RESUSCITATION STATUS AND CHARACTERISTICS AND OUTCOMES OF PATIENTS TRANSFERRED FROM SUBACUTE CARE TO ACUTE CARE HOSPITALS: A MULTI-SITE PROSPECTIVE COHORT STUDY

Running Head: Resuscitation status and inter-hospital transfers

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RESUSCITATION STATUS AND CHARACTERISTICS AND OUTCOMES OF PATIENTS TRANSFERRED FROM SUBACUTE CARE TO ACUTE CARE HOSPITALS: A MULTI-SITE PROSPECTIVE COHORT STUDY

Running Head: Resuscitation status and inter-hospital transfers

ABSTRACT

Aims and objectives: To examine the relationship between resuscitation status and i) patient characteristics, ii) transfer characteristics and iii) patient outcomes following an emergency inter-hospital transfer from a subacute to an acute care hospital.

Background: Patients who experience emergency inter-hospital transfers from subacute to acute care hospitals have high rates of acute care readmission (81%) and in-hospital mortality (15%).

Design: This prospective, exploratory cohort study was a subanalysis of data from a larger case-time-control study in five Health Services in Victoria, Australia. There were 603 transfers in 557 patients between August 2015 and October 2016. The study was conducted in accordance with the STrengthening the Reporting of Observational studies in Epidemiology guidelines.

Methods: Data were extracted by medical record audit. Three resuscitation categories (full resuscitation; limitation of medical treatment (LOMT) orders; or not-for-cardiopulmonary resuscitation (CPR) orders) were compared using Chi-square or Kruskal Wallis tests. Stratified multivariable proportional hazard Cox regression models were used to account for health service clustering effect.

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Findings: Resuscitation status was 63.5% full resuscitation; 23.1% LOMT order and 13.4% not-for-CPR. Compared to patients for full resuscitation, patients with not-for-CPR or LOMT orders were more likely to have rapid response team calls during acute care readmission or to die during hospitalisation. Patients who were not-for-CPR were less likely to be readmitted to acute care and more likely to return to subacute care.

Conclusions: Two-thirds of patients in subacute care who experienced an emergency inter-hospital transfer were for full resuscitation. Although the proportion of patients with LOMT and not-for-CPR orders increased after transfer, there were deficiencies in the documentation of resuscitation status and planning for clinical deterioration for subacute care patients.

Relevance to Clinical Practice: As many subacute care patients experience clinical deterioration, patient preferences for care need to be discussed and documented early in the subacute care admission.

Keywords: Clinical deterioration; Goals of Care; Do-Not-Resuscitate Orders; Cardio-Pulmonary Resuscitation; Resuscitation Decisions; Resuscitation Policies; Withholding Resuscitation; Rehabilitation; Subacute Care

RESUSCITATION STATUS AND CHARACTERISTICS AND OUTCOMES OF PATIENTS TRANSFERRED FROM SUBACUTE CARE TO ACUTE CARE HOSPITALS: A MULTI-SITE PROSPECTIVE COHORT STUDY

INTRODUCTION

There is a large body of knowledge regarding recognising and responding to clinical deterioration in patients located in acute care hospitals (Jones 2014, Jones et al. 2018, Jones et al. 2013, Jones et al. 2012b) however clinical deterioration of patients located in subacute care hospitals is not well understood. Subacute care includes rehabilitation or geriatric evaluation and management (GEM) (also called slow stream rehabilitation) and is multidisciplinary care focused on optimising physical and mental function and quality of life (Australian Institute of Health and Welfare 2013). Clinical deterioration in subacute care hospitals usually culminates in an emergency inter-hospital transfer to the emergency department (ED) of an acute care hospital (Considine et al. 2013, Considine et al. 2019). Patients who experience an emergency inter-hospital transfer from a subacute care to an acute care hospital often (76%) require ED care, have high rates of acute care readmission (81%) and 15% die during the same episode of

hospitalisation. This raises questions about whether ambulance transfer, ED care and acute care readmission are the appropriate response to clinical deterioration in patients in subacute care hospitals (Considine et al. 2019).

BACKGROUND

Full resuscitation is the default status for all hospitalised patients. However some patients will have specific resuscitation orders, including not-for-cardiopulmonary resuscitation (CPR) or limitation of medical treatment (LOMT) orders that may preclude interventions such as intensive care unit admission or mechanical ventilation. Patients' values and care preferences can inform decisions about resuscitation status, and conversations regarding resuscitation status should include understanding the elements of care patients would decline if they had decision making capacity (Thomas et al. 2014). In most Australian hospitals, not-for-CPR and LOMT orders apply only to the patient's current condition and not to conditions that may or may not occur in the future; therefore not-for-CPR and LOMT orders do not function as advance care plans (State Government of Victoria 2014). The key concepts underlying advance care planning are comfort, quality of life, respect and shared decision-making through proactive care planning.

In hospital settings, nurses are the professional group that have the most direct care contact with patients and their families. They are also the professional group with the greatest responsibility for patient assessment, interpretation of clinical data, recognition of clinical deterioration and escalation of care (Considine & Currey 2015). Clinical deterioration is defined as movement "from one clinical state to a worse clinical state which increases their individual risk of morbidity... or death" (Jones et al. 2013). For nurses, the recognition of clinical deterioration requires a response which can include managing the patient's deterioration within nursing scope of practice and current medication orders; activating the rapid response team (RRT); or commencing basic life support and activating the cardiac arrest team. A key driver of nurses' decisions regarding the appropriate response to clinical deterioration is the accurate documentation of the patient's resuscitation status. Recent Australian data show that only 13.1% of patients in acute care and 46.6% of patients in subacute care hospitals have a documented LOMT order (Considine et al. 2019).

Aim

The aim of this study was to examine the relationship between resuscitation status (full resuscitation, LOMT orders or not-for-CPR orders) and i) patient characteristics, ii) transfer

features and iii) patient outcomes in patients who experienced an emergency inter-hospital transfer from a subacute care to an acute care hospital for clinical deterioration.

METHODS

Design

This prospective, exploratory cohort study is a subanalysis of data derived from a larger case-time-control study (Considine et al. 2019). The study was conducted in accordance with the STrengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines (von Elm et al. 2007) (see Supplementary File 1).

Setting

This study was conducted in 21 wards from eight subacute care hospitals in five Australian health services. Each health service comprised a cluster of hospitals with geographically separate acute and subacute care hospitals.

Participants

The study population was patients admitted to inpatient rehabilitation or GEM units at the subacute care hospitals. Data were collected on consecutive emergency inter-hospital transfers from subacute care to acute care hospitals between 22 August 2015 and 30 October 2016. . Patients receiving palliative care were excluded and post-transfer data were unavailable for transfers to non-study sites. Ethical approval, including a waiver of consent, was obtained from the Human Research Ethics Committees at each health service in the study and Deakin University.

A sample size of at least 500 patient transfers achieves more than 80% power to detect an effect size (defined as square root of Chi-square statistic divided by sample size) of 0.15 using a 2 degrees of freedom Chi-Square test with a significance level (alpha) of 0.05 for bivariate comparisons of Full Resuscitation, LOMT, and Not For CPR groups using chi-square tests. An effect size between 0.1 to 0.3 is considered a medium effect size according to Cohen (Cohen 1988), as such the study has enough power to detect moderately small differences. In addition a sample size of 500 meets the rule of thumb requirement of at least 10 events per risk factor for performing robust multivariable analyses such as multinomial logistic regression model and Cox regression.

Data collection

Comorbidity status was calculated using ICD-10-AM (International Classification of Diseases, 10th Revision, Australian Modification) codes (Frost et al. 2009, National Centre for Classification in Health (NCCH) 1998, Quan et al. 2005) to determine the Charlson Comorbidity Index (Charlson et al. 1987). The Functional Independence Measure (FIM score) was calculated on subacute care admission and ranged from 18 to 126; the higher the score, the more independent the patient) (Bernard et al. 2016). For the purpose of this study, resuscitation status was classified as:

- 1) Full resuscitation: patients had full resuscitation orders clearly specified or no documentation of resuscitation status, thereby defaulting to full resuscitation;
- 2) Limitation of Medical Treatment (LOMT) orders: patients had specific limitations of medical treatment, often including not-for-CPR, but with other orders for escalation of care.
- 3) Not-for-CPR: patients had a documented not-for-CPR order, which also commonly specified not for defibrillation, endotracheal intubation or intensive care admission.

Data analysis

Descriptive statistics were used to summarise the study data. Chi-square or Kruskal Wallis tests were used to examine relationships between the variables and test the hypotheses that there were associations between resuscitation status and patient characteristics, transfer characteristics and patient outcomes following transfer. Because there were three nominal outcome categories (full resuscitation, LOMT and not-for CPR), multinomial logistic regression models were implemented for each potential confounder one at a time. For all comparisons, the 'full resuscitation' group was the reference group and odds ratios (OR), with 95% CIs, of 'LOMT' and 'not-for CPR' relative to the 'full resuscitation' group across different strata of the potential risk factors were reported. Length of stay was considered as time-to-event data and stratified multivariable proportional hazard Cox regression models were used to account for hospital clustering, with the median length of stay and confidence intervals (95% CIs) reported. IBM SPSS Statistics v24 (IBM Corporation 2016) was used for the analysis and a p-value of ≤ 0.05 was considered statistically significant. The patient was transferred to a non-study site acute care hospital in 32 (5.3%) transfers, therefore transfer and outcome data were not available for these transfers. In total, data were collected from 603 transfers in 557 patients.

RESULTS

There were 603 emergency inter-hospital transfers from subacute to acute care hospitals in 557 patients. Common reasons for transfer were: neurological (19.3%), respiratory (14.0%), cardiac (13.9%), gastro-intestinal (12.8%) issues; sepsis or febrile illness (13.0%); or falls (8.1%). For 63.5% (n=383) transfers from subacute care, patients were for full resuscitation; in 23.1% (n=139) of transfers, a LOMT order was documented and for 13.4% (n=81) of transfers the patient was not-for-CPR. Of the 383 transfers whereby the patient was for full resuscitation, 33.5% (n=202) had full resuscitation status clearly documented and for 30.0% (n=181) of transfers there was no documentation regarding resuscitation status, thus defaulting to full resuscitation. There was a significant increase in the proportion of patients with LOMT orders (31.0%) or not-for-CPR (17.2%) following transfer (Table 1).

** Table 1 here

A total of 82 (14.7%) patients died during their health service stay: 7 died in ED, 53 died during acute care readmission and 22 died following their return to subacute care. Transition to end-of-life care was documented for 7.9% (n=44/557) of patients following transfer from subacute to acute care. Almost half of the patients who transitioned to end-of-life care (n=21/44) were discharged from the health service to a hospice or residential aged care facility.

Resuscitation status and patient characteristics

There were no significant relationships between resuscitation status and patient gender, country of birth or preferred language other than English (Table 1). Older people, those with multiple comorbidities, or those with lower FIM scores on subacute care admission were more likely to have a not-for-CPR or LOMT order documented during their subacute care admission. Patients admitted to Geriatric Evaluation and Management were more likely to have LOMT or not-for-CPR orders compared to patients admitted for rehabilitation (Table 1).

Resuscitation status and transfer characteristics

Resuscitation status and transfer characteristics are summarised in Table 2. There were no significant associations between resuscitation status and transfer day of the week (p=0.231) or overnight transfers (p=0.398). Emergency ambulances were used less commonly in transfers of not-for-CPR patients (67.3%) than in patients with LOMT orders (81.4%) or those for full resuscitation (74.3%), but this difference was not statistically significant (p=0.702). For three-quarters (n=455/571) of the transfers, patients required care in the ED; only 17.7% (n=101/571)

of transfers resulted in patients being readmitted directly to an acute care ward. Resuscitation status had no significant influence on ED triage categories ($p=0.056$).

** Table 2 here

Resuscitation status and patient outcomes

Most transfers (82.5%, $n=471/571$) resulted in patients being readmitted to acute care and there was no significant difference in acute care hospital readmission by patient resuscitation status ($p=0.489$) (Table 4). Only 13.5% ($n=77$) of patients transferred returned to their subacute care hospital without readmission to acute care (Table 3). The odds of being transferred back to subacute care versus transferred to home or usual residence after the acute care readmission was 3.46 times higher (95% CI: 1.19-10.05; $p=0.011$) for patients with not-for-CPR status compared to those for full resuscitation (the reference category).

** Table 3 here

During the acute care readmission ($n=471$), 25 patients had an intensive care unit (ICU) admission; of these, most ($n=18/25$) patients were for full resuscitation and the other seven patients had a LOMT order, but none specified not for ICU admission. In contrast, the odds of a patient having a RRT call during their acute care readmission was significantly ($p=0.002$) higher for those with a LOMT order (OR=2.38, 95% CI:1.35-4.19) or not-for-CPR (OR=2.00; 95% CI:1.12-3.57) compared to those designated for full resuscitation (Table 4). Compared to patients designated for full resuscitation, in-hospital mortality was higher for patients who had not-for-CPR orders in place (OR=5.13) ($p=0.001$) and those with LOMT orders (OR=2.47) ($p=0.001$) (Table 3).

Comparisons of ED and hospital length of stay by resuscitation status are presented in Table 4. The median length of stay in subacute care prior to transfer was 8.0 days for patients designated for full resuscitation, 13.0 days for patients with LOMT orders and 9.0 days for patients who had not-for-CPR orders. There were no significant associations between resuscitation status and median length of stay in subacute care prior to transfer ($p=0.298$), ED length of stay ($p=0.695$), acute care readmission length of stay ($p=0.396$), or overall health service length of stay ($p=0.983$).

DISCUSSION

This study had four major findings. First, not-for-CPR or LOMT orders were more common in patients who were older, had multiple comorbidities, lower functional independence and who were admitted to GEM units. Second, resuscitation status had no relationship with any of the transfer characteristics examined (time and day of the week; use of emergency ambulances; need for ED care or ED triage category). Third, compared to patients for full resuscitation, patients with not-for-CPR or LOMT orders were more likely to have RRT calls during acute care readmission or to die during their hospitalisation and patients who were not-for-CPR were less likely to be readmitted to acute care and more likely to be transferred back to subacute care. Finally, the study results show clear deficiencies in the documentation of resuscitation status and planning for clinical deterioration for patients in subacute care. These major findings will be discussed in the sections to follow.

It is not surprising that resuscitation status was associated with specific patient characteristics and our study findings that age, comorbidities and functional independence influence resuscitation status resemble those of other studies. A number of studies have shown that patients with LOMT or not-for-CPR orders are more likely to be older, female, and have multiple comorbidities (JÄDerling et al. 2013, Jones et al. 2012a, Stream et al. 2018). Other patient characteristics associated with LOMT or not-for-CPR orders are hospitalisation in the preceding six months (Stream et al. 2018), admission under a medical unit (Jones et al. 2012a), living in residential aged care or supported accommodation (Jones et al. 2012a) and hospital admission for an acute event (JÄDerling et al. 2013).

Studies of readmission to acute care from subacute care show that advanced age, lower functional independence, polypharmacy, certain clinical diagnoses and longer stay in acute care prior to subacute care admission were predictive of hospital readmission from inpatient rehabilitation (Hammond et al. 2015, Morandi et al. 2013, Slocum et al. 2015). Given we have some understanding of the subacute care patients who are at risk of acute care readmission and the characteristics of patients with and without LOMT or not-for-CPR orders, the challenge is to integrate this information to ensure that the resuscitation status is appropriate to the patient's clinical condition and congruent with patient and family values and preferences. Further, there are a number of tools that can assist clinicians to identify patients with a higher likelihood of death in the following 6 to 12 months (National Gold Standards Framework Centre 2019, The University of Edinburgh 2019, Woolfield et al. 2019) which may provide clinicians with some

guidance about resuscitation status, admission to intensive care, degree of respiratory or haemodynamic support, inter-hospital transfer, and end-of-life care and prompt meaningful and evidence-informed conversations with patients and families.

The second major finding was that we did not identify a relationship between resuscitation status and any of the transfer characteristics examined. The majority (79.7%) of patients in this study however did require ED care following transfer and there was no relationship between resuscitation status and triage category suggesting that resuscitation status is not related to clinical urgency. Despite issues of ED overcrowding (Sun et al. 2013), the ED remains the most common portal of entry to acute care and direct admission to acute care wards is uncommon, even following transfer from a subacute care site within the same health service (Considine et al. 2019, Vilpert et al. 2018). Alternatives to the ED should be considered for patients who clearly need acute care readmission. Decisions relating to the inter-hospital transfer were appropriately focused on the clinical needs of the patient, although resulting in high resource use, particularly ambulance and ED services.

The third major finding was that compared to patients for full resuscitation, patients with not-for-CPR or LOMT orders were more likely to have RRT calls during acute care readmission or to die during their hospitalisation. LOMT and not-for-CPR orders and RRT calls are not mutually exclusive: there are patients with LOMT and not-for-CPR orders who receive RRT reviews and there are patients who, as a result of an RRT review, receive LOMT and not-for-CPR orders. RRTs in patients with pre-existing LOMT and not-for-CPR orders are not uncommon. A recent systematic review of 31 studies involving 47,850 patients reported that not-for-CPR or LOMT orders are present in 1.5% to 32.5% of patients at the time of RRT review (Pearse et al. 2019). Further, other studies report that 20% to 35% of patients had LOMT or not-for-CPR orders in place prior to RRT calls (Casamento et al. 2008, Jones et al. 2012a) (JÄDerling et al. 2013, Jones et al. 2007) and that RRT calls on the same day as the LOMT or not-for-CPR orders occur in 35% to 46.1% of these patients (JÄDerling et al. 2013, Jones et al. 2007). Alternatively, LOMT and not-for-CPR orders can be an outcome of an RRT call. The same systematic review described previously showed that LOMT and not-for-CPR orders occur post RRT review in 1.3% to 62% of patients (Pearse et al. 2019). Australian data show that LOMT or not-for-CPR orders occur following RRT calls in 11% - 13% of patients (Casamento et al. 2008, Jones et al. 2012a). These findings raise questions about care planning and access to palliative care clinicians in patients who may benefit from that service. The reasons for nursing

staff to make RRT calls in patients with LOMT and not-for-CPR orders warrant further investigation as it may be that poor symptom control was the catalyst for the RRT call, but it may also be that patients with LOMT and not-for-CPR orders can have reversible issues that warrant urgent intervention.

In our study, in-hospital mortality was 15% and was higher for patients who had not-for-CPR orders in place (OR=5.13) and those with LOMT orders (OR=2.47) ($p<0.001$) compared to patients designated for full resuscitation which is not surprising given the goals of care for these patients. This finding is similar to studies of RRT calls that show patients with LOMT who have an RRT call are significantly more likely to die in hospital than patients without LOMT [48.4% versus 12.3%, $p<0.001$ (Jones et al. 2012a); 60.6% versus 6.6%, $p<0.001$ (JÄDerling et al. 2013)]

Patients who were not-for-CPR were less likely to be readmitted to acute care and more likely to be transferred back to subacute care than patients who were for full resuscitation. Our study showed that episodes of acute illness requiring ED care and acute care readmission may be expected in patients from subacute care hospitals. This finding is consistent with other work that showed one in four patients in post-acute care required acute care readmission from post-acute care and that the risk factors for acute care readmission were inadequate transition of care processes or mismatch between patient needs and resources available in the subacute care setting (Burke et al. 2016). Following acute care readmission, patients with LOMT or not-for-CPR orders were more likely to be discharged to residential aged care or hospice care, compared to patients designated for full resuscitation, who were transferred back to subacute care or discharged home/usual residence. A geriatric and/or palliative care assessment may have informed decisions about resuscitation status for patients in our study, considering they were older with complex care needs.

Finally, our study showed clear deficiencies in the documentation of resuscitation status and planning for clinical deterioration for patients in subacute care. One third (30%) of patients who experienced an emergency inter-hospital transfer from a subacute to acute care hospital for clinical deterioration had no documentation of their resuscitation status, thus defaulting to full resuscitation, despite having a median age of 80 years, multiple comorbidities and only moderate functional independence on subacute care admission. These results are similar to previous

studies that showed less than 30% of patients in subacute care and 34% of ICU patients had their resuscitation status recorded (Orford et al. 2016, Tan et al. 2013).

There were modest changes to documentation of resuscitation status increased after transfer, with LOMT and not-for-CPR orders increasing by 7.9% and 3.8% respectively and full resuscitation orders decreasing by 11.7%, however, post transfer, 51.8% of patients were still designated as full resuscitation. Increasing age, higher comorbidity score and lower functional independence were all associated with more LOMT and not-for-CPR orders, compared to full resuscitation. Ideally, resuscitation status should be documented in the early stages of the original acute care admission, preceding subacute care admission, and if this has not occurred, then documentation of resuscitation status should occur on subacute care admission, before clinical deterioration occurs.

Failure to document resuscitation status has significant implications for nurses who carry the highest level of responsibility for recognising clinical deterioration and escalating care. When clinical deterioration occurs in the absence of documentation of resuscitation status, nurses are usually required by their hospital policies to escalate care either to the RRT or cardiac arrest team. In acute care hospitals, these teams tend to be ICU led with ready access to specialist critical care staff (Considine et al. 2018). In subacute care hospitals however, the RRT response will be onsite medical staff within hours but out-of-hours the most common response to patients fulfilling RRT activation criteria or who have experienced cardiac arrest is to call an emergency ambulance (Considine et al. 2018) which then compels paramedics to engage in active treatment and transport to an emergency department.

Our data suggest that escalations of care may be necessary in patients located in subacute care hospitals who have LOMT or not-for-CPR orders. In this study 33.5% of patients with LOMT and 15.3% of patients with not-for-CPR orders were transferred by emergency ambulance. Acute care readmission occurred in 29.7% of patients with LOMT and 17.8% of patients with not-for-CPR orders suggesting that the transfer was warranted. The reasons for escalation of care are unclear and should be the focus of further work. It may be proposed that unplanned emergency transfers to an acute hospital may be related to resource constraints at the subacute care hospital such as limited medical and nurse staffing, limited or no access to imaging or pathology testing, and limited capacity to deliver respiratory or haemodynamic support. Alternatively, it may be that these patients, despite their resuscitation status, had clinical deterioration that was reversible

and treatable or that they had symptoms that required management beyond the resources of subacute care hospitals.

Strengths and Limitations

This study was conducted in five health services in Victoria, Australia and included the largest reported cohort, to date, of patients in subacute care who experienced clinical deterioration. This was a prospective study, however, it was beyond the aim of the study to examine whether the transfers could have been prevented. The high acute care readmission rate and lack of association between resuscitation status and transfer features would suggest many of the transfers were warranted. The use of medical record data has inherent limitations and collecting data across transitions of care resulted in missing data related to the transfer and patient outcomes; however, this occurred in only 32 of the 603 transfers. Review of the data relating to resuscitation status showed that some data collector's notes were more detailed, which enabled the researchers to determine that 21 patients were transitioned to end-of-life care outside the health service. Because collection of these data was not part of the study protocol and therefore they were not consistently collected across all health services, this finding suggests our data could underestimate the number of people who transitioned to end-of-life care.

CONCLUSIONS

Two-thirds of patients in subacute care who experienced an emergency inter-hospital transfer were for full resuscitation. Resuscitation status was associated with specific patient characteristics but no relationships with transfer characteristics were identified suggesting that the clinical decisions about escalation of care were not influenced by resuscitation orders. The reasons for and potential preventability of emergency inter-hospital transfers from subacute to acute care hospitals warrants further investigation and should be the focus of future research. Compared to patients for full resuscitation, patients with not-for-CPR or LOMT orders were more likely to have RRT calls during acute care readmission raising questions about the drivers of RRT calls in this patient cohort. Patients who were not-for-CPR were less likely to be readmitted to acute care and more likely to be transferred back to subacute care and this patient group should be an area of further research as these are the patients in whom transfer may have been preventable. Finally, the study results show clear deficiencies in the documentation of resuscitation status and planning for clinical deterioration for patients in subacute care. Although the proportion of patients with LOMT and not-for-CPR orders increased after transfer, there were still gaps in the documentation, which has significant implications for nursing staff in

subacute care, ambulance paramedics and ED staff. Patient preferences for care in the event of clinical deterioration at a subacute care hospital need to be discussed and documented early in the subacute care admission, with review at every transition in care.

Relevance to clinical practice

Clinical deterioration in patients located in subacute care hospitals should be an expected event and strategies to manage acute deterioration should be part of each patient's plan of care. Resuscitation status is one element of planning for acute clinical deterioration in patients in subacute care settings but it is a blunt measure of what is the most appropriate response, therefore planning the response to clinical deterioration in subacute care should include the patient's clinical state, patient and family values and preferences, staffing and other resources within the subacute care setting, and a plan for accurate handover and appropriate clinical management by paramedics and ED clinicians should transfer be necessary. Finally, alternative pathways for acute care readmission that avoid the ED should be considered or patients transferred from subacute care hospitals.

What does this paper contribute to the wider global clinical community?

- Subacute care is a vital component of the healthcare system and the importance of subacute care in maximising patients' functional status to enable patients to live as independently as possible, with high quality of life will only increase as the population ages and comorbidities become more prevalent
- Patients who experience emergency inter-hospital transfers from subacute to acute care hospitals have high rates of acute care readmission (81%) and high in-hospital mortality (15%) so are at significant risk of poor outcomes
- Resuscitation status is one element of planning for acute clinical deterioration in subacute care patients but planning a response to clinical deterioration in subacute care should also include the patient's clinical state, patient and family values and preferences, staffing and resource availability in subacute care, and accurate handover and appropriate clinical management by paramedics and ED clinicians should transfer be necessary
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Table 1: Resuscitation status and patient characteristics (N=603 transfers)

	Full Resuscitation (n=307)		Limitations of Medical Treatment (n=192)		Not-For-CPR (n=104)		p value ^a
	n	%	n	%	n	%	
Male gender	161	51.4	99	31.6	53	16.9	0.960
Country of birth non-English speaking	114	55.9	61	29.9	29	14.2	0.148
Preferred language other than English	42	49.4	32	37.6	11	12.9	0.340
Type of subacute care admission							<0.001
• Geriatric Evaluation & Management	80	30.9	116	44.8	63	24.3	
• Rehabilitation	226	66.1	76	22.2	40	11.7	
LOMT during subacute care admission	383	63.5	139	23.1	81	13.4	<0.001
LOMT during acute care admission post transfer	296	51.8	177	31.0	98	17.2	<0.001
	Median	IQR	Median	IQR	Median	IQR	p value ^b
Age (years)	74.0	63-83	83.5	76-89	84.0	72-89	<0.001
Charlson Comorbidity index	3.0	2-4	4.0	3-6	4.0	3-6	<0.001
Functional independence measure (FIM) on admission to subacute care	65.0	49-82	54.0	35-74	58.0	43-77	<0.001

Table 2. Resuscitation status and inter-hospital transfer characteristics (N=571 transfers)

	Full Resuscitation (n=296)		LOMT (n=177)		Not For CPR (n=98)		X ² (df) p value ^a
	n (%)	Odds Ratio [95% CI]	n (%)	Odds Ratio [95% CI]	n (%)	Odds Ratio [95% CI]	
Day of week of transfer to acute care							2.506 (2) 0.231
• Weekday	229 (50.9)		138 (30.7)		83 (18.4)		
• Weekend	66 (55.0)	Reference	39 (32.5)	1.18 [0.69-2.00]	15 (12.5)	0.62 [0.33-1.19]	
Transfer to acute care overnight (1800-0759)	43 (44.8)	Reference	30 (31.3)	1.20 [0.67-2.14]	23 (24.0)	1.51 [0.82-2.79]	1.845 (2) 0.398
Mode of Transfer ^a (n=558)							0.707 (2) 0.702
• Emergency Ambulance	220 (51.2)		144 (33.5)		66 (15.3)		
• Private Ambulance	71 (55.5)	Reference	29 (22.7)	1.28 [0.68-2.38]	28 (21.9)	0.92 [0.52-1.66]	
• Other ^a	4 (36.4)		4 (36.4)		3 (27.3)		
First contact in acute care ^a (n=556)							4.70 (2) 0.096
• Emergency Department	239 (52.5)	Reference	139 (30.5)	0.82 [0.46-1.47]	77 (16.9)	0.49 [0.26-0.93]	
• Direct admission to Ward	49 (48.5)		31 (30.7)		21 (20.8)		
• Other ^a	8 (57.1)		6 (42.9)		0 (0)		
ED Triage Category ^b (n=370)							12.273 (6) 0.056
• ATS 1	11 (50.0)		4 (18.2)	0.74 [0.18-3.09]	7 (31.8)	2.67 [0.74-9.69]	
• ATS 2	42 (46.7)		39 (43.3)	1.76 [0.82-3.80]	9 (10.0)	1.15 [0.38-3.46]	

	Full Resuscitation (n=296)		LOMT (n=177)		Not For CPR (n=98)	
• ATS 3	90 (51.4)		47 (26.9)	0.94 [0.47-1.90]	38 (21.7)	2.49 [1.02-6.08]
• ATS 4	46 (58.2)	Reference	25 (31.6)		8 (10.1)	
• ATS 5 ^b	1 (25.0)		3 (75.0)		0 (0)	

ATS = Australasian Triage Scale, ED = emergency department; RRT = Rapid Response Team; ICU = Intensive Care Unit

^a Model analysis excluding 'other'. ^b Model analysis excluding ATS 5 due to number in cells less than 5.

Table 3. Resuscitation status and patient outcomes (N=571 transfers)

	Full Resuscitation (n=296)		LOMT (n=177)		Not For CPR (n=98)		X ² (df) p value ^a
	n (%)	Odds Ratio [95%CI]	n (%)	Odds Ratio [95%CI]	n (%)	Odds Ratio [95%CI]	
• Return to subacute care	42 (54.5)	Reference	28 (36.4)	1.20 [0.68-2.14]	7 (9.1)	1.62 [0.67-3.89]	
• Hospital Admission	247 (52.4)		140 (29.7)		84 (17.8)		
• Other ^a (including died in ED)	7 (53.8)		3 (23.1)		3 (23.1)		
Outcomes following acute care admission ^a (n=471)							8.955 (2) 0.011
• Transferred to subacute care	182 (55.2)	Reference	88 (26.7)	2.03 [0.97-4.24]	60 (18.2)	3.46 [1.19-10.05]	
• Home or usual residence	42 (75.0)		10 (17.9)		4 (7.1)		

	Full Resuscitation (n=296)		LOMT (n=177)		Not For CPR (n=98)			
• Other	24 (24.5)		53 (54.1)		21 (21.4)			
RRT calls in acute care following transfer	43 (36.8)	Reference	42 (35.9)	2.38 [1.35-4.19]	32 (27.4)	2.00 [1.12-3.57]	12.449 (2)	0.002
Unplanned ICU admission following transfer	18 (72.0)	Reference	5 (20.0)	0.41 [0.14-1.20]	2 (8.0)	0.28 [0.06-1.32]	5.611 (2)	0.060
In-hospital mortality (in acute or subacute care) (n=527)	22 (26.8)	Reference	33 (40.2)	2.47 [1.29-4.73]	27 (32.9)	5.13 [2.54-10.37]	24.361 (2)	0.001

ATS = Australasian Triage Scale, ED = emergency department; RRT = Rapid Response Team; ICU = Intensive Care Unit

^a Model analysis excluding 'other'. ^b Model analysis excluding ATS 5 due to number in cells less than 5.

Table 4. Resuscitation status and emergency department and hospital length of stay (N=603 transfers)

	Full Resuscitation (N=307)		Limitations to Medical Treatment (N=192)		Not For CPR (N=104)			
	Median	95%CI	Median	95%CI	Median	95%CI	Median	p value ^a
Subacute care LOS prior to transfer (days) (n=601)	8.0	6.1-9.9	13.0	9.8-16.2	9.0	6.1-11.9	13.0	0.298
Emergency department LOS following transfer (hours) (n=422)	6.5	5.9-7.1	7.0	6.2-7.8	5.0	3.6-6.4	7.0	0.695
Acute care readmission LOS (days) (n=487)	7.0	6.2-7.8	7.0	6.5-9.5	8.0	5.9-10.1	7.0	0.396
Total Health service LOS (days) (N=603)*	32.0	29.1-34.9	36.0	32.5-39.5	34.5	30.9-38.1	36.0	0.983

^a Cox Regression; CPR=Cardiopulmonary Resuscitation; LOS = length of stay; 95%CI = 95% confidence interval, * includes first acute care admission, subacute care admission, and where applicable acute care readmission

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