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Received 11 July 2011; accepted in revised form 2 November 2011

*Age and Ageing* 2012; 41: 412–416  
doi: 10.1093/ageing/afs021  
Published electronically 4 March 2012

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## The impact of frailty and delirium on mortality in older inpatients

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### Abstract

**Background:** delirium and frailty are common among hospitalised older people but delirium is often missed and frailty considered difficult to measure in clinical practice.

**Objective:** to explore the relationship between delirium and frailty in older inpatients and determine their impact on survival.

**Design and setting:** the prospective cohort study of 273 patients aged  $\geq 75$  years.

**Measures:** patients were screened for delirium at presentation and on alternate days throughout their hospital stay. Frailty status was measured by an index of accumulated deficits (FI), giving a potential score from 0 (no deficits) to 1.0 (all 33 deficits), with 0.25 used as the cut-off between 'fit' and 'frail'.

**Results:** delirium was detected in 102 patients (mean FI: 0.33) and excluded in 171 (mean FI: 0.18) ( $P < 0.005$ ); 111 patients were frail. Among patients with delirium, the median survival in fit patients was 359 days (95% CI: 118–600) compared with 88 days for those who were frail (95% CI: 5–171;  $P < 0.05$ ).

**Conclusion:** delirium was associated with higher levels of frailty: the identification of frail patients may help to target those at a greatest risk of delirium. Survival following delirium was poor with the combination of frailty and delirium conferring a particularly bleak prognosis.

**Keywords:** delirium, frail older adults, survival, elderly

## Introduction

Delirium [1] and frailty [2] are common among older inpatients. Since each is significantly associated with chronological age, their importance is likely to increase with the ageing of the inpatient population [3]. Each is associated with adverse outcomes. Delirium is consistently associated with high mortality even when adjusted for other factors, including illness severity [1, 4, 5]. Though it is measured in different ways, frailty, by definition identifies those at risk of adverse outcomes, including death [6]. Previous studies of community-dwelling older people have shown frailty to be more strongly associated with death than chronological age and co-morbidity [7].

The relationship between these common and important syndromes is currently incompletely explored [8]. Owing to its sporadic occurrence, fluctuating course and diverse clinical presentation, the diagnosis of delirium is often missed [9, 10]. Frailty is not yet routinely or systematically assessed in older inpatients. Some frailty measures are considered to be difficult to apply in clinical practice [11]. Others, by defining all older patients as frail, lack discriminatory utility [2].

In this cohort study, patients were screened for delirium on admission and throughout their inpatient stay. Frailty was investigated using an index of accumulated deficits. In this way, we aimed to explore the relationship between delirium and frailty in older patients and determine their impact on survival.

## Methods

### Design and setting

Participants were men and women aged 75 years and over admitted acutely to a general medical service at a district general hospital in South Wales. All patients were screened for inclusion in the study. Of 393 eligible patients, 278 were recruited. Reasons for non-participation were refusal of consent ( $n = 98$ ) or assent (10) and the unavailability of

proxy consent (7). Study methodology has been described in detail elsewhere [1].

The study was approved by the South East Wales research ethics committee. Informed consent for inclusion into the study was sought for each patient. In cases where individual capacity to undertake healthcare decision was impaired, relative assent was obtained.

### Measures

#### Delirium

Patients were screened for delirium at presentation using DSM-IV criteria [12]. Ongoing, alternate day clinical assessment and screening for delirium continued for all participants during their inpatient admission.

#### Frailty

A frailty index (FI) on admission was constructed from 33 variables representing conditions that accumulate with age and are associated with adverse outcomes [13]. Deficits included co-morbidities and functional, sensory and cognitive impairments. Each individual's deficit points were summed and divided by the total number of deficits considered to yield an FI with theoretical range 0–1. For example, someone with five deficits would have an FI value of 0.15 (5/33).

Although the FI can be considered as a continuum with higher values representing greater frailty, 0.25 has been proposed as the cut-off between 'fit' and 'frail' [14].

#### Outcomes

Patients were followed for 5 years after index admission. Time to death was established from hospital records, supplemented by the local register of deaths.

### Analysis

Survival was compared between frailty and delirium groups using the Kaplan–Meier plot (log-rank test). The hazard ratio for frailty was calculated and then adjusted for delirium according to Cox's proportional analysis.

## Results

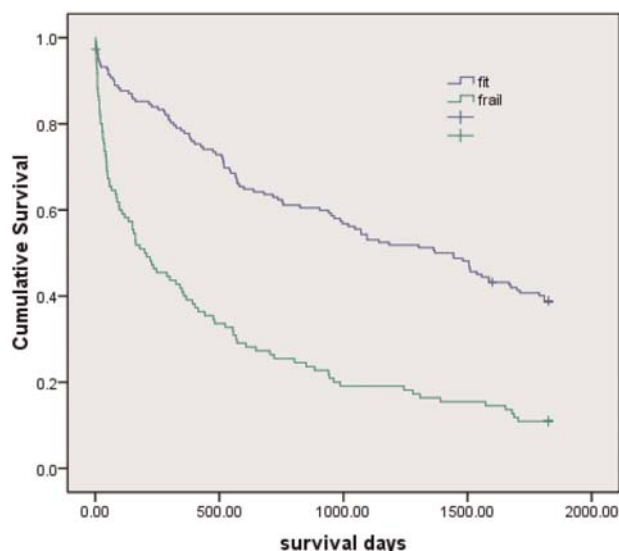
Delirium status, FI and 5-year survival were determined for 273 patients out of 278 patients recruited (98%). The mean age of patients was 82.3 years (SD: 7.5); 112 were men. Delirium was detected in 102 patients and excluded in 171. FI scores were normally distributed, with a mean value of 0.24 (S.D. 0.14). Patients with delirium had significantly higher FI scores than those without delirium ( $0.33 \pm 0.14$  versus  $0.18 \pm 0.11$ ;  $P \leq 0.005$ ).

A total of 162 patients were 'fit' (FI < 0.25) and 111 'frail' (FI  $\geq 0.25$ ). Delirium was detected in 29 fit patients (18%) and in 72 patients who were frail (65%) ( $P \leq 0.005$ ).

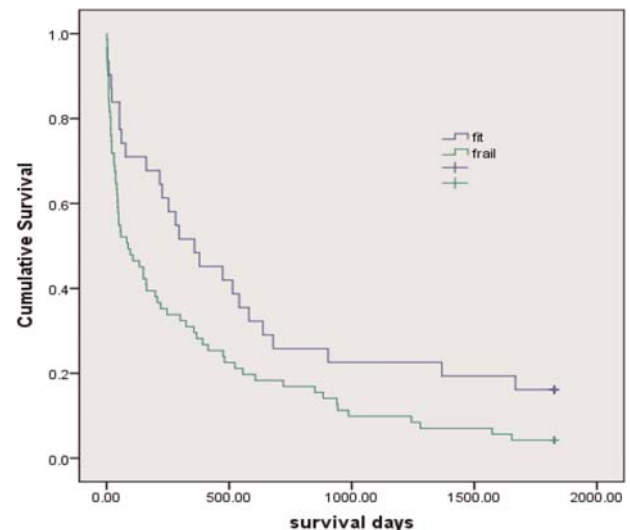
Considering the patient cohort as a whole, the median survival following index admission was significantly longer for patients who were fit [1,368 days (95% CI: 1014–1722)] compared with those who were frail [207 days (95% CI: 88–326)] ( $P < 0.005$ ) (Figure 1). Frailty status also impacted survival in patients with delirium. The median survival for fitter patients with delirium was 359 days (95% CI: 118–600). Inpatients with both frailty and delirium survived for a median of 88 days [95% CI: 5–171];  $P = 0.02$ ] (Figure 2).

## Discussion

Frailty, measured by an index of accumulated deficits, was common among hospitalised older patients. The median



**Figure 1.** All patients: survival post index admission by frailty status—frail, bottom curve (frailty index  $\geq 0.25$ ), versus fit, top curve (frailty index < 0.25).



**Figure 2.** Patients with delirium: survival post index admission by frailty status—frail, bottom curve (frailty index  $\geq 0.25$ ), versus fit, top curve (frailty index < 0.25).

survival of inpatients identified as frail was significantly shorter, affording validation of the frailty measure as a predictor of adverse outcomes. Since frailty is intended to be a marker of vulnerability, it is also congruent that frail patients had significantly higher rates of delirium. Survival following delirium was poor for all patients and was significantly impacted by frailty status. The median survival for inpatients in our cohort with a combination of frailty and delirium (88 days) is comparable, for example, with that of patients with malignant gastric outlet obstruction [15] or multiple brain metastases [16].

We acknowledge methodological weaknesses. Data were only collected at a single hospital site. Multivariate analysis was not conducted as many of the factors that may influence risk could not be adjusted for as they were used in the composition of the FI itself. Furthermore, scrutiny of these individual items may well have yielded associations but the findings would not be as generalisable as those gleaned from overall frailty status [17]. Although the characterisation of frailty using an FI is a well-validated approach [17], it is not the only one available. The most well known and widely used definition of frailty is that proposed by Fried *et al.* [18] as a syndrome or phenotype of at least three of five criteria: weight loss, exhaustion, weak grip strength, slow walking speed, low physical activity. However, older inpatients are often unable to complete these performance-based tests [19, 20] and many of our cohort could not have been evaluated using such syndromic definitions.

Our study also has certain strengths. All older patients admitted to hospital were screened for inclusion, patients were well characterised at baseline and few were lost to follow-up. Investigations of delirium are challenged by its fluctuating course and diverse presentation but here, comprehensive serial evaluation of patients throughout their inpatient episode optimised delirium detection.

Although the rate of delirium among our cohort (37%) is consistent with other studies [4, 5], the prevalence of frailty (41%) is less easy to contextualise. Frailty has been identified in between 27 and 80% of older inpatients depending on the defining criteria used [2, 21]. The challenges of frailty measurement among patients in hospital are well described [11]. Here, the FI was derived from routinely collected data and could be determined for all patients, regardless of their cognitive or functional abilities; this increases its potential utility in the clinical setting. The purpose of frailty identification has also been questioned [11]. Since the FI stratifies patients on a continuum rather than as dichotomous groups, further work could identify the different cut-offs for those most likely to benefit from interventions (including multidisciplinary rehabilitation) as well as those at highest risk of adverse outcomes.

In this cohort in non-delirious patients, frailty is an arbiter of poor outcome. However, survival following delirium was reduced in both fit and frail patients. The combination of frailty and delirium conferred a particularly poor prognosis. This raises important questions regarding patient management. Although there are proven measures to prevent delirium [22], evidence regarding interventions to improve outcomes following delirium diagnosis remains conflicting [23]. Similarly, while complex interventions such as education, optimised nutrition and exercise have been proposed to delay or prevent frailty [24], there is, as yet, no evidence that such interventions can mitigate adverse outcomes for frail older inpatients. Whether the provision of increased medical and multidisciplinary care to frail older inpatients with delirium can improve outcomes or whether these patients have an irreversible trajectory that should trigger a more palliative approach should be the focus of further enquiry.

## Key points

- Delirium is associated with higher levels of frailty.
- The identification of frail patients may help to target those at a greatest risk of delirium.
- Although frailty itself is an arbiter of poor outcome, survival following delirium is poor, regardless of frailty status.
- In this cohort, the median survival of frail inpatients with delirium was 88 days.

## Conflicts of interest

None declared.

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- Received 28 July 2011; accepted in revised form 19 October 2011

*Age and Ageing* 2012; 41: 416–419  
doi: 10.1093/ageing/afs022

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# Gender differences in care home admission risk: partner's age explains the higher risk for women

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## Abstract

**Background:** older women have a higher risk of care home admission than men, this difference remains even after accounting for variations in health. A likely reason for this is the difference in social support provided by spouses. Older men may provide less care for their wives than women do for their husbands.

**Objectives:** this study assessed two competing explanations for this. First, older men are less willing to undertake traditionally feminine caring roles; secondly, older men are less physically able to provide care.

**Design:** the Northern Ireland Longitudinal Study (NILS), a representative (c28%) sample of the Northern Ireland population.

**Findings:** a total of 20,830 couples were followed over 6 years, with 415 care home admissions among NILS cohort members. Women had a higher admission risk after controlling for cohort members' age and health; however, there was no gender difference after adjusting for partner's age.

**Conclusion:** these results suggest that advanced age and physical frailty explain why men provide less care for their partners than women do; rather than being unwilling to undertake a caring role. The narrowing gap in life expectancy between men and women may have an effect on the future demand for formal care.

**Keywords:** care home admission, informal care, gender differences, elderly

## Introduction

Most studies within the UK have demonstrated that women are more likely than men to be admitted to a nursing or residential home. This excess risk persists even after adjustment for differences in age and health status [1, 2]. Other studies have shown that the difference is mainly within married couples as admission risk is, for example, similar for men and women living alone [3].

There are two explanations for this gender difference. The first is that older men provide less care because they are less willing or less equipped to do so, due to socio-cultural

gender stereotyping. This is somewhat supported by cross-sectional studies demonstrating a female preponderance of caring [4]. The second is that the difference is due to demographic factors. Women tend to marry men older than themselves [5]. This means that the partners of older women may be less physically able to provide care due to their own age-related frailty. This difference is important for future demand for care home places; the first may be a consequence of historical demarcation of roles, a pattern that may not be evident in future generations, the alternative is somewhat fixed by the age of people's partners.