The Ability of Frailty to Predict Outcomes in Older People Attending an Acute Medical Unit

S Conroy & T Dowsing

Abstract

Background

This study assessed the role of frailty assessment in the AMU.

Methods

Patients were assessed for frailty and their outcomes ascertained at 90 days.

Results

The Canadian Study on Health and Aging Clinical Frailty Scale categorised 29% of patients as moderately-severely frail. Frailty did not differentially identify those likely to be discharged within one day, nor with long stays. Mortality at 90 days was 32%; frailty was associated with the risk of dying, odds ratio 1.4. 21% of patients were readmitted at 30 days, and 33% at 90 days, but frailty was not predictive.

Discussion

Moderate-severe frailty in people aged 70+ was common and was predictive of higher mortality, but did not appear to predict admission, length of stay or readmission.

Keywords

Frailty, Acute medical care, Length of stay, Readmission, Mortality.

Background

A key innovation in NHS acute care has been the introduction of Acute Medical Units (AMUs), which are now present in 98% of hospitals.[1] AMUs are generally well staffed wards with a continuous medical and nursing staff present that are designed to receive patients admitted acutely to the hospital, referred predominantly from either Emergency Departments or primary care.

Older people accessing acute care are at increased risk of adverse outcomes,[2] but identifying the specific population attending AMUs that are at the highest risk is difficult. Recent reviews of a range of risk stratification tools used in the acute care context have found that the predictive properties of such tools are insufficient for clinical practice.[3-5]

An alternative approach to using risk stratification tools is to describe a clinical phenotype of older people who are at high risk of adverse outcomes. Frailty is a state of loss of resistance to external stressors leading to extreme vulnerability and subsequent decline.[6] In community populations, frailty is associated with an increased risk of functional decline, death, hospitalisation and worsening mobility[7] so it is logical to test frailty scales to assess their predictive properties in acute care to see if they can be used as a method of identifying those at risk.

We undertook this service evaluation to measure the prevalence of frailty in one AMU using the Canadian Study on Health and Aging Clinical Frailty Scale (CSHA CFS)[8 9] and to ascertain its ability to predict outcomes relevant to acute triage (mortality, length of stay and readmissions).

Methods

Over a two month period in 2011, patients attending the AMU (Monday to Friday) at the Leicester Royal Infirmary, aged 70 or over, were assessed for frailty using CSHA frailty scale. The assessment was undertaken by a single observer (TD) specifically trained in assessing frail older people.

Core demographic information was collected from hospital notes, including age, gender and date of admission. The CSHA clinical frailty scale was ascertained as follows:

1. Very fit — robust, active, energetic, well-motivated and fit; these people commonly exercise regularly and are in the most fit group for their age
2. Well — without active disease, but less fit than people in category 1
3. Well, with treated comorbid disease — disease symptoms are well controlled compared with those in category 4
4. Apparently vulnerable — although not frankly dependent, these people commonly complain of being "slowed up" or have disease symptoms

Simon Conroy*
PhD

Teresa Dowsing*
BSc

*Geriatric Medicine, Windsor Building, Leicester Royal Infirmary, Leicester

Correspondence:
Simon Conroy
Geriatric Medicine, Windsor Building, Leicester Royal Infirmary, Leicester, LE1 5WW
Email: spc3@le.ac.uk

5. Mildly frail — with limited dependence on others for instrumental activities of daily living
6. Moderately frail — help is needed with both instrumental and non-instrumental activities of daily living
7. Severely frail — completely dependent on others for the activities of daily living, or terminally ill

Pilot work had indicated about a third of people aged 70+ were frail; in order to detect 30% frailty prevalence with a precision of 5% in either direction using 95% confidence intervals, 323 frail older people would need to be assessed. Allowing for approximately twice as many assessed patients to be non-frail, we planned to assess 900 individual patient care episodes.

The hospital number was used to link individual patients to their HES data for the relevant admission (cross-checking with date of admission) – this allowed length of stay, 30/90-day readmissions (to the acute hopsital) and mortality (in-hospital and in the community) to be ascertained.

Simple descriptive statistics were used to describe the population characteristics. A pre-planned analysis looking at the outcomes of the most frail (by dichotomising the CSHA clinical frailty scale at 1-5 (non-mildly frail) and 6-7 (moderate-severe frailty) was undertaken, using linear regression adjusted for age and gender for continuous outcomes (length of stay) and adjusted logistic regression for dichotomous outcomes (readmissions, mortality). To assess the predictive properties of the scale, a Receiver Operating Characteristic (ROC) was plotted with the area under the curve (AUC) calculated. An area greater than 0.70 was used to show that a scale has acceptable discriminatory value, 0.60-0.69 as poor, and 0.50-0.59 as very poor.[10 11] Statistical analyses were performed using Stata version 9.

This work was carried out as part of a planned service development so research ethics approvals were not required, though hospital governance approvals were obtained.

Results

Overall, 2503 people were admitted to the AMU during the 10 week study period, of whom 1165 (48%) were 70 years or older. Of those aged 70+, 654 patients were assessed representing 905 separate admissions (some patients attended on more than one occasion). The mean age was 82.3 years (95% CI 81.8-82.9) and 380 (42.4%) were male.

The CSHA clinical frailty scale categorised 263/905 (29%, 95% CI 26-32%) as moderately-severely frail (clinical frailty scale 6-7) (Table 1).

Table 1. Frailty prevalence according to CSHA clinical frailty scale.

CSHA clinical frailty scale	Number meeting criteria	Proportion
1 Very fit	12	1%
2 Well	94	10%
3 Well, with treated comorbid disease	168	19%
4 Apparently vulnerable	178	20%
5 Mildly frail	190	21%
6 Moderately frail	167	18%
7 Severely frail	96	11%

Length of stay

225/905 (25%) older people had an length of stay of ≤1 day; the CSHA clinical frailty scale did not differentially identify those likely to be discharged within one day, even after adjusting for age and gender. As the numbers people being discharge in each frailty band was small, the confidence intervals were wide and all crossed unity. Similarly, the CSHA clinical frailty scale did not differentiate those likely to be admitted to the base wards for on-going acute care. When frailty was dichotomised to those scoring 1-5 or 6/7 (moderately-severe frailty), it was not able to accurately differentiate those likely to be discharged from the AMU (odds ratio 1.2, 95% CI 0.9-1.7).

The initial length of stay was heavily left skewed, with 49% having a length of stay of ≤5 days. The median length of stay was 6 (IQR 2-14) days. Length of stay was dichotomised with >6 days indicating long stays; again the CSHA clinical frailty scale did not differentially identify those at risk of long lengths of stay, with broad confidence intervals for each cut point. An ROC analysis of the CSHA clinical frailty scale against the raw length of stay revealed an AUC of 0.5. Moderate-severe frailty did not significantly predict increasing length of stay relative risk 5.0 (95% CI 0.7-35.1) (Figure 1).

Readmission

191/905 (21%) of attendances resulted with a readmission within 30 days, and 299/905 (33%) resulted in a readmission within 90 days.

The CSHA clinical frailty scale did not significantly predict readmission at 30 days (OR 1.1 (1-1.2)) or 90 days (OR 1.0 (1.0-1.1). Using moderate-severe frailty did not help.

Mortality

The overall mortality rate over the 90 days follow up period was 32% (210/654). The CSHA clinical frailty scale was associated with the risk of dying, odds ratio 1.4 (95% CI 1.3-1.5), and this was not altered by adjusting for age or gender.

Discussion

This study of over 900 individual attendances in one Acute Medical Unit demonstrated that moderate-severe frailty in people aged 70+ was common (29%) according to the CSHA clinical frailty scale.

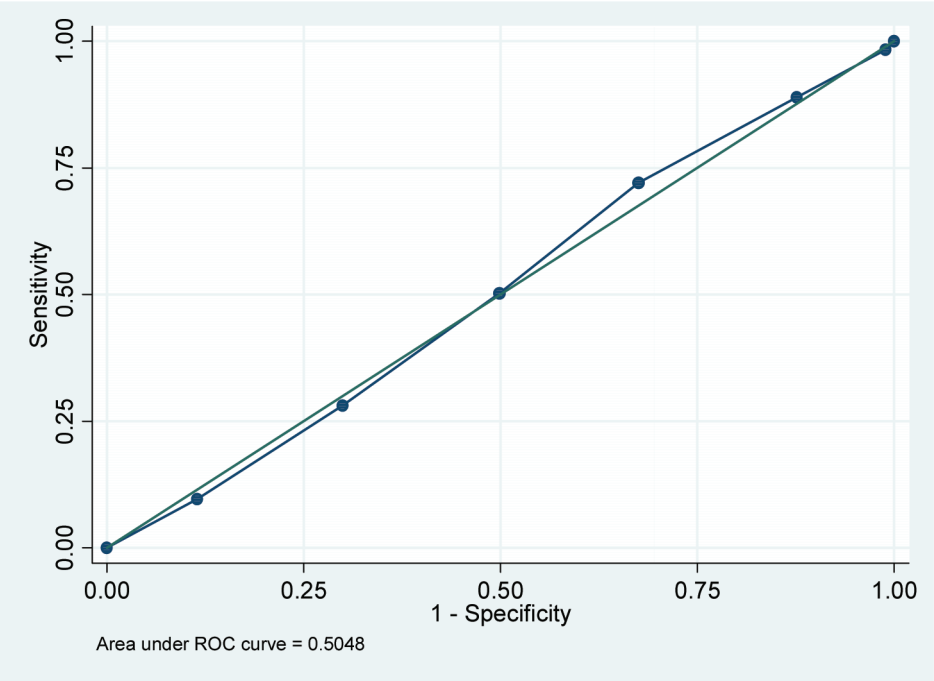

Figure 1. CSHA clinical frailty scale against length of stay.

However, frailty did not appear to predict some of the outcomes of interest to clinicians working in acute care (admission for on-going care, length of stay, readmission), with the exception of mortality, which frailty predicted with modest odds ratios of 1.4.

Strengths of this study include the moderately large dataset, the single rater which avoids inter-rater reliability issues and the relative completeness of the dataset. Limitations include the short defined time period of assessment and cross-sectional nature. Not all patients were assessed, in particular those attending out of hours; it is possible that this introduced some selection bias. Although the sample size was adequate to estimate the prevalence of frailty with reasonable accuracy, it may have been insufficient to detect small but potentially important outcomes, such as long length of stay (the confidence intervals for this were very wide). A larger study involving more than one centre might find different outcomes, so caution needs to be exercised in generalising these findings.

The weak predictive properties of the CSHA clinical frailty scale in this context are consistent with the findings from other studies.[3,4] Whilst frailty remains an important clinical concept, the CSHA clinical frailty scale alone appears insufficient to direct decision making or 'streaming' in acute care. Additional work is required to develop better tools to direct patient care in the acute medical unit setting.

Conflict of Interest

All authors have no conflict of interest to declare. No extraneous funding was obtained.

References

1. Percival F, Day N, Lambourne A, *et al*. An Evaluation of Consultant Input into Acute Medical Admissions Management in England, Wales and Northern Ireland. London: Royal College of Physicians, 2010.
2. Woodard J, Gladman J, Conroy S. Frail older people at the interface. *Age Ageing* 2010; **39(S1):** i36.
3. Graf CE, Giannelli SV, Herrmann FR, *et al*. Can We Improve the Detection of Old Patients at Higher Risk for Readmission After An Emergency Department Visit? *Journal of the American Geriatrics Society* 2012; **60(7):** 1372-73.
4. Kansagara D, Englander H, Salanitro A. Risk prediction models for hospital readmission: A systematic review. JAMA: *The Journal of the American Medical Association* 2011; **306(15):** 1688-98.
5. Cotter PE, Bhalla VK, Wallis SJ, *et al*. Predicting readmissions: poor performance of the LACE index in an older UK population. *Age Ageing* 2012; **41(6):** 784-9.
6. Fried LP, Hadley EC, Walston JD, *et al*. From bedside to bench: research agenda for frailty.[erratum appears in Sci Aging Knowledge Environ. 2005; 2005(41):er3 Note: Newman, Anne [corrected to Newman, Anne B]]. Science of Aging Knowledge Environment 2005; **2005(31):** pe24.
7. Rothman MD, Leo-Summers L, Gill TM. Prognostic significance of potential frailty criteria. *Journal of the American Geriatrics Society* 2008; **56(12):** 2211-16.
8. Rockwood K, Mitnitski A. Frailty in relation to the accumulation of deficits. *Journals of Gerontology Series A-Biological Sciences & Medical Sciences* 2007; **62(7):** 722-7.
9. Rockwood K, Song X, MacKnight C, *et al*. A global clinical measure of fitness and frailty in elderly people.[see comment]. *CMAJ Canadian Medical Association Journal* 2005; **173(5):** 489-95.
10. Hosmer D, Lemeshow D, editors. Applied Logistic Regression. Second Edition ed: John Wiley & sons, 2002.
11. Cook NR. Use and Misuse of the Receiver Operating Characteristic Curve in Risk Prediction. *Circulation* 2007; **115(7):** 928-35.