 (80.2)	62 (69.7)	17.54	.004	**<.001**
Specialist palliative care consulted	156 (52.5)	72 (70.6)	42 (39.6)	42 (47.2)	21.44	.004	**<.001**
Not-for-resuscitation order present	260 (87.5)	101 (99.0)	87 (82.1)	72 (80.9)	18.83	.004	**<.001**
Nonessential medications ceased	229 (77.1)	92 (90.2)	78 (73.6)	59 (66.3)	16.54	.005	**<.001**
Antisialagogue prescribed	159 (53.5)	66 (64.7)	46 (43.4)	47 (52.8)	9.52	.005	.009
Advance Care Directive/Medical Enduring Power Of Attorney asked about	74 (24.9)	36 (35.3)	20 (18.9)	18 (20.2)	8.99	.006	.011
Social support offered	197 (66.3)	75 (73.5)	57 (53.8)	63 (70.8)	8.56	.006	.014
Benzodiazepine prescribed	217 (73.1)	84 (82.4)	75 (70.8)	58 (65.2)	7.58	.007	.023
Antiemetic prescribed	177 (59.6)	71 (69.6)	59 (55.7)	47 (52.8)	6.63	.008	.036
Bereavement follow-up offered	34 (11.5)	11 (10.8)	7 (6.6)	16 (17.9)	6.24	.010	.044
GP/specialist notified of death	290 (97.6)	100 (98.0)	101 (95.3)	89 (100.0)	4.78	.013	.091
GP details present	288 (96.9)	98 (96.1)	101 (95.3)	89 (100.0)	4.08	.017	.13
Religious support offered	194 (65.3)	73 (71.6)	62 (58.5)	59 (66.3)	3.98	.025	.137
Syringe driver for EOL care medications	166 (55.9)	60 (58.8)	64 (60.4)	42 (47.2)	3.95	.050	.139
Emergency contact documented	297 (100.0)	102 (100.0)	106 (100.0)	89 (100.0)	n/a[a]		

ICU = intensive care unit; EOL = end-of-life.
'Processes of Care' sorted as per the Holm critical *p* value for the chi-square test. To be statistically significant, the obtained or unadjusted *p* value must be lower than or equal to the corresponding Holm critical *p* value.
The bold text refers to statistical significance.
[a] This item is present for 100% of decedents across the groups.

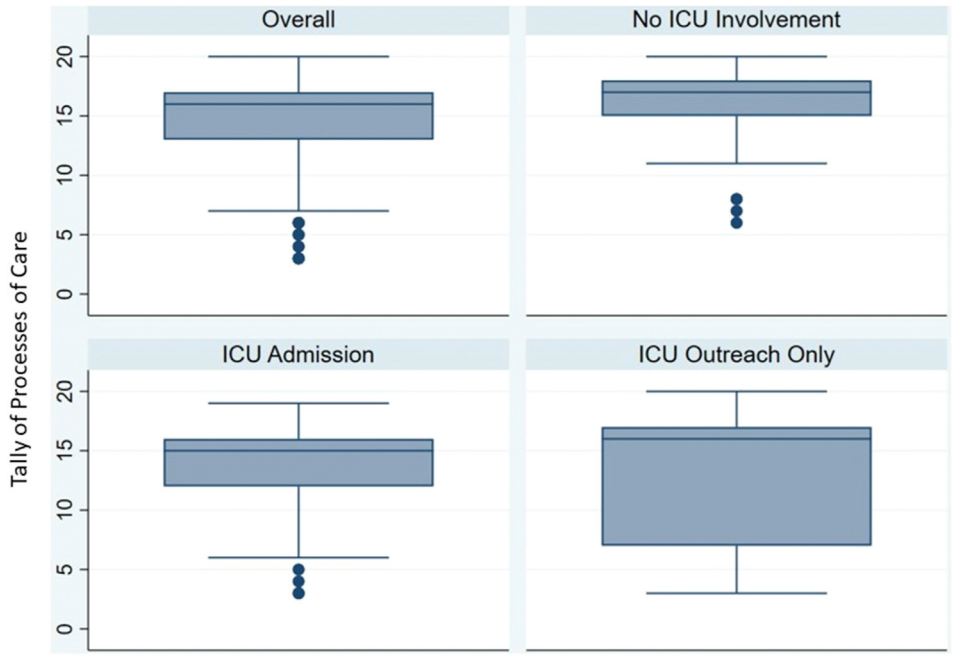

Fig. 1. ICU involvement and 'Processes of Care' box plots. ICU = intensive care unit.

the *ICU Outreach Only* cohort (IQR = 10), reflecting a much lower dispersion of scores around the medians. When the tallies for the three cohorts (*No ICU Involvement, ICU Admission,* and *ICU Outreach Only*) were compared using median quantile regression with robust standard errors[9] to reduce the effects of possible heterogeneity of variance such as differences in IQR, there was a statistically significant overall difference ($p < .001$). The *No ICU Involvement* cohort had the highest median tally, suggesting the highest quality of EOL care (P50 = 17, *IQR* = 3, 15–18), followed by the *ICU Outreach Only* cohort (P50 = 16, *IQR* = 10, 7–17) and the *ICU Admission* cohort (P50 = 15, *IQR* = 4, 12–16). It should be noted, however, that the *ICU Outreach Only* cohort had a higher IQR than the other two cohorts, and although the 75th percentiles appeared to be comparable, the 25th percentile was lower for this cohort, suggesting a greater range and a greater number of lower scores.

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The difference between the *ICU Admission* cohort and *No ICU Involvement* cohorts was clearly statistically significant ($p < .001$), whereas that between the *ICU Outreach Only* and *No ICU Involvement* cohorts ($p = .081$) failed to achieve statistical significance.

When adjusting for potential confounders, multivariable median quantile regression indicated that the overall differences between the three cohorts in quality of care remained statistically significant ($F(2,284) = 12.49$, $p < .001$). Contact with the ICU outreach team only or an ICU admission during the final inpatient stay resulted in lower median tallies (differences = −0.79 and −1.53, respectively), compared with no ICU involvement. Only the latter was statistically significant ($p < .001$), echoing the unadjusted results (Table 3). The effect of gender was statistically significant ($p = .007$), wherein there was a positive relationship with the tally, indicating higher quality of care for female patients (regression coefficient = 0.91). Each admission to the hospital increased the predicted adjusted median tally by 0.12; this association was statistically significant ($p = .001$).

3.3. Specialist palliative care

Whilst evidence of specialist palliative care consultation was found in just more than half of the entire sample, there was a statistically significant (using the Holm-adjusted p procedure) overall difference between the cohorts ($\chi^2(2) = 21.44$, $p < .001$). Specialist palliative care consultation was least likely for those in the *ICU Admission* cohort (39.6%, $n = 42$), followed by those in the *ICU Outreach Only* cohort (47.2%, $n = 42$). Each prevalence was significantly lower than those in the *No ICU Involvement* cohort (70.6%, $n = 72$) ($p < .001$ in both cases). Where there was evidence of specialist palliative care consultation, there was a higher median tally of 'Processes of Care' ($P50 = 16$) but lower dispersion of scores around the median (IQR = 2, P25−P75 = 15−17) compared with the tally of those with no evidence of specialist palliative care consultation (P50 = 13, IQR = 7, 8−15) (Fig. 2). This difference was statistically significant using median quantile regression with robust standard errors ($p < .001$). Note that the total tally in this analysis was 19, omitting specialist palliative care consultation as a process.

4. Discussion

The development of a measure of EOL care by operationalising 20 'Processes of Care' into a tally was an efficient approach to evaluating the quality of care provided and the factors that may impact on care. A median tally of 16 of 20 'Processes of Care' suggests there was moderate alignment between the EOL care provided and the expectations and recommendations of the ACSQHC for EOL care in acute hospitals.[7] Many of the 'Processes of Care' have been previously evaluated individually or collectively in terms of their contribution to EOL care. For example, the use of EOL medication bundles,[15,16] the provision of spiritual/religious support,[17] and communication with family have all been found to contribute to the quality of EOL care.[18,19]

The key to this study was the evaluation of the influence of ICU involvement on the quality of EOL care. An ICU clinician was involved in the care of 66% of patients who died in 2017 within the site investigated, either through ICU admission (36%) or contact with the ICU outreach team only (30%), a finding similar to other Australian studies.[4,20] Baseline differences between cohorts such as the younger age of the *ICU Admission* cohort, lower incidence of dementia, and higher likelihood of a primary surgical admission and having been transferred from another acute care facility suggest that this cohort may have had more acute reversible disease. These characteristics may also be associated with a better baseline prognosis and hence a greater likelihood that an acute interventional approach would be taken. Although 'Processes of Care' could be improved in the ICU, these baseline differences may delay recognition of dying and hence the time available to implement EOL 'Processes of Care'.

The tally for EOL care quality was indeed higher for those in the *No ICU Involvement* cohort. This finding likely reflects that for patients who remain under the care of their admitting specialist, their care preferences toward the end of life are likely known to the admitting specialist and may be less clear to ICU clinicians who have no prior history with the patient. The primary goal of intensive care is to assist patients to survive critical illness,[21] and ICU outreach teams are tasked with identifying, reviewing, and treating acutely unwell patients within hospital sites.[22] Thus, the dying trajectory in an ICU is distinctly different from the EOL care that is

Table 3
Multivariable quantile regression analysis adjusting for potential confounders.

Variable	Regression coefficient	95% CI	P value
ICU involvement			
No ICU involvement	Reference[a]		
ICU admission	−1.53	−2.13 to −.92	**<.001**
ICU outreach only	−.79	−1.86 to .28	.15
Age (years)	−.004	-.03 to .02	.75
Number of admissions in the last 12 months	.12	.04 to .19	**.001**
Female sex	.91	.25 to 1.57	**.007**
Diagnosis of cancer	.47	-.27 to 1.20	.22
Diagnosis of dementia	.15	−1.03 to 1.34	.80
Type of admission			
Medical	Reference[b]		
Surgical, elective admission	−.35	−2.97 to 2.27	.79
Surgical, emergency	.44	−0.09 to 0.98	.10
Admission source			
Home	Reference[c]		
Residential care	−.44	−1.57 to .68	.44
Acute health facility	.18	-.44 to .81	.57
Other	.18	−2.28 to 2.65	.88

CI = confidence interval; EOL = end-of-life; ICU = intensive care unit.
The bold text refers to statistical significance.
[a] The *No ICU Involvement* group was chosen as the reference group to determine the effect of ICU personnel involvement on the tally.
[b] Medical admission type was chosen as the reference to determine if the type of surgical admission affected quality of EOL care.
[c] Admission from home was chosen as the reference as most deceased patients were admitted from home.

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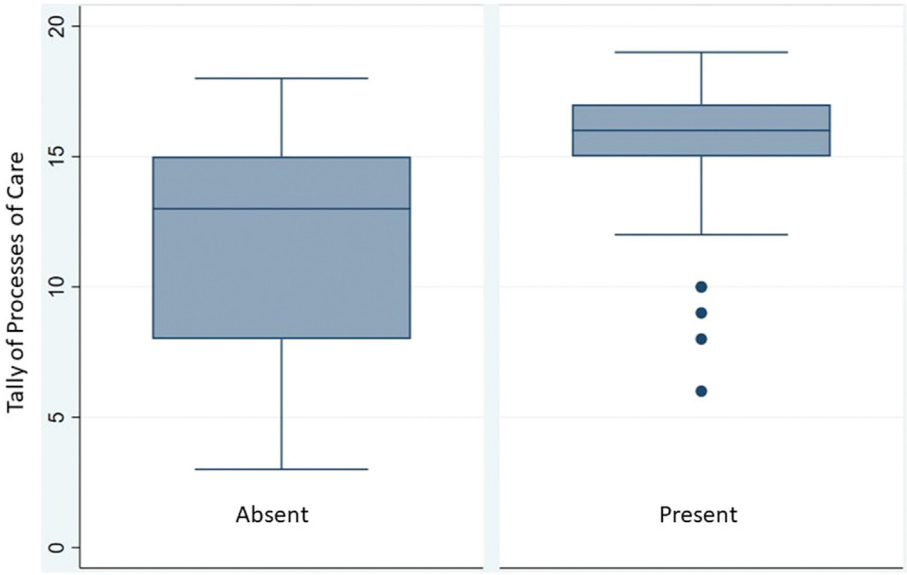

Fig. 2. Speacialist palliative care consultation and 'Processes of Care' box plots.

provided in a ward and overseen by the admitting specialist. In addition, ICU outreach teams act as a safety net,[23] addressing a mismatch between rapid intervention needs of deteriorating patients and available services.[5] However, differentiating between patient deterioration from a reversible condition and dying is inherently challenging.[23–25] Engagement of ICU outreach teams may reflect and/or contribute to uncertainty and delay in determining the goals and intensity of treatment. The heterogeneity of reasons why patients may require ICU outreach services may explain the high variability in the 'Processes of Care' tally evident in the *ICU Outreach Only* cohort. Furthermore, the variability in the nature and composition of ICU outreach teams can compromise the types of decisions that can be made or influenced during outreach. In private health care, ultimate responsibility for EOL care management rests with the admitting consultant.

Given the imperative to 'rescue',[23] ICU clinicians initially focus on resuscitative interventions and prevention of further deterioration. However, assessment by an ICU outreach clinician or ICU admission should also be seen as a trigger for holistic assessment, open conversations about patient deterioration,[26,27] and evaluation of the goals of care and treatment limitations.[5] In this study, there was evidence of recognition that the patient was dying and that the prognosis was discussed with family in 88% of cases. These findings are consistent with a previous study conducted at the same site,[28] elsewhere in Australia,[29,30] and internationally.[31] These actions take time; the time from ICU outreach review or ICU admission to patients' death was not measured. The time available for ICU clinicians to influence EOL conversations and to implement appropriate care for those patients who were dying may have been limited.

For those in the *No ICU Involvement* cohort, the higher tally of 'Processes of Care' likely reflects the treating physician's familiarity with the patient's condition and preferences, earlier recognition of dying, and prioritising of EOL discussions with patients and family about care preferences towards the end of life. Comprehensive and ongoing communication between patients, family, and the treating team is an element of care most commonly cited as a priority towards the end of life,[19,32] and endorsed by the ACSQHC [3,7].

In just more than half of all cases, there was evidence of specialist palliative care consultation, similar to other Australian studies citing referral rates of 40–50%.[25,28] When cohorts were compared, specialist palliative care consultation was significantly more likely for those in the *No ICU Involvement* cohort. Although this study was not designed to test the effect of specialist palliative care consultation on EOL care, where there was evidence of specialist palliative care consultation, on average, there was a higher quality EOL care tally. The timing of specialist palliative care consultation was also not recorded; however, other studies have found that referral to specialist palliative care occurred late in the dying trajectory, often in the final 24–48 h before death.[25,33,34] Only 40% of those in the *ICU Admission* cohort received a specialist palliative care consultation. This correlates with other studies that report rates of referral to specialist palliative care for ICU patients range from 20%[27] to 40%,[35] with referral to specialist palliative care less likely when ICU physicians feel they are able to provide adequate palliative care themselves.[36] Given that the focus of palliative care includes relieving suffering and supporting the needs of families,[37] a specialist palliative care consultation would likely lead to other 'Processes of Care', such as religious and social support and bereavement follow-up being offered.[35]

4.1. Strengths and limitations

The strength of this study is that all inpatient deaths aside from those who died in the operating room or emergency department, across one full calendar year, were included, thereby reducing sample bias. Quantifying quality of EOL care allowed for analysis of factors associated with quality of EOL care and provided baseline data for future research.

There were some limitations. This audit was conducted at a single private acute care hospital. Owing to possible nuances associated with this setting and differences in practice between settings, it may not be possible to make inferences about EOL care quality to other settings. Data related to the timing of individual 'Processes of Care' were not collected, and it is reasonable to suggest that the timing of individual 'Processes of Care' likely impacts quality of EOL care. Furthermore, it was not possible to separate ICU involvement based on the MET, Code Blue team, or ICLNC. For example, a patient may have had multiple interactions with ICU

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clinicians such as ICLNC review, followed by a MET call, Code Blue call, and ICU admission. The clinicians involved may not have been in a position to implement treatment limitations.

There are also limitations associated with the retrospective audit. The audit findings suggested that 12.5% of patients did not have a valid and completed resuscitation plan at death. Resuscitation decisions may have been recorded elsewhere in the medical record, such as in the clinical notes or treatment plan; yet for the purposes of data collection in this audit, the official resuscitation plan document was the only source used to record resuscitation status. An audit is limited by the evidence available in the data source,[38]; therefore, it is also possible that actions taken by clinicians, such as offers for bereavement support, occurred but were not recorded in the medical record.

5. Conclusion

The findings of this study show it is possible to use a tally of processes of care as a proxy measure of EOL care. Although there was moderate alignment between EOL care provided and ACSQHC recommendations, there is scope for improvement. Given that ICU clinicians were involved in the care of the majority of inpatient deaths, ICU clinicians are ideally placed to influence the quality of EOL care. High-quality EOL care begins with early recognition that a patient is dying and early communication about the patient's prognosis with the patient and family. These actions act as precursors to other 'Processes of Care' essential to EOL care quality. In addition to responding to patient deterioration, ICU outreach clinicians have an opportunity to lead and influence discussions about the patient's deterioration with the patient/family, review resuscitation orders, discuss the most appropriate venue for care, and initiate referral for specialist palliative care consultation. Given the number of patients requiring EOL care in acute health services is likely to increase as the population ages, EOL care quality will remain a high priority.

Conflict of Interest

None declared.

CRediT authorship contribution statement

Anthony King: Conceptualisation, Methodology, Project administration, development of the case report form (CRF), data collection and analysis, and writing. **Mari Botti**: Conceptualisation, Methodology, Data checking analysis, Supervision, Writing. **Dean P. McKenzie**: Methodology, Development of the CRF, Data analysis, Writing. **Jonathan Barrett**: Conceptualisation, Methodology, Project administration, Development of the CRF, Writing. **Melissa J. Bloomer**: Conceptualisation, Methodology, Development of the CRF, Data analysis, Supervision, Writing.

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References

[1] Arnold E, Finucane AM, Oxenham D. Preferred place of death for patients referred to a specialist palliative care service. BMJ Support Palliat Care 2015;5(3):294–6.
[2] Goldsbury DE, O'Connell DL, Girgis A, Wilkinson A, Phillips JL, Davidson PM, et al. Acute hospital-based services used by adults during the last year of life in New South Wales, Australia: a population-based retrospective cohort study. BMC Health Serv Res 2015;15(1):537. https://doi.org/10.1186/s12913-015-1202-8.
[3] Australian Commission on Safety and Quality in Health Care. National Safety and Quality Health Service Standards Sydney. NSW: ACSQHC; 2017 [cited 2018 2 June]. Available from: https://www.safetyandquality.gov.au/publications/national-safety-and-quality-health-service-standards/.
[4] Le Guen M, Tobin A. Epidemiology of in-hospital mortality in acute patients admitted to a tertiary-level hospital. Intern Med J 2016;46(4):457–64. https://doi.org/10.1111/imj.13019.
[5] Jones DA, Bagshaw SM, Barrett J, Bellomo R, Bhatia G, Bucknall TK, et al. The role of the medical emergency team in end-of-life care: a multicenter, prospective, observational study. Crit Care Med 2012;40(1):98–103. https://doi.org/10.1097/CCM.0b013e31822e9d50.
[6] Hilton AK, Jones D, Bellomo R. Clinical review: the role of the intensivist and the rapid response team in nosocomial end-of-life care. Crit Care 2013;17(2):224. https://doi.org/10.1186/cc11856.
[7] Australian Commission on Safety and Quality in Health Care. National Consensus Statement: essential elements for safe and high quality end-of-life care. Sydney: ACSQHC; 2015.
[8] Australian Commission on Safety and Quality in Health Care. End-of-life care audit toolkit. Canberra: ACSQHC; 2019. https://www.safetyandquality.gov.au/our-work/comprehensive-care/end-life-care/end-life-care-audit-toolkit.
[9] Davino C, Furno M, Vistocco D. Quantile regression: theory and applications. Chichester, UK: Wiley; 2014.
[10] Hilbe J. Modeling count data. New York: Cambridge University Press; 2014.
[11] McKenzie DP, Mackinnon AJ, Martindale C, Clarke DM. Modelling the frequency of psychiatric admissions. Int J Methods Psychiatr Res 1998;7(3):136–41.
[12] Holm S. A simple sequentially rejective multiple test procedure. Scand J Stat 1979:65–70.
[13] Norman G, Streiner D. Biostatistics: the bare essentials. Raleigh, North Carolina: People's Medical Publishing House; 2014.
[14] Stata Corporation. Stata statistical software: release 15. College Station: StataCorp LP; 2017.
[15] Clark K, Byfieldt N. Improving the quality of care delivered to people imminently dying in hospital by implementing a care bundle: an observational before and after feasibility study. Int J Care Coord 2015;18(1):18–26. https://doi.org/10.1177/2053434515574788.
[16] Jackson K, Mooney C, Campbell D. The development and implementation of the pathway for improving the care of the dying in general medical wards. Intern Med J 2009;39(10):695–9. https://doi.org/10.1111/j.1445-5994.2009.02002.x.
[17] Balboni TA, Balboni M, Enzinger AC, Gallivan K, Paulk ME, Wright A, et al. Provision of spiritual support to patients with advanced cancer by religious communities and associations with medical care at the end of life. JAMA Intern Med 2013;173(12):1109–17. https://doi.org/10.1001/jamainternmed.2013.903.
[18] Anderson RJ, Bloch S, Armstrong M, Stone PC, Low J. Communication between healthcare professionals and relatives of patients approaching the end-of-life: a systematic review of qualitative evidence. Palliat Med 2019;33(8):926–41. https://doi.org/10.1177/0269216319852007.
[19] Virdun C, Luckett T, Davidson PM, Phillips J. Dying in the hospital setting: a systematic review of quantitative studies identifying the elements of end-of-life care that patients and their families rank as being most important. Palliat Med 2015;29(9):774–96. https://doi.org/10.1177/0269216315583032.
[20] ANZICS-CORE MET dose investigators. Mortality of rapid response team patients in Australia: a multicentre study. Crit Care Resusc 2013;15(4):273.
[21] Truog RD, Campbell ML, Curtis JR, Haas CE, Luce JM, Rubenfeld GD, et al. Recommendations for end-of-life care in the intensive care unit: a consensus statement by the American College of Critical Care Medicine. Crit Care Med 2008;36(3):953–63. https://doi.org/10.1097/ccm.0b013e3181659096.
[22] Bellomo R, Goldsmith D, Uchino S, Buckmaster J, Hart GK, Opdam H, et al. A prospective before-and-after trial of a medical emergency team. Med J Aust 2003;179(6):283–7.
[23] Lyons PG, Edelson DP, Churpek MM. Rapid response systems. Resuscitation 2018;128:191–7. https://doi.org/10.1016/j.resuscitation.2018.05.013.
[24] Bloomer MJ, Endacott R, O'Connor M, Cross W. The 'dis-ease' of dying: challenges in nursing care of the dying in the acute hospital setting. A qualitative observational study. Palliat Med 2013;27(8):757–64. https://doi.org/10.1177/0269216313477176.
[25] Gunasekaran B, Scott C, Ducharlet K, Marco D, Mitchell I, Weil J. Recognising and managing dying patients in the acute hospital setting: can we do better? Intern Med J 2019;49(1):119–22. https://doi.org/10.1111/imj.14177.
[26] Bloomer M, Endacott R, Ranse K, Coombs M. Navigating communication with families during withdrawal of life-sustaining treatment in intensive care: a qualitative descriptive study in Australia and New Zealand. J Clin Nurs 2017;26(5–6):690–7. https://doi.org/10.1111/jocn.13585.
[27] Downar J, Rodin D, Barua R, Lejnieks B, Gudimella R, McCredie V, et al. Rapid response teams, do not resuscitate orders, and potential opportunities to improve end-of-life care: a multicentre retrospective study. J Crit Care 2013;28(4):498–503. https://doi.org/10.1016/j.jcrc.2012.10.002.

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[28] Bloomer M, Hutchinson A, Botti M. End-of-life care in hospital: an audit of care against Australian national guidelines. Aust Health Rev 2019;43(4):578–84. https://doi.org/10.1071/AH18215.
[29] Maubach N, Batten M, Jones S, Chen J, Scholz B, Davis A, et al. End-of-life care in an Australian acute hospital: a retrospective observational study. Intern Med J 2019;49(11):1400–5. https://doi.org/10.1111/imj.14305.
[30] Clark K, Byfieldt N, Green M, Saul P, Lack J, Philips JL. Dying in two acute hospitals: would usual care meet Australian national clinical standards? Aust Health Rev 2014;38(2):223–9. https://doi.org/10.1071/AH13174.
[31] Parikh P, Brokaw FC, Saggar S, Graves L, Balan S, Li Z, et al. Has there been any progress in improving the quality of hospitalised death? Replication of a US chart audit study. BMJ Support Palliat Care 2012;2(1):17–23. https://doi.org/10.1136/bmjspcare-2011-000089.
[32] Bischoff KE, Sudore R, Miao Y, Boscardin WJ, Smith AK. Advance care planning and the quality of end-of-life care in older adults. J Am Geriatr Soc 2013;61(2):209–14. https://doi.org/10.1111/jgs.12105.
[33] Bloomer M, Botti M, Runacres F, Poon P, Barnfield J, Hutchinson A. End-of-life care for older people in subacute care: a retrospective clinical audit. Collegian 2019;26:22–7. https://doi.org/10.1016/j.colegn.2018.02.005.
[34] Poulose JV, Do YK, Neo PSH. Association between referral-to-death interval and location of death of patients referred to a hospital-based specialist palliative care service. J Pain Symptom Manag 2013;46(2):173–81. https://doi.org/10.1016/j.jpainsymman.2012.08.009.
[35] Zalenski RJ, Jones SS, Courage C, Waselewsky DR, Kostaroff AS, Kaufman D, et al. Impact of palliative care screening and consultation in the ICU: a multihospital quality improvement project. J Pain Symptom Manag 2017;53(1). 5-12.e3, http://www.sciencedirect.com/science/article/pii/S0885392416303311.
[36] Prizer L, Gay J, Perkins M, Emerson K, Glass A, Miyaski J. Using social exchange theory to understand non-terminal palliative care referral practices for Parkinson's disease patients. Palliat Med 2017;31:861–7. https://doi.org/10.1177/0269216317701383.
[37] World Health Organization. WHO definition of palliative care. 2018 [cited 2018 28 Feb]. Available from: http://www.who.int/cancer/palliative/definition/en/.
[38] LoBiondo-Wood G, Haber J, Nursing Research. Methods and critical appraisal for evidence-based practice. 8th ed. St. Louis, Missouri: Elsevier Mosby; 2014.

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