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Compliance with processes of care in intensive care units in Australia and New Zealand – a point prevalence study

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SUMMARY

There are indications that compliance with routine clinical practices in intensive care units (ICU) varies widely internationally, but it is currently unknown whether this is the case throughout Australia and New Zealand. A one-day point prevalence study measured the prevalence of routine care processes being delivered in Australian and New Zealand ICUs including the assessment and/or management of: nutrition, pain, sedation, weaning from mechanical ventilation, head of bed elevation, deep venous thrombosis prophylaxis, stress ulcer prophylaxis, blood glucose, pressure areas and bowel action. Using a sample of 50 adult ICUs, prevalence data were collected for 662 patients with a median age of 65 years and a median Acute Physiology and Chronic Health Evaluation II score of 18. Wide variations in compliance were evident in several care components including: assessment of nutritional goals (74%, interquartile range [IQR] 51 to 89%), pain score (35%, IQR 17 to 62%), sedation score (89%, IQR 50 to 100%); care of ventilated patients e.g. head of bed elevation >30 degrees (33%, IQR 7 to 62%) and setting weaning plans (50%, IQR 28 to 78%); pressure area risk assessment (78%, IQR 18 to 100%) and constipation management plan (43%, IQR 6 to 87%). Care components that were delivered more consistently included nutrition delivery (100%, IQR 100 to 100%), deep venous thrombosis (96%, IQR 89 to 100%) and stress ulcer (90%, IQR 78 to 100%) prophylaxis, and checking blood sugar levels (93%, IQR 88 to 100%). This point prevalence study demonstrated variability in the delivery of 'routine' cares in Australian and New Zealand ICUs. This may be driven in part by lack of consensus on what is best practice in intensive care units, prompting the need for further research in this area.

Key Words: critical care, intensive care, quality measurement, quality indicators, healthcare, process assessment (healthcare)

Quality of care and patient safety are essential for patients with critical illness. Current healthcare improvement initiatives recognise that both resources (structure) and clinical activities (processes) must be addressed in combination with local practice contexts (culture) to ensure or improve quality of care[1]. Process measures offer important insights into quality by providing a direct measure of care; however, they are often overshadowed by an emphasis on short-term patient outcomes[2]. Any indicators or measures used to assess process of care must be supported by good clinical evidence or based on either established clinical standards or agreed criteria and include identifiable actions[2].

A set of common evidence-based practices for intensive care unit (ICU) patients, along with related process measures, have been identified, reviewed and recommended based on established level of evidence gradings[3-6]. The 'FASTHUG' mnemonic (Feeding, Analgesia, Sedation, Thromboembolism prophylaxis, Head-of-bed elevation, stress Ulcer prevention and Glucose control) has been widely promoted for use at the bedside[7]. Bowel management and pressure area risk assessment have also been identified as cares that require increased attention[8,9]. Many of these practices have been incorporated into contemporary clinical practice guidelines that are relevant to the treatment of critically ill patients[10-17].

A number of recent studies have reported different levels of compliance with these processes of care in ICUs, indicating that omissions in care may be common[5,8,18-21]. It is not known whether this is the case in Australian and New Zealand (ANZ) practice. The aim of this study was to therefore measure the

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prevalence of routine care actually being delivered in a large sample of ANZ ICUs.

MATERIALS AND METHODS

Setting and patients

A one-day point prevalence study was conducted in 50 ICUs treating adult patients in ANZ on one of three designated days in May/June 2009, as part of the Australian and New Zealand Intensive Care Society (ANZICS) Clinical Trials Group (CTG) point prevalence program. There were a total of 182 adult ICUs (35 tertiary, 39 metropolitan, 49 rural/regional, 59 private) in both countries[22] at the time of recruitment. In order to obtain a large sample of ANZ ICUs, a public invitation to participate was issued via mailing lists to all ANZICS members, including member units of the ANZICS CTG. All patients admitted to the participating ICUs at 1000 hours on the study day were included.

Data collection

Statements exploring process of care activities were developed by the research team after completing a comprehensive literature search, considering relevant recommendations by professional bodies (e.g. National Health and Medical Research Council[14], Institute of Healthcare Improvement[23]), then reviewing and modifying them for clinical appropriateness within the context of ANZ intensive care practice. This informed the development of a study specific case report form (CRF) and data

TABLE 1
Data definitions

Item	Description	Reason 'not applicable'
Nutrition	Any form of caloric intake (i.e. enteral, parenteral, oral). Includes patients who have had feeds suspended temporarily but will be fed for more than half of the study day (or are expected to receive an adequate caloric intake if on intermittent feeds or an oral diet).	Low acuity: patient expected to recover quickly 'Nil by mouth' for gastrointestinal reasons Fasting for surgery Palliative or terminal care Other (please document)
Nutrition within 24 h	Refers to whether nutrition was commenced within 24 h of admission to the ICU.	Unknown (e.g. Patient has been in the ICU <24 h)
Formal assessment of nutritional goals	The prescription of a nutritional goal based on a combination of weight, demographics and biochemistry.	Patient receiving a normal ward diet
Nutritional goals	Achieved when at least 80% of the calculated requirement had been delivered; averaged over the preceeding 24 h.	Patient in ICU <24 h
Pain assessment	Refers to whether the medical team has assessed the patient's pain on the study day. The medical team needed to have asked the patient or bedside nurse about pain.	Medical team had not seen the patient at time of audit or patient has not been in ICU long enough to assess
Patient pain	Refers to whether the patient was experiencing significant pain at the time of audit. 'Significant' pain might be worse than 3/10 on a visual analogue score, or pain that is clearly distressing to the patient or the nurse.	
Pain management plan	Documented by ICU staff, anaesthetist or acute pain service. Standing orders for pain management count as a plan provided they are clearly being applied to the patient.	
Need for sedation	Includes those patients with an artificial airway (endotracheal tube or trachestomy only) and requires sedation for facilitation of ventilation. Excludes patients on non-invasive ventilation and those who do not require sedation for facilitation of ventilation.	
Sedation medications	Includes any drugs given for the purpose of sedation, delivered via infusion or bolus, in the last 24 h. This includes benzodiazepines (midazolam, diazepam etc.) propofol, opioids if used with sedative intent (morphine, fentanyl), dexmedetomidine, antipsychotic drugs used with sedative intent (haloperidol, olanzepine, quetiapine) and other drugs such as chloral hydrate.	
Sedation titration	Includes patients being titrated on the sedation score or level as prescribed by medical staff. Can include extremely deep sedation targeted to an intracranial pressure.	

dictionary (key definitions provided in Table 1) that were piloted by three ICUs and subsequently refined based on feedback from research staff at the pilot sites. On the study day, data was collected by research staff using the CRF and data dictionary on multiple processes of care including nutrition, presence and management of pain, sedation, prophylaxis for venous thromboembolism, ventilation, elevation of the head of bed, stress ulcer prophylaxis, management of constipation, and pressure areas. Items required a 'yes', 'no' or 'not applicable' answer; 'not applicable' was defined as not clinically indicated according to the data dictionary. The definitions provided were used in conjunction with local clinical policies.

TABLE 1
Data definitions (continued)

Item	Description	Reason 'not applicable'
Pharmacological DVT prophylaxis	Includes unfractionated heparin (sodium heparin, calcium heparin), low molecular weight heparin (enoxaparin, dalteparin).	Systematic anticoagulation (heparin/ warfarin/heparinoids/pentasaccharide) or IVC filter
		Coagulopathy/bleeding risk
		Repeat surgery
		Not indicated due to unit policy
		Other contraindication
Mechanical prophylaxis	Includes the use of sequential compression devices, not anti-embolic stockings.	Unit policy
DVT prophylaxis (drug and/or mechanical)	Calculated variable using 'pharmacological DVT prophylaxis' and 'mechanical prophylaxis' variables. Patient receiving either drug prophylaxis or mechanical prophylaxis or both.	
Ventilation	Invasive ventilation is defined as ventilation via an endotracheal tube or tracheostomy, includes CPAP. Patients who are totally unsupported (just receiving supplemental oxygen via an artificial airway) are not considered 'ventilated'.	
Ventilation orders	refers to a written protocol allowing nurse titration of ventilation that is being followed. Ventilation orders were to be reviewed within the previous 24 h.	Patient in ICU <24 h
Readiness to wean from the ventilator	The use of formal techniques including spontaneous breathing trials, negative inspiratory pressure, or rapid shallow breathing index.	
Head of bed elevation	Objective assessment using a protractor when the head of bed was visibly elevated (to the nearest five degrees; categories provided on the CRF).	Haemodynamically unstable
		Unstable spine
		Other defined reason (please indicate)
Stress ulcer prophylaxis	The prescription of proton pump inhibitors (omeprazole, esomeprazole, pantaprazole etc.) or H2 antagonists (ranitidine, famotidine etc.) or sulcralfate.	Unit policy
BSL treatment	Includes patients currently needing treatment for either high or low BSL such as insulin, oral hypoglycaemics for high BSL, oral glucose, food or intravenous glucose for low BSL.	
Pressure area risk assessment tool	Includes Waterlow scale, Braden Scale and others.	Patient in ICU <24 h
Pressure area	Includes anything from stage one, "intact skin with non-blanchable redness of a localised area usually over a bony prominence", to stage four "full thickness tissue loss with exposed bone, tendon or muscle".	
Pressure area interventions	Pressure-relieving devices, positioning the patient off the area, topical or systemic antibiotics, protecting the area from moisture, debridement, cleansing, applying clean dressings, implenting patient (re-) positioning, transferring and turning techniques.	
Bowel management (treatment for constipation)	Patient's bowels not opening normally within the past three days. 'Normal' bowel function excluded patients with diarrhoea.	Patient has experienced significant diarrhoea

ICU=intensive care unit, DVT=deep vein thrombosis, IVC=inferior vena cava, CPAP=continuous positive airway pressure, CRF=case report form, BSL=blood sugar levels.

Data relating to care delivered was collected using the patient's observation charts and medical record, and by questioning the bedside nurse and treating medical staff. Head of bed elevation was measured using an inclinometer (Lev-o-gage®, Sun Company, Inc., Colorado, USA) calibrated in five-degree increments. Clinical and demographic information was collected as part of the overall point prevalence program.

Analysis

Descriptive statistics were used for all clinical and demographic data. Prevalence was the number of cares delivered (or clinical condition present, e.g. patient in pain) divided by the total number of patients. Compliance was calculated as the number of patients who received a process of care, divided by the total number of 'applicable' patient cares. Patient cares deemed 'not applicable' to the patient at the time of audit were excluded (except where indicated in the results). Variability in compliance with processes of care between participating units was examined using medians, ranges and interquartile ranges. No assumptions were made for missing data. Proportions were compared by Chi-square analyses where appropriate, using SPSS version 17 (IBM SPSS Statistics, Chicago, Illinois, USA).

TABLE 2
Patient demographics, n=662

Demographic	IQR/percentage
Age, y*	65 [50-73]
Gender, male	403 (61)
Severity of illness, APACHE II score*	18 [13-24]
Days in ICU, up to and including study day*	4 [2-9]
Re-admissions to ICU	53 (8)
Source of admission to ICU	
Operating theatre	263 (40)
Accident and emergency	150 (23)
Hospital floor	143 (22)
Another ICU/hospital	104 (16)
Most common major diagnostic categories (postoperative)	
Cardiovascular	92 (33)
Gastrointenstinal	64 (23)
Neurological	35 (13)
Trauma	35 (13)
Most common major diagnostic categories (non-operative)	
Respiratory	101 (27)
Sepsis	63 (17)
Cardiovascular	45 (12)
Trauma	44 (12)

IQR=interquartle range, APACHE=acute physiology and chronic health evaluation, ICU=intensive care unit. * Median [IQR]. All other values are n (%).

RESULTS

Fifty ICUs treating adult patients participated (31 tertiary, 12 metropolitan, three rural/regional, four private). This represented 27% of all ANZ adult ICUs (89% of all tertiary units, 31% of metropolitan units, 6% of rural/regional, and 7% of private ICUs). A total of 662 patients were studied – patient demographics are summarised in Table 2.

Overall compliance with processes of care is outlined in Table 3. Considerable variability in compliance with care activities between ICUs was identified (Figure 1). Descriptive and prevalence data for each care component are detailed below.

Nutrition

Some form of nutrition (enteral, parenteral, oral) was being delivered to 80% of patients and not applicable for 18% (6% patients nil by mouth for gastro-intestinal reasons, 3% were low acuity and expected to recover quickly, 2% were fasting for surgery, 1% were receiving palliative/terminal care, and 6% were for other unspecified reasons), leaving 2% patients who received no form of nutrition without identified clinical reasons. Nutritional goals were assessed in 67% of applicable patients and of these goals were achieved in 79%, but not in 21%. In the first 24 hours following admission 38% of applicable patients had not received any nutrition.

Pain

Of all applicable patients, pain had been assessed by the treating medical team in 71%, and 42% had a documented pain score in the preceding four hours. Patients who had their pain levels formally assessed by the medical team appeared more likely to have a documented pain score (46% vs 32%, $\chi^2=9.45$, $P=0.002$). Patients who had surgery up to four days prior to the study day seemed more likely than non-surgical patients to have their pain assessed by the medical team (79% vs 67%, $\chi^2=9.85$, $P=0.002$) as well as a pain score documented in the prior four hours (51% vs 37%, $\chi^2=12.53$, $P<0.0001$). According to bedside nurses, 17% of patients (n=115) were experiencing significant pain, of whom 42% did not have a pain score recorded in the preceding four hours. Of the 115 patients assessed as in pain 80%, had a pain management plan in place. Of applicable patients, 90% had their plan reviewed in the preceding 24 hours.

Sedation and ventilation

There were 301 invasively ventilated patients with 229 patients receiving sedatives to facilitate ventilation. Sedation medication was being titrated to a prescribed level for 87% of patients. A formal sedation score was used to assess 74% of sedated patients. The most frequently used tools were the Riker Sedation-Agitation Scale (32%) and the Richmond Agitation and Sedation Scale (25%). Complete cessation of sedation was evident in 28% of patients on the study day. The main reason (determined by clinical observation) was preparation for extubation (13%); 2% were receiving routine daily interruption of sedation, 1% were over-sedated and 12% had an unspecified reason.

Ventilation orders had been reviewed in 92% within the previous 24 hours. Formal assessment of readiness to wean from mechanical ventilation was conducted in 60% of patients and a weaning plan was set for 52% of patients. The head of bed was visibly elevated for 95% of ventilated patients; the angle was between five and 30 degrees for 60%, 31 to 45 degrees for 30%, and greater than 45 degrees for 10%.

DVT prophylaxis

Pharmacological (drug) DVT prophylaxis was prescribed in 79% (n=518) of patients; of those 45% also received mechanical prophylaxis, 51% received no mechanical prophylaxis and mechanical prophylaxis was not applicable for 4%. Drug prophylaxis was not applicable for 19% of patients (n=127) and in this group 58% received mechanical prophylaxis, 41% received no mechanical prophylaxis

TABLE 3
Compliance with processes of care

Care item	Yes	No	N/A	Total	Compliance percentage
Patient receiving nutrition today	524	10	120	654	98*
Nutritional goals formally assessed	324	213	112	649	67*
Nutritional goals being achieved	237	63	21	321	79
Patient receiving nutrition <24 h	368	222	59	649	62
Patient pain assessed by medical team today	426	174	53	653	71
Pain score documented <4 h	279	380	–	659	42
Pain management plan in place	92	23	–	115	80
Progress of pain management plan reviewed	69	8	12	89	90
Sedation medication titrated to sedation score or prescribed level	200	29	–	229	87
Sedation score used to assess patient	170	59	–	229	74
Ventilation orders reviewed <24 h	262	22	–	284	92
Readiness to wean formally assessed	179	120	–	299	60
Weaning plan set	155	144	–	299	52
Head of bed elevated >30°	114	170	–	284	40
Drug DVT prophylaxis, where appropriate	518	14	127	659	97*
Mechanical prophylaxis	312	323	21	656	51*
DVT prophylaxis, drug and/or mechanical†	601	53	–	654	92
Stress ulcer prophylaxis prescribed	544	91	26	661	86*
BSL checked in past six hours	599	60	2	661	91
BSL targets set	192	12	–	204	94
BSL within range	135	52	–	187	72
Pressure area risk assessment tool used in past 24 h	408	186	61	655	69
Targeted interventions implemented for patients with pressure areas	82	25	–	107	77
Bowels opened normally <3 days	345	209	101	655	68*
Constipation management plan	96	109	–	205	47

N/A=not applicable, DVT=deep vein thrombosis, BSL=blood sugar level. * Numerator='yes'+'not applicable' responses; denominator=total responses, including 'not applicable' responses. † Calculated variable where any form of DVT prophylaxis and valid contraindications to both='yes'.

(the majority of these patients were 'not applicable' for drug prophylaxis due to coagulopathy/bleeding risk), and mechanical prophylaxis was not applicable for 2%. Of the remaining 2% (n=14) of patients who were eligible to receive drug prophylaxis and did not, nine were receiving mechanical prophylaxis, leaving only five patients that did not receive any form of DVT prophylaxis without clinical reasons.

Stress ulcer prophylaxis

Stress ulcer prophylaxis was prescribed for 86% of the patients where applicable. Of the 340 patients possibly at higher risk of stress ulceration (i.e. patients ventilated and/or with a coagulopathy), 12% were not receiving stress ulcer prophylaxis.

Blood sugar level

Overall, 91% of patients had their blood sugar levels (BSL) checked in the previous six hours. Of the 204 patients receiving treatment for high or low BSL, targets were set for 94%. Of the 192 patients with targets set, 27% were not within the desired range. For these 52 patients, all had their BSL checked in the previous six hours, 79% were receiving nutrition, while 19% were not receiving nutrition because of a deliberate clinical decision (2% missing). Patients receiving treatment for high or low BSL appeared more likely to have their BSL checked than patients not receiving glycaemia treatment (99% vs 87%, $\chi^2=22.17$, $P<0.0001$).

Pressure area

A pressure area risk assessment tool (e.g. Waterlow, Braden) had been used in the previous 24 hours in 69% of applicable patients. Of the 110 patients who had one or more identified pressure areas, a risk assessment tool was not used for 35% and no targeted interventions had been implemented for 23%.

Bowel management (constipation)

Just over half of the patients audited (53%) had 'normal' bowel function, 32% of patients had not had a normal bowel action in the previous three days, while 15% had experienced diarrhoea with or without aperients. Of the 209 patients who had not had a normal bowel action, 53% did not have a constipation management plan in place.

DISCUSSION

Major findings

Our findings demonstrated variability in the delivery of routine interventions in ICUs in Australia and New Zealand. Care components delivered consistently included nutrition delivery, DVT and stress ulcer prophylaxis, as well as blood sugar management. These findings are consistent with previous international studies[5,19-21] and are not surprising given these aspects of intensive care practice are reasonably well-established[11,14,17,23]. Conversely, wide variations in compliance were evident in

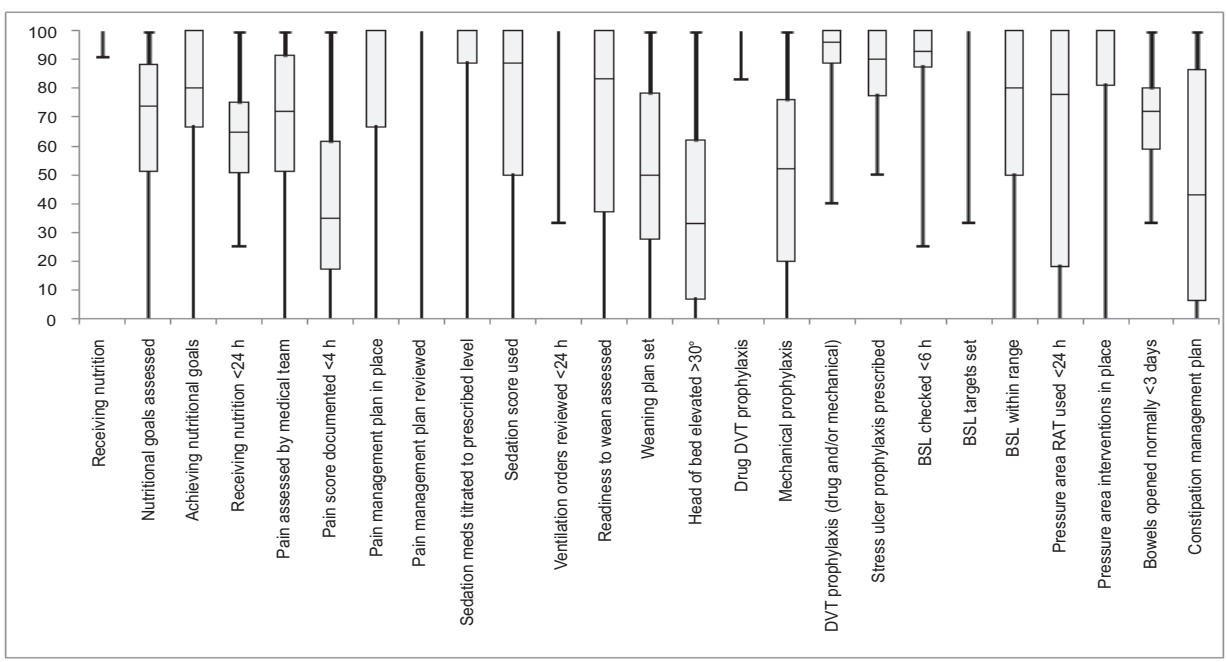

FIGURE 1: Box and whisker plots illustrate medians (horizontal lines), interquartile ranges (shaded box), and range amongst intensive care units. Medians and interquartile ranges are not evident when these measures are at 100%. DVT=deep vein thrombosis, BSL=blood sugar level, RAT=Risk Assessment Tool.

several aspects of care: assessment of nutritional goals, pain and sedation, care of ventilated patients (particularly head of bed elevation and weaning practices), as well as pressure area and bowel management practices. This is also consistent with previously reported findings from the United States of America[5,20], United Kingdom[21] and Canada[19].

While it was beyond the scope of this point prevalence study to determine the reasons for omissions of care, there is evidence to suggest many may be due to preventable slips and lapses that can lead to adverse patient events[24]. Human error has been identified as a factor in 55% of largely preventable ICU incidents. Violations of standard practice were a cause in 28%, distractions were a cause in 22% and slips occurred in 18%[25]. Evidence of omissions in care highlights the need for clinician support tools such as checklists, daily goals forms and regular audits to enhance work practices and the delivery of routine care[9,26,27]. It was unknown how many of the participating ICUs used any support tools at the time of the study, although this should be a topic for further study.

The lack of convincing clinical evidence and/or agreement around some of the indicators is another factor that may have influenced some of our results. For example, inconclusive evidence on the benefit of early enteral nutrition[28-30] makes it unclear whether the 38% of patients not receiving nutrition in the first 24 hours represents deficient practice or is a result of the lack of agreement on this practice. Clinical practice guidelines[10] recommend that enteral feeding be commenced within the first 24 to 48 hours following admission, however due to the practicalities of this one-day point prevalence study, only the previous 24 hours was reviewed. Another recommended practice that displayed considerable variability and may be viewed as a deficiency was the formal assessment of nutritional goals. Although this is considered best practice, it is currently based on low-level evidence and may not be feasible or necessary for all patients. Further studies are therefore needed to help inform practice guidelines for these aspects of care.

Although clinical evidence is far from definitive, best practice recommendations for analgesia and sedation management in mechanically ventilated adults have been developed[12,13] and include regular assessment of pain and sedation with validated scales, setting goal scores and regularly reviewing response to treatments[12,13]. Regardless of whether we examined mechanically ventilated patients or all ICU patients, our findings on pain management were similar; over a quarter did not have their pain assessed by the medical team and over half did not have a recent pain score documented, including those in pain according to the bedside nurse. The finding that postoperative patients seemed more likely to have their pain assessed and documented may suggest a focus on those patients where pain is anticipated. However the observational research design precludes establishing cause-and-effect relationships.

For sedation, a quarter of mechanically ventilated patients receiving sedatives were not assessed with a formal sedation scale, potentially leading to prolonged duration of mechanical ventilation and length of stay[31]. Our findings also demonstrated that a daily 'sedation hold'[32] has not been widely adopted in ANZ practice, with only 2% of patients receiving routine daily interruption of sedation. This is consistent with an earlier ANZ study[33], and reflects a practice preference to titrate the sedative dose to a defined endpoint while remaining consistent with practice guidelines for mechanically ventilated patients[12,13].

Other deficiencies in practice for mechanically ventilated patients were apparent. Almost two thirds of patients were positioned lower than the recommended 30 to 45 degrees head of bed elevation[17,23], which exposes patients to an increased risk of aspiration of gastric contents[34] and nosocomial pneumonia[35]. Despite some evidence suggesting that daily weaning assessments reduce the duration of mechanical ventilation,[36] compliance with weaning practices (i.e. assessing readiness to wean and setting weaning plans) was only moderate, with significant variability noted between ICUs.

Evidence for delivery of stress ulcer prophylaxis can be interpreted in two ways; either delivered routinely in the ICU[23] or for high-risk patients only[37]. While overall compliance in this and earlier point prevalence studies[20,37] was relatively high, the wide range in compliance across ICUs (50 to 100%) may reflect disparate views by clinicians. A small proportion of patients (12%) possibly at high risk of bleeding were also not receiving stress ulcer prophylaxis; this may indicate omissions in care rather than deliberate clinical decision. Conversely, there appears to be general agreement about delivering DVT prophylaxis to ICU patients[14,38]; almost all eligible patients in this study received pharmacological or mechanical DVT prophylaxis (97%), confirming previous work demonstrating wide implementation in ANZ ICUs[39].

Management of blood glucose levels is also important in clinical management of ICU patients. A large majority (91%) of patients in this study had their BSL checked within the previous six hours. Although over a quarter of patients with targets set were not within the prescribed target range, all had

blood sugar estimations in the previous six hours, as did those patients receiving treatment for high or low BSLs. These findings could reflect the difficulty in maintaining BSLs, rather than inadequate management[40].

Our findings regarding prevalence of pressure areas, the use of risk assessment tools and targeted interventions are similar to a previous Australian study[41]. Although assessment tools for pressure areas were not used in almost a third of patients, the efficacy of these instruments has been questioned[42]. That aside, 23% of patients with pressure areas were not receiving relevant care[16].

Constipation is considered common in critically ill patients. In this study one third of patients had not had a bowel action in the previous three days and of these, over one-half did not have a constipation management plan. The evidence for deleterious effects of constipation is however contradictory[43,44] and there are also issues with definition, with claims that the common state of non-defecation in critically ill patients is often (and perhaps inappropriately) treated the same as constipation which could be quite rare[45].

Study strengths and limitations

This study required research nurses to ask treating clinicians about and document actual care delivery. This approach enabled determination of compliance with care, rather than compliance with documentation of care and is more credible than surveys capturing individual's perceptions of adherence which may elicit results that differ from actual practice[46]. This study examined a number of areas of care at one point in time, which provided a unique snapshot of care that has not been attempted previously. As this study included almost 90% of all tertiary ICUs in ANZ, we have a clear indication that omissions in care do occur – even in ICUs within teaching hospitals.

One limitation of this and similar work is that there continues to be no general consensus about the evidence for some elements of care, which means that some of our results need to be interpreted with caution. There were also methodological limitations to this bi-national point prevalence study. Sampling from self-selected ICUs, most of which were involved in CTG studies, may not be representative of overall ANZ practice. Although there was good representation of tertiary ICUs in the sample, ICUs from metropolitan, rural/regional and private hospitals were under-represented. Arguably, participating units from teaching hospitals understand and implement the evidence base for current practice and this may potentially underestimate the overall rate of omissions in care.

Findings derived from a single time-point, cross-sectional analysis may not reflect usual practice, although this method has been used in previous international studies[37,39,47]. This study design does not provide insight into why there are variations in practice both within and between ANZ ICUs. Despite the development work for the CRF and data dictionary, there were still some ambiguities around definitions. For example, it is unlikely that questions relating to weaning were answered consistently across sites since the definition of 'weaning' is generally unclear and both the practice of assessing weaning readiness and methods of weaning can vary greatly[47].

The way forward involves further research in a number of areas including: large pragmatic clinical trials focussing on processes of care where there is currently equivocal evidence; examining the reasons for variability in practice, including the impact of ICU culture and the lack of consensus about clinical evidence; quality improvement studies evaluating the impact of clinician support tools on practice adherence; and the impact of variability in practice on patient outcomes.

CONCLUSION

There appears to be some lack of uniformity in the delivery of 'routine' cares in ANZ ICUs. It may be important to implement mechanisms that ensure patients receive every applicable care consistent with current best practice. However, there is lack of consensus around what is best practice in ICUs, which requires increased attention given these findings. The results of this study highlight the need for further process of care research in ANZ ICUs.

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