

Effect of bedroom size on falls in hospital: Does one size fit all?

Ike Ugboma, MBBS,¹ Amy K. Drahota, PhD,^{2,3} Bernie Higgins, BSc,⁴ and Martin Severs,
MBBS^{1,2}

¹ Medicine for Older People, Portsmouth Hospitals NHS Trust, UK, ² School of Health
Sciences & Social Work, University of Portsmouth, UK, ³ UK Cochrane Centre, Oxford, UK,
⁴ Department of Mathematics, University of Portsmouth, UK

Corresponding Author:

Amy Drahota, SHSSW, University of Portsmouth, James Watson (West), 2 King Richard 1st
Road, Portsmouth, Hampshire, PO1 2FR, UK; Telephone: +44 23 92 844432; Fax: +44 23 92
844416; Email (can be published): amy.drahota@port.ac.uk

Alternate Corresponding Author:

Email (can be published): ike.ugboma@porthosp.nhs.uk

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Running head: Effect of bedroom size on falls in hospital

To the Editor: Hospital design has seen a trend moving from large open-plan wards, to multi-bed bays [1], and now single room design policies are being implemented in hospitals across a number of countries (including for example the UK, USA, and Australia [2-4]). The thinking behind this approach is commonly attributed to infection control, reduction of medical errors, increased privacy, provision of personalised spaces, and noise control [5-6]. Yet the evidence behind these beliefs has been highlighted as lacking, or conflicted [7]. Not disputing the importance of these issues, there is an opposing view, especially with respect to older individuals at higher risk of falls [8], and for those for whom the company of a fellow patient may actually be held in high regard [9].

Improving patient observation is a commonly utilised strategy for those at risk of falls and injury. In our experience of establishing a study on flooring for fall-related injury prevention, policies to place high risk patients in rooms with good line of sight from the nursing station appear widespread [10]. Yet there is a dearth of empirical evidence on room type for patient safety, particularly with respect to falls [7-8]. Serendipitously, the double-relocation of a local elderly care general rehabilitation ward provided an ideal opportunity to assess the influence of bedroom type on falls.

We retrospectively analysed fall-rates on an elderly care unit, which was decanted first from a facility arranged in four 4-bedded bays and eight single rooms (Period A: 12 months, 8760 patient bed-days; and Period B: 10 months, 6623 patient bed-days), to a second facility with a 15-bed open-plan ward and a single side-room (Period C: 13 months, 6755 patient bed-days), and then to a third facility, arranged in three 4-bedded bays and six single rooms (Period D: 12 months, 6387 patient bed-days). Routine operational processes, policies, and staff turnover did not change during the study period. There was one major staff change with the

appointment of a new consultant in Period B. Bed-to-nurse ratio was predominantly consistent across the study periods (Period A unknown; Period B = 1.45; Period C = 1.46; Period D = 1.48). Prior to each move the ward capacity was run down to 15 beds.

Patient falls data were retrieved from the standard incident-report monitoring system. The mean incidence rates of falls per 1000 patient bed-days over the four study periods (Periods A, B, C, and D) were 13.27 (SD = 6.13), 13.98 (SD = 8.03), 5.90 (SD = 3.77), and 15.80 (SD = 9.82) respectively. Following square root transformation, an ANOVA indicates a significant difference in fall-rates between Periods ($F = 5.10$, $df = 3$, $p = 0.005$). This effect is also apparent when the data are analysed using the Kruskal Wallis test ($H = 12.32$, $df = 3$, $p = 0.006$, adjusted for ties). Subsequent pair-wise comparisons suggest that the open plan ward (Period C) produced a significant reduction in fall rates compared to the wards with 4-bedded bays and single rooms (Period A, $p = 0.002$; Period B, $p = 0.008$; Period D, $p = 0.014$).

Figure 1 demonstrates the trend in fall-rates over time.

This study is retrospective and based on standard audit data, and as such does not incorporate data on individual patient characteristics or recurrent fallers. The built and designed environment (e.g. room/ward size) is in a dynamic system with the social environment (e.g. staffing levels and skills) and patient characteristics (e.g. case mix). Changing one component will change the dynamic of the system and alter its outcomes.

With regard to hospital room size, there are a variety of qualitative studies on patient preferences [e.g. 9], along with a large volume of “expert” opinion cited [7], based on reasoning as opposed to clinical evidence, which has become engrained into policies and guidance. The observational data presented here only points to one outcome (patient falls) of

a multitude of trade-offs which should be considered in hospital design. Nonetheless, here stands a small contribution from which future research evidence can grow, and which may encourage guideline developers to think twice before deciding that one (room) size fits all.

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Conflict of interest checklist

Elements of Financial/Personal Conflicts	IU		AD		BH		MS	
	Yes	No	Yes	No	Yes	No	Yes	No
Employment or Affiliation		X		X		X		X
Grants/Funds		X		X		X		X
Honoraria		X		X		X		X
Speaker Forum		X		X		X		X
Consultant		X		X		X		X
Stocks		X		X		X		X
Royalties		X		X		X		X
Expert Testimony		X		X		X		X
Board Member		X		X		X		X
Patents		X		X		X		X
Personal Relationship		X		X		X		X

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REFERENCES

1. Alalouch C, Aspinall P. Spatial attributes of hospital multi-bed wards and preferences for privacy. *Facilities* 2007;25:345-62.
2. Hutton J. NHS Hospitals. House of Commons Hansard. 2004 Apr 28;420(Part No. 576): Column 1092W.
3. Facility Guidelines Institute. Guidelines for Design and Construction Health Care Facilities, 2006 edition.
4. Department of Human Services, Victoria, (DHS). Design guidelines for hospitals and day procedure centres, 2004.
5. Chaudhury H, Mahmood A, Valente M. The effect of environmental design on reducing nursing errors and increasing efficiency in acute care settings: a review and analysis of the literature. *Environ Behav* 2009;41:755-86.
6. Ulrich R, Quan X, Zimring C, et al. The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a-Lifetime Opportunity. The Centre for Health Design, 2004.
7. van de Glind I, de Roode S, Goossensen A. Do patients in hospitals benefit from single rooms? A literature review. *Health Policy* 2007;84:153-61.
8. Hurst K. UK ward design: Patient dependency, nursing workload, staffing and quality - An observational study. *Int J Nurs Stud* 2008;45:370-81.
9. Rowlands J, Noble S. How does the environment impact on the quality of life of advanced cancer patients? A qualitative study with implications for ward design. *Palliat Med* 2008;22:768-74.
10. Clinical Trial Registration. The HIP-HOP Flooring Study: Helping Injury Prevention in Hospitalised Older People [online]. <http://clinicaltrials.gov/ct2/show/NCT00817869>. Accessed January 14, 2011.

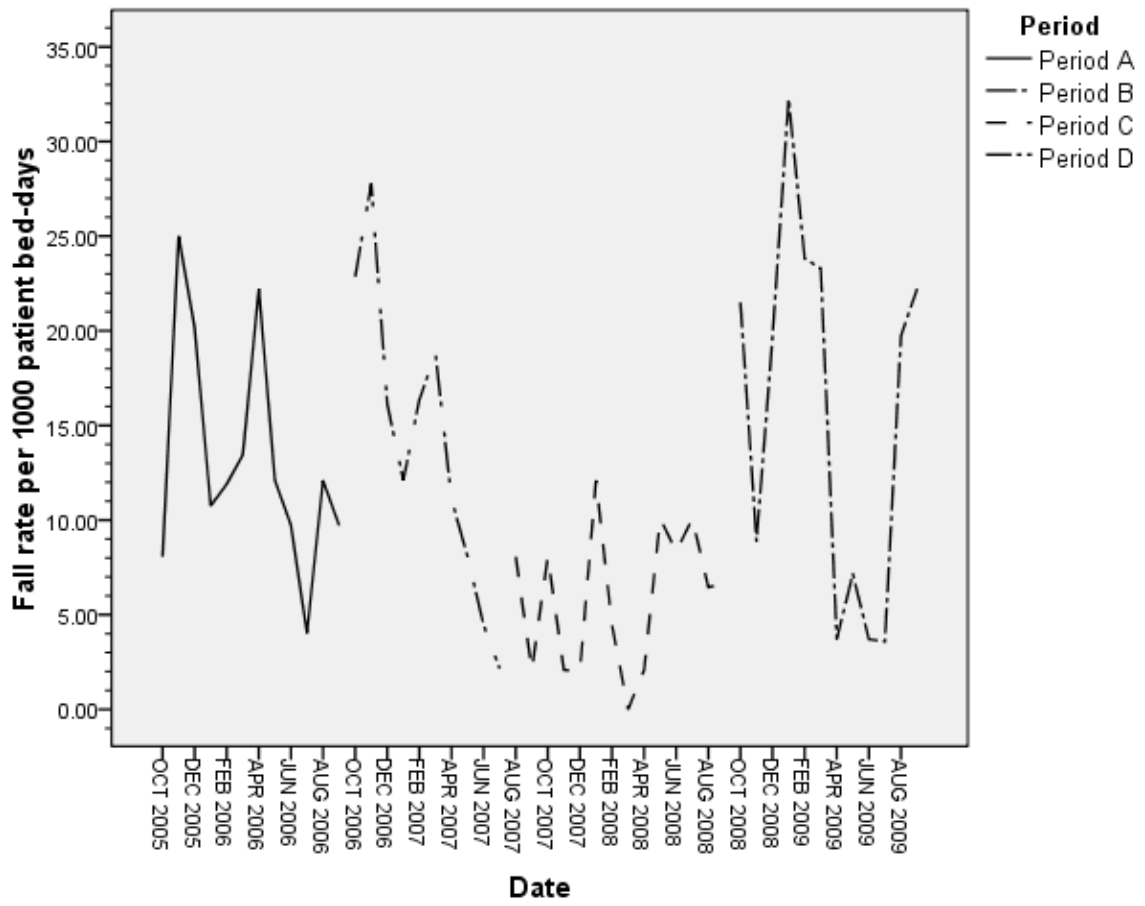


FIGURE LEGENDS

Figure 1. Trend in fall rates (per 1000 patient bed-days). Period A: four 4-bedded bays and eight single rooms; Period B: same facility as Period A + new consultant; Period C: 15-bed open-plan ward and a single side-room; Period D: three 4-bedded bays and six single rooms.