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Space to care and treat safely in acute hospitals: Recommendations from 1866 to 2008

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ABSTRACT

This paper will explore and discuss the spatial recommendations, and the supporting research evidence, for in-patient bed spaces. The bed space is defined as the area around an individual bed that offers privacy either as a single room or a cubicle. A document review from 1866 to 2008 found that the recommendations for bed space width had increased by 1.1 m over 44 years, from 2.4 m (1961) to 3.6 m (2005). However, a small scoping project in the United Kingdom revealed that the bed space areas in recently built hospitals (medical and surgical wards) were less than the recommendations. These data are discussed in the context of healthcare Evidence-Based Design to consider three patient safety issues (falls, noise and infection transmission). A role for ergonomics is proposed in the design, planning and evaluation stages as a methodology bridge between clinicians and architects (participatory ergonomics) and as an expert adviser to address design issues of patient safety and environmental functionality.
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1. Introduction

The bed space is the largest repeating design envelope in an acute hospital. It is defined as the area around an individual bed that offers privacy either as a single room or a cubicle (with curtains or screens) in a multiple occupancy ward. This space presents a complex design challenge due to the different people who will occupy the space (patients, clinicians, support staff, visitors etc.) and the wide range of task activities (Lu and Hignett, 2005). From the time of Florence Nightingale, and before, the design of hospitals has been viewed as an important and integral part of the therapeutic environment. Nightingale (1893) successfully argued for improvements in hospital design including less cramped conditions as under-dimensioned rooms made it more difficult to carry out the intended functions and activities (Teikari, 1995). However, Palmer (1996) suggests that Nightingale would challenge 21st century design professionals to create patient bedrooms of a sufficient size to accommodate two caregivers simultaneously, as well as the visitor/patient chair, dresser, bedside cabinet, over-bed tray, straight-backed chair, and washing facilities and allow a gurney, bed or wheelchair to be move in and out of the room. A survey in 2004 found that nurses base their decision to work at a hospital on a variety of factors, including the workspace in wards (Harrison, 2004). In particular the logical and rational organisation of space and equipment was seen as highly important for staff retention, from too little space to work in and doors too small to allow easy movement of beds, to the location of equipment and insufficient electrical points (CABE, 2004).

Although it is acknowledged that the physical environment has a significant impact on health and safety (including confidentiality, cross infection and travel time), it has been suggested that hospitals are not designed with the explicit goal of enhancing staff and patient safety through facility design innovations (Reiling et al., 2004).

This study aimed to investigate the recommendations and research in healthcare building design by (1) mapping the historical changes in bed space guidance; (2) reviewing their impact with a small scoping study; (3) considering the research evidence relating to three patient safety issues: falls, noise and infection transmission; and (4) proposing a role for ergonomics in future hospital design.

2. Method

2.1. Historical recommendations

The historical recommendations for bed space guidance were identified and retrieved from national (UK) and international sources. The National Health Service (NHS) Estates archive was searched to retrieve guidance documents. Data were tabulated and charted to investigate changes in bed space width and area for both ward cubicles (multiple occupancy) and single rooms (Table 1, Figs. 1 and 2).

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Table 1
Bed space dimensions from archival documents and site visits.

Recommendations	Bed space width (m)	Bed space length (m)	Bed space area (m^2)
1866: Poor Law Board	1.82	–	–
1946: General Nursing Council of England and Wales	3.05	–	–
1951: Medical Research Council	2.43	–	–
1955: The Nuffield Provincial Hospitals Trust	2.13	–	–
1961: HBN 4 – Ward Units	2.4	2.9 (assumed)	6.96
1986: HBN 40, Common Activity Spaces Vol. 1 – Example layouts; Common components	2.5	2.9	7.25
1990: HBN 4 – Adult Acute Wards	2.5	2.9	7.25
1993: HOSPITAL 1	**2.3**	**2.85**	**6.56**
1995: HBN 40, Vol. 2 – Treatment Areas	2.7	2.9	7.83
1997: HBN 04, Vol. 1 – In-patient Accommodation	2.9	2.9	8.41
1999: Adler. Metric Handbook (cubicle)	2.9	2.5	7.25
1999: Adler. Metric Handbook (room)	3.1	3.3	10.23
2001: HOSPITAL 2	**2.4**	**2.6**	**6.24**
2001: HOSPITAL 3	**2.71**	**2.93**	**7.94**
2001: American Institute of Architects (cubicle)	2.9	3.2	9.28
2001: American Institute of Architects (room)	2.9	3.75	10.88
2002: HFN 30 – Infection Control in the Built Environment (cubicle)	3.6	2.9 (assumed)	10.44
2002: HOSPITAL 4	**2.7**	**2.9**	**7.83**
2002: HOSPITAL 5	**2.65**	**2.9**	**7.69**
2003: WorkCover, Australia (cubicle)	2.6	3.5	9.1
2003: WorkCover, Australia (room)	2.75	3.3	9.1
2003: ACC, NZ (cubicle)	2.4	2.85	6.84
2003: ACC, NZ (room)	2.9	3.5	10.15
2003: HBN 04 (room)	–	–	23.5
2003: Reiling et al. USA (room)	3.8	4.7	17.86
2004: Villeneuve, Canada	4.0	3.5	14.0
2005: NHS Estates (cubicle)	3.6	3.1 (p 9)	11.16
2005: NHS Estates (room)	3.6	3.7	13.32
2006: American Institute of Architects (cubicle). Clear floor area exclusive of toilet rooms, closets, lockers, wardrobes, alcoves or vestibules			9.29
2006: American Institute of Architects (room)			11.15
2006: American Institute of Architects (including family space)	3.66	3.96	14.86
2008: Hignett and Lu (cubicle/room)	3.81	3.41	10.84

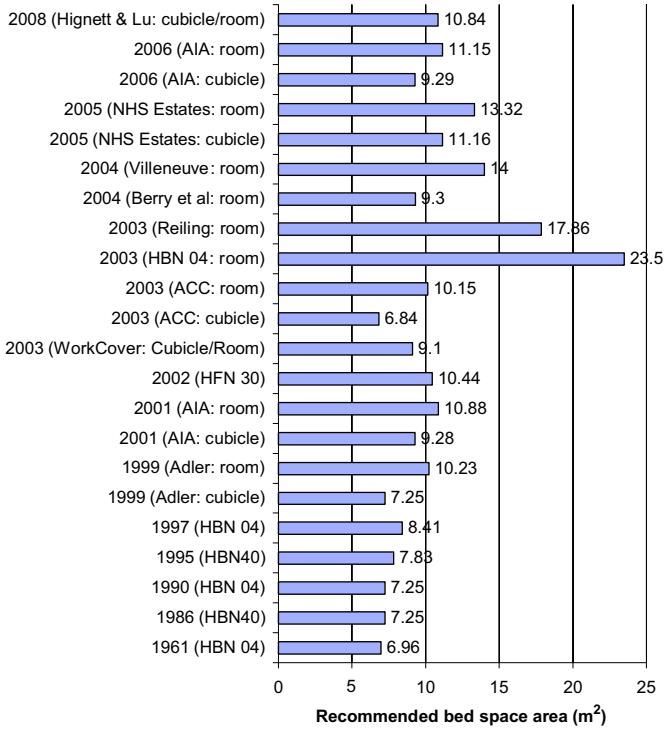

Fig. 1. Bed space area: cubicle and room dimensions.

2.2. Scoping study

Twenty-five hospitals in the UK with new building projects (rather than refurbishments) in the last ten years were approached. Five agreed to participate, resulting in a small convenience sample. Ethical approval was granted from MREC (Wales) 04/MRE09/31, with additional individual site approval (ethical and research governance). Each site was visited and 2–4 empty bed spaces (rooms and cubicles) were measured and photographed. The bed spaces were selected to represent examples of the largest repeating units, e.g. general medical/surgical adult wards in the most recent building design; they were not chosen to represent best or worst case dimensions.

2.3. Evidence base

To contextualise these data the outputs from five international reviews were scrutinised and summarised in Table 2 using the framework of a systematic review to comment on the: (1) definition of the research question; (2) methods for identifying the research studies (search strategy); (3) selection of studies for inclusion; (4) quality appraisal of included studies; (5) extraction of the data; and (6) a synthesis of the data (Hamer and Collinson, 1999).

3. Results

3.1. Historical recommendations

Data were retrieved on bed spaces from 1866 to 2008 (Table 1, Figs. 1 and 2). It can be seen that recommendations have regularly

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