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Efficacy of a tool to predict short-term mortality in older people presenting at emergency departments: Protocol for a multi-centre cohort study

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ABSTRACT

Background: Prognostic uncertainty inhibits clinicians from initiating timely end-of-life discussions and advance care planning. This study evaluates the efficacy of the CriSTAL (**Cri**teria for **S**creening and **T**riaging to **A**ppropriate a**L**ternative care) checklist in emergency departments.

Methods: Prospective cohort study of patients aged ≥65 years with any diagnosis admitted via emergency departments in ten hospitals in Australia, Denmark and Ireland. Electronic and paper clinical records will be used to extract risk factors such as nursing home residency, physiological deterioration warranting a rapid response call, personal history of active chronic disease, history of hospitalisations or intensive care unit admission in the past year, evidence of proteinuria or ECG abnormalities, and evidence of frailty to be concurrently measured with Fried Score and Clinical Frailty Scale. Patients or their informal caregivers will be contacted by telephone around three months after initial assessment to ascertain survival, self-reported health, post-discharge frailty and health service utilisation since discharge. Logistic regression and bootstrapping techniques and AUROC curves

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will be used to test the predictive accuracy of CriSTAL for death within 90 days of admission and in-hospital death.

Discussion: The CriSTAL checklist is an objective and practical tool for use in emergency departments among older patients to determine individual probability of death in the short-term. Its validation in this cohort is expected to reduce clinicians' prognostic uncertainty on the time to patients' death and encourage timely end-of-life conversations to support clinical decisions with older frail patients and their families about their imminent or future care choices.

Strengths and limitations of this study

- This cohort study is the largest validation of the CriSTAL tool based on objective parameters available at the point of care
- It is anticipated that prediction of individual risk of death will improve prognostic certainty across health systems
- Follow-up is limited to three months post assessment

1. Background

Uncertainty of the time to death in frail older patients on admission to hospital can be challenging in acute settings (Fisher & Ridley, 2012), and can inhibit doctors from discussing prognosis with elderly patients with a short life expectancy (Parvez, Abdel-Kader, Song, & Unruh, 2015).

Recognition of the *dying* status varies with clinical judgment (Glare et al., 2008; Sullivan et al., 2007), the extent of decline and its time course (Murray, Kendall, Boyd, & Sheikh, 2005), and the obvious presence of imminent death (Ellershaw & Ward, 2003). Some illness trajectories manifesting as progressive decline with intermittent exacerbations indicate well that end-of-life is inevitable regardless of the time to death (Murray et al., 2005). During the last few months of the older patient's life there is an increased use of emergency departments (ED) and in-hospital services (Lowthian et al., 2011; Rosenwax & McNamara, 2011). Despite terminal illness, many older patients receive aggressive treatments which may be potentially futile or harmful (Barnato, McClellan, Kagay, & Garber, 2004; Earle et al., 2004). Many deaths will be recognized as imminent only in the last few days of life as the clinical picture becomes obvious (Jones et al., 2012; Kennedy et al., 2014).

Failure to discuss prognosis and risk of death can compromise appropriate patient care, delays important knowledge being conveyed to patients and their caregivers about their health, and denies personalized end-of-life treatment options including whether to shift from aggressive interventions to supportive care (Kennedy et al., 2014; Papadimos, Gafford, Stawicki, & Murray, 2014). At times, the prognosis is known or presumed but is not communicated to families even if they want to know and accept that the exact prediction may be uncertain (Evans et al., 2009).

Calls for better prognostication models have been made to reduce clinical uncertainty (Smith, White, & Arnold, 2013) and to better predict short-term mortality (Yourman, Lee, Schonberg, Widera, & Smith, 2012), as existing risk stratification instruments for older people in ED do not accurately differentiate risk levels (Carpenter et al., 2015) or are reliant on blood tests or do not report calibration or external validation (Brabrand, Folkestad, Clausen, Knudsen, & Hallas, 2010). We previously developed a screening tool: **Cri**teria for **S**creening and **T**riaging to **A**ppropriate a**L**ternative care (CriSTAL) (Cardona-Morrell & Hillman, 2015), based on age, nursing home residency, history of ICU or hospital admission, chronic conditions, and frailty as measured by the Fried Score (Fried et al., 2001) (Additional file 1). The tool has been tested retrospectively in single centres in Australia and USA among patients receiving rapid response calls after they deteriorated in hospital, indicating good correlation with the outcome of death (Cardona-Morrell et al., 2016; Williams, Cardona-Morrell, Stevens, Bey, & Glasgow, 2017). The present study is a validation of CriSTAL using a prospective cohort study design in routine ED care in three countries with different health systems to determine its usefulness in supporting end-of-life discussions.

1.1. Study hypothesis

The use of an objective list of clinical parameters that can be readily obtained at the point of care can identify older patients at risk of death in the ensuing three months to better predict this event and enhance prognostic certainty near the end of life.

1.2. Objectives

1. To establish the efficacy of individual and combined parameters in the CriSTAL tool to predict In-hospital death or post-discharge death up to 3-months post admission.
2. To determine the minimum number of variables sufficient to adequately predict in-hospital or post-discharge death.

2. Methods

The CriSTAL validation study is a prospective observational project to determine how accurately the CriSTAL tool can anticipate death for older people at high risk.

2.1. Setting

This study will be led by academics and clinicians in these different healthcare systems: Sydney (Australia) in collaboration with clinicians from EDs in Odense, Bispebjerg, Esbjerg, Copenhagen (Denmark) and Cork (Ireland).

2.2. Participants

Consecutive patients aged 65 years and above with any diagnosis presenting at ED in five Australian teaching hospitals, four Danish hospitals and one Irish hospital are eligible for study participation if admission is authorised for at least one day and written consent (or surrogate consent for those unable to independently provide written consent) is obtained to participate, respond to follow-up telephone contact around three months post discharge, and allow access to data for the follow-up period. All participants will be assigned a unique study identifier for the purpose of follow-up.

2.3. Exclusion criteria

Patients discharged from emergency departments before enrolment; patients and/or surrogates unable to communicate in the local language (English or Danish); and cognitive impairment or dementia, or a decreased level of consciousness, unless there is a consenting surrogate to become the informant authorised to provide the patients' information.

2.4. Procedure

Eligible subjects will be identified and recruited in the Emergency Department of each participating hospital by registered nurses with experience in emergency, aged care or intensive care or junior medical