Impact of Cognitive Impairment on Inpatient Falls in Single Room Setting and its Adverse Outcomes

Singh I[1*], Edwards C[2] and Okeke J[3]

[1]Consultant Physician and Geriatrician, Department of Geriatric Medicine, Ysbyty Ystrad Fawr, Aneurin Bevan University Health Board, Ystrad Mynach, Wales, UK

[2]Consultant Clinical Scientist, Academic Dermatologist, Aneurin Bevan University Health Board, UK

[3]Specialty Registrar (StR), Geriatric Medicine, South Wales, UK

*Corresponding author: Inderpal Singh, Consultant Physician and Geriatrician, Department of Geriatric Medicine, Ysbyty Ystrad Fawr, Ystrad Mynach, Wales, CF82 7EP, UK, Tel: 01443 802205; E-mail: inder.singh@wales.nhs.uk

Abstract

Dementia is associated with increased risk of falls; furthermore single rooms are associated with a higher risk of inpatient falls (IF). Hospitals are facing an increasingly ageing population, of whom one third could have cognitive impairment (CI). The aim of this study is to determine the prevalence of cognitive impairment amongst patients who have fallen in the hospital and compare adverse outcomes between inpatient fallers with and without CI (NCI).

Methods: This is a retrospective observational study. CI was defined on the basis of case notes recording of dementia, CI, chronic confusion, functional impairment due to memory problems or MMSE/MoCA< 25.

Results: The mean age of patients with CI and NCI were 84.23 ± 7.44 and 80.21 ± 11.05 years (p<0.01), 57% and 48.2% were females respectively. The total number of inpatient falls incidents reported over the two years was 1611. The falls incidents in patients with CI were 814 (242 patients) and 797 falls incidents were reported from NCI (434 patients). The mean falls/inpatient faller in patients with CI and NCI were 3.36 ± 4.00 and 1.84 ± 1.46 respectively (p<0.001). There was a significant increase in the length of stay in patients with CI (50.68 ± 40.49) compared to NCI (37.92 ± 37.8, p<0.001). More patients (23.63%) with CI needed a new care home placement as compared to NCI group (11.1%, p<0.001). The hip fracture in CI and NCI were 2.9% and 1.4% respectively (p=NS).

Conclusion: Older people with CI have significantly higher incidence of inpatient falls in single rooms and adverse outcomes including discharge to a new care home and prolonged length of stay when compared to inpatient fallers with NCI. We acknowledge the study's weakness that there are no outcome data for patients with CI who did not fall in the hospital. Prompt identification of dementia patients and falls risk assessment could prevent associated adverse outcomes.

Keywords: Inpatient falls; Dementia; Older people; Single rooms; Fracture

Introduction

Worldwide populations are ageing and hospitals are increasingly admitting older people [1]. Furthermore the number of patients with dementia will increase exponentially with the ageing population and these numbers are expected to double in the next 20 years. Dementia affects 36 million people worldwide, 700 000 people are affected in the UK [2,3]. Dementia is much more common in hospitalised patients and 42.4% of acute medical admissions of over-70s have been reported to have dementia and only half were diagnosed prior to admission [4].

Caring for this ageing population with dementia, some of which will have multiple chronic and disabling diseases will be a challenge to healthcare systems, particularly general hospitals. At any one time, a quarter of acute hospital beds in the UK are in use by people with dementia. Patients with dementia have poorer health outcomes, longer hospital stays, higher rates of re-admissions and institutionalization. Dementia is also associated with impaired mobility and is an independent risk factor for falling [5]. People with dementia are 2-3 times more likely to fall [6]. The incidence of falls could be up to 8 times more as compared to patients with intact cognition [7].

Unsurprisingly, falls are common among hospital inpatients and account for almost two-fifths of the patient safety incidents reported to the National Reporting and Learning System in the UK. Rates from 2.9-13 falls/1000 patient-bed-days have been reported from different types of patient accommodation in community hospitals, intermediate care provision or acute settings [8,9].

Over the last decade, there has been a trend of constructing more single rooms in many parts of the world to deliver high level of patient care whilst minimizing hospital acquired infections [10,11]. Although SR provides enhanced dignified and personalized care, much higher incidence of falls (2.5 times) has been observed [12-14].

This brings new challenges for the multidisciplinary team (MDT) to manage patients who are at highest risk of falling due to dementia and now being cared for in SR facility. This needs further evaluation and researching. In this study we aim to determine the prevalence of cognitive impairment (CI) amongst inpatient fallers and compare adverse outcomes between inpatient fallers with and without CI in a 100% single-bedded hospital.

Methods

Study design

This is a retrospective observational study based on an analysis of a two-year (Nov 2011-Oct 2013) standard IF incident data in an extended general hospital with 100% single rooms. The standard hospital data for incidence of inpatients falls (IF) is recorded on Datix. Datix is web-based patient safety software for healthcare risk management which provides a comprehensive overview of risk management activities including incident of IF or an adverse event. The standard incident data on IF and associated injury were further analyzed.

Setting

Ysbyty Ystrad Fawr (YYF) is part of Aneurin Bevan University Health Board (ABUHB), the first local general hospital to be commissioned in the UK to provide 100% single rooms with en-suite facilities. The new hospital replaced two other hospitals which were mostly multi-bed wards (MB-W) and opened in November 201, in Ystrad Mynach, Wales UK.

Data and statistical analysis

The standard incident data was collated for two years (Nov 2011-Oct 2013). The data collection was continued to the end of December 2014. The whole cohort was divided in two samples: patients with CI and those with no cognitive impairment (NCI). The information on CI was extracted from web-based clinical work station, clinic/General Practitioner letters and standard hospital coding. CI was defined on the basis of case notes recording of dementia, CI, chronic confusion, functional impairment due to memory problems or MMSE/MoCA<25. Unidentifiable patients were excluded. The two samples were compared for the incidence of IF and adverse outcome including any injury, hip fracture, length of stay (LoS) and new care home (CH) placement. The index admission was defined as any one episode of admission until discharge or death. Mortality data were also collected on all patients for one year following first incident of IF and also discharge from the hospital. Mortality analyses were done for 30 days following date of discharge, one year from the first incident of fall in the hospital and also from the date of discharge from the hospital. All statistics were conducted using STATISTICA StatSoft data analysis software system, version 9.1 (Statistica Inc., 2010).

Ethical approval was not required for this service evaluation, however, all questions and forms required to carry out the study were sent to the Research and Development (R & D) Department at ABUHB, to assess risks to patient identification and the Health Board. R & D approved the study with no further need for ethical approval.

Results

The total number of inpatient falls incidents reported over the 2 years were 1611 affecting a total of 676 patients. The mean age of females (51.3%) was significantly higher (83.53 ± 9.90 years) as compared to males (79.67 ± 9.93 years, p<0.001). The majority of patients (85%) were admitted from their homes requiring formal or informal care support (mean age=81.29 ± 10.11. A small minority was admitted from care homes or other hospitals and they were comparatively older (mean age=87.05 ± 6.81 years). There was significantly higher inpatient falls rate in men (2.72 ± 3.39) as compared to women (2.07 ± 2.24, p=0.004). The outcomes for all the inpatient fallers studied are shown in Table 1.

The inpatient falls incidents in patients with CI and NCI were 814 (242 patients) and 797 (434 patients) respectively. The mean age of the patients with CI was significantly higher (84.23 ± 7.44 years) than NCI (80.21 ± 11.05, p<0.001) and they were significantly more females (57%) in the CI cohort as compared to NCI (48.2%, p=0.03). The comparative outcome following an inpatient fall in patients with CI and NCI is shown in Table 2.

	N=676	Mean Age (years)	Mean LoS (days)	Mean falls
Discharged to own home	63.4% (361/676)	79.80 ± 10.7	32.47 ± 26.52	2.08 ± 2.53
Discharged to care home	25.4% (172/676)	84.85 ± 8.85	60.56 ± 42.51	3.09 ± 3.84
Inpatient death	17.9% (121/676)	83.18 ± 8.57	45.51 ± 51.12	2.36 ± 2.23
No fracture	95.5% (646/676)	81.55 ± 10.10	41.49 ± 37.63*	2.37 ± 2.87
All fracture	4.4% (30/676)	83.88 ± 9.63	64.10 ± 61.96	2.57 ± 3.00
Hip fracture	1.9% (13/676)	86.31 ± 5.02*	70.15 ± 64.4	2.15 ± 2.82
*p<0.01				

Table 1: Outcomes for all the inpatient fallers.

	Cognitive Impairment (CI)	No Cognitive Impairment (NCI)	P value
Profile of falls			
Number of patients % (n)	35.8 (242/676)	64.2 (434/676)	
Falls incidents	814	797	
Mean falls/inpatient faller	3.36 ± 4.00	1.84 ± 1.78	p<0.0001
Recurrent falls (Range of falls per index admission)	1-33	1-16	
Interqurtile range	3	1	
Median falls/in patient faller	2 ± 4.00	1 ± 4.00	
Discharge destination			
Own home % (n)	39.7 (96/242)	61 (265/434)	p<0.0001
New Care Home% (n)	23.6 (57/242)	11.1 (48/434)	p<0.0001
Injury			
No fracture% (n)	95 (230/242)	95.8 (416/434)	p=0.62
Non-hip fracture% (n)	2.1 (5/242)	2.8 (12/434)	p=0.58

Hip fracture% (n)	2.9 (7/242)	1.4 (6/434)	p=0.17		One-year post discharge %	40 (84/208)	44 (153/347)	0.39

Length of stay (days)			
Mean	50.68 ± 40.49	37.92 ± 37.81	p<0.0001
Median	42 ± 40.49	29 ± 37.81	p<0.0001
Interquartile range	46	34	
Mortality			
Inpatient %	14 (34/242)	20 (121/434)	0.05
30-day post discharge %	0 (0/208)	2.6 (9/347)	0.02

Table 2: Outcome of inpatient fallers with CI and NCI.

In terms of survival, the Kaplan–Meier plot shows a steady reduction in longevity but there was no significant difference in one year post discharge mortality in two groups (CI=40%, NCI=44%, p=0.39) (Figure 1). One-year mortality from the date of first incident fall in hospital in patients with CI and NCI was 49% and 55.% respectively, this was/was not significantly different (p=0.10).
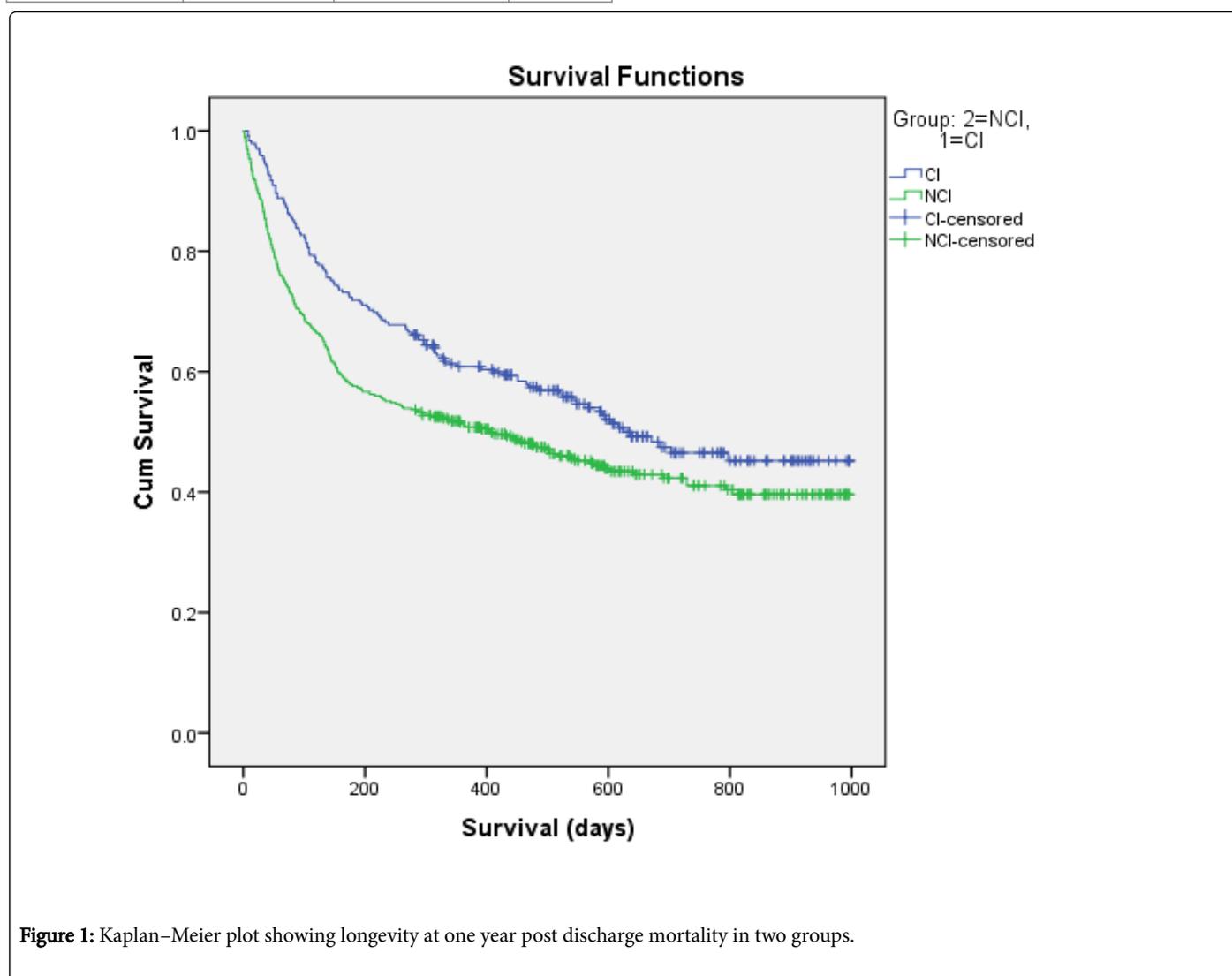
Figure 1: Kaplan–Meier plot showing longevity at one year post discharge mortality in two groups.

Discussion

Mild cognitive impairment (MCI) is a condition where subjects have recognized degrees of objective cognitive impairment which falls short of current standardized definition of a dementia syndrome. Dementia is a syndrome of a chronic and progressive nature in which there is disturbance of multiple domains of brain functioning. These impairments may include memory loss, mood changes, learning capacity, calculations, language, judgment or problems with communicating and reasoning [15]. Dementia is best described, regardless of the underlying cause, as cognitive deficits having impact on activities of daily living (ADLs) or social interaction, often associated with behavioural and psychological symptoms of dementia (BPSD) [15].

Falls are a public health problem worldwide [16]. Hospital patients are at a greater risk of falling than people in the community due to unfamiliar environment, concurrent co-morbidities, acute illness, and treatments [17]. Dementia is often recognized for the first time as an incidental condition when people are admitted to an acute hospital for another reason. A fall or recurrent falls may be the first indicator of impaired memory, judgment, orientation or visuospatial perception.

In this study, there was significantly higher incidence of IF in patients with cognitive impairment (double) when compared to those with normal cognitive functions. Dementia is an independent risk factor for falls but there is a relative lack of good studies evaluating falls risk factors in cognitively impaired older people [18]. Several risk factors including unstable gait [19], severity of dementia [19], impaired stability when standing [20] and ADL limitations [20,21] have evidence for higher risk of falling in dementia. Other factors commonly associated with falls include overactive bladder symptoms, polypharmacy and presence of behavioral disturbances like wandering or agitation [22]. This study was done in a hospital with 100% single rooms and the incidence of falls is higher in SR environment with ensuite facility. The risk of falling is 2.5 to 3 times higher as compared to MB-W design [12-14]. Therefore managing patients with dementia in SR could increase the falls risk exponentially by 5-6 times as compared to patients with no cognitive impairment admitted to MB-W. There could be other factors that result in higher falls risk in SR with ensuite: elimination-related and easy access to ensuite facility; patients being less visible from nursing stations and delay in responding to call bell due to increased walking distance in corridor; unable to safeguard falling patient due to comparatively large room area.

Falls in the hospital also results in poor outcomes including prolonged hospitalization [23]. More than 200,000 falls/year including 900 severe incidents of patient harm and 90 deaths have been reported on National Health Service (NHS) wards [24]. Immediate annual healthcare cost is over £15 million for England and Wales. The extra cost of caring for patients who have suffered a fall amounts to an estimated £2.4 billion/year [24]. In this study we have observed significantly higher LoS following an inpatient fall in patients with dementia as compared to NCI. In addition, there were significantly greater chances of new CH placement following an IF in patients with CI.

Although this study did not show any difference in incidence of hip fractures in patients with or without CI, older people with NCI who sustained an IF were more likely to die during hospitalization The inpatient mortality in patients with normal cognition who had an IF was higher as compared to those inpatient fallers with cognitive impairment. Similarly inpatient fallers with normal cognition were at higher risk of dying at one year as compared to those with cognitive impairment. This could be due to other co-morbidities burden in the study population which is not taken into consideration whilst evaluation mortality.

Falls in patients with dementia in the hospitals will remain a challenge. There is lack of training for doctors in comprehensive geriatric assessment (CGA) and unfamiliarity with key principles and practices of geriatric medicine. Falls and management of dementia is not covered very widely during general medical training [25]. All people with suspected dementia or known dementia using inpatient services should be assessed by MDT for potentially modifiable risk factors in order to have strategies and joint care plan to prevent falls. The medication review, muscle strengthening and balance training exercises programme, management of symptomatic postural hypotension and depression could be the core elements to reduce falls in people with dementia. The communication among staff, carers and patients should be improved to ensure that all staff coming into contact with people suffering from dementia are aware of their diagnoses and associated needs. "This is Me" or a similar document can be used to record personal information, preferences and communication requirements [26].

Our study has certain strengths. We achieved complete outcome evaluation for IF and mortality up to one year after inpatient falls or discharge from the hospital. We are not aware of any other study which has reported comprehensive outcome data to measure the impact of inpatient falls in patients with dementia as compared to normal cognitive functions. We acknowledge methodological weaknesses. This was a single centre observational study based on the incident reporting and retrospectively it was pragmatic to analyse only outcome data. The prospective cohort comparisons to evaluate outcomes were not made to those who did not fall (non-fallers) but with cognitive impairment. The severity of dementia was not taken in account and all patients with cognitive impairment are grouped together. We have also not studied other complex patient characteristics like acute medical illness, polypharmacy, incontinence, functional dependence and physical impairment and other activities which may have contributed to inpatient falls in those with cognitive impairment or higher mortality with normal cognition. The impact of co-morbidity burden on inpatient falls was also not studied as there is evidence that associated co-morbidity increases the rate of cognitive and functional decline in patients with dementia [27]. Although dementia is a strong predictor for discharge to care home, co-morbidity is more predictive than dementia for hospital mortality [28]. Therefore our findings must be interpreted with some caution because this is a comparative study and adjustment has not been made for these confounding variables.

It will be difficult to carry out randomized controlled studies for IF in patients with or without CI. Therefore we propose further similar observational studies on incidence and outcome of falls in both environments including single rooms and M-BW from various other hospitals. This will provide more evidence and could potentially guide the need of appropriate proportion of single bedded and multi-bedded bays before planning new hospitals which admits frail older adults [29-32]. Such evidence will not only help to provide patient choice, enhance dignity and privacy but also give us an opportunity to admit older people with high falls risk to appropriate facility ensuring their safety.

Conclusion

This study has shown a significantly higher incident of inpatient falls and adverse outcome (higher length of stay and need of a new care home) in patients with cognitive impairment as compared to inpatient fallers with normal cognition admitted to single rooms. The observed increased incidence of inpatients falls among dementia patients not only bring new challenges for the healthcare staff in the single room environment but also suggests further research comparing the outcomes with dementia patient who did not fall in the single rooms. This will help to balance the appropriate proportion between single-rooms and multi-bedded bays in the new facilities to cater needs of frail older people with dementia. Nevertheless prompt identification of dementia patients and timely falls risk assessment could prevent associated adverse outcomes.

Acknowledgments

Authors' Contributions

J.O., data collection, data analysis and interpretation. C.E., Data analysis. I.S., wrote the first draft, study design and data interpretation. All authors contributed to the writing of the paper and approve the final version.

References

1. Christensen K, Doblhammer G, Rau R, Vaupel JW (2009) Ageing populations: the challenges ahead. Lancet 374: 1196-1208.

2. World Alzheimer Report (2009) The global prevalence of dementia Alzheimer's Disease International.

3. Living well with dementia: a national dementia strategy. London: Department of Health, 2009.

4. 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: 61-66.

5. Ballard CG, Shaw F, Lowery K, McKeith I, Kenny R (1999) The prevalence, assessment and associations of falls in dementia with Lewy bodies and Alzheimer's disease. Dement Geriatr Cogn Disord 10: 97-103.

6. Tinetti ME, Speechley M, Ginter SF (1988) Risk factors for falls among elderly persons living in the community. N Engl J Med 319: 1701-1707.

7. Allan LM, Ballard CG, Rowan EN, Kenny RA (2009) Incidence and prediction of falls in dementia: a prospective study in older people. PLoS One 4: e5521.

8. Oliver D, Daly F, Martin FC, McMurdo ME (2004) Risk factors and risk assessment tools for falls in hospital in-patients: a systematic review. Age Ageing 33: 122-130.

9. NPSA, The third report from the Patient Safety Observatory: slips, trips and falls in hospital. 2007.

10. Ulrich R, Quan X, Zimring C, Joseph A, Choudhary R (2004) The role of the physical environment in the hospital of the 21st century: a once-in-a-lifetime opportunity. Report to The Center for Health Design, for the designing for the 21st century hospital project.

11. Lawson B, Phiri M (2000) Hospital design. Room for improvement. Health Serv J 110: 24-26.

12. Okeke J, Daniel J, Naseem A, Ramakrishna S, Singh I (2013) Impact of all single rooms with ensuite facility in an acute care hospital in Wales (UK) Age and Ageing 42: iii1-iii11.

13. Singh I, Okeke J (2013) Risk of inpatient falls is increased with single rooms. BMJ 347: f6344.

14. Ugboma I, Drahota AK, Higgins B, Severs M (2011) Effect of bedroom size on falls in hospital: does one size fit all? J Am Geriatr Soc 59: 1153-1154.

15. Singh I, Varanasi A, Williamson K (2014) Assessment and management of dementia in the general hospital setting. Reviews in Clinical Gerontology 24: 205-218.

16. Chen LH, Warner M, Fingerhut L, Makuc D (2009) Injury episodes and circumstances: National Health Interview Survey, 1997-2007. Vital Health Stat 10 : 1-55.

17. Evans D, Hodgkinson B, Lambert L, Wood J (2001) Falls risk factors in the hospital setting: a systematic review. Int J Nurs Pract 7: 38-45.

18. Härlein J, Dassen T, Halfens RJ, Heinze C (2009) Fall risk factors in older people with dementia or cognitive impairment: a systematic review. J Adv Nurs 65: 922-933.

19. Kobayashi N, Kusuma Wati DN, Yamamoto M, Sugiyama T, Sugai Y (2009) Severity of dementia as a risk factor for repeat falls among the institutionalized elderly in Japan. Nurs Health Sci 11: 388-396.

20. Whitney J, Close JC, Jackson SH, Lord SR (2012) Understanding risk of falls in people with cognitive impairment living in residential care. J Am Med Dir Assoc 13: 535-540.

21. Salvà A, Roqué M, Rojano X, Inzitari M, Andrieu S, et al. (2012) Falls and risk factors for falls in community-dwelling adults with dementia (NutriAlz trial). Alzheimer Dis Assoc Disord 26: 74-80.

22. Taylor ME, Lord SR, Delbaere K, Mikolaizak AS, Close JC (2012) Physiological fall risk factors in cognitively impaired older people: a one-year prospective study. Dement Geriatr Cogn Disord 34: 181-189.

23. Bates DW, Pruess K, Souney P, Platt R (1995) Serious falls in hospitalized patients: correlates and resource utilization. Am J Med 99: 137-143.

24. NICE news and features. Older patients at high risk of hospital falls.

25. Singh I, Hubbard RE (2011) Teaching and learning geriatric medicine. Reviews in Clinical Gerontology 21: 180-192.

26. 'This is me' Alzheimer's society.

27. Solomon A, Dobranici L, Kreholt I, Tudose C, Lăzărescu M (2011) Comorbidity and the rate of cognitive decline in patients with Alzheimer dementia. Int J Geriatr Psychiatry 26: 1244-1251.

28. Zekry D, Herrmann FR, Grandjean R, Vitale AM, De Pinho MF, et al. (2009) Does dementia predict adverse hospitalization outcomes? A prospective study in aged inpatients. International Journal of Geriatric Psychiatry 24: 283-291.

29. Snow T (2008) Planning the future of ward design. Nurs Stand 23: 12-13.

30. Pennington H, Isles C (2013) Should hospitals provide all patients with single rooms? BMJ 347: f5695.

31. van de Glind I, de Roode S, Goossensen A (2007) Do patients in hospitals benefit from single rooms? A literature review. Health Policy 84: 153-161.

32. Jolley S (2005) Single rooms and patient choice. Nurs Stand 20: 41-48.