Sustained reduction in serious fall-related injuries in older people in hospital

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ABSTRACT

Objective: To determine whether the rate of falls and associated serious injuries in a hospital aged care setting can be reduced using a multistrategy prevention approach.

Design, setting and participants: Three-year quality improvement project comparing data at baseline (2001) and at 2-year follow-up (2003) after interventions to reduce falls. All patients admitted to the Aged Care Services wards at Caulfield General Medical Centre, Melbourne, between January 2001 and December 2003 were included.

Interventions: Multistrategy approach phased in over 3 months from September 2001 and involving data gathering, risk screening with appropriate interventions, work practice changes, environmental and equipment changes, and staff education.

Main outcome measures: Total number of falls; number of falls resulting in serious injuries (fractures, head injuries, death); staff compliance with the risk assessment.

Results: Over a 2-year period, there was a 19% reduction in the number of falls per 1000 occupied bed-days (OBDs) (12.5 v 10.1; $P = 0.001$) and a 77% reduction in the number of falls resulting in serious injuries per 1000 OBDs (0.73 v 0.17; $P < 0.001$). Staff compliance with completing the falls risk assessment tool increased from 42% to 70%, and 60% of staff indicated they had changed their work practices to prevent falls.

Conclusion: A multistrategy falls prevention program in an aged care hospital setting produced a significant reduction in the number of falls and a marked reduction in serious fall-related injuries. Incorporating a falls prevention program into all levels of an organisation, as part of daily care, is crucial to the success and sustainability of falls prevention.

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Falls are the leading cause of injury in Australian hospitals, with 38% of all hospital incidents related to falls.[1] Patients are at increased risk of falling in the hospital setting because of increased incidence of confusion, confounding medical conditions, polypharmacy and environmental factors. A fall in hospital that results in serious injury is estimated to add at least $15 000 to a patient's costs, as a result of increased length of stay and surgical costs. Besides the psychological and physical impact on the individual, it is estimated that the annual cost due to falls is over $500 million in Victoria and $2 billion nationally.[2]

A number of systematic reviews have shown that targeted multi-intervention approaches can reduce falls among older people in the community.[3-5] In hospital settings, single interventions have not been proven successful in preventing or reducing falls, whereas multisystem or multistrategy approaches have shown to be more effective.[6-11] Only recent studies, however, have had sufficient power to support this.[12,13]

In 2001–2003, Aged Care Services (ACS) at Caulfield General Medical Centre (CGMC), Melbourne, undertook a 3-year project with the aim of reducing the total number of falls by 25% and the number of falls resulting in serious injury by 50%.

METHODS

Setting and patients

ACS at CGMC has four wards with between 96 and 120 beds, comprising acute care of the elderly, geriatric evaluation and management, and restorative care. During the period of the study, two-thirds of admissions of aged care patients were acute and unplanned. Data on falls for all patients admitted during the 3-year period January 2001 to December 2003 were included in our study. We compared baseline data with data collected after introduction of various initiatives to reduce falls.

Definitions

A standardised definition for a "fall" was developed by the project team as follows:

> An unintended change of position which results in the person coming inadvertently to the ground or other surface lower than the person had been previously. This includes impacting against an adjacent surface (eg, wall or furniture), slips, trips and lowering/assisting a patient who is in the act of falling.

Incident monitoring and injury definition was by the Australian Incident Monitoring System from the Australian Patient Safety Foundation in Adelaide. Levels of injury were categorised as follows:

- Levels 1–4: minor injuries, including grazes and bruises;
- Levels 5–6: significant injuries, including lacerations/skin tears requiring suturing/bandage/cold pack, or any injury requiring further investigation such as x-ray;
- Level 7: injuries resulting in a fracture, head injury or increased length of stay;
- Level 8: injuries resulting in permanent disability or contributing to death.

The project

The Falls Prevention Project was a prospective, non-randomised quality improvement project that was phased in over 3 months from September 2001. We piloted and trialled various small projects on the different wards and in different groups of patients to find which approaches appeared to be helpful as well as acceptable to both patients and staff. The successful strategies (Box 1) were then systematically rolled out to the other wards.

The project was approved by the CGMC Ethics Committee. Informed consent was not gathered, as this was a quality improvement project with no randomisation. Before the start of interventions, focus groups of patients, carers and staff were held to discuss various initiatives, especially those involving patient confidentiality. A simple questionnaire was developed to seek feedback from staff about their use of the screening tool (see below) and whether they found it useful and easy to use.

1 Strategies that have been trialled at Caulfield General Medical Centre to reduce falls

Bedside falls

- Review of toileting protocols and practices for patients at risk of falling
- Fitted bed sheets
- Review of use of non-slip bedside mats
- Extended bedside call bells so patients do not fall reaching out
- Non-slip chair mats
- Electric low beds that go to within 12 cm of floor
- Bed alarms that identify when patients have moved out of their bed
- Bed poles to assist patients to transfer more independently

Increasing surveillance

- Family brochure informing them about falls and encouraging their involvement
- Volunteer program
- Early feeding of dependent patients
- Engaging patients in more activities
- Orange wrist band and chart above bed to identify patients at high risk of falling

Reducing night falls

- "Glow in the dark" commode seats
- "Glow in the dark" toilet signs
- Night sensor light

Education

- Each ward appointed a "falls prevention" portfolio holder
- Ward compliance audits
- Staff orientation brochures/folders
- Falls risk assessment tool and medical record alert sticker
- Promotion of team ownership of the project and problem-solving of reasons for falls on respective wards
- Protocols for after-fall reviews
- Reporting of falls at multidisciplinary and quality improvement meetings and management forums

General environment

- Review of patients' footwear
- Reducing clutter around bed and ward
- Bathroom door magnets to stop doors knocking patients
- Non-slip bathroom flooring
- Change of floor cleaning processes to reduce "high shine, high wax" finish
- Appropriate height of seating ◆

2 Demographics of patients admitted to Aged Care Services wards at Caulfield General Medical Centre in 2001 and 2003

	Jan–Dec 2001	Jan–Dec 2003
Number of admissions	1905	2056
Sex (% women)	63.6%	62.6%
Average age in years (range)	82.4 (45–105)	82.4 (53–103)
Median length of stay in days (range)	20.7 (1–161)	18.2 (1–158)
Number of beds open (12-month average)	96	120

During the study, monthly and quarterly reports were produced for each of the wards and for the ACS executive in order to identify trends and areas to target. Summary data were also provided to the CGMC Quality Committee and Clinical Risk Committee. Any unusual or unexpected rise in the number of falls or injuries led to a more detailed analysis for explanation and action.

Root-cause analyses

Root-cause analyses of falls allowed us to identify systems and processes that contributed to falls on the wards and helped us set priority areas for focus. These analyses continued throughout the project for serious (Level 7 and 8) injuries. Of a number of published tools tested, we found the Falls Risk Assessment Scoring System (FRASS) tool gave the highest predictive value for falls in our patient population, together with good staff compliance in completing the tool.[14] This tool allocated points for various risk factors such as confusion, multiple medications, history of falls, ambulation, need for assistance with toileting, and age. It was completed by nursing staff for all patients on admission, and was repeated after any fall. Given the large number of "at risk" patients identified by the FRASS tool, we further allocated some patients to a "super high-risk" category — based on a score higher than 15 out of 30 — to provide a priority focus for staff. Potential medical contributing factors (such as intercurrent illness, medications and postural hypotension) were taken into consideration and addressed.

Statistics

Falls and incidents were measured in absolute numbers as well as per 1000 occupied bed-days (OBDs), the latter correcting for the variable number of beds being open or occupied.

Comparisons between baseline (2001) and 2-year (2003) data were made using the χ^2 test for equal proportions.

RESULTS

In the 12-month periods of 2001, 2002 and 2003, respectively, 1905, 2260 and 2056 consecutive patients were admitted to ACS wards.

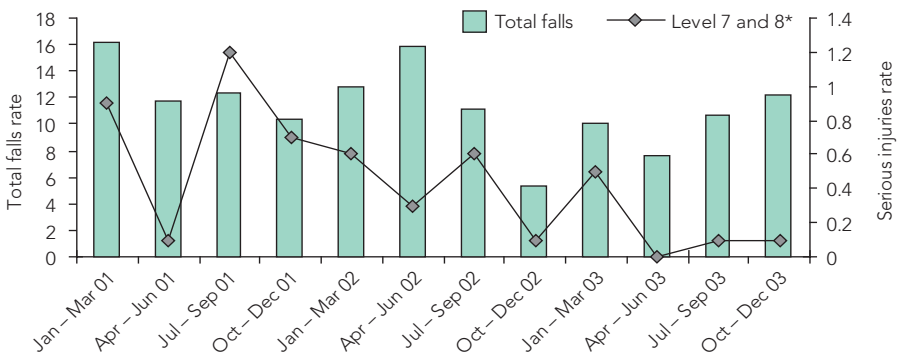
There was little difference in patient demographics between the 12-month baseline period (2001) and the second full year of the project (2003), except for a slight reduction in length of stay by 2.5 days (Box 2). Root-cause analyses identified a number of key contributing factors, the major one being that 82% of falls were not observed. Over 60% occurred around the bed. Other contributing factors were ward equipment (eg, beds, chairs); medical factors (eg, hypotension, toileting issues, neurological and musculoskeletal impairment); intrinsic patient factors (eg, confusion, impulsiveness, language barrier, footwear); environmental factors (eg, lighting and floor surfaces); and staff attitude and knowledge (eg, resistance to changing work practices and to adopting additional documentation).

The total number of falls in each year of the project and the number involving serious injury, together with a quarterly breakdown, are shown in Box 3. Between 2001 and 2003, there was a 19% reduction in falls per 1000 OBDs ($P = 0.001$). Of greater importance was the 77% reduction in serious (Level 7 and 8) injuries per 1000 OBDs over the same period ($P = 0.0004$).

Auditing of staff compliance with completion of the FRASS tool showed an increase from 42% to 70% after 2 years. A staff satisfaction survey after the first year indicated that 60% of staff had altered their work practices to be more effective in preventing falls and 74% were more aware of falls prevention issues for their patients. We also identified factors contributing to staff injuries, which were mainly the result of the reflex reaction of staff in trying to catch falling patients or of patients pulling on staff as they fell. Strategies are being identified to minimise this type of injury.

3 Number of falls and serious fall-related injuries in Aged Care Services wards at Caulfield General Medical Centre, 2001–2003

	Jan–Dec 2001 (baseline)	Jan–Dec 2002 (Year 1)	Jan–Dec 2003 (Year 2)
Total occupied bed-days (OBDs)	37133	43274	41013
Total number of falls	465	489	413
Falls per 1000 OBDs	12.5	11.3	10.1
Reduction in falls per 1000 OBDs, baseline to Year 2	*19.2% (95% CI, 16.7%–21.7%; P = 0.001)*		
Number of serious injuries*	27	17	7
Serious injuries* per 1000 OBDs	0.73	0.39	0.17
Reduction in serious injuries per 1000 OBDs, baseline to Year 2	*76.8% (95% CI, 74.1%–79.5%; P < 0.001)*		



* Level 7 and 8 injuries, as defined by the Australian Incident Monitoring System of the Australian Patient Safety Foundation.

DISCUSSION

Our study demonstrated that a low-cost, hospital-based multistrategy falls prevention program can significantly reduce the incidence of falls and fall-related serious injury among patients in aged care wards. Our expanded definition of a fall meant we were recording many minor and often insignificant events in the 2-year follow-up period that were not likely to be coded at baseline. Hence, we believe the actual reduction in falls over baseline to be even greater than reported here. These reductions occurred despite a number of confounding factors at CGMC, including reduced length of stay of patients and introduction of a "minimal restraint policy" in October 2001, meaning that patients at high risk of falling were less likely to be restrained.

Few published studies provide longer term follow-up, and our results to date suggest that changes and gains can be sustained. By end of 2003, we had well exceeded our overall target of 50% reduction in serious injuries and were close to our 25% target for reduced number of falls.

Given that so many falls were, and are, unwitnessed, the principal driver for our project was to try to increase surveillance, optimise the environment, and improve the management of this high-risk population by a multistrategy approach (Box 1).

Unlike other studies, ours has shown not only a highly significant reduction in serious injuries but also that this could be sustained over an extended period. Vassallo et al reported a borderline reduction in falls, but no significant reduction in injuries, in a rehabilitation population.[15] Their program was initiated up to 3 days after admission, and changes were based on weekly evaluation and case conference. In our project, assessment commenced on the day of admission (when the risk of falls is likely to be high), and changes were made prospectively, as and when necessary. We noted that it took more than 6 months to establish a culture of improved reporting, particularly of minor falls and repeat falls.

Healey et al, in a 12-month controlled study of elderly inpatients using a targeted risk factor approach, demonstrated a significant reduction in falls but not in fall-related injuries.[13] Haines et al reported on an intensive multicomponent trial in a subacute hospital setting that achieved a 30% reduction in falls but no reduction in serious injuries;[12] no long-term data were presented to show whether the changes could be sustained. Oliver et al, in a systematic review of hospital falls prevention programs, found that many involved only short-term follow-up[6] (in contrast to our 2-year follow-up). One of the longest studies, by Barrett et al, reported an increased number of falls but a 25% reduction in injury over a 5-year period.[11] As their data were not standardised for the number of OBDs, it is difficult to interpret this finding.

Our CGMC project was a quality improvement project and not a randomised controlled trial. It was a real-life intervention conducted pragmatically within a hospital, based on interventions believed to be effective that were identified, owned and adhered to by the staff themselves. We attribute the success of our project to looking at aspects of the total system (not just medical problems and nursing practices) that might be contributing to patient falls. Conducting a randomised controlled trial in this type of setting is very difficult because of the high turnover of patients, their frailty, various acute illnesses, cognitive impairment and the heterogeneity of the interventions. Our approach has allowed progressive introduction of simple and practical interventions without the need to attribute the end result to any specific intervention.

Using the first 12 months' data as a historical control does introduce the potential bias of unforeseen confounders, including changes in casemix, staff and activity. However, most factors remained fairly constant over the 3-year period of the study. Admission criteria to CGMC did not change, although length of stay was reduced as a result of greater efforts to improve throughput of patients. Medical and nursing staffing profiles were unchanged and no additional staff were placed on the wards from the project team. Data were collected from the same wards, with similar patient profiles at the beginning and end of the study. Furthermore, our methodology overcame the bias introduced by studying multiple interventions within the same institution (the Hawthorne effect), which would likely have occurred in any randomised approach. Oliver, in a recent editorial, discussed the complexity of trial design in fall intervention studies.[16]

The program implemented at CGMC involved low-cost interventions. The project

manager and part-time project officer were funded from the project grant and were not there to provide any additional "hands-on" resources at the ward level. Consequently, we anticipate that after completion of projects like ours there are not likely to be major ongoing costs to the organisation, making this an affordable strategy for other centres to explore. The most useful piece of equipment purchased during our study was electric beds that could be lowered to within about 12 cm of the ground. This dramatically reduced injuries related to inappropriate transfers from beds. The cost of the new beds was supplemented by hospital fundraising initiatives.

An unexpected bonus of our project for the organisation has been the improvement of systems elsewhere in the hospital, including data collection, incident analysis, clinical governance and focus on work practice issues. Repeat fallers have been found to contribute up to 60% of all falls, and are hence now a special focus of attention.

Our results confirm the belief of other investigators that a multisystem approach, rather than single interventions, is needed to achieve a significant reduction in falls and fall-related injury.[6-13,17] Reducing falls is an imperative compounded by the rapid ageing of our population: between 2001 and 2051, there will be an anticipated five-fold increase in people aged over 85 years, the group at greatest risk of falling and sustaining serious injury in hospital. While our study did not attempt to measure the cost-effectiveness of interventions, the reduction in serious injuries from 27 to seven a year would have brought at least modest savings to the organisation, given the estimated cost of $15 000 per serious injury.

For a hospital wishing to introduce a multistrategy falls prevention program, dedicated resources would be needed initially to develop, implement and monitor the program, but ongoing management should be sustainable within the existing organisational infrastructure. As most interventions are likely to cost little or nothing, the strategy should also be cost-effective.

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COMPETING INTERESTS

The DHS was not involved with study design, data collection, analysis, interpretation of results or preparation of our article for publication.

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