

Effects of frequent PATient moves on patient outcomes in a large tertiary Hospital (the PATH study): a prospective cohort study

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Abstract

Objective. The aim of the present study was to investigate the incidence of and patient outcomes associated with frequent patient moves.

Methods. In a prospective cohort study, any bed move and the reason for the move were documented. Patients were assessed on admission for anxiety, social support and delirium. Adverse events, length of stay and satisfaction were recorded. Patients moved three or more times were compared with those moved less than three times.

Results. In all, 566 patients admitted to a tertiary referral hospital were included in the study. Of these, 156 patients (27.6%) were moved once, 46 (8.1%) were moved twice and 28 (4.9%) were moved at least three times. Those moved three or more times were almost threefold more likely to have an adverse event recorded compared with those moved fewer times (relative risk (RR) 2.75; 95% confidence interval (CI) 1.18, 6.42; $P=0.02$) and to have a hospital stay twice as long (RR 7.10; 95% CI 2.60, 11.60; $P=0.002$). Levels of satisfaction and anxiety were not affected by frequent moves and there was no effect on delirium.

Conclusion. Frequent bed moves affect patient safety and prolong length of stay.

What is known about the topic? Retrospective and qualitative studies suggest that patient safety and costs may be affected by frequent patient moves.

What does this paper add? The present study is the first prospective study to assess the negative effects of frequent patient moves on specific patient outcomes, such as adverse events, length of stay and satisfaction with care.

What are the implications for practitioners? Within- and between-ward moves may affect patient safety. Patients should be moved only when there is a clear and unavoidable reason for doing so.

Additional keywords: healthcare costs, patient safety, patient transfer.

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Introduction

Considerable attention is being focused nationally^{1,2} and internationally³ on issues surrounding the number of times

patients are moved during their episode of acute hospital care. For example, a recent qualitative study of issues associated with transferring a patient to an 'inappropriate' ward identified

several safety themes, such as delayed diagnosis and treatment, compromised nursing care, communication breakdown among staff who are not used to working together and a lack of appropriate equipment and medications.⁴ Staff also discussed the effect on confused patients of being moved, and their increased potential risk for falls.⁴ Patient safety may also be compromised during handover, defined as 'The transfer of responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or professional group on a temporary or permanent basis'.⁵ However, steps involved in a handover are not standardised for all transfers and the relationship between handover and patient outcomes, such falls, length of stay (LOS) or preventable adverse events, remains unclear.⁶ Similar issues are involved with transfers for procedures. For example, 420 errors were noted among 101 patients being transferred for a procedure in the Radiology Department of a metropolitan teaching hospital in Australia, with the most frequent of these errors being inadequate handover.⁷

Less attention has been paid to quantifying costs associated with between- and within-ward patient moves. A careful study of over 200 patient transfers in a 750-bed tertiary facility in the US found the overall mean time associated with a move was 1 h and the cost US\$36.⁸ A 'dose-response' relationship has been shown to exist between the number of moves and the LOS, which affects the cost of an episode of care. For example, one study showed that the LOS for patients having no transfers was 1.67 days; this increased to 2.91 days if the patient was moved once, to 3.86 days if the patient was moved twice and to 9.0 days if the patient was moved three times.⁹ Although that study was a small retrospective study, the findings are not unusual. In our own unpublished work, we have found that patients who have multiple moves between wards remain in hospital almost twice as long as those who were admitted to, and remained in, their home ward. Our hospital is a large teaching facility in Brisbane, Australia and based on bed-day costs provided by the study hospital's Casemix and Clinical Costing Unit at the time, each additional day in hospital was calculated at A\$679.00 per bed-day (M. Fenn, unpubl. data). These data represent a considerable potential cost saving if strategies for reducing moves could be implemented. However, that study focused on neurosurgical patients, so whether the same phenomenon occurs hospital wide is not known.

Levels of satisfaction and anxiety have also been associated with the number of bed moves. Two areas have received the most attention: transfers to mixed-bed bays¹⁰⁻¹³ and transfers from intensive care or critical care settings to general wards.¹⁴⁻¹⁶ Patient-related issues around mixed-sex bays include being uninformed about the possibility of being admitted to a mixed-sex setting,¹² loss of dignity^{10,12} and safety.¹³ Anxiety associated with transfer from specialised care environments was named in 1987 as 'relocation stress syndrome' and may affect the relocating patient and their families.¹⁷ Information interventions, designed to reduce such stress, have been recently reviewed and shown to be effective for both families and patients.¹⁵ However, a study designed to measure the effect of a liaison nurse on transfer anxiety did not show benefit for patients or families.¹⁸

Despite this research, the effects of frequent bed moves on important health outcomes remain unclear.

Aims

The aims of the present study were to determine: (1) the incidence of multiple moves; (2) predictors of risk factors associated with multiple moves; and (3) whether multiple (three or more) moves affect patient safety, satisfaction, cost or LOS.

Methods

Research design

The present study used a prospective cohort study design. The primary outcomes of interest were: (1) the incidence of three or more moves; (2) predictors of risk factors associated with three or more moves; and (3) adverse outcomes associated with three or more moves. We defined two types of moves. The first was any transfer within a ward, either to a different bed in the same room or to a bed in another room in the same ward. The second type of move concerned any move from one ward to another or between the hospital's short-stay assessment unit and the ward. The initial move, from the emergency department to the first ward or department, was not included as a move. We did not include moves for investigations or for surgery, unless the patient was subsequently returned to a different bed following the procedure. The outcome 'adverse outcome' was a composite measure of any fall, medications error, pressure ulcer and 'other' adverse event (e.g. treatment errors, delays in treatment related to transfers, unnecessary exposure, such as X-ray). Secondary outcomes were LOS, anxiety, delirium and patient satisfaction. The study was approved by the Hospital's Human Research Ethics Committee.

Population and setting

Patients admitted to medical, surgical and women's health wards of a metropolitan hospital in Queensland, Australia, were potentially eligible for inclusion in the study. The hospital is a general tertiary referral teaching hospital with over 900 beds and admitting over 90 000 people each year. Patients are also admitted from northern New South Wales and from the Pacific rim. The hospital is colocated with a children's hospital and a mental health facility.

Inclusion criteria were an anticipated hospital stay of at least 3 days, age ≥ 18 years, ability to speak and read English and the ability to complete a self-reported questionnaire. Patients were excluded if they were unable or unwilling to provide consent or were admitted to a mental health, intensive or critical care unit.

Instruments

To evaluate the secondary outcomes of the study, the first three of the following measures were used. The fourth measure was included to assess whether low social support acted as a predictor of negative patient outcomes.

- (1) The Confusion Assessment Method (CAM) was originally developed using a literature review and expert opinion.¹⁹ Designed for use by non-psychiatric health carers, the CAM has been validated, adapted and translated in numerous studies.^{20,21} A diagnosis of delirium requires the patient

to exhibit an acute change in mental state and difficulty focusing attention, plus either disorganised thinking patterns or altered levels of consciousness.

- (2) The anxiety questions from the Hospital Anxiety and Depression Scale (HADS)²² were used to assess patient anxiety. This scale is one of the most frequently used measures of anxiety in healthcare research, with well-established reliability and validity.²² Scoring is between 0 and 21, with higher scores indicating higher levels of anxiety. The normative score for the anxiety section of the HADS among 1792 members of the general population was 6.14.²³
- (3) Three visual analogue scales were used to assess a patient's satisfaction with care. Each 100-mm line was anchored at one end with the words 'not at all satisfied' and at the other with 'completely satisfied'. The scales measured 'overall satisfaction', 'satisfaction with nursing care' and 'satisfaction with medical care'.
- (4) The Brisbane Social Support Scale (BSSS) is a modified version of the Maternity Social Support Scale (MSSS), which was devised as a simple tool to assess social support in clinical and research settings.²⁴ The MSSS has been used in several research settings.^{25,26} The scoring range is between 6 and 30, with higher scores indicating greater support. A cut-off point of 25 indicates adequate support.²⁴

Procedure

Data collection

On admission, patients were provided with written and verbal information about the study by a research nurse. Consenting patients were asked to complete two instruments (the anxiety section of the HADS and the BSSS). They also completed details about prior hospitalisation, their history of falls and pressure injury and their preferences for mixed-bed bays and private rooms. The research nurse completed the CAM questions, documented the presence of any pressure ulcer and collected baseline and admission data (e.g. patient demographics, admitting diagnosis (cardiac, respiratory, diabetes, other endocrine condition, renal, vascular, dermatology, neurology, haematology, peripheral vascular disease or other condition), number of comorbidities, medication use and whether patients were clinic or private patients). Participants were tracked daily for information about bed moves, the reason for the move and whether a timely medical review had been completed for patients transferred to or from an outlying ward. When patients were ready for hospital discharge, they were asked to repeat the HADS and complete the satisfaction survey. If a patient was missed before hospital discharge, a follow-up letter was sent and a telephone call attempted. Any safety incidents, such as medication errors, hospital-acquired infections, falls, pressure ulcer development or other adverse events (e.g. a call to the medical emergency response team), were retrieved from the hospital's critical incident database. The LOS and discharge destination (e.g. home, hostel) were also recorded at discharge.

Sample size calculation

No formal sample size calculation was conducted. Based on an 18% incidence of three or more moves in our previous

unpublished study, we assumed that if we recruited approximately 500 patients, there would be a sufficient number of frequent movers to compare differences between those moved three or more times with those who were not moved as frequently.

Statistical analysis

Data were entered into and analysed using SPSS version 21.0 (IBM Corporation, Chicago, IL, USA). Patient characteristics and demographics are described as the mean \pm s.d. or as counts with percentages. The incidence of moves was dichotomised into less than three or three or more to assess the effect of moves on the primary and secondary outcomes of the study. Associations between risk factors (e.g. age, gender, anxiety scores, social support etc.) and outcomes were analysed univariately by χ^2 or *t*-tests as appropriate. Results are reported as risk ratios (RR) or the mean difference (MD) with associated 95% confidence intervals (CI) and *P*-values.

Results

Between March and August 2014, of the 1529 patients screened, 566 patients were eligible and agreed to participate in the study. Those excluded consisted of 610 (39.9%) who were unable to provide consent for cognitive reasons, 39 (2.6%) who were non-English speaking, 26 (1.7%) who were <18 years of age, 11 (0.7%) who were critical care patients, 268 (17.5%) who refused and nine patients for whom data was missing. Of those included, 308 (54.4%) were male and the mean age of the cohort was 58.1 ± 17.0 years. Although the patient's home was the primary residence for 530 (93.6%) participants, only 413 (73.0%) were admitted from there, with 98 (17.3%) being transferred from another hospital. Most patients (399; 70.5%) had previously been an in-patient at the study hospital and 507 (90%) presented with at least one comorbidity. There were no differences between groups in terms of their admission diagnosis. Anxiety scores were low when compared with the general population,²³ but

Table 1. Baseline and admission data by number of within- or between-ward moves

Results are given as the mean \pm s.d. or as counts, with percentages in parentheses. **P* < 0.05 compared with those with less than three moves

	No. moves	
	<3 (<i>n</i> = 538)	≥ 3 (<i>n</i> = 28)
Age (years)	58.1 \pm 17.2	58.6 \pm 14.4
Male	290 (53.9%)	18 (64.3%)
Public admission	471 (88.0%)	25 (89.3%)
Admitted for surgery	361 (67.1%)	18 (66.7%)
Admitted to home ward	452 (84.0%)	20 (71.4%)
One or more comorbidity	432 (89.4%)	26 (92.9%)
Previous admission to study site	384 (71.5%)	15 (53.6%)*
History of pressure ulcer	40 (7.4%)	2 (7.1%)
History of injurious fall	139 (25.9%)	9 (32.1%)
Total social support score ^A	23.3 \pm 6.4	24.0 \pm 6.03
Total anxiety score ^B	5.68 \pm 4.2	4.61 \pm 5.09

^ASocial support was evaluated using the Brisbane Social Support Scale (BSSS).²⁴

^BAnxiety was evaluated using the anxiety questions from the Hospital Anxiety and Depression Scale.²²

Table 2. Outcomes for three or more versus less than three within- or between-ward moves

RR, risk ratio; MD, mean difference; CI, confidence interval

Outcome	No. for whom data available	No. moves		RR or MD (95% CI)	P-value
		≥3	<3		
Adverse event	556	5/26 (19.2%)	37/530 (7.0%)	RR 2.75 (1.18, 6.42)	0.02
Length of stay	565	13.36 (±12.10)	6.26 (±5.14)	MD 7.10 (2.60, 11.60)	0.002
Satisfaction with					
Doctors	537	88.0 ± 17.21	83.75 ± 23.18	RR 4.25 (–2.78, 11.28)	0.24
Nurses	539	93.36 ± 9.00	92.26 ± 14.31	RR 1.10 (–2.64, 4.84)	0.56
Overall	538	83.36 ± 21.64	87.13 ± 20.04	RR –3.77 (–12.43, 4.89)	0.39

social support was borderline.²⁴ Other baseline and admission details are given in Table 1.

Primary outcomes

Most patients were not moved at all during their hospital stay (336; 59.4%). A further 156 (27.6%) were moved once, 46 (8.1%) were moved twice and 28 (4.9%) were moved three or more times. An adverse event was almost threefold more likely to occur among those moved three or more times compared with patients moved fewer times (RR 2.75; 95% CI 1.18, 6.42; $P=0.02$).

Secondary outcomes

LOS among patients who were moved three or more times was twice as long as those who were moved fewer times (MD 7.10 days; 95% CI 2.60, 11.60; $P<0.005$). Levels of anxiety did not differ between groups, nor did anxiety levels change significantly between admission and discharge. Delirium was an exclusion criterion, so none of the patients had delirium on admission, nor was delirium diagnosed in any of the 541 patients assessed on discharge. Levels of overall satisfaction, satisfaction with doctors and satisfaction with nurses were similar between groups. Table 2 lists details of outcomes. Patients were also asked to nominate from whom they received help (doctors, nurses, physiotherapists, social workers or others). Significantly more patients who were moved three or more times nominated the physiotherapists as providing help than those moved less than three times (44.0% vs 24.6%, respectively; $P=0.03$) and almost twice as many patients moved three or more times named the cleaner as helping than those moved fewer times (32.0% vs 17.3%, respectively), but this result did not reach statistical significance ($P=0.61$). There were no differences between groups in perceived help from doctors, nurses or social workers.

Process outcomes

Information was available for 310 patient moves. Of these, 214 (69%) were originally admitted to their home ward. Within-ward moves were recorded more often than between-ward moves (184 (59.4%) vs 126 (40.6%), respectively). The most frequent reason for a within-ward move was that the bed was required for another patient (65.8%). For between-ward moves, the most frequent reason was to transfer the patient to their home ward (38.1%). Other reasons for moves are given in Table 3. When a patient is transferred to another ward, vital signs and other patient assessments should occur on admission. For 91 (72.2%) of the 126 between-ward admissions, there was evidence that such an

Table 3. Reasons for within- and between-ward moves

	Within-ward move (n = 184)	Between-ward move (n = 126)
Bed needed for another patient	121 (65.8%)	
Patient request	21 (11.4%)	
Patient had infection	17 (9.2%)	4 (3.2%)
Patient required closer observation	12 (6.5%)	
Bed closure	7 (3.8%)	5 (4.0%)
Moved to same-sex bay	6 (3.3%)	
Transfer to home ward		48 (38.1%)
Transfer from flexible bed/short-stay ward		23 (18.2%)
Transfer to new specialist team		15 (11.9%)
Return from intensive care unit		10 (7.9%)
Transfer from home ward		10 (7.9%)
Post-surgery transfer		7 (5.6%)
Transfer to subacute care ward		4 (3.2%)

assessment had occurred; 18 patients were not assessed on admission and data were missing for the remaining 17 patients. A medical review should also occur when a patient is transferred to a different ward. The mean length of time until a transferred patient was seen by a doctor was 11.43 ± 7.18 h (ranging from 43 min to 24.30 h).

Discussion

The present study is the first prospective study to investigate the effects of multiple bed moves on patient outcomes. The results demonstrate that patients who are moved frequently are at higher risk of acquiring harmful safety indicators that we categorised as 'adverse events'. The results of the present study are similar to those from a large retrospective analysis of patients who were admitted to an academic medical centre in the US ($n=7851$).³ That study, which focused on the number of units to which the patient was admitted per hospitalisation, found a twofold increase in falls, a threefold increase in medication errors and a fourfold increase in other adverse events among patients admitted to multiple units.³

These outcomes confirm the safety aspects of frequent patient moves,⁴ which may be related to delays in treatment. For example, it was clear in the present study that over one-third of frequently moved patients were not seen by a medical practitioner within a reasonable time following admission to the unit. Alternatively, because we did not control for acuity and illness severity, it possible that sicker patients had longer LOS and so potentially

were exposed to more opportunities for adverse events to occur. However, patients in both groups were similar for other risks, such as age, number of comorbidities, admission diagnosis and previous histories of falls and pressure injury.

Apart from safety concerns, there are substantial economic implications associated with patients who are moved frequently. In our study, LOS among frequently moved patients was approximately 7 days longer than among those who were moved less frequently. Based on Commonwealth Department of Health figures, the minimum bed day cost is approximately A\$400, but the actual cost is more likely to be around A\$600 per day.²⁷ Based on this estimate, an increase of approximately A\$4200 may be expected for each patient moved three or more times. There are also penalties imposed for prolonged LOS if the cause is a hospital-acquired adverse event. For example a 'financial adjustment' of A\$12 500 is charged for a hospital-acquired blood stream infection. In addition, considerable staffing resources are tied up with patient transfers. Communication needs to occur with relatives, other members of the healthcare team, other departments, bed managers etc. Physical tasks, such as preparing the room for a new patient, returning equipment and collecting medications are required, as well as documentation and data entry; all are time-consuming activities. The cost of time taken with tasks associated with admissions, discharges and transfers on an average acute ward has been estimated at A 386 per day,²⁸ and patient transfers may account for 30% of a nursing day.²⁹

Some of the reasons for within- and between-ward moves were inevitable, such as return from theatre to a different ward if the patient's condition had deteriorated, moves from the intensive care unit and from the flexible bed/short-stay unit and moving an infectious patient to an isolation area. However, most moves were classified as 'bed needed for another patient', and this group may need closer scrutiny. The bulk of these bed moves were because of the patient's condition, the assumption being that those with the highest needs should be placed closest to the nursing station. This practice may rest more with tradition than utility, and its effectiveness in terms of patient safety requires further investigation. Auditing and providing feedback on the frequency of patient moves may be one way of changing practice, especially if inter-ward comparisons are made. Similarly, conducting case reviews of frequent movers may provide opportunities to discuss the practice and the rationale behind each move.

Limitations

Although the present study on patient moves is the largest prospective study published to date, it was limited by being a single-site study and by the low number of participants who were moved three or more times. When we started our program of research into patient moves, we retrieved estimates from the hospitals Casemix and Clinical Costing data, which indicated that in March 2012, 18.7% of all patients admitted to the hospital had three or more moves during their episode of care (this excluded movement for diagnostic and surgical procedures and intraward moves). The highest percentage of moves (26%) occurred in the division of medicine. Since that time, efforts to reduce the number of bed moves seem to have been successful.

Although such a reduction is positive, it limited our ability to recruit patients who had a high number of bed moves.

The present study would have been strengthened using a matched cohort in terms of acuity and other risks that may have affected the results. In addition, wide confidence intervals were present for most of the outcomes, indicating a level of uncertainty around results. It would also have been useful to include patients with delirium or cognitive impairment. A large part of the Royal Brisbane and Women's Hospital's population falls into this category, and almost 40% of those approached for the present study were unable to be enrolled because of a cognitive disturbance. This result may also explain the difference between the actual and anticipated number of patients who had three or more moves. That is, we based our sample size on the number of all hospital admissions who had three or more moves. It is quite possible that those with cognitive impairment are moved more frequently than others; excluding these patients may have affected our calculations.

Implications for policy, practice and research

Patient safety and LOS are important considerations for hospital administrators. Efforts to reduce the number of bed moves, both within and between wards, needs to be part of strategic planning, with clear targets set for acceptable standards. Although attaining zero moves may be impossible, because some patients will require a bed move for medical reasons, there is scope, with effective planning and coordination, for a reduction in the number of times a patient is moved. For example, the category of moves labelled 'bed required for another patient' needs further investigation. Models of nursing care that allow close observation of patients, regardless of their location in the ward, may provide a pragmatic solution to the time-wasteful efforts associated with moving patients for this purpose. Future prospective studies should involve hospitals where there is a high prevalence of multiple moves so that findings from the present study can be assessed. In addition, although patients in the present study were similar in terms of age, number of comorbidities, age, type of admission etc., a true matched cohort study would provide a higher level of confidence in results. It would also be very important to include those with cognitive impairment in any future study. Such inclusion would provide extremely important information as to how often such patients are moved compared with cognitively intact patients and the effects of frequent moves in this cohort on falls, medication errors etc.

Finally, we had planned a regression analysis to identify the factors that may be associated with frequent moves. The low incidence of those moved three or more times made this analysis unrealistic, but such an analysis should be considered in future studies.

Conclusion

Frequent bed moves affect patient safety, prolong LOS and increase nurses' workload.

Competing interests

None declared.

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