A retrospective observational study of mortality rates in elderly patients with shock in a New Zealand district hospital ICU

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ABSTRACT

AIM: Admitting very elderly, critically ill patients to ICU is controversial. We compared our mortality data in a subgroup of elderly patients to internationally published outcomes.

METHODS: Tauranga Hospital ICU retrospectively investigated their mortality outcomes for patients with septic shock. The ANZICS adult database (AORTIC), Tauranga Hospital computer records and medical records were used to identify the study cohort and provide information on demographics, admission times and shock types between January 2009 and December 2014. Patients were divided into groups; not old (<74 years), old (75–84 years) and very old (>85 years) to compare survival statistics at ICU discharge, hospital discharge, 28 days, six months and 12 months.

RESULTS: Patients in the >85 year group at Tauranga ICU had a 38.5% survival.

CONCLUSION: With careful selection, elderly patients with septic shock may have an acceptable outcome.

Admitting very elderly patients to intensive care units (ICU) is a controversial issue. With current demographic projections, increasing life expectancy and increasing complexity of interventions, we will see many more elderly patients seeking intensive care services.[1–4] Balancing the benefit intensive care can offer to these patients is often a complex and multidisciplinary decision.[2–3] Pursuing unrealistic goals and expectations is not in the interest of individuals or the public resources.

A review of the very elderly and ICU care concluded that there are contradicting views in the literature, and it is reasonable that selected patients may benefit from ICU level care, but more research is required to identify this group.[1] Emergent admissions in this age group are associated with particularly poor outcomes.[6–7]

This was highlighted in a recent study looking at ICU outcomes in elderly patients with unplanned admissions requiring inotropes for circulatory failure.[8] This secondary analysis of a large multicentre randomised controlled trial showed that a mere 2% of the over 85-year-old group survived to one year.[8–9]

This study raised questions as to the benefit of treating this defined group of very elderly patients, who are commonly referred to intensive care services. We used the study as a basic framework to investigate what our ICU shock mortality rates were, and to draw conclusions on our current practice.

Method

The Bay of Plenty Clinical School Research Unit approved this study. The study was carried out at Tauranga Hospital ICU, Bay of Plenty, New Zealand.

Mortality was compared in patients admitted to Tauranga Hospital ICU with circulatory failure in three age groups: not old (<74 years), old (75–84 years) and very old (>85 years) between 1 January 2009 and 31 December 2014. The study was designed

around the method in the Biston study, and measured standard mortality outcomes.[7]

The ANZICS adult database, AORTIC (Australasian Outcomes Research Tool in Intensive Care), was used to retrospectively find all those patients admitted to Tauranga Hospital ICU with a diagnosis of shock within the specified time period. All shock types were included, for example septic, hypovolaemic, anaphylactic and cardiogenic shock. All patients transferred from the neighbouring hospital in Whakatane who required ICU support were also included.

Inclusion criteria: those with shock under the care of an intensivist where shock was defined as MAP <70mmHg, or systolic BP <100mmHg, and/or requiring inotropic support within the first 24 hours only.

Exclusion criteria: those <18 years, and physiology not suggestive of shock, did not meet inclusion criteria.

The AORTIC database provided data on APACHE II scores (Acute Physiology and Chronic Health Evaluation) and SOFA scores (Sequential Organ Failure Assessment) for each patient at ICU admission. Age adjusted APACHE scores were also recorded. The hospital computer-based record system (Webpas), was used to identify hospital and ICU admission dates, and mortality dates. Medical records confirmed types of shock and inotrope usage within the first 24 hours of ICU admission. Some patients included in the study did not require inotropes within the first 24 hours or at all during their ICU admission, however, these patients were still included if their physiology met the inclusion criteria.

The outcomes measured were patient status (dead or alive) at ICU discharge, hospital discharge, 28 days, six months and 12 months.

Results

AORTIC identified 260 admissions to Tauranga Hospital ICU with shock between 2009 and 2014. Three patients had two admissions for shock. After review of AORTIC data, 10 patients were excluded from the study population, as they did not meet the inclusion criteria. This left a final study cohort of 250 patients, with only one patient having had two admissions of shock.

The demographic data is summarised in Table 1 and Table 2.

APACHE II score was similar across the three age groups—19, 22 and 21—in ascending group order. When adjusted for

Table 1: Main demographic data.

Age (years)		**<74 (n=164)**	**75–84 (n=73)**	**>85 (n=13)**
Male		85 (52%)	46 (63%)	5 (38%)
SOFA		7 (±3.0)	8 (±3.5)	6 (±3.3)
APACHE II		19 (±8.5)	22 (±7.8)	21 (±6.9)
APACHE II minus age		16 (±7.7)	15 (±7.0)	15 (±6.9)
	Urinary	31	20	2
	GI	41	21	6
	Pulmonary	30	12	1
	Soft tissue	18	3	1
	Other	25	7	1
	Unknown	10	7	1
Septic shock	**Total**	155 (95%)	70 (96%)	12 (92%)
Cardiogenic shock		8 (5%)	3 (4%)	0
Other shock		1 (1%)	0	1 (8%)

±Indicates standard deviation.

Table 2: Ethnicity demographics.

Ethnic Group	<74yrs	75-84yrs	>85yrs
NZ European	56.7%	64.4%	84.6%
Māori	32.3%	13.6%	0.0%
European Other	6.1%	22.0%	15.4%
Asian, Pacifica, Indian	4.9%	0.0%	0.0%

age, the groups were more comparable, but the <74 year group appeared to have a slightly worse prognostic prediction, with an age adjusted APACHE II of 16, compared to the other groups both scoring 15. There was no pattern to SOFA scores; (seven, eight and six in ascending group order).

Septic shock was the most common shock type across all groups (94.8%). Gastrointestinal and urinary were the most frequent origin of sepsis. Only 4.4% of patients were admitted with cardiogenic shock, of which none were in the very old group. Only 0.8% of patients were admitted for other shock types (anaphylactic and hypovolaemic).

As age increased, fewer patients had an interhospital transfer. In the >85 year group, eight (61.5%) patients required vasopressor support in the first 24 hours of ICU care. Noradrenaline was the most common vasopressor agent given (62.5%).

Discussion

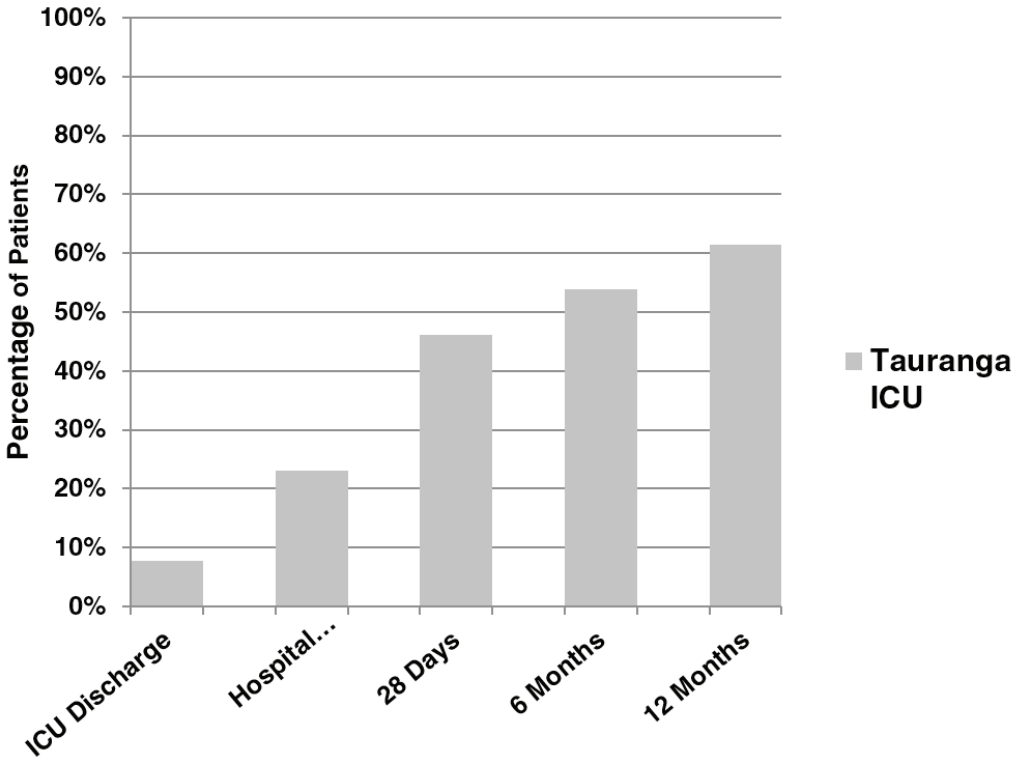
The European study highlighted the fact that the long-term outcome for very elderly patients was particularly poor after a critical illness involving cardiovascular failure that required inotropic support.[8] Outcomes for both acute medical and surgical ICU admissions in this age group have been shown to be poor in many studies, however, the extremely poor survival rate in the Biston study of 2% at one year was unexpected.[7–10] Tauranga is situated in a region of New Zealand with a relatively high proportion of elderly demographic, and the findings of the Biston study had some relevance to our practice.[11] The fact that the Biston study was a secondary analysis of a study looking at inotrope use may have a selection bias, putting this cohort of patients in a very sick group with profound irretrievable shock. This is reflected in their high ICU mortality, although they did mention that many of their patients in the very elderly group had isolated septic shock of urinary tract origin, which is associated with a better prognosis.[12]

Our retrospective observational study focused on shock in the elderly, rather than inotrope or vasopressor use. A significant number of patients in the very old group in our study were discharged from the ICU (92.3%) and survived to hospital discharge (76.9%) (Figure 1). 38.5% of our patients in the very old group survived to 12 months, which surpassed the 2% survival found in the Biston study.[8] Findings from a large Australasia and New Zealand retrospective analysis have shown a trend to a reduction in mortality in sepsis in all age groups.

Table 3: Mortality rates at each outcome.

Age (years)	< 74 (n=164)	75–84 (n=73)	>85 (n=13)
ICU discharge	16.5% (27)	30.1% (22)	7.7% (1)
Hospital discharge	22% (36)	42.5% (31)	23.1% (3)
28 days	23.2% (38)	49.3% (36)	46.2% (6)
6 months	28.7% (47)	56.2% (41)	53.8% (7)
12 months	34.8% (57)	61.6% (45)	61.5% (8)

Figure 1: Mortality rates in the >85 year group.



The hospital mortality for the 2012 >85 year old group was 30.4% (CI 27.9–32.9).[13] Our hospital mortality rate of 23.1% may represent further realisation of this trend, but more likely random variation and small sample size. The six patients receiving vasopressors in the Tauranga >85 year group (61.5%) had outcomes similar to those who merely met the criteria for shock. Numbers are too small for statistical analysis, but it is interesting that vasopressor use did not predict poor outcome.

The one-year survival of our 75 to 84-year-old group is similar to the greater than 85-year-old group, indicating possible selection bias in which we would most likely not treat sicker patients in the very old group. The differences in vasopressor use between the studies were not reflected by the SOFA scores. Inotrope or vasopressor use as a predictor of outcome may be flawed in that it may not in some cases represent cardiovascular failure. Vasopressors may be required to support circulatory function with the addition of sedation and intermittent positive pressure ventilation (IPPV). The use of vasopressors may also represent a specific goal in treatment defined by individualised cardiovascular parameters and fluid volume use. IPPV may be a better predictor of mortality.[14] Initiating IPPV is a significant step in the management of septic shock and indeed any ICU patient. Limitations are often placed around this intervention, accounting for why our cohort had better outcomes.

The ethnic composition of each group was less diverse as the age increased. For New Zealand, it was interesting but not unexpected to see that the Māori cohort was not represented in the very old group. Twenty-five percent of the Bay of Plenty region's population is Māori.[15] The Māori demographic are known to have a shorter life expectancy (73.0 years for Māori males and 77.1 years for females) compared to non-Māori counterparts (80.3 years for non-Māori males and 83.9 years for females).[16]

A major limitation of our study is the small numbers and retrospective nature of the cohort. Although we appear to be achieving an acceptable balance in mortality statistics

in a group of patients that universally have been reported to have a poor outcome, the study does not indicate a clear-cut selection criteria in which we were able to achieve these outcomes. Decisions are made on case-by-case bases, often with multidisciplinary and family input. There is a need to define and improve this process of selecting the patients from this elderly cohort that will benefit from intensive care treatment. Research and validation of frailty scores in many clinical domains, including critical care is showing promise in integrating the spectrum of disease burden and functional reserve with outcomes.[17-18]

Conclusion

The decision whether to admit and treat the very elderly patient with septic shock in ICU is a complex decision. Although age in itself is not a reason to deny a patient ICU admission, it is taken into account in context of the burden of chronic and acute disease.[19-22] The patient selection and subsequent treatment at a secondary level New Zealand hospital produced results that saw most of the patients during a five-year period, including those >85 years being discharged alive from hospital. This study suggests that with carefully considered selection, elderly patients greater than 85 years of age may have an acceptable long-term outcome following an episode of septic shock.

Competing interests:
Nil.

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