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A Critical Age: The Influence of Frailty Measurements

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While prognosis of elderly patients in intensive care is often seen as poor, this is largely due to deficits that can be described with the vocabulary of frailty and its measures. Using the Clinical Frailty Scale as a tool to assess patients referred to intensive care might facilitate discussions about treatment aims, and identify patients who are likely to require enhanced support for re-enablement after critical illness.

The increase in the proportion of patients over the age of 65 by 50% in the coming decades has been dubbed the “silver tsunami”. It poses an unprecedented challenge to critical care to deliver equitable care to appropriate patients. The decision on which patients are suitable for intensive care treatment is a continuing debate, and age in itself is not a reliable predictor for outcome in an individual. Frailty is a measure of a patient’s physiological rather than chronological age, and is based on a detailed social and functional history. Assessments in ICU patients may improve prognostication, but feasibility of assessments is not known.

In this article we will summarise the current literature on frailty in the critically ill, and examine the feasibility of implementing a frailty score in the clinical practice of intensive care medicine.

Study	Population	Methodology	Outcomes
Pol 2011	All patients Vascular	Prospective cohort; n=142 (ICU admissions, n=23)	GFI (15-item questionnaire) predicts post-op delirium
Sundermann 2011	Age ≥74 Cardiac surgery	Prospective; cohort; n=400	CAF (FP criteria, ADLs, body control, serum albumin, creatinine and BNP, spirometry) predicts 30-day mortality
Afilalo 2012	Age ≥70 Cardiac surgery	Prospective cohort; n=152	Gait speed superior to FP and MSSA in predicting in-hospital mortality or major morbidity
Green 2012	Age ≥60 Cardiac (TAVI)	Prospective cohort; n=159	Novel composite frailty score (grip strength, gait speed, ADLs, serum albumin) predicts 12-month mortality
Stotecky 2012	Age ≥70 Cardiac (TAVI)	Prospective cohort; n=100	MGA score (MMSE, MNA, ADLs) predicts 30-d and 12-month mortality
Robinson 2013	Age ≥65 Colo-rectal/ cardiac	Prospective cohort; n=201	Number of “frailty traits” (including “Up and go” time, ADLs, Charlson score, serum albumin, anaemia) predicts LOS, complications and readmissions

Table 1. Studies Evaluating Frailty Measures in Patients Undergoing Elective Surgery Prior to ICU Admission

Introducing a Frailty Score for the Critically Ill – Which One?

Frailty can be described as an accumulation of deficits, ‘the frailty phenotype’, characterised by decreased strength, low energy, weight loss, slowed movement and reduced physical activity (Fried et al. 2001). There is a range of assessment tools for frailty (de Vries et al. 2011), and this is illustrated in studies assessing the link between preoperative frailty and outcome from surgery (see Table 1). Some of these assessments are not possible in patients with critical illness, as they depend on assessment of a non-stressed patient, providing opportunity for demonstration of fitness (e.g. gait speed), physiological measurement (e.g. spirometry) and cognitive ability. Studies assessing frailty in the critically ill will therefore use frailty assessments that are by necessity based on an accurate history of the patient’s premorbid state.

The use of frailty to help predict outcome in the critically ill is still in its infancy, andit is not certain which frailty measurements are best suited to be used in the critically ill population. Over the last four years we have started to explore how descriptions of frailty could be used by clinicians at

the bedside in the ICUs of two District General Hospitals in North Wales. Both units admit between 650 and 750 patients per year.

Firstly we explored the feasibility of using different frailty assessments. We reviewed 56 sets of notes from patients admitted to the ICU aged 70 and above, and assessed their frailty with six tools selected from the critical care and wider literature. These were the Clinical Frailty Scale (CFS) (Rockwood et al. 2005); Identification of Seniors at Risk tool (ISAR, McCusker et al. 1999); Barthel index (Wade and Collin 1988); Katz Index (Katz et al. 1970); the DUKE activity status index (Hltaky et al. 1989) and the Survey of Health, Ageing and Retirement in Europe (SHARE, Romero-Ortuno et al. 2010).

The mean age of patients was 80 (SD 4), and 33 of the patients were male. Four patients came from care homes, and 22 lived on their own. Evidence for functional or social history in medical records was scanty. The median CFS was 6 (=moderately frail, IQR 4-6), ISAR 3 (IQR 2-4), Barthel Index 75 (IQR 60-100) and Katz 6 (IQR 4-6). Based on note review only we were unable to complete DUKE index and SHARE for the majority of patients.

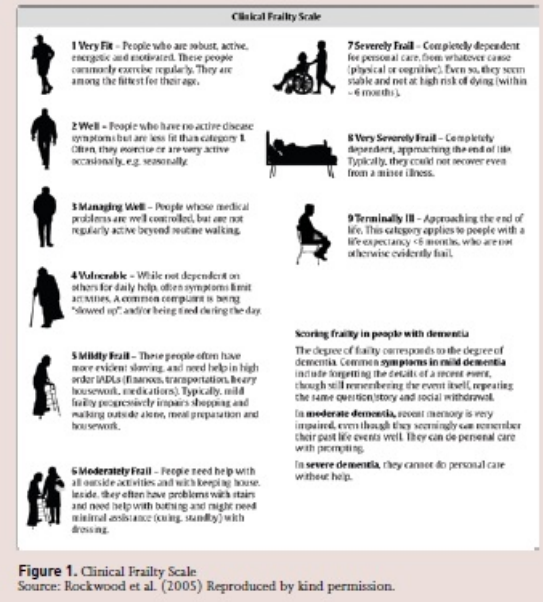

Figure 1. Clinical Frailty Scale
Source: Rockwood et al. (2005) Reproduced by kind permission.

Of the frailty scores tested, the CFS showed the most promise. A higher CFS, but not age over 80, was associated with higher mortality ($p<0.045$). A CFS of 6 or more was also associated with a hospital length of stay of 15 days or more ($p<0.02$), but not with longer ICU length of stay. Similar associations could not be established for any of the other tested measures.

We then assessed the reproducibility of CFS frailty assessment between observers. We introduced the CFS into routine clinical practice for a 2 month trial by adding assessment documentation to admission documentation, and admitting staff were asked to assess patients' frailty at a point two weeks prior to admission. Two medical students were blinded to results of initial assessments, and independently interviewed 30 patients and/or relatives in order to obtain CFS values for two weeks and one year prior to admission. Twenty (66.7%) patients had identical CFS scores, 6 patients (20%) had a difference of 1 and 4 (13.3%) had a difference in score >1. There was strong correlation between CFS taken by clinical staff and those taken by the investigators (Spearman's rho 0.64, $p<0.0001$) and between CFS two weeks prior and one year prior to admission (Spearman's rho 0.79, $p<0.0001$).

Studies to date assessing frailty in patients following ICU admission have used a variety of measures based on the frailty Phenotype (FP), and/or the Clinical Frailty Scale (see Table 1). The study by Le Maguet and colleagues is of particular interest as the FP and CFS appear to perform differently in predicting outcomes: prevalence of precritical illness frailty ranged from 23% (CFS) to 41% (modified FP), depending on which frailty measure had been utilised (Le Maguet et al. 2014). Patients identified as frail according to CFS were significantly more likely to be discharged to a location other than home, and to have increased ICU, hospital and 6-month mortality. With the exception of ICU mortality, patients identified as frail according to FP did not experience worse outcomes of statistical significance (Le Maguet et al. 2014).

Frailty as a Predictor of Outcome in the Critically Ill

Although the relationships between co-morbidity, functional limitation and outcome from critical illness have been explored over a number of years, the concept of frailty as applied to an ageing critically ill population is a relatively new one. Studies to date assessing frailty in patients following ICU admission have used a frailty score based on the frailty Phenotype (FP) and/or the Clinical Frailty Scale and are summarised in Table 2. These studies report outcomes from a population more generally representative of critically ill elderly patients than preoperative assessment studies summarised in Table 1, and increased frailty was associated with worse outcomes in all studies.

In the largest study of frailty and critical illness to date, Bagshaw used the CFS to assess 421 patients over the age of 50, and found the prevalence of frailty, as defined by a CFS > 4, to be 32.8%. Frail patients were older, were more likely to be female, and had more comorbidities and greater functional dependence than those who were not frail. In-hospital mortality was higher (32% v 16%) and remained higher at 1 year (48% v. 25%); major adverse events were more common (39% v 29%). Frail survivors were more likely to become functionally dependent (71%

v 52%), have significantly lower quality of life and were more often readmitted to hospital (56% v 39%) (Bagshaw et al. 2014).

In a separate small study, insight into the dynamic nature of frailty in patients with critical illness is provided by Baldwin and colleagues (2014), who assessed recovering patients approaching hospital discharge and considered over 80% to be frail according to Frailty Phenotype.

Conclusion

Our preliminary work would suggest that age doesn't matter in critical illness, once frailty is assessed. So why should it not be routinely measured? Frailty is common in critically ill patients and is associated with poorer outcomes (in terms of ICU and hospital mortality), may require greater hospital resource utilisation (in terms of hospital length of stay), and following hospital discharge is associated with greater degree of disability, dependence and intermediate-term mortality. Of the number of frailty assessment tools that have been applied to the critically ill, the Clinical Frailty Scale (CFS) currently has merit as a predictor of short-term and intermediate-term outcomes, and a simplicity that could facilitate application by non-geriatrician specialists. Simplicity and reproducibility are likely to make the CFS a tool that is suitable for clinical practice and research. Potential applications could be the impact of frailty on outcomes in critical care and on rehabilitation needs post critical illness.

Study	Population	Methodology	Outcomes
Bagshaw 2014	Age ≥50 ICU admission	Prospective cohort; n= 421	CFS predicts hospital and 12-month mortality, ICU and hospital lengths of stay, adverse events, and post-discharge dependence
Masud 2013	Age ≥65 Burns ICU	Retrospective cohort; n=42	CFS predicts ICU mortality
Baldwin 2014	Age ≥65 ICU admission	Prospective cohort; n=22	FP criteria (measured prior to hospital discharge) predicts 1-month disability and 6-month mortality
Le Maguet 2014	Age ≥65 ICU admission	Prospective cohort; n=196	Modified FP criteria and CFS predict ICU mortality; CFS predicts hospital and 6-month mortality

Table 2. Studies Evaluating Frailty Measures after ICU Admission

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