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Conflicting Benefits and Hazards of Hospital-Style Bed Rails

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ABSTRACT

This paper reviews the design and use of hospital-style bed rails. Rails were originally used as a safety feature for psychiatric patients at risk of falling in the 1800s. There are benefits, for example security in transit, facilitating repositioning, but also hazards, including deaths and injuries associated with entrapment. The developments in the technological specification of hospital beds (electric) has increased with their functionality. However, a survey in England and Wales found that patients on electric beds / pressure mattresses were three times more likely to have their rails raised. This may lead to an increase in the exposure to the risks associated with bed rails and presents a conflict for designers, staff and patients.

INTRODUCTION

Hospital beds are one of the highest volume medical devices and are found in all areas of health care. There are probably over 400,000 hospital-style beds in

England. This includes over 220,000 in hospitals (Hignett et al, 2007) as well as beds in nursing and residential homes and for care at home (Mitchell et al, 1998). The design has moved a long way since the development of the King's Fund bed specification in 1966 (Maxwell, 1997). In 1998 it was recommended that all areas (hospitals, nursing homes and private homes) should consider using powered, profiling, adjustable height beds in the UK for patients with limited or compromised mobility (Mitchell et al, 1998). There are many issues relating to the design of hospital beds, including infection control, tissue viability (mattress design), maintenance, usability (by patients and caregivers) and resuscitation support. This paper will focus on the design and use of bed (side) rails.

Bed rails (also known as side rails, bed side rails, cot sides and safety rails) are adjustable metal or rigid plastic bars that attach to the bed and are available in a variety of shapes and sizes from full, three-quarters, half, one-quarter, and one-eighth in lengths as well as one or two (split rails) for each side of the bed. Full length bed rails are available in two basic designs, trombone (telescoping) and concertina/folding (Govier and Kingdom, 2000; MDA, 2002).

WHEN ARE RAILS USED?

Healey et al (2009) carried out a survey of bed rail use at night (22.30 – 06.30) in seven randomly selected hospitals in England and Wales. They surveyed 1,092 patients in all specialities except obstetrics and paediatrics and collected data on mattress type, bed type, bed rail use, patient age, mobility, conscious state, confusion, and nurses' rationale for bed rail use. They found that 26% of patients had full rails raised and 9% of patients had partial rails raised. Patients had raised bed rails if they were described as confused (four to seven times more likely); on electric beds/alternating pressure mattresses (three times more likely). 74% of full rails were raised as a response to a perceived falls risk (by the nursing staff), with only 7% raised to be used as a turning aid and 5% raised following a patient request. For partial rails, 30% were raised to be used as a turning or rolling aid, 23% as a request from a patient, and 16% to prevent falls. The authors comment that '*although some patients may use bedrails as a movement aid, they are not designed for that purpose, and alternative equipment may be more effective.'*

The use of bed rails has been discussed since the 1960s, with Fagin and Vita (1965) commenting that *'to many conscious patients, side rails are frightening and imply dangerous illness. To others, side rails are irritating and humiliating because they emphasize the confining aspects of hospitalization'*. Most patients want to retain their independence, in particular with respect to elimination needs, for example '*on numerous occasions seriously ill patients climbed over the bed rails to go to the bathroom, thus averting the embarrassment of a soiled bed'* (Parrish and Weil, 1958). These negative perceptions seem unchanged in 2000s. Gallinagh et al (2001) interviewed patients and elicited negative comments about the bed rail as a restraint and inappropriate use of rails by getting round the rail if they wanted to exit the bed. The patients thought the nurses were using bed rails as standard practice, firstly if the patient was restless to stop the patient and/or bed clothes

slipping, and secondly as a risk averse response to staff concerns about blame or litigation if the patient fell out of bed. The use of bed rails has been identified as a component of a risk averse safety culture. Oliver et al (2008) suggest that falls could be '*cited as a failure in the duty of care (a crucial feature of successful clinical negligence claims* [in the UK]*)*'. The increased use of rails (to prevent falls) can lead to a change in clinical practice with restriction in movement and patient autonomy which, in turn, may limit or delay rehabilitation.

WHAT ARE THE BENEFITS AND HAZARDS?

Benefits

Bed rails may serve a number of purposes (HBSW, 2003) including security in transit, facilitating turning and repositioning within the bed or transferring in or out of a bed, providing a feeling of comfort and security, facilitating access to bed controls, and providing a physical barrier to remind the patient of the bed perimeters. However no studies have been located exploring or measuring these benefits. Bed rails have been used extensively as an intervention to manage falls (McCarter-Bayer et al, 2005; Capezuti et al, 2007; Rainville, 1984; Dunn, 2001; Kilpack et al, 1991; Hanger et al, 1999; Healey et al., 2004), but there is no evidence that they prevent falls or injury (Capezuti et al, 2007; Hanger et al, 1999).

Another benefit for bed rails is as extra storage space for bed controls. Foster (2004) compared three designs of hospital bed control handsets; bed rail mounted, pendant (on cable) and control panel (figure 1). Visual (macular degeneration) and tactile impairment were simulated to evaluate any related errors with 36 participants for the task of adjusting the height of bed. Data were collected using subjective perception rating questionnaires and link analysis for error evaluation. The bed rail mounted handset was perceived to be the most complex to use but produced the fewest errors (link analysis).

Electric beds have benefits for both patients and care givers. Patient independence is enhanced through self-adjustments for both bed position and height. Staff safety has been improved by reductions in musculoskeletal demands for moving a patient in bed or transferring to/from the bed (Dhoot and Georgieva, 1996; Hampton, 1998; RCN, 1996). Milke et al (2008) suggest that the use of electric beds may contribute to a reduction in the use of bed rails as staff may feel more comfortable leaving full bed rails off electric beds since they can be lowered nearly to the floor and therefore are less likely to cause serious injury if residents happen to fall out of bed. Dhoot and Georgieva (1996) found that using an electric bed (with patient access to controls) enhanced patient independence, with 2.3 times more positional self-adjustments and 5.8 times more height adjustments (frequency) in comparison with a hydraulic (manual) bed.

FIGURE 1 Control panel handset and bed rail hand set

Hazards

Donius and Rader (1994) suggested that the use of bed rails can have negative consequences including obstructing vision, separating the care receiver from the caregiver, creating noise, causing trauma if the patient's body strikes or becomes entangled in the side rail, dislodging tubes during raising and lowering, and creating a sense of being trapped or jailed. The patient population who have been identified as being at risk from bed rails are those who are frail, elderly and/or have conditions including agitation, delirium, confusion, pain, uncontrolled body movements, hypoxia, faecal impaction and acute urinary retention (HFCA, 2000).

There have been two papers reporting deaths, injuries and near miss adverse events associated with the use of bed rails (Todd et al, 1997; McLaughlin, 2003) using the adverse event (AE) data (JHACO, 1998) from the Food and Drug Administration (FDA) Manufacturer and User facility Device Experience database (MAUDE). The frequency of bed rail-related reports increased from 111 reports between 1985 and 1995 to 325 reports between 1998-2001 (McLaughlin, 2003). Hazards associated with rails include entrapment (1) in the mattress-rail horizontal gap (or head/foot board); (2) within the rails, including latch failure where the rail drops due to the patient struggling to free themselves; (3) with the body off the bed and the neck or chest compressed by the rail; and (4) between split side rails (Parker and Miles, 1997). Hignett and Griffiths (2005) analysed the data from MAUDE with respect to the type of rail associated with adverse events. They found that incidents involving half rails were more likely to be associated with head, neck or face entrapments and were also more likely than other bed rail types to result in death. There is very limited public domain information available about incidents involving hospital beds in the UK. Marsden (2004) reported 94 incidents in 2002 involving bed rails and 20 deaths in the UK involving bed rails since 1997.

It is possible that the use of bed rails can alter the location of a fall. Donius and Rader (1994) suggested that the use of bedrails may increase the distance of falls from the bed whereas Hignett et al (2010) found the reverse in a small pilot study, where patient falls with raised rails were clustered at the foot end of the bed.

Oliver (2002) describes the use of bed rails and covert restraints (e.g. positioning of furniture, tucking of bed clothes too tight, chair type) as a possible infringement of the autonomy and dignity of patients. Maslow's theoretical model for basic human needs consists of a hierarchy in which physiological needs and the needs for safety and belonging and love can be said to be homeostasis-related. Maslow suggested that people are '*wanting beings'*, always wanting more than they already have so when one level of the hierarchy is met they will move to another level (Mullins, 1993).

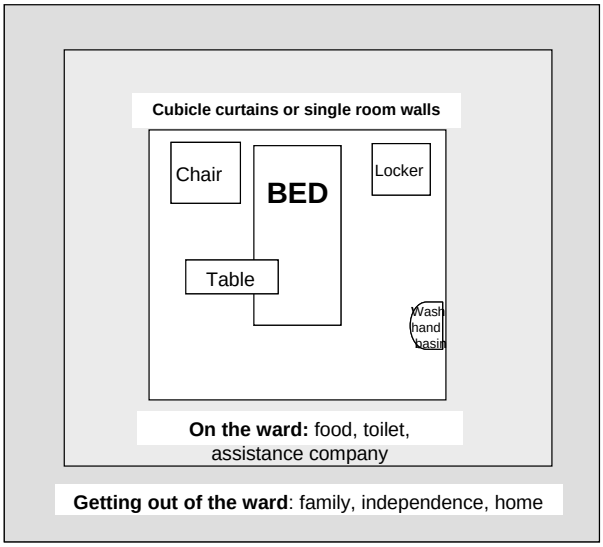

FIGURE 2 Safety and Functionality conflicts

To apply Maslow's model for falls Hignett and Masud (2006) reviewed the levels using a patient-centred model for movement and suggest specific needs for falls (figure 2). In level one (physiological needs) motivation for movement may include bladder and bowel function (to support homeostasis), hunger, thirst and activity. When these basic needs are fulfilled the motivation for movement may involve safety issues including freedom from pain, the threat of physical attack, and protection from danger or deprivation. Levels three, four and five are perhaps less likely to be activated for the 'at risk' group, although an independently mobile patient may be trying to fulfil needs at these higher levels.

CONFLICTS IN BED RAIL USE

There is a conflict in the use of bed rails. At one pole there are clear hazards associated with their use from a reduction in autonomy, movement and rehabilitation through to entrapment, injury and death. At the other pole there are potential benefits for patients with respect to access to the bed controls, turning/rolling assistance. For staff, the main benefits are based on a risk-averse behaviour relating to litigation. The question for quality in healthcare product design and clinical practice is whether the design and use of bed rails can support functionality and provision of care for patients and staff without introducing hazards. From the current evidence it would seem that balance is tipped towards a norm of bed rail use that is likely to increase rather than decrease risk of injury to patients. Can design innovate in spite of risk-averse culture which prefers to restrain patients who are perceived by caregivers to be at risk of falling. Can design lead safety behaviour or is innovation stifled by a risk-averse safety culture?

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