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The impact of standardised goals of care documentation on the use of cardiopulmonary resuscitation, mechanical ventilation, and intensive care unit admissions in older patients: a retrospective observational analysis

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ABSTRACT

Background. In South Australian hospitals, 'Do Not Resuscitate' orders have been replaced by '7-Step Pathway Acute Resuscitation Plans', a standardised form and approach that encourages shared decision-making while providing staff with clarity about goals of care. This initiative has led to increased rates of documentation about treatment preferences, including 'Not-For-Cardiopulmonary Resuscitation'. **Aim.** To quantify any effect of the 7-Step Pathway form versus previous 'Do Not Resuscitate' orders on cardiopulmonary resuscitation, mechanical ventilation, and/or intensive care unit admission during hospitalisation. **Methods.** We completed a retrospective, observational study in two Australian tertiary hospitals using interrupted time-series analysis. We examined the number of medical inpatients aged 70 years and over who received one or more Intensive Treatments-cardiopulmonary resuscitation, mechanical ventilation, or intensive care unit admission-in the 2 years before and 2 years after the introduction of the form. **Results.** There were 2759 Intensive Treatments across 66 051 inpatient admissions; 1304/32 489 (4.0%) pre-intervention and 1455/33 562 post-intervention (4.3%). Sub-group analysis of those who died in hospital showed 400/1669 (24%) received Intensive Treatments pre-intervention and 382/1624 post-intervention (24%). Interrupted time-series analysis suggested that the intervention did not significantly alter Intensive Treatments over time at Hospital 1 and was associated with a significant slowing of the already decreasing use of Intensive Treatments at Hospital 2. Among patients who died in hospital, there was minimal change at either site. **Conclusions.** There was no reduction in Intensive Treatments in older medical inpatients following the introduction of standardised goals of care documentation.

Keywords: advance care planning, do not resuscitate, end-of-life care, goals of care, health communication, intensive care unit, shared decision-making.

Background

Establishing and documenting an older person's goals of care enables treatment that is both medically appropriate and in accordance with a patient's known treatment preferences. Recommendations about cardiopulmonary resuscitation (CPR) attempts, mechanical ventilation, and intensive care unit (ICU) admission form part of this decision-making for many patients. The discussion is also an opportunity to explore a palliative care or hospital-avoidance approach. In the hospital setting, clear documentation of these decisions can be used to guide treatment decisions when a patient clinically deteriorates, especially in the after-hours setting, or when a patient no longer has decision-making capacity due to illness or delirium. Goals of care plans are now used in place of stand-alone 'Do Not Resuscitate' (DNR) orders in many centres across Australia and overseas.[1–4]

The 7-Step Pathway Resuscitation Plan and Alert form (The Form) (Supplementary File S1) is the cornerstone of the South Australian State-endorsed, standardised approach to resuscitation planning and goals of care, which was introduced as part of a wider healthcare policy reform in 2014. As outlined in the supporting Clinical Directive, resuscitation planning can 'avoid burdensome, futile, traumatic and/or unwanted treatment and procedures when a person is dying, …[and also] is used to assist clinicians in situations of rapid deterioration to make decisions about care and treatment.'[5]

The updated approach to resuscitation planning was initially supported by a series of face-to-face in-house education sessions for hospital staff and a number of online supportive resources that remain freely accessible.[5] By comparison, there was previously no State-wide policy or educational resources to guide clinicians. Among medical inpatients aged over 70 years, the Form's introduction has been associated with an increase in the number of patients with resuscitation-planning documentation from 34% to 63% within 48 h of admission, and a concurrent increase in Not-For-CPR documentation from 31 to 55%.[4]

The 7-Step Pathway replaced an informal system of *ad hoc* DNR orders, which were documented in a heterogeneous manner, with inconsistent recording of other treatment goals. DNR orders have been associated with two distinct but equally significant harms; patients receiving unnecessarily *conservative* treatment (other than CPR) where life-prolonging intervention was otherwise still preferred and appropriate, and patients receiving inappropriately *aggressive* or futile treatment because goals of care documentation were lacking or incomplete.[6–8] The impact of a goals of care plan, as distinct from a DNR order, on the number of patients who ultimately receive life-prolonging interventions such as CPR, mechanical ventilation, and ICU admission during their inpatient stay is not established.

Aims

This study seeks to establish whether the introduction of the 7-Step Pathway Form (as part of a broader State-wide healthcare policy reform) has changed the number of medical inpatients aged 70 years and over who receive CPR, mechanical ventilation, and ICU Admission – hereafter referred to as Intensive Treatment – during their hospital admission. The same question was addressed in the subset of these patients who died in hospital.

Methods

A retrospective observational study was completed across the two largest public urban tertiary centres in South Australia, with a combined inpatient bed capacity of 1400 patients. Inclusion criteria were all medical inpatients aged 70 years and over who stayed at least one night in hospital, with exclusion of day-patients, surgical inpatients, and patients discharged directly from the emergency department. This population was selected following internal audits and prior research which showed the uptake of the Form intervention in this cohort was at least 60% and thus any significant impact would be more readily observed.[4] Patients under 70 years and surgical inpatients were not included as there is no previous research on these cohorts.

In both centres, data were obtained from the ICU, Medical Emergency Response/Rapid Response Team (RRT) and hospital administrative databases from January 2012 to December 2019. This period was selected to allow for a 4-year study period at each site while accounting for a decline in data quality pre-2012 and in-progress data entries post-December 2019. The hospital administrative databases and Integrated South Australian Activity Collection were used to source total inpatient admissions, inpatient deaths, ICU admissions, use of mechanical ventilation during admission, and rates of in-hospital cardiac arrest, defined based on ICD code I46. Data concerning the presence of a DNR order and other goals of care at the time of a RRT call were extracted from the RRT database.

The primary measure of interest was a composite outcome of cardiac arrest in the ward setting, mechanical ventilation, and ICU admission (Intensive Treatments). This composite outcome was selected to best reflect the anticipated change in treatments in older medical patients, and the tiered treatment options available on goals of care plans in use across Australia and overseas. The primary outcome was reviewed in all hospital admissions (per 1000 separations) and separately reviewed in those who died during their hospital admission (per 1000 deaths). Where a patient was admitted more than once during the study period, all admissions were counted separately. No distinction was made between patients who received one versus several Intensive Treatments during their admission. The ICD coding entries for cardiac arrest were used as a surrogate for a presumed instance of CPR on the ward. A review of raw data suggested these numbers correlate sufficiently well.

Statistical analysis

Statistical analysis was performed using Stata 15 (Stata Corp, College Station, TX, USA). Data are presented as aggregated quarterly outcomes, with eight quarters included before and after Form-introduction at each site. Due to a staggered roll-out of the Form across the state, the period of time reviewed differs between sites, from June 2012 to July 2016 at Hospital 1, and from January 2016 to December 2019 at Hospital 2. The timeframe was limited by data quality prior to 2012 and ongoing/incomplete data entries beyond December 2019.

Interrupted time-series analyses were used to measure the trends in Intensive Treatment used for the eight quarters

pre-intervention, immediately after intervention, and for the eight quarters post-intervention.[9] Ordinary least squares regression method with Newey–West standard errors was used to estimate model parameters. Statistical significance was set at a *P*-value of <0.05.

One of the strengths of the interrupted time-series analysis is that it can account for pre-intervention trends when presenting the effect of an intervention.[10] The populations were otherwise not corrected for differences in patient demographics between sites or over time.

Ethics approval

Ethics approval for this low-risk retrospective study was obtained. The study was approved by the Southern Adelaide Local Health Network Human Research Ethics Committee.

Results

Across the study period, there were 66 051 medical admissions in patients aged 70 years and over, with 2759 instances of Intensive Treatments recorded. The proportion of patients who received an Intensive Treatment during their admission was 1304/32 489 (4.0%) pre-intervention and 1455/33 562 post-intervention (4.3%). During their hospital admission, 3374 medical inpatients aged over 70 years died, an average of 211 patients per quarter. Among the patients who died across both sites, 782 received one or more of CPR, mechanical ventilation, and/or ICU Admission; 400/1669 (24%) pre-intervention and 382/1624 post-intervention (24%).

Results of the two sites are further presented in Table 1, and discussed separately.

At Hospital 1 (Fig. 1), the average quarterly rate of Intensive Treatments before the Form's introduction was 34 per 1000 separations, with no significant change in this rate over the pre-Form period. After the introduction of the Form, the quarterly frequency of Intensive Treatments was 43 per 1000 separations. The change in slope post-intervention was not statistically significant. There was also no significant change in the number of Intensive Treatments received by older medical inpatients immediately upon Form introduction in July 2014.

Among the sub-group of patients who died at Hospital 1, there was an increase (*albeit* not statistically significant) in the number of Intensive Treatments given before death, with an additional 13 Intensive Treatments per 1000 separations each quarter ($P = 0.06$).

Table 1. Use of intensive treatments before, during and after 7-Step Pathway Form intervention.

	Pre-intervention slope	Change immediately post Form	Post-intervention slope	Comparative change in slope pre/post Form
Intensive treatments per quarter (per 1000 separations)				
H1	−0.33 (*P* = 0.66)	+6.47 (0.23)	+0.96 (*P* = 0.11)	+1.29 (*P* = 0.19)
H2	−2.8 (*P* = 0.002)	+6.53 (0.245)	−0.8 (*P* = 0.14)	+2.00 (*P* = 0.04)
Intensive treatments per quarter used in patients who died (per 1000 deaths)				
H1	−11.53 (*P* = 0.05)	+64.44 (*P* = 0.08)	+1.81 (*P* = 0.5)	+13.34 (*P* = 0.06)
H2	+2.32 (*P* = 0.58)	−10.03 (*P* = 0.430)	+3.31 (*P* = 0.5)	+0.99 (*P* = 0.84)

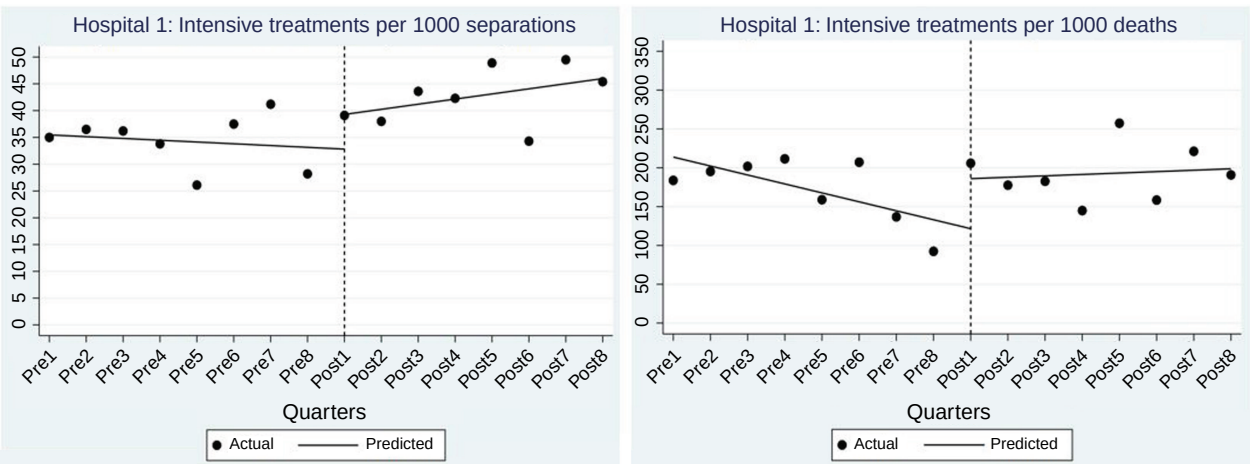

Fig. 1. Quarterly use of Intensive Treatments at Hospital 1.

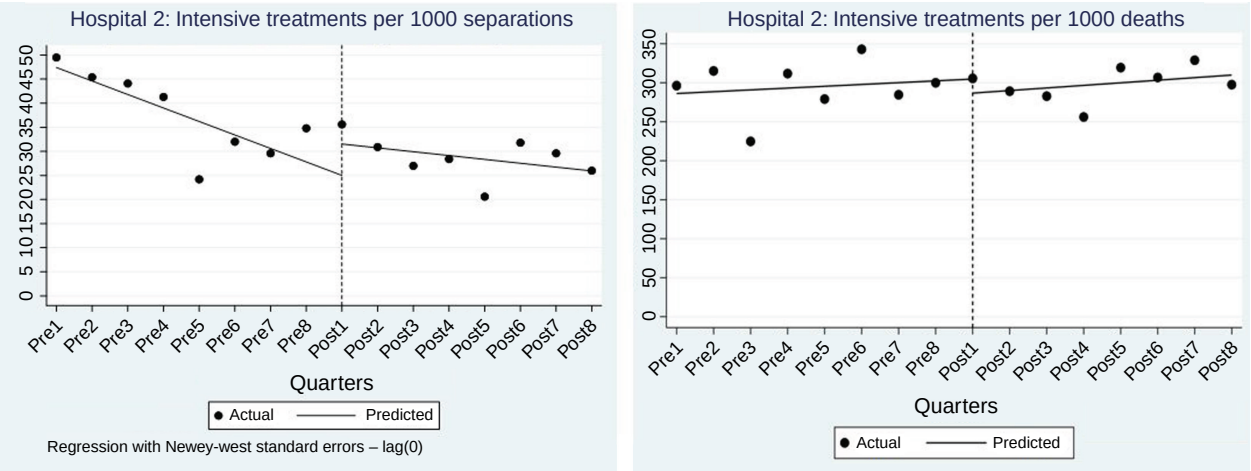

Fig. 2. Quarterly use of Intensive Treatments at Hospital 2.

At Hospital 2 (Fig. 2), before the introduction of the Form, Intensive Treatments were recorded in approximately 37 instances per 1000 separations per quarter, and post-Form, in 29 per 1000 separations. Unlike Hospital 1, before the intervention, there was a significant trend toward fewer Intensive Treatments occurring (2.8 instances fewer per quarter per 1000 separations) ($P = 0.002$). This downward trend occurred in the setting of higher pre-existing rates of Intensive Treatment use. Post-Form introduction, there was a net increase of 2 Intensive Treatments per 1000 separations per quarter, resulting in a significantly less steep decline than was evident beforehand ($P = 0.044$).

At Hospital 2, the subgroup analysis of patients who died in hospital showed an unchanged frequency of Intensive Treatments delivered before, during, and after the Form was introduced.

The database entries about goals of care at the time of RRT call were of inadequate quality to include in our analyses due to inter-site and inter-recorder variability in how goals of care plans and DNR orders were defined, particularly in the pre-Form years. We were therefore unable to replicate previously published findings demonstrating that the rate of patients with No-CPR documentation had substantially increased following Form introduction.[4]

Discussion

At Hospital 1, the Form did not alter the proportion of medical inpatients aged 70 years and over who received Intensive Treatments during their hospital admission, nor did it significantly change the proportion of inpatients who received Intensive Treatments in the admission before they died. At Hospital 2, the number of Intensive Treatments was already declining each quarter, and the rate of this decline significantly slowed following the Form roll-out. This change was not evident among the sub-group of patients who died in hospital.

Sustained use of Intensive Treatments with the increased numbers of goals of care plans provides reassurance that the intensity of life-sustaining care is not being inappropriately withheld in this patient cohort; a concern that has been repeatedly highlighted when stand-alone DNR orders were the *modus operandi*.[6–8,11]

In terms of inappropriately aggressive treatment, the question of whether dying patients are still being subjected to non-beneficial (and therefore harmful) intervention remains an area for future research. As a result of a renewed focus on minimising burdensome treatments for the dying patient, we anticipated the Form's introduction would be associated with a reduction in the use of Intensive Treatments in this cohort. This hypothesis is not supported by these results, which show unchanged use of Intensive Treatments in patients who died in hospital. Further research to review the use of specific treatments such as inotropic support, cardiac monitoring and angiogram, major surgery, and palliative care referrals would be useful to address this question.

The composite outcome of cardiac arrests, mechanical ventilation, and ICU admission was chosen to reflect the treatment options available on tiered Goals-of-Care Plans such as the 7-Step Pathway Form and allow for comparative research with international centres in the future. A rationalisation of tiered treatments within this composite measure would not be captured in our results. For example, the compositive outcome would not identify a patient who has declined mechanical ventilation but still receives non-invasive ventilation in the ICU. To address this, sub-group analyses of rates of mechanical ventilation and cardiac arrest calls were also reviewed and again did not reveal any significantly altered trends following Form-introduction across both sites (data not shown).

Culture and educational opportunity may differ between sites and may explain some of the inconsistencies we observed between these two sites after the introduction of the Form. The best example of an Australian healthcare-wide

intervention with inter-site variability is the MERIT study, where the implementation of a Rapid Response Team Model across 12 sites was significantly affected by knowledge of the intervention, understanding of its purpose, and perception of each hospital's readiness for change in the way care was provided.[12]

A limitation of our study is its retrospective, observational design. Interrupted time-series analysis studies are widely accepted as a reasonable alternative to review the impact of a healthcare intervention where randomised trials are impractical.[10] The power of the study was limited by the low absolute numbers of medical patients who received cardiac arrest calls and ICU admission. An initial decision to maximise opportunity for inter-site comparison by having equal number of data points before and after the intervention, rather than uneven tails, may have reduced power further. Finally, the results reflect a real-world perspective of how a healthcare intervention impacts care. While previous work at this centre and similar research at other sites has suggested a near-doubling in documentation when standardised plans are introduced,[4] we were unable to re-affirm this expected change in frequency from our available electronic database. Results may reflect that the increased form completion rates were predominantly driven by additional conversations with healthier patients, who were never at risk of requiring Intensive Treatments. Other potential confounding factors such as inter-site variability in ICU admission criteria and Acute Physiology And Chronic Health Evaluation (APACHE) scores of the study population would assist understanding of these results and improve generalisability.

Conclusion

The 7-Step Pathway Acute Resuscitation Plan aims to promote shared decision-making, respect for patient autonomy, and clarity about goals of care. Compared to non-standardised DNR orders, the introduction of the '7-Step Pathway Acute Resuscitation Plan and Alert' form did not significantly reduce the number of older medical inpatients who received Intensive Treatments during their hospital admission or before in-hospital death. We were unable to demonstrate an expected reduction in aggressive intervention among those who died in hospital. Doctors who might otherwise have avoided discussing goals of care due to fear of inappropriate treatment withdrawal can be reassured by our observations concerning the undiminished prevalence of life-prolonging treatment in this cohort.

Supplementary material

Supplementary material is available online.

References

1 Hickman SE, Keevern E, Hammes BJ. Use of the physician orders for life-sustaining treatment program in the clinical setting: a systematic review of the literature. *J Am Geriatr Soc* 2015; 63(2): 341–50. doi:10.1111/jgs.13248

2 Dahill M, Powter L, Garland L, *et al.* Improving documentation of treatment escalation decisions in acute care. *BMJ Open Qual* 2013; 2: u200617.w1077. doi:10.1136/bmjquality.u200617.w1077

3 Fritz Z, Malyon A, Frankau JM, *et al.* The Universal Form of Treatment Options (UFTO) as an alternative to Do Not Attempt Cardiopulmonary Resuscitation (DNACPR) orders: a mixed methods evaluation of the effects on clinical practice and patient care. *PLoS One* 2013; 8(9): e70977. doi:10.1371/journal.pone.0070977

4 Dignam C, Brown M, Thompson CH. Changes in resuscitation and end-of-life documentation in older patients' clinical case notes: a comparison of 2011 and 2017 practice. *Australas J Ageing* 2018; 38(1): 28–32. doi:10.1111/ajag.12587

5 Safety and Quality Unit. Resuscitation Planning 7 Step Pathway Clinical Directive Version 2.0. SA Health. 2021. Available at https://www.sahealth.sa.gov.au/wps/wcm/connect/023d0e804db3a8e5a465fdaaaf0764d6/Clinical_Directive_Resuscitation+Planning_V2.0_09022021.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-023d0e804db3a8e5a465fdaaaf0764d6-nKPPPmE [Accessed 15 December 2021]

6 Cohen RI, Lisker GN, Eichorn A, *et al.* The impact of do-not-resuscitate order on triage decisions to a medical intensive care unit. *J Crit Care* 2009; 24: 311–5. doi:10.1016/j.jcrc.2008.01.007

7 Scarborough JE, Pappas TN. The effect of do-not-resuscitate status on postoperative mortality in the elderly following emergency surgery. *Adv Surg* 2013; 47: 213–25. doi:10.1016/j.yasu.2013.04.001

8 McNeill D, Mohapatra B, Li JYZ, *et al.* Quality of resuscitation orders in general medical patients. *QJM* 2012; 105: 63–8. doi:10.1093/qjmed/hcr137

9 Linden A. Itsa: Stata module for conducting interrupted time series analysis for single and multiple groups. 2014. Available at http://ideas.repec.org/c/boc/bocode/s457793.html [Accessed September 2021]

10 Fretheim A, Zhang F, Ross-Degnan D, *et al.* A reanalysis of cluster randomised trials showed interrupted time-series studies were valuable in health system evaluation. *J Clin Epidemiol* 2015; 68(3): 324–33. doi:10.1016/j.jclinepi.2014.10.003

11 Myint PK, Rivas CA, Bowker LK. In-hospital cardiopulmonary resuscitation: trainees' worst and most memorable experiences. *QJM* 2010; 103: 865–73. doi:10.1093/qjmed/hcq129

12 Cretikos MA, Chen J, Hillman KM, *et al.* The effectiveness of implementation of the medical emergency team (MET) system and factors associated with use during the MERIT study. *Crit Care Resusc* 2007; 9(2): 205–12.

Data availability. Data have not been made publicly available as ethics and governance approval did not include permission to upload data to public repositories.

Conflicts of interest. The authors declare no competing interests.

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