

PATIENT FALLS FROM BED AND THE ROLE OF BEDRAILS IN THE ACUTE CARE SETTING

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ABSTRACT

The use of bedrails in preventing patient falls from bed remains highly controversial and has received only limited research attention throughout the last decade. The present study questioned the relationship between bedrail use and patient falls from bed particularly in terms of age-gender characteristics, mental status and the severity of injuries sustained. A retrospective, cross-sectional analysis was conducted of 419 patient falls occurring in an urban, acute care hospital from 1993-2000. This audit identified 136 falls from bed. It was found that for all age-gender groups the incidence of falls from bed with bedrails elevated was equal to or higher than when bedrails were not elevated. Patients in a 'non rational' state at the time of falling were significantly more likely to have fallen with the bedrails elevated ($\chi^2=19.463$, $p<0.001$). Whilst there was no statistically significant relationship between the position of bedrails and the severity of injuries sustained ($\chi^2=1.088$, $p=0.780$) the fact that there was a patient death resulting from a fall from bed over elevated bedrails was considered to be of particular clinical significance. Thus the role of bedrails as protective or safety devices was challenged and an urgent re-evaluation of current practices recommended.

INTRODUCTION

Context

The majority of patient falls within acute care settings occur from or near the patients' bed (Joanna Briggs Institute for Evidence Based Nursing and Midwifery 1998). Traditionally, the elevation of bedrails has been a routine, precautionary measure to prevent bed-related falls and has often served to give nurses, as much as patients, a sense of reassurance. However, the efficacy and safety of this still widespread practice has come under increasing examination by nurses (Jehan 1999) and has been a source of ongoing debate within the health-care profession.

It has been argued that popular assumptions of 'good' or 'standard' nursing procedure to prevent falls, including bedrail use, are often based on consensus rather than research (Whedon and Shedd 1989, p.111). Despite the fact that studies indicate that bedrails can potentiate rather than prevent patient injuries, it is commonly perceived that leaving the bedrails down is neglectful and unsafe (Govier and Kingdom 2000). Belief in the effectiveness of restraints in general is reinforced by the perception that failure to restrain puts health care providers at risk for legal liability (Capezuti et al 1998; Rubenstein et al 1994).

Restraint use has historically been associated with 'legal paranoia' (Ejaz et al 1994, p.960) more because it is defensible than because it has been proven effective (Whedon and Shedd 1989). In 1957, despite the acknowledgment that bedrails do not prevent patient falls from bed, Ludlam (cited in Whedon and Shedd 1989,

p.112) stated that 'It is much easier to defend or settle a legal case when the rails are up than when they are down'.

More recently however, the use of bedrails on the basis of legal ramifications has received justifiable criticism (Flicker 1995). Not only do bedrails not bar a conscious patient from leaving a bed if there is intent but furthermore, Wilson (1996, p.65) claims that given the evidence 'failure to restrain is rarely a negligent act'. As there is no clear legal position in regard to restraint use generally, their application and removal often becomes a 'nursing judgement' (George et al 1999; Wilson 1996).

Aside from and in addition to the unresolved legal controversy surrounding bedrail use, there are a number of emergent ethical implications. For whilst bedrails are essentially protective and safety devices they may also function as a form of restraint (Jehan 1999). The use of bedrails as restraints is an emotive issue with many authors expressing concern at the loss of patients' freedom, dignity and autonomy (Everitt and Bridel-Nixon 1997; Hanger et al 1999; Wilson 1996). Others warn that such usage by nurses is not only unethical but could in fact be perceived as a type of physical abuse (Jehan 1999; Tyler 1992).

In an Australia-wide audit involving 35 acute and sub-acute care facilities (n=976), 70% of those restrained were done so with bedrails. Further to this, consent for restraint by bedrails had only been documented in 16.2% of cases (Woodward 1998). It is argued that for those patients who are competent, consent should be obtained before the use of physical restraints as such patients have the right to refuse restraints (Flicker 1995; Wilson 1999). However, the definition of competence and means by which it can be determined are fraught with difficulty.

The role of bedrails as restraints and of late, their increasing association with patient injury has heightened the controversy surrounding their use. Furthermore, it has been suggested that the improper use of bedrails may actually contribute to patient falls and has been considered by some as an extrinsic or environmental falls risk factor (National Ageing Research Institute (Australia) 2000; Rubenstein et al 1994). Given that the decision to elevate or lower bedrails often rests primarily with nurses, continued nursing research and education into the risks surrounding their use is of utmost importance.

Aims

The questionable role of bedrails in preventing falls from bed was initially noted during descriptive examination of 419 patient fall incidents occurring within an urban acute care hospital between 1993-2000. Almost one third of all falls were reported to be 'from bed' with over half of those occurring whilst the bedrails were elevated. In addition, there had been one patient death

directly resulting from a fall from bed over elevated bedrails.

Given this, coupled with the fact that only limited literature exists which relates specifically to falls from bed and bedrail position, the study aimed to determine factors associated with falls from bed, particularly over elevated bedrails, in order to identify 'at risk' patient groups and circumstances conducive to such falls. Further, driven by recent reports linking bedrail use with increased patient injury together with the observed bedrail-related patient death, the study sought to establish whether the extent of injuries resulting from falls from bed over elevated bedrails was greater than for falls from bed when bedrails were not elevated. It was anticipated that with such information, the current practice of bedrail use within the acute care setting might be better informed and in consequence, the incidence of bedrail-related falls from bed may be reduced.

LITERATURE REVIEW

The controversy surrounding bedrail use is not a new research issue. In 1957, Ludlam (cited in Everitt and Bridel-Nixon 1997) studied 7,822 falls from bed across 120 hospitals in the United States of America and found that bedrails were elevated in 63% of reported falls. Over 40 years ago, Hazell, 1960, (cited in Govier and Kingdom 2000, p.40) observed that 'the more backward a ward appeared, the more cot sides seemed to be in evidence'. Further, in 1979, Walsh and Rosen revealed that 51% (n=53) of patients fell from bed where bedrails were elevated. However, whilst research on restraint use in general has been given considerable attention since the mid-1980s (Capezuti et al 1996), research which specifically addresses the use of bedrails has been limited.

The existing literature indicates that patients will fall from bed despite the elevation of bedrails (Evans 1999). Not only is there a distinct lack of scientific evidence to support the efficacy of bedrails in reducing patient falls and fall-related injuries but rather, studies have highlighted possible deleterious effects concluding that they may in fact 'do more harm than good' (Hanger et al 1999, p.529; Capezuti et al 1998; Everitt and Bridel-Nixon 1997; Flicker 1995; Rubenstein et al 1994; Wilson 1996).

Use of bedrails and injury severity in patient falls from bed

It has been suggested that injuries sustained from falls over elevated bedrails are possibly more severe in nature as a result of the increased height and greater obstruction encountered (Capezuti et al 1999; Evans 1999; Hanger et al 1999; Jehan 1999). Hanger et al (1999, p.530) caution that the 'use of bedrails is not benign but carries significant risks including death'. They found for instance

that the implementation of a bedrail policy discouraging the overuse of bedrails in conjunction with a staff education program resulted in a significant reduction in the severity of injuries in patients falling from bed. Similarly, Ejaz et al (1994) reported that the reduction of bed and chair restraints also in conjunction with staff education resulted in a decrease of injurious falls. Capezuti et al (1998, p.M47) state that 'evidence that restraint removal does not significantly increase falls and injuries is crucial if beliefs and practice with regard to restraint use are to be changed'.

In addition to falls injury associated with bedrail use, it has been suggested that patients who are confused may become even more distressed and agitated due to the inability to understand the reason for bedrails, subsequently further increasing their risk of falling (Downton 1993; Gray and Gaskell 1990; Hanger et al 1999). Hanger et al (1999, p.529) state that elevated rails, in terms of the 'enclosed prison-like feeling' may promote rather than alleviate agitation. For example, in a retrospective case controlled study (62 falls and 62 controls) 90% of the 'confused' patients who had fallen, did so with the bedrails elevated at the time of fall (Bates et al 1995).

Current practice

Despite the fact that bedrails are frequently used by nurses, guidelines to such usage are often insufficient, with, according to Jehan (1999) the understanding surrounding their use being poor at best and in some cases quite dangerous. Recognising that the elevation of bedrails without correct assessment can lead to serious consequences, there have been calls for their use to be tailored to patients' individual needs (Capezuti et al 1999; Walter 1999). Regardless of this, bedrails are still commonly in use in many hospitals in Australia and their usage requires urgent re-evaluation.

According to the U.S. Food and Drug Administration - Centre for Devices and Radiological Health (2000), most patients can be in bed safely without bedrails and several alternate suggestions have been put forward to meet patient safety needs. These include adjusting the bed to the lowest possible position, improving lighting and offering patients an opportunity to address elimination needs at night before retiring or before procedures in order to reduce restlessness (Govier and Kingdom 2000). Also discussed has been the possibility that half-length bedrails may reduce patients' need to climb over rails to exit the bed, whilst addressing issues of safety and patient reassurance (Joanna Briggs Institute for Evidence Based Nursing and Midwifery 1998). However, as yet, no research has been conducted to establish an effective and safe length for bedrails and there is no evidence on this matter to help inform clinical practice (Evans 1999).

METHODOLOGY

Research design

All patient incident forms from financial years 1993-2000 were reviewed and those pertaining specifically to falls were selected (n=419). A fall was considered to be any event in which the patient unintentionally came to rest on the floor or ground. Information on each fall was extracted and entered into an electronic database established using the statistical package SPSS (Version 10.0). Variables included patient demographics, pre-fall medical diagnosis and mental status, date and time of fall, fall type, position of bedrails at time of falling, and the extent of injuries sustained from the fall. Descriptive information detailing how each fall occurred and the nature of injuries sustained was obtained from the nurse's notes and was also incorporated into the database.

Analysis

Data specifically concerning falls from bed (n=136) and on bedrail position (n=92) were selected from the data set for analysis. In attempting to identify patient groups at risk of falls from bed and over elevated bedrails, particular focus was on patient age-gender characteristics and pre-fall mental status. It was hypothesised, for instance, that patient mental status and age may have been contributing factors in determining which groups had bedrails elevated and it was questioned whether these rails had a protective effect on such patients.

Patient ages (in years) were re-coded into four age groups, <65, 65-74, 75-84, and, 85+. Given that age is commonly regarded as an important variable in patient's risk of falling (Evans et al 1998; Rawsky 1998) those ages over 65 were separated into categories so that the distribution of the incidence of falls from bed among the older ages could be examined. Age-gender information for those who fell from bed was matched with existing age-gender data for all patients admitted during 1993-2000 (n=52,992). This enabled calculation of the mean number of falls from bed and by bedrail position for each age-gender group admitted and the analysis of any significant age-gender differences in falls incidence.

In assessing for a relationship between patient mental status and bedrail position at the time of falling, data on patient mental status were first coded based on descriptions provided on the patient incident forms. Patients were recorded as being either 'rational' or 'not rational', which incorporated the categories senile, disorientated and sedated.

Similarly, in analysing the relationship between the extent of injuries sustained from falls from bed and bedrail position, content of the nursing notes on patient incident forms that documented patient injuries was first manually

converted into categories. These included ‘no injury’, ‘minor injury’ (scratch or bruise), ‘moderate injury’ (sprain, cut requiring stitches), ‘major injury’ (fracture, head injury) and ‘death’.

The time at which each fall occurred was re-coded into approximate nursing shifts (0701-1500, 1501-2300, 2301-0700) and data were analysed to assess for a relationship between time and falls from bed and bedrail position. Content analysis of descriptive information of each fall event as provided by the nursing notes was used to determine the proportion of falls from bed related to patients’ attempts to meet elimination needs.

RESULTS

Overview - falls from bed

There were 419 falls recorded from July 1993 to June 2000, 136 (32.5%) of which were reported to be ‘from bed’. This equated to an overall incidence rate of 26 falls from bed per 1000 patients admitted during that time. In terms of age distribution, an independent-samples t-test revealed that the mean age of patients who fell from bed (67 years) was significantly older than for those who did not fall from bed (53 years) ($t=7.106, p<0.001$). As seen in Table 1, falls from bed were more prevalent for those patients aged over 65 years with an ANOVA indicating that the incidence of falls from bed increased significantly with age ($F=19.258, p<0.001$). The incidence of falls from bed appeared to be higher for males than females at all age groups, though this was not significant ($t=0.283, p=0.777$).

Table 1: Incidence of falls from bed per 1000 patients admitted 1993-2000 (n=52,992)

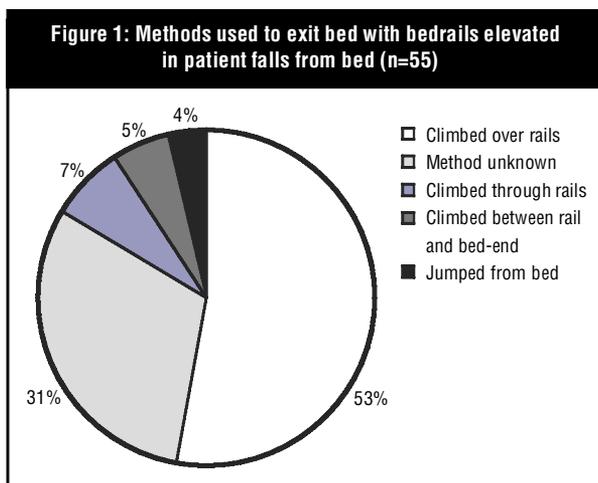
	Age group			
	<65	65-74	75-84	85+
Male	1.3	2.9	4.5	10.5
Female	1.0	1.8	3.2	6.8
Total	1.2	2.3	3.7	8.1

Chi-square analysis found that falls from bed were significantly more likely to occur between the hours 2300-0700 ($\chi^2=15.500, p<0.001$). Further, content analysis of the nursing notes on patient incident forms revealed that over half (54.5%) of falls from bed occurring during these hours were directly related to patients’ attempts to meet elimination needs.

Falls from bed and bedrail position

The position of bedrails at the time of falling had been reported for 92 of the 136 falls from bed. Of these, 55 patients, or almost 60%, had fallen from bed whilst the

bedrails were elevated. As shown in Figure 1, in over half of cases (53%) patients were in the act of climbing over the bedrails at the time of falling, four patients (7%) had climbed through them, three (5%) patients had squeezed between the end of the bedrails and the bed-end and two patients (4%) had ‘jumped’ over them. In the remaining 31% of cases, patients were found lying next to the bed with the bedrails still elevated, though the exact method used to by-pass the bedrails had not been documented.



As shown in Table 2, for all age groups except those aged over 85 years, the incidence of falls from bed with the bedrails elevated was higher than, or equal to, when bedrails were not elevated. As with falls from bed generally, there was a significant increase in the incidence of falls with age both over elevated bedrails ($F=5.124, p=0.002$) and not elevated bedrails ($F=11.054, p<0.001$). There was no difference in mean age between patients who fell from bed with the bedrails elevated and not elevated with both groups having a mean age of 68 years. Male patients appeared slightly more likely (though not significantly) to fall from bed than female patients, both with bedrails elevated ($t=0.467, p=0.640$) and not elevated ($t=0.744, p=0.457$).

Table 2: Incidence of patient falls from bed by age-gender group and position of bedrails per 1000 patients admitted 1993-2000 (n=52,992)

Rails	Age category							
	<65		65-74		75-84		85+	
	Up	down	Up	down	Up	down	Up	down
Male	0.6	0.3	1.2	1.0	1.7	1.4	2.3	5.8
Female	0.3	0.3	0.7	0.2	1.4	1.0	2.5	1.9
Total	0.5	0.3	1.0	0.6	1.6	1.2	2.4	3.9

Falls from bed over elevated bedrails were more likely to occur between the hours 2300-0700 ($\chi^2=4.955, p=0.084$) though this was not significant at the 0.05 level. Almost 20% of falls from bed over elevated bedrails

during these hours were related to elimination, with all such falls occurring while patients were climbing over the rails in order to get to the toilet.

It was noted that a high proportion (87.5%) of patients falling over elevated bedrails had a pre-fall mental state of 'not rational'. It was revealed that those who fell from bed with the bedrails elevated were significantly more likely to have been in a non-rational state at the time of falling than for those who fell from bed when the bedrails were not elevated ($\chi^2=19.463$, $p<0.001$) and the relationship was moderate-to-strong (symmetric Soma's $d=-0.502$).

Despite a patient death resulting from a fall whilst climbing over bedrails, the majority (61.82%) of falls from bed over elevated bedrails did not result in any documented injury. The proportion of minor and moderate injuries sustained was also less for falls over elevated bedrails than when bedrails were not elevated. Hence, in this study, no statistically significant relationship was found between bedrail position and injury severity in falls from bed ($\chi^2=1.088$, $p=0.780$).

DISCUSSION

Some 60% of falls from bed occurred where the bedrails were elevated. This was not dissimilar from figures reported in early research (Ludlam 1957, cited in Everitt and Bridel-Nixon 1997; Walsh and Rosen 1979). These results, together with the lack of literary evidence to support the use of bedrails in falls prevention (Hanger et al 1999), challenge the traditional perceived role of bedrails in minimising falls from bed in acute care settings and highlight the ongoing controversy surrounding their use. For whilst bedrails undoubtedly have an important role in maintaining patient safety in certain instances they do not prevent a patient getting out of bed if there is intent (Everitt and Bridel-Nixon 1997).

The incidence of falls from bed was particularly prevalent amongst older age groups, regardless of bedrail position. It is thought that the desire for many older patients, particularly males, to retain their independence and reluctance to wait for assistance, especially when trying to get to the toilet (Garcia et al 1988), may see them attempt to get out of bed with or without the presence of bedrails. Frequency and urgency of elimination may further compound this situation.

For these patients then, bedrails may serve merely as a 'stumbling block which increases the risk of falling' (Whedon and Shedd 1989, p.112) and their usage should be treated with caution. Hanger et al (1999) too argue that 'a rail does not stop the desire; it only frustrates the patient by making the desire more difficult and hazardous to achieve' and thus it is more logical to alleviate the desire to get out of bed through programs such as regular toileting.

According to the literature, 'falls occur more frequently among women than men at all ages' (National Health and Medical Research Council 1994, p.4). However, in this study the incidence of falls from bed, both over elevated and not elevated bedrails, was slightly higher for males than females. A possible explanation, as alluded to, may be that male patients are more reluctant to wait for, or accept assistance with exiting the bed.

In addition, anecdotal evidence suggests that the hospital in which this study was set receives a disproportionate number of male patient admissions associated with drug and alcohol abuse, many of which would be in a 'not rational' state and hence represent an increased risk of falls from bed, especially over elevated bedrails. Whilst analysis of the relationship between patient medical diagnosis and falls was beyond the scope of this study, it was noted however that 12.5% of patients who fell from bed had an alcohol-related diagnosis and that 85% of these patients were males. Of further interest, 70% of patients who had an alcohol-related medical related diagnosis and fell from bed, did so over elevated bedrails and two-thirds were considered 'not rational' at the time of falling.

The relationship between bedrail position and pre-fall mental status was found to be statistically significant in that a greater proportion of patients who fell from bed where the bedrails were elevated were recorded as having a pre-fall condition of 'not rational'. However, it must be noted that this 'not rational' group was more likely to have their bedrails elevated as a routine part of their clinical management. There is no way of knowing how many patients who were 'not rational' had bedrails elevated and did not sustain a fall. This limits us to examining those who did fall from bed and whether bedrails were elevated at that time.

Regardless of these limitations, the findings of this study suggest that bedrails may not be as protective as expected in 'not-rational' patients. This echoes concerns expressed by Hanger et al (1999) as to the potential for bedrail use to cause further distress and agitation among already confused patients and is consistent with Downton (1993) who proposed that patients in such a state had an equal chance of falling regardless of the position of bedrails. The authors are led to question how many falls could perhaps have been prevented or the effects of the fall minimised had the bedrails not been elevated and suggests the need for a re-examination of current practices with respect to the use of bedrails with these patients.

Fortunately the majority of those falling from bed were not seriously injured, regardless of the position of the bedrails. In accordance with recent literary concern as to the safety of bedrail use (Capezuti et al 1999; Evans 1999; Hanger et al 1999; Jehan 1999), it was hypothesised that elevation of the bedrails at the time of falling increased the

intensity of injuries sustained. Despite the death of a patient who had climbed over the bedrails, this relationship was not found to be statistically significant. However, the fact that one fall over elevated bedrails resulted in death is of immense clinical significance and only serves to highlight the importance of further research in this area.

The lack of a statistically significant finding on the relationship between severity of injury and the elevation of the bedrails may have been due in part to the incomplete documentation of data on bedrail position, thus reducing the sample size of patients who had information recorded for each of the required variables. For example, of the 136 incident forms documenting patient falls from bed, 44 had no information regarding the position of bedrails, which limited analysis and may have contributed to Type I or Type II errors.

CONCLUSION

The issue of bedrail use, particularly amongst older patients and those categorised, as 'non-rational' requires urgent attention if the incidence of falls from bed and the associated potential for serious injury are to be reduced. Clearly it is time for a re-think of established clinical beliefs and practice habits in relation to bedrail use with these patients. Recent suggestions of management of this patient group by lowering the bed height rather than elevating the bedrails would appear to be worth serious consideration and exploration with properly constituted intervention studies. Further, Skeen (1992) puts forth that a controlled trial of mechanical restraints be undertaken in patients at risk of falling in order to define which subgroups of patients would benefit from restraint use and determine whether restraints cause injury.

Evidence for the continued use of bedrails with certain groups of patients in acute care settings remains uncertain. Clearly, further research into the impact of bedrails, the development of legal and ethical guidelines to their usage as well as possible alternatives is of utmost importance not just for patients but for nurses, given that the elevation or lowering of bedrails is primarily a nursing decision.

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