RESEARCH ARTICLE

International Journal of Geriatric Psychiatry

Survival of people with dementia after unplanned acute hospital admission: a prospective cohort study

Elizabeth L. Sampson[1,2†], Baptiste Leurent[1], Martin R. Blanchard[3,4], Louise Jones[1] and Michael King[3,4]

[1]Marie Curie Palliative Care Research Unit, UCL Mental Health Sciences Unit, University College London Medical School, London, UK
[2]Barnet Enfield and Haringey Mental Health Trust, London, UK
[3]UCL Mental Health Sciences Unit, University College London Medical School, London, UK
[4]Camden and Islington NHS Foundation Trust, London, UK
Correspondence to: Elizabeth L. Sampson, E-mail: e.sampson@ucl.ac.uk

[†]ELS obtained funding devised the project, collected and analysed data and drafted the final paper. MB, MK and LJ supervised the project, data analysis and contributed to the interpretation of results and writing of the paper. BL led data analysis and wrote the paper.

Objective: To examine the effect of dementia on longer term survival after hospital admission, and to assess whether dementia is an independent predictor of mortality. This information is vital for the provision of appropriate care.

Methods: A prospective cohort study, in a large urban acute general hospital, of 616 people (70 years and older) with unplanned medical admission. The principal exposure was DSM-IV dementia and main outcome mortality risk. Dementia severity was analysed by using the Functional Assessment Staging scale. We examined a range of modifying variables: acute physiological disturbance (Acute Physiology and Chronic Health Evaluation), chronic comorbidity (Charlson Comorbidity Index, CCI) and pressure sore risk (Waterlow score).

Results: A total 42.4% of the cohort had dementia. Nearly half (48.3%) had died 12 months after admission (median survival time 1.1 years compared with 2.7 years in people without dementia). Unadjusted hazard ratios for mortality in people with dementia was 1.66 (95% CI 1.35–2.04) and for people with moderately severe/severe dementia 2.01 (95% CI 1.57–2.57). After sequential adjustment (age, gender, Acute Physiology and Chronic Health Evaluation score, Charlson Comorbidity Index and Waterlow score), patients with dementia had a mortality risk of 1.24 (95% CI 0.95–1.60) and those with moderately severe/severe dementia 1.33 (0.97–1.84).

Conclusions: People with dementia had half the survival time of those without dementia. The effect of dementia on mortality was reduced after adjustment, particularly by the Waterlow score, a marker of frailty. The median survival of 1 year suggests clinicians should consider adopting a supportive approach to the care of older people with moderate/severe dementia who have an emergency hospital admission.

Key words: dementia; prognosis; acute hospital; mortality; palliative care
History: Received 13 August 2012; Accepted 21 November 2012; Published online 21 December 2012 in Wiley Online Library (wileyonlinelibrary.com).
DOI: 10.1002/gps.3919

Introduction

Currently, there are an estimated 700 000 people with dementia in the UK. This is set to increase to over 1 million by 2025 (Knapp and Privette, 2007). Evidence from large epidemiological studies suggests that one in three of those over the age of 65 years will die whilst suffering from dementia (Brayne *et al.*, 2006), and median survival from onset of dementia to death is 4.1 years (Xie *et al.*, 2008).

The emergency admission of an older person with dementia to an acute hospital increases short-term mortality risk further. We have found that in patients with unplanned acute medical admissions, 18% of those with dementia (median length of admission 11 days) died during the index admission compared

with 8% of those without dementia (median length of admission 7 days). The hazard ratio for mortality in those with dementia compared with those without, adjusted for age and severity of acute physical illness, was 2.09 (95% CI, 1.10–4.00) (Sampson *et al.*, 2009). Morrison *et al.* demonstrated a longer term effect in patients with advanced dementia and pneumonia admitted to the acute hospital; 6-month mortality after pneumonia was 53% in those with dementia, compared with 13% of those who were cognitively intact (adjusted hazard ratio 4.6, 95% CI 1.8–11.8) (Morrison and Siu, 2000). Medical staff consistently overestimate prognosis in advanced dementia; at nursing home admission only 1.1% of residents were perceived to have life expectancy of less than 6 months, however, 71% died within that period (Mitchell *et al.*, 2004a).

There is increasing evidence that people with dementia often receive poor quality end of life care (Sampson *et al.*, 2006; Thuné-Boyle *et al.*, 2010). Prognostic uncertainty has been identified as a key reason for this (Morrison and Siu, 2000). It has been argued that medical care based on cure and maximal prolongation of life is inappropriate for patients with advanced dementia, particularly those with acute physical illness, and that a more palliative approach to care should be adopted (Volicer, 1997). Improved information on longer-term prognosis would allow clinicians to feel more confident in adapting a palliative model of care for frail older people with dementia.

This study was designed to examine survival in a large, representative cohort of people over 70 years who had been admitted to the general hospital with acute medical illness. Our objective was to examine the effect of dementia on longer term survival after acute hospital admission and to assess whether this is an independent predictor of mortality.

Method

Study population

For a detailed description of study methods and the cohort, see Sampson *et al.*, (2009). Recruitment took place at a large north London general hospital serving an area of socioeconomic and ethnic diversity. All patients aged 70 years and older with an unplanned medical admission to any medical speciality were eligible for inclusion. The cohort was recruited from 4 June 2006 to 4 December 2006. Participants were excluded if they were admitted for less than 48 h (this was to exclude patients undergoing brief admission to the accident and emergency ward) or did not speak sufficient English for basic cognitive assessment. All patients were assessed within 72 h of admission by an old age psychiatrist.

Diagnosis of dementia

All participants were first screened with the Confusion Assessment Method (CAM) using the version that maximises sensitivity (Inouye *et al.*, 1990). Those who screened positive for delirium were re-assessed 4 days later and if they remained positive for delirium were excluded from further analysis. This aimed to minimise the risk of misclassification of delirium as dementia. After this, a diagnosis of dementia was generated by an independent clinician experienced in old age psychiatry using a structured clinical assessment based on operationalised DSM-IV criteria (American Psychiatric Association 1994) This comprised cognitive testing by using the Mini Mental State Examination (MMSE Folstein *et al.*, (1975)), structured review of the clinical notes and discussion with family and other carers.

Other explanatory and outcome variables

Demographic data (age, gender and place of residence) were gathered from the hospital notes. All patients admitted acutely to the hospital receive standardised assessment of continence and are routinely assessed for risk of pressure sores with the Waterlow Scale (Waterlow, 1985). It is the most widely used pressure sore risk tool used in the UK. This measures a range of risk factors including gender, continence, malnutrition, mobility and neurological deficits. Full hospital notes were reviewed for chronic comorbidity by using standardised and validated ICD-10 coding lists (Sundararajan *et al.*, 2004), and severity of comorbidity was calculated by using the modified Charlson comorbidity scale (Charlson, 1987), from which the item on dementia was removed. This is a valid and reliable measure of comorbidity in older people (de Groot *et al.*, 2003) The APACHE II gives the severity of acute illness by using 12 routine physiological parameters, taken at the point of admission, including core temperature, mean arterial pressure, Glasgow Coma Scale and laboratory values (serum sodium, potassium, creatinine and haematocrit) (Knaus *et al.*, 1985). We used a modified version as arterial blood gas sampling was not routinely performed on all patients (Adamis *et al.*, 2006). Severity of functional impairment was measured by using the Functional Assessment Staging Scale (FAST) (Reisberg *et al.*, 1982),

an observational scale that describes a continuum of seven successive stages of dementia, from normality to the most severe dementia. This was categorised by using established cut-off points as '1' no impairment, '2–5' mild/moderate impairment and '6–7' moderately severe/severe impairment (Reisberg *et al.*, 1996). Length of hospital stay was collected from hospital administrative data.

Mortality

All participants were 'flagged' by using the UK Office for National Statistics system allowing automatic notification of date of death and provision of a copy of the death certificate. Survival time was from the date of hospital admission to the date of death or until censoring on 9 July 2009.

Diagnosis on admission

Data were collected from Hospital Episode Statistics by using the primary ICD-10 diagnosis coded for the index admission and categorised according to the Ambulatory Care Sensitive Condition system (Sanderson and Dixon, 2000). The commonest Ambulatory Care Sensitive Condition categories in this cohort were acute ischaemic heart disease, chronic obstructive pulmonary disease (COPD), urinary tract infection and pneumonia.

Ethical issues

We sought verbal consent from participants or, if they lacked capacity to consent, verbal assent from their carers. The study involved the collection of routine clinical data that has subsequently been fully anonymised. Screening for cognitive impairment, dementia and delirium should be routine on hospital admission. The study was approved by the Royal Free Hospital NHS Trust Ethics Committee (06/Q0501/31).

Data analysis

Cohort characteristics were reported and compared between patients with and without DSM-IV dementia by using *t*-tests and χ^2 tests, as appropriate. We then examined mortality rates by DSM-IV dementia diagnosis and severity, as measured by the FAST scale. These were plotted and compared using Kaplan–Meier plots and the log-rank test.

Finally, multivariable Cox models were fitted to analyse the effect of dementia adjusted sequentially for clinically relevant variables that have been shown in the literature to be associated with mortality in acute hospital inpatients or people with dementia: age and gender (Xie *et al.*, 2008), Apache II (Knaus *et al.*, 1985) and modified Charlson score (Zekry *et al.*, 2011), pressure sore risk (Waterlow score) (Sancarlo, *et al.*, 2011). Similar multivariable Cox models were also fitted to examine the effect of the severity of dementia (FAST) on survival. The proportional hazard assumption was checked by using Nelson–Aalen plots, testing for an interaction with time. Variables were kept as continuous when their relation to mortality was linear, and grouped in standard categories otherwise.

All statistical analyses were performed by using STATA version 11 (Stata Corp, College Station, TX, USA). All the *p*-values reported are two-sided and considered significant when less than 5%. All confidence intervals are at the 95% level. There was little missing data and analyses were performed on a complete case basis.

Results

A total of 805 patients over the age of 70 years had unplanned admissions to the hospital lasting more than 48 h during the recruitment period. Of these, 45 were discharged before they could be assessed leaving 760 (94.5%) patients for further assessment. Of these, 30 did not wish to participate (3.7%), and 20 did not speak adequate English (2.5%). Therefore 710 (88.2%) were screened with the CAM, and a further 93 excluded because they had persistent delirium. One participant was excluded because they had more than 50% of data missing and this left 616 participants (76.7%) for this analysis.

Patients excluded from this analysis (refused to participate, insufficient English, persistent delirium or moribund) had significantly increased in-hospital mortality during the index admission compared with those who were included (20.4% vs 9.4%, $\chi^2 = 10.17$, $p = 0.001$), but those excluded did not differ significantly with respect to age, gender, Charlson score or APACHE II score (for further details, see Sampson *et al.*, 2009).

Cohort characteristics

Characteristics of the cohort are presented in Table 1. The mean age of participants was 83.2 years (range 70–101 years) and 59% were women. The majority of participants resided in their own homes with over 20% of patients were from residential or nursing homes.

Table 1 Cohort characteristics by DSM-IV dementia diagnosis. Mean ± SD or *n* (%)

Variables	Total	DSM-IV dementia		*p*-value*
	N = 616	No *N* = 355 (57.6%)	Yes *N* = 261 (42.4%)	
Socio-demographics				
Gender				
Female	364 (59)	182 (51)	182 (70)	<0.001
Age, years	83.2 ± 7.3	80.9 ± 6.9	86.2 ± 6.7	<0.001
Ethnicity (*n* = 599)**				
White	550 (92)	319 (92)	231 (92)	0.91
Education (*n* = 528)				
>9 years	216 (41)	158 (50)	58 (28)	<0.001
Marital status (*n* = 608)				
Married	202 (33)	139 (39)	63 (25)	<0.001
Widowed	283 (47)	140 (39)	143 (56)	
Single/divorced	123 (20)	76 (22)	47 (19)	
Place of residence				
House	438 (71)	312 (88)	126 (48)	<0.001
Residential	42 (7)	8 (2)	34 (13)	
Nursing	90 (15)	8 (2)	82 (31)	
Sheltered	46 (7)	27 (8)	19 (7)	
Smoking (*n* = 611)				
Never	285 (47)	143 (40)	142 (56)	
Ex	271 (44)	171 (48)	100 (39)	
Current	55 (9)	41 (12)	14 (5)	<0.001
Clinical				
Modified Charlson score	2.6 ± 2.2	2.7 ± 2.3	2.3 ± 2.0	0.02
Apache II score (*n* = 596)	12.0 ± 3.6	11.4 ± 3.1	12.9 ± 4.1	<0.001
Albumin level, g/L	38.9 ± 5.3	39.5 ± 5.2	38.1 ± 5.4	0.001
Waterlow score (*n* = 610)	13.1 ± 6.4	10.6 ± 4.6	16.6 ± 6.8	<0.001
Presence of pressure sores,(*n* = 614)				
Yes	58 (9)	8 (2)	50 (19)	<0.001
Incontinence (*n* = 614)				
Yes	150 (24)	22 (6)	128 (49)	<0.001
FAST score				
1	264 (43)	259 (73)	5 (2)	
2–5 (mild to moderate)	180 (29)	96 (27)†	84 (32)	<0.001
6–7 (moderately severe to severe)	172 (28)	0 (0)	172 (66)	
Number of admissions in the last year	0.86 ± 1.3	0.87 ± 1.4	0.86 ± 1.2	0.95
Diagnosis on admission				
Acute Cardiac Syndrome	56 (9)	43 (12)	13 (5)	<0.001
COPD	38 (6)	32 (9)	6 (2.3)	
Urinary Tract Infection	54 (9)	17 (5)	37 (14.2)	
Pneumonia	91 (15)	29 (8)	62 (24)	
Other	377 (61)	234 (66)	143 (55)	
Duration of index admission, days (*n* = 615)	14.2 ± 15.8	12.3 ± 15.0	16.7 ± 16.7	<0.001
Death during index admission				
Yes	58 (9)	19 (5)	39 (15)	<0.001

COPD, chronic obstructive pulmonary disease; FAST, Functional Assessment Staging scale.
*p-value from χ^2 test or Student's t-test, as appropriate.
**n reported if missing data.
†Some patients who complained of subjective difficulties as defined by the FAST scale did not reach DSM-IV criteria for dementia.

DSM-IV dementia was present in 42% of participants. FAST scores demonstrated that over a quarter of the cohort were moderately or severely impaired in activities of daily living as a result of dementia.

There was a much higher prevalence of dementia in patients admitted from residential and nursing homes than those admitted from other settings. Patients with dementia had higher Waterlow scores, greater risk of pressure sores on admission, poorer chronic health status (Charlson Score) and significantly higher APACHE scores suggesting greater acute physiological disturbance at the time of the index admission.

Mortality

Patients with DSM-IV dementia and with increasing functional impairment, as measured by the FAST scale

had higher mortality rates. Of people with dementia, 48% had died by 12 months after admission, compared with 33% of those without dementia. In those with the most severe dementia (FAST scores of 6–7), 50% had died by 12 months from the index hospital admission. Median survival was 2.7 years for those with no dementia compared with 1.1 year for those with dementia (Table 2).

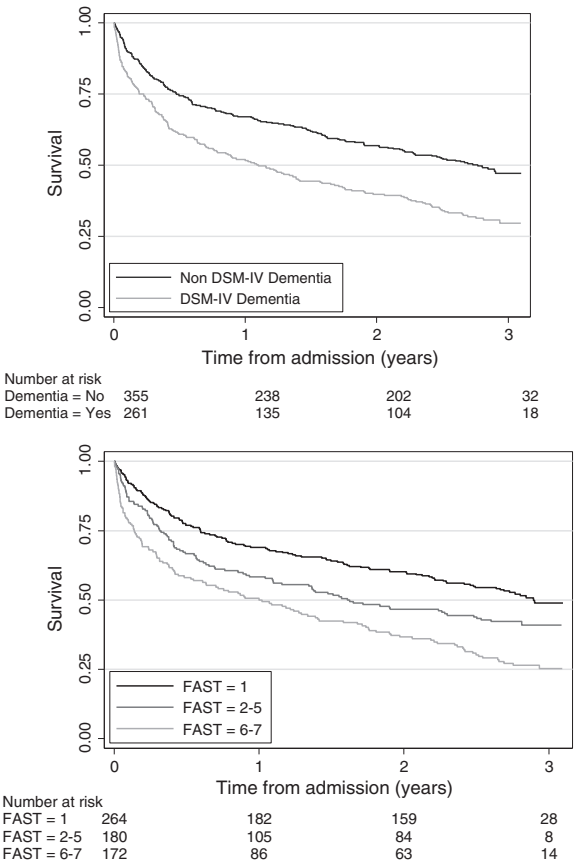
The Kaplan–Meier curves (Figure 1) demonstrate the reduction in survival probability that occurs with increasing DSM IV dementia and with increasing dementia severity on the FAST scale (log-rank test for equality of survivor functions was <0.001 for both measures).

Proportional hazard regression

The effect of dementia on mortality remained constant over time (nonsignificant interaction between time and dementia, $p = 0.79$). Unadjusted Cox models showed that patients admitted with DSM-IV dementia were 1.66 times less likely to survive until any given time (95% CI, 1.35–2.04). A similar increase in mortality risk (HR 2.01, 95% CI 1.57–2.57) was seen in those with the most severe dementia, FAST categories 6–7. All adjustment variables were strongly related to death ($p < 0.001$), except gender ($p = 0.69$) (Table 3).

Table 4 gives hazard ratios for the association between dementia and FAST scores.

Sequential adjustments showed that the effect of DSM-IV dementia was still significant after adjustment for age, sex, Apache II score and Charlson score (Hazard Ratio (HR) = 1.56 95% CI, 1.23–1.98), but became nonsignificant after adjustment for Waterlow score (HR = 1.24 95% CI, 0.95–1.60) (Table 3). Similar results were found for patients with severe impairment on the FAST score.



Log-rank test for equality of survivor function: p<0.001 for both figures

Figure 1 Kaplan–Meier unadjusted survival curves by DSM-IV dementia diagnosis and FAST score.

Table 2 Mortality by DSM-IV dementia diagnosis and FAST score (95% CI)

	DSM-IV dementia		FAST score		
	No $n = 355$	Yes $n = 261$	1 $n = 264$	2–5 $n = 180$	6–7 $n = 172$
Mortality (%)					
6 months	25.6 (21.1–30.2)	39.1 (33.1–45.0)	23.1 (18.0–28.2)	33.3 (26.4–40.3)	41.8 (34.5–49.3)
12 months	33.0 (28.1–37.9)	48.3 (42.2–54.4)	31.1 (25.5–36.7)	41.7 (34.4–48.9)	50.0 (42.5–57.5)
Median survival					
Years	2.7 (2.2–NA)	1.1 (0.7–1.6)	2.9 (2.3–NA)	1.6 (1.1–2.5)	1.0 (0.5–1.4)
Mortality rates (1000 person years)	278 (240–321)	491 (424–568)	256 (215–304)	368 (304–446)	554 (465–659)

Total $N = 616$, total person-year = 1018.
NA, not available; FAST, Functional Assessment Staging scale.

Table 3 Cox univariable regression models for the effect of study variables on mortality

Variables	HR (95% CI)	*p*-value
DSM-IV dementia		
No	1.0	
Yes	1.66 (1.35–2.04)	<0.001
FAST score		
1	1.0	
2–5	1.37 (1.06–1.77)	<0.001
6–7	2.01 (1.57–2.57)	
Gender		
Male	1.0	
Female	1.04 (0.85–1.29)	0.69
Age		
(per 1 year increase)	1.03 (1.01–1.04)	<0.001
Apache II score		
0–9	1.0	
10–14	1.29 (0.99–1.68)	<0.001
≥15	2.11 (1.55–2.89)	
Modified Charlson		
0–1	1.0	
2–3	1.53 (1.19–2.97)	<0.001
≥4	2.16 (1.65–2.84)	
Waterlow		
(Per 1 pt increase)	1.06 (1.04–1.08)	<0.001
Pneumonia		
No	1.0	
Yes	1.93 (1.48–2.51)	<0.001

NA, not available; FAST, Functional Assessment Staging scale; Apache II, Acute Physiology and Chronic Health Evaluation II.

Discussion

Older people with dementia are frequently admitted to the acute hospital. Although other studies have examined the impact of this on short-term mortality during the index admission (Zekry *et al.*, 2009), this study is novel in that we have examined longer term survival up to 12 months, controlling for a range of modifying factors that are used in routine clinical practice.

We found that people with dementia had significantly shorter median survival times; 1.1 years compared with 2.7 years in those without dementia. It should be noted that 15% of those with dementia died during the index admission. It is possible that this high initial mortality contributed to the longer term increased mortality risk. At 6 months, 41.8% of those with severe dementia had died, compared with 23.1% of those without dementia. Our results reflect those of Morrison and Siu 2000 who demonstrated similar 6-month mortality (53%) in a more selected population of people with severe dementia and pneumonia. Thus life expectancy in this group was similar to older people with other serious life-limiting illnesses such as stage IV congestive cardiac failure (Nohria *et al.*, 2002) or metastatic breast cancer (Kiely *et al.*, 2011).

People with dementia had an unadjusted risk of mortality that was 1.66 times than those without; this risk was doubled in people with moderately severe/severe dementia and a FAST score of 6–7 (HR 2.01, 95%CI 1.57–2.57) and was constant over the follow-up period of the study (up to 3 years). These risks remained significantly increased after adjusting for demographic factors, acute physiological disturbance on the index admission (APACHE II score) and chronic comorbidity (Charlson score). However, the strength of association was reduced when adjusted for Waterlow score (HR = 1.24 95% CI, 0.95–1.60). The Waterlow score measures appetite, skin condition and mobility, thus it is a marker of nutritional status and function. Studies in nursing home residents with dementia have found that pressure ulcers are a strong predictor of mortality regardless of the degree of cognitive impairment (Gambassi *et al.*, 1999). In addition, in the acute hospital, shorter term mortality is no longer associated with cognitive status, once nutritional status (Zekry *et al.*, 2009) anorexia and function in activities of daily living are taken into account. The relationship between dementia, frailty and mortality is complex. Adding cognition to models of frailty improves their ability to predict a range of adverse outcomes; however, the underlying mechanisms and level of interaction remain unclear (Avila-Funes *et al.*, 2009).

Table 4 Cox regression models for the effect of DSM-IV dementia on mortality, sequentially adjusted for other covariates. HR (95% CI), *p*-value

Adjustment variables:	None (unadjusted) ($n = 616$)	Age and sex ($n = 616$)	+ APACHE II and modified Charlson ($n = 596$)	+ Waterlow score ($n = 592$)
DSM-IV dementia				
No	1.0	1.0	1.0	1.0
Yes	1.66 (1.35–2.04) $p < 0.001$	1.53 (1.22–1.91) $p < 0.001$	1.56 (1.23–1.98) $p < 0.001$	1.24 (0.95–1.60) $p = 0.11$
FAST sore				
1	1.0	1.0	1.0	1.0
2–5	1.37 (1.06–1.77)	1.31 (1.00–1.71)	1.38 (1.05–1.80)	1.26 (0.96–1.66)
6–7	2.01 (1.57–2.57) $p < 0.001$	1.84 (1.41–2.40) $p < 0.001$	1.81 (1.36–2.40) $p < 0.001$	1.33 (0.97–1.84) $p = 0.13$

A recent out-patient clinic based cohort study found that nearly a third of frail patients with Alzheimer's disease died within 1 year (Bilotta *et al.*, 2012). Thus, the Waterlow score may be a marker of general frailty associated with cumulative risks of comorbidity, poor physical health and nutrition; factors which may be mediators on the pathway between dementia and death.

Strengths and limitations of this study

We were able to recruit a large representative sample of older people undergoing unplanned acute hospital admission. The hospital involved serves five separate Primary Care Trusts (healthcare economies) covering a total population of 1.2 million. Follow-up rates for the primary outcome were high as we 'flagged' participants with the UK Office for National Statistics and automatically received notifications of the date of death.

The DSM-IV dementia criteria have high inter-rater reliability and agreement with the gold-standard National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association (NINCDS–ADRDA) criteria (Chui *et al.*, 2000) but, compared with ICD-10 may identify more cases, particularly of mild dementia because ICD-10 requires duration of at least 6 months. The prevalence of DSM IV dementia in our acute hospital cohort (42%) was very similar to that found in other studies in this setting, which range from 40.2 to 43.3% (Laurila *et al.*, 2004; Zekry *et al.*, 2008). We aimed, as far as possible, to avoid the misclassification of delirium as dementia. We used repeated assessment for delirium with the valid and reliable CAM tool, a technique used in other studies of this type. We tried to exclude patients with persistent delirium before they underwent cognitive testing with the Mini Mental State Examination and diagnosis for dementia. Given that people with pre-existing dementia are at much higher risk of developing delirium, and mixed delirium/dementia is associated with very high mortality (Rockwood *et al.*, 1999), by excluding those with persistent delirium, we may have actually underestimated mortality risk in this cohort. The study was conducted in a single hospital, and it is possible that the increased mortality risk of those with dementia is atypical. However, the hospital has one of the lowest standardised mortality ratios in the UK; therefore, risk may actually be higher in other settings (Dr Foster, 2010).

Residual confounding is possible; in particular, we may not have had full information on participants' past medical history and could not measure all possible factors that may have an impact of survival in this patient group such as concurrent depressive illness (Zekry *et al.*, 2009). The addition of a validated frailty index should be considered in future studies. We have, however, used other measures that are embedded in usual UK clinical and nursing practice, such as the Waterlow scale, or those that can be derived from standard clinical information.

Clinical implications

This study has demonstrated that dementia is associated with a sharply reduced survival over 12 months in people with dementia who have undergone unplanned acute hospital admission, in particular amongst those with moderately severe and severe dementia. An emergency admission of an older person with dementia may be a useful indicator of mortality risk. In addition, the busy acute hospital ward may be a particularly challenging, risky and stressful environment for an older person with dementia. This may be the point at which health professionals should consider adopting a more supportive or community-based approach to their care, particularly in those with more advanced dementia.

This may be a useful 'transition' point at which to consider advance care planning and discussion of prognosis with the patient (if possible) or with their family to consider which interventions are in their best interests both now and in the future. Further work is now required to examine whether we can develop a simple but robust prognostic model for people with dementia in this setting that clinicians can use to inform their decision making. Although the use of such models in clinical practice has been questioned (Moons *et al.*, 2009), there is strong evidence that clinicians routinely overestimate the survival times of people with dementia (Mitchell *et al.*, 2004). The use of information on prognosis can significantly improve the quality of care provided to people with dementia as they approach the end of life (Mitchell *et al.*, 2009). Our data may be of use in promoting a supportive or palliative approach for a growing cohort of older people with dementia, focussing on improving quality rather than length of life.

Conflict of interest

The study sponsors had no role in study design, collection, analysis or interpretation of data, in the writing of the report or the decision to submit the report for publication.

Key points

- Dementia is common in the acute hospital affecting 42% of older people with unplanned acute medical admission.
- Nearly half (48.3%) of those with dementia died 12 months after admission (median survival time 1.1 years compared with 2.7 years in people without dementia).
- People with moderately severe/severe dementia had an unadjusted mortality risk double than that of those without dementia, although this was attenuated after controlling for a range of confounding variables such as age, chronic comorbidity and in particular pressure sore risk, a marker of frailty.
- The reduced survival time of people with dementia suggests that clinicians should consider adopting a supportive or palliative approach to the care of older people with moderate/severe dementia who have an emergency hospital admission.

Acknowledgements

This project was funded by a Medical Research Council (UK) Special Training Fellowship in Health Services Research awarded to ELS. We would like to thank Dr Dan Lee (Health Services for Elderly People, Royal Free Hospital NHS Trust), the staff of the Medical Acute Admissions Unit and Ginnette Kitchen, Lucy Watkin, Noel Collins, Jenny Drife and Viv Green for assistance with data collection and processing. Louise Jones' and Elizabeth Sampson's posts are supported by Marie Curie Cancer Care core funding, grant MCCC-FCO-11-U.

References

Adamis D, Treloar A, Martin FC, Macdonald AJ. 2006. Recovery and outcome of delirium in elderly medical inpatients. *Arch Gerontol Geriatr* **43**(2): 289–298.

American Psychiatric Association. 1994. *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn, American Psychiatric Association: Washington DC.

Avila-Funes JA, Amieva H, Barberger-Gateau P, *et al*. 2009. Cognitive impairment improves the predictive validity of the phenotype of frailty for adverse health outcomes: the three-city study. *J Am Geriatr Soc* **57**(3): 453–461.

Bilotta C, Bergamaschini L, Nicolini P, *et al*. 2012. Frailty syndrome diagnosed according to the Study of Osteoporotic Fractures criteria and mortality in older outpatients suffering from Alzheimer's disease: a one-year prospective cohort study. *Aging Ment Health* **16**(3): 273–280.

Brayne C, Gao L, Dewey M, Matthews FE. 2006. Dementia before death in ageing societies--the promise of prevention and the reality. *PLoS Med* **3**(10): e397.

Charlson ME. 1987. Studies of prognosis: progress and pitfalls. *J Gen Intern Med* **2**(5): 359–361.

Chui HC, Mack W, Jackson JE, *et al*. 2000. Clinical criteria for the diagnosis of vascular dementia: a multicenter study of comparability and interrater reliability. *Arch Neurol* **57**(2): 191–196.

de Groot V, Beckerman H, Lankhorst GJ, Bouter LM. 2003. How to measure comorbidity: a critical review of available methods. *J Clin Epidemiol* **56**: (3): 221–229.

Dr Foster. How healthy is your hospital? Dr Foster Intelligence. 21–7–2010. http://www.drfosterintelligence.co.uk/hospitalguide/index.asp. 21-7-2010.

Folstein MF, Folstein SE, McHugh PR. 1975. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res* **12**(3): 189–198.

Gambassi G, Landi F, Lapane KL, *et al*. 1999. Predictors of mortality in patients with Alzheimer's disease living in nursing homes. *J Neurol Neurosurg Psychiatry* **67**(1): 59–65.

Inouye SK, van Dyck CH, Alessi CA, *et al*. 1990. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med* **113** (12): 941–948.

Kiely BE, Soon YY, Tattersall MH, Stockler MR. 2011. How long have I got? Estimating typical, best-case, and worst-case scenarios for patients starting first-line chemotherapy for metastatic breast cancer: a systematic review of recent randomized trials. *J Clin Oncol* **29**(4): 456–463.

Knapp M, Privette A. 2007. *Dementia UK* Alzheimer's Society, Alzheimer's Society: London.

Knaus WA, Draper EA, Wagner DP, Zimmerman JE. 1985. APACHE II: a severity of disease classification system. *Crit Care Med* **13**(10): 818–829.

Laurila JV, Pitkala KH, Strandberg TE, Tilvis RS. 2004. Detection and documentation of dementia and delirium in acute geriatric wards. *Gen Hosp Psychiatry* **26**(1): 31–35.

Mitchell SL, Kiely DK, Hamel MB, *et al*. 2004. Estimating prognosis for nursing home residents with advanced dementia. *JAMA* **291**(22): 2734–2740.

Mitchell SL, Teno JM, Kiely DK, *et al*. 2009. The clinical course of advanced dementia. *N Engl J Med* **361**(16): 1529–1538.

Moons KG, Royston P, Vergouwe Y, Grobbee DE, Altman DG. 2009. Prognosis and prognostic research: what, why, and how? *BMJ* **338**: b375.

Morrison RS, Siu AL. 2000. Survival in end-stage dementia following acute illness. *J Am Med Assoc* **284**(1): 47–52.

Nohria A, Lewis E, Stevenson LW. 2002. Medical management of advanced heart failure. *JAMA* **287**(5): 628–640.

Reisberg B, Ferris SH, de Leon MJ, Crook T. 1982. The Global Deterioration Scale for assessment of primary degenerative dementia. *Am J Psychiatry* **139**(9): 1136–1139.

Reisberg B, Ferris SH, Franssen EH, *et al*. 1996. Mortality and temporal course of probable Alzheimer's disease: a 5-year prospective study. *Int Psychogeriatr* **8**(2): 291–311.

Rockwood K, Cosway S, Carver D, Jarrett P, Stadnyk K. 1999. The risk of dementia and death after delirium. *Age Ageing* **28**(6): 551–6, *1999 Oct.(40 ref)* no. 6, pp. 551–556.

Sampson EL, Blanchard MR, Jones L, Tookman A, King M. 2009. Dementia in the acute hospital: prospective cohort study of prevalence and mortality. *Br J Psychiatry* **195**: (1): 61–66.

Sampson EL, Gould V, Lee D, Blanchard MR. 2006. Differences in care received by patients with and without dementia who died during acute hospital admission: a retrospective case note study. *Age Ageing* **35** 2: 187–189.

Sancarlo D, D'Onofrio G, Franceschi M, *et al*. 2011. Validation of a Modified-Multidimensional Prognostic Index (m-MPI) including the Mini Nutritional Assessment Short-Form (MNA-SF) for the prediction of one-year mortality in hospitalized elderly patients. *J Nutr Health Aging* **15**(3): 169–173.

Sanderson C, Dixon J. 2000. Conditions for which onset or hospital admission is potentially preventable by timely and effective ambulatory care. *J Health Serv Res Policy* **5**(4): 222–230.

Sundararajan V, Henderson T, Perry C, *et al*. 2004. New ICD-10 version of the Charlson comorbidity index predicted in-hospital mortality. *J Clin Epidemiol* **57**(12): 1288–1294.

Thuné-Boyle ICV, Sampson EL, Jones L, *et al*. 2010. Challenges to improving end of life care of people with advanced dementia in the UK. *Dementia* **9**: 285–298.

Volicer L. 1997. Hospice care for dementia patients. *J Am Geriatr Soc* **45**(9): 1147–1149.

Waterlow J. 1985. Pressure sores: a risk assessment card. *Nurs Times* **81**(48): 49–55.

Xie J, Brayne C, Matthews FE. 2008. Survival times in people with dementia: analysis from population based cohort study with 14 year follow-up. *BMJ* **336**(7638): 258–262.

Zekry D, Herrmann FR, Grandjean R, *et al*. 2008. Demented versus non-demented very old inpatients: the same comorbidities but poorer functional and nutritional status. *Age Ageing* **37**(1): 83–89.

Zekry D, Herrmann FR, Grandjean R, *et al*. 2009. Does dementia predict adverse hospitalization outcomes? A prospective study in aged inpatients. *Int J Geriatr Psychiatry* **24**(3): 283–291.

Zekry D, Loures Valle BH, Graf C, *et al*. 2011. Prospective comparison of 6 comorbidity indices as predictors of 1-year post-hospital discharge institutionalization, readmission, and mortality in elderly individuals. *J Am Med Dir Assoc* **13**(3): 272–278.