Outcome of in-patient falls in hospitals with 100% single rooms and multi-bedded wards

INDERPAL SINGH1, JUSTIN OKEKE1, CHRIS EDWARDS2

1Department of Geriatric Medicine, Ysbyty Ystrad Fawr, Ystrad Mynach, CF82 7EP Wales, UK
2Academic Dermatologist, Aneurin Bevan University Health Board, Newport, UK

Address correspondence to: I. Singh. Tel: (+44) 1443802205; Fax: (+44) 1443802431, Email: nder.singh@wales.nhs.uk

Abstract

Background: falls in hospital account for almost two-fifths of the patient safety incidents reported to the National Reporting and Learning System in UK. Studies have suggested an increased incidence of falls in single-bedded hospitals.

Objective: to compare the outcome of in-patient falls occurring in units with 100% single rooms (SRs) and multi-bedded wards (M-BWs).

Sampling design and methods: an observational study. Retrospective standard incident reporting data (DATIX) on in-patient falls and associated injury were obtained from both sites over 18 months each. There was no change in demographics, size and characteristics of population except change in the geography of new hospitals.

Results: the total number of in-patient fall incidents reported over the 3 years was 1,749. The mean age of patients on M-BW and SR sites was 81.0 ± 2.4 (51.3% females) and 80.3 ± 10.3 (50.7% females), respectively. The mean incidence of falls/1,000 patient-bed days on M-BW and SR sites was 5.44 ± 4.76 and 15.82 ± 19.56, respectively (P < 0.01). Overall fracture incidence/1,000 patient-bed days on M-BW and SR sites was 0.07 ± 0.48 and 0.36 ± 1.52 (P < 0.01), respectively. The hip fracture incidence/1,000 patient-bed days on M-BW and SR sites was 0.04 ± 0.38 and 0.15 ± 1.00 (P < 0.01), respectively. One-year mortality from the date of first incident fall was lower in M-BWs (41.1%) compared with SRs (47.1%), but this is not significant (P = 0.12).

Conclusion: this observational study shows a significantly increased incidence of falls and fracture in a hospital design with SRs compared with a multi-bedded facility. Consideration should be given to increased incidence of falls and falls-related injury in SRs when deciding on the percentage of single-room provision in new hospitals to admit frail older adults.

Keywords: in-patient falls, ageing, single rooms, older people, fracture

Introduction

Falls are common among hospital in-patients. Rates from 2.9 to 13 falls/1,000 patient-bed days have been reported from different types of patient accommodation in community hospitals, intermediate care provisions or acute settings [1, 2]. Up to 30% of such falls may result in an injury, resulting in poorer outcome. 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 [3]. The extra cost of caring for such patients amounts to an estimated £2.4 billion/year.

In the past, the design of healthcare facilities has focussed mainly on accommodating the physical requirements of service delivery and provision of care. Over the last decade, several reports have explored the impact of hospital environment on patient outcome. These tend to favour the construction of more single rooms (SRs) [4, 5]. At present, just under one-third (30.7%) of NHS beds in England are SRs [6], and of 218 Scottish hospitals, 32% are SR facilities. These figures seem to be rising steadily [7]. Despite the assumption that privacy, increased dignity and high levels of patient care are achieved by SR facilities, there is currently no hard evidence to support this statement [8].

Worldwide populations are ageing, and hospitals are increasingly admitting older people [9]. This brings new challenges for the multidisciplinary team and also requires a dramatic change in nursing working culture. SR facilities could impact on outcomes in older people in many ways. This needs further evaluation and researching. In this study, we compared the outcome of in-patient falls in two different settings: a 100% single-bedded unit and a multi-bedded ward (M-BW)-type hospital. Both were under one health board.
Methods

Study design
This is an observational study. The standard hospital data for incidence of in-patients falls are recorded on DATIX. DATIX is a web-based patient safety software for healthcare risk management.

Setting
The standard incident data on in-patient falls and associated injury were analysed retrospectively for the two sites of the Aneurin Bevan University Health Board. Ysbyty Ystrad Fawr (YYF) was the newly built, first local general hospital to be commissioned in the UK to provide 100% SRs with en suite facility. The hospital moved from its two old sites (mostly M-BWs) to the new site in November 2011. The total number of general medical and care of the elderly beds at the old site was 44 and 83 (123), whereas at the new site it was 56 and 88 (144), respectively. The bed occupancy rate over 18 months each at old and new sites was 61,330 and 59,340 days, respectively. Both sites continued to admit acute and sub-acute patients. There was no change in demographics, size and characteristics of population except change in the geography of new hospital which has now 100% SRs. The permanent nursing and medical firms from two old hospitals were transferred to the new site, and new nursing staff and healthcare assistants were recruited to provide similar 1:7 nurse/patient ratio to cater increased numbers of beds.

Data and statistical analysis
The standard inpatient incident data were collated for 18 months at two sites: old site (May 2010 to October 2011) and new site (November 2011 to April 2013). The data collection was continued till the end of December 2014. The two samples were compared for the incidence of in-patient falls and adverse outcome including fracture, length of stay and new care home (CH) placement. The index admission was defined as any one episode of admission till discharge/death. Mortality analysis was done for 30 days following the first incident fall/date of discharge and for 1 year. All statistics were conducted using the 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, to assess risks to patient identification and the health board.

Results
The total number of in-patient fall incidents reported over the 3 years was 1,749. One hundred and thirty-one incidents were excluded due to missing data. The demographics of in-patient fallers in SRs and M-BWs are presented in Table 1. The adjusted mean falls/1,000 patient-bed days for the effect of age and gender remained significant for M-BW and SR sites; 5.51 (CI 3.34–7.68) and 15.83 (14.43–17.24), respectively ($F = 61.31, P < 0.01$). The mean fall per in-patient faller on M-BW was lower (1.66 ± 1.46) compared with that on SR (2.33 ± 2.87, $P < 0.001$). The recurrent falls during an index admission were also less common on M-BW site (12), whereas in SR site, maximum numbers of falls reported were 33. There was an increase in emergency admissions (new site–4,487; old site–2,646) with the introduction of front door services; elective and sub-acute admission were slightly higher at the new site (3,672) compared with the old site (3,269) due to planned increase in medical beds at the new site.

The outcome of in-patient falls at two sites is presented in Table 2. One-year mortality from the date of first incident fall in hospital in M-BW and SR sites was 41.1 and 47.1%, respectively; this was also not significantly different ($P = 0.12$). In the M-BW site, 90.6% were admitted from home and 7.1% were admitted from CH. In comparison, 87.5% were admitted from home; 5% were admitted from CH in the SR site. In the M-BW site, 59.1% were discharged back to their own home and in the SR site 60.5% were discharged back to their own home ($P = 0.74$).

Discussion
Falls are a public health problem worldwide [10]. Hospital patients are at a greater risk of falling [11]. This results in poor outcomes including prolonged hospitalization [12]. The proportion of single-occupancy rooms in NHS hospitals is rising and the new hospital design includes greater ratios of single-bedded accommodation, in some cases 100% SRs [13].

Table 1. Demographics: Comparison of in-patient falls in SRs and M-BWs

<table>
<thead>
<tr>
<th></th>
<th>SRs</th>
<th>M-BWs</th>
<th>$P$ value</th>
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<tbody>
<tr>
<td>Demographics</td>
<td></td>
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<tr>
<td>Age (mean, SD)</td>
<td>80.3 ± 10.3</td>
<td>81.0 ± 12.4</td>
<td>0.11</td>
</tr>
<tr>
<td>Gender (females)</td>
<td>50.7% (271/535)</td>
<td>51.3% (115/224)</td>
<td>0.86</td>
</tr>
<tr>
<td>Number of patients</td>
<td>535</td>
<td>224</td>
<td>N/A</td>
</tr>
<tr>
<td>Number of falls</td>
<td>1,244</td>
<td>374</td>
<td>N/A</td>
</tr>
<tr>
<td>Falls/1,000 patient-bed days</td>
<td>15.8 ± 19.6</td>
<td>5.4 ± 4.7</td>
<td>&lt;0.01</td>
</tr>
</tbody>
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Table 2. Outcome data: Comparison of in-patient falls in SRs and M-BWs

<table>
<thead>
<tr>
<th></th>
<th>SRs</th>
<th>M-BWs</th>
<th>$P$ value</th>
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<tbody>
<tr>
<td>Hip fractures/patient-bed days</td>
<td>0.15 ± 1.0</td>
<td>0.04 ± 0.38</td>
<td>&lt;0.01</td>
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<tr>
<td>Length of stay (LoS)</td>
<td></td>
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<tr>
<td>Median</td>
<td>34 ± 38</td>
<td>44 ± 38</td>
<td>&lt;0.01</td>
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<tr>
<td>Inter-quartile range</td>
<td>39</td>
<td>48</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mortality</td>
<td></td>
<td></td>
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<tr>
<td>In-patient (IP)</td>
<td>19.1% (102/535)</td>
<td>16.1% (36/224)</td>
<td>0.35</td>
</tr>
<tr>
<td>30 days</td>
<td>8.3% (36/433)</td>
<td>5.8% (11/188)</td>
<td>0.29</td>
</tr>
<tr>
<td>Discharge to new care home</td>
<td>19.40% (91/468)</td>
<td>23.60% (48/203)</td>
<td>0.21</td>
</tr>
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</table>
However, there have been adverse outcomes of single rooms including reduced social interaction, less surveillance by staff and increased in-patient falls [14–16]. This observational study showed a 2.9-fold greater incidence of in-patient falls in SR compared with M-BW. The fall incidence/1,000 patient-bed days in this study is similar to an elderly care unit with four-bedded bays and SR from another hospital in UK [15].

The observed significant increase of in-patient fall rate in SR could be due to several factors: patients being less visible from nursing stations; easy access to en suite toilet facility; delay in responding to call bell due to increased walking distance in corridor; unable to safeguard falling patient due to hospital design. The M-BWs are often in the line of vision of the nursing station with the added advantage of increased surveillance by fellow patients within the ward and thus many in-patient falls can be prevented. The research shows falls may be reduced by 18–31% through multi-factorial assessments and interventions [17]. Some studies have reported a reduction in falls in SR but did emphasise this was because SRs were more private and allowed relatives the freedom to stay with the patient and assist with care [18].

A Cochrane review (2010) on interventions for preventing falls in older people suggested that multi-factorial interventions reduce falls and risk of falling in the hospitals [19]. The recent studies on fall prevention initiatives in an acute care hospital have shown effectiveness in reducing falls and fall-related injury rates significantly [20, 21]. Nursing staff awareness and education on common problems of older people including falls and immobility have also shown reduction of work-related stress in hospital setting [22]. However, there is a dearth of studies showing reduction of falls in the single-room setting.

SRs provide flexibility and enhanced dignity in care, meeting the expectations of the public and government policies. SR can minimise healthcare-associated infections [16, 23, 24] and could positively impact patients’ hospital experience through improved sleep hygiene, reduced noise level, better interaction between family and staff [4] but there is lack of evidence on recovery rates and patient safety [25]. It will be challenging for healthcare design professionals, planners and administrators to design new hospitals to meet the needs of old and frailer populations. The generalised ‘one size fits all’ guideline should not be applied while designing new hospitals [26, 27].

Our study has certain strengths. We achieved complete follow-up for in-patient falls and mortality up to 1 year. We are not aware of any other study that has reported comprehensive outcome data to measure the impact of in-patient fall. We acknowledge methodological weaknesses. We have only co-related change of hospital geography and have not studied many complex patient characteristics such as reason for admission, co-morbidities, dementia, incontinence or polypharmacy. This was an observational study based on the incident reporting and retrospectively it was pragmatic to analyse only outcome data. 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. We also acknowledge that this is a single-centre observational study and prospective cohort comparisons to evaluate outcomes were not made to those who did not fall. The detailed characteristics of in-patient fallers in the SRs and M-BWs are currently being studied prospectively. 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 risk to falls to appropriate facility ensuring patient safety.

**Conclusion**

This observational study has shown a significantly higher incidence of falls and injury including hip fracture in a hospital design with SR facility compared with the multi-bedded facility. Patient population, their associated risk factors and needs should predispose a balanced ratio between single-bedded rooms and multi-bedded rooms. The observed increased incidence of falls and injury in this study will certainly make managing frail older people in single rooms more challenging, suggesting further research to support policy-making and quality of care.

**Key points**

- SRs are associated with an increased incidence of in-patient falls.
- Overall fracture and hip fracture incidence/1,000 patient-bed days is higher.
- Future research should build the body of knowledge on single-bedded rooms.

**Authors’ contribution**

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

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**Conflicts of interest**

None declared.
References


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