Impact of a fall prevention programme in acute hospital settings in Singapore

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ABSTRACT

Introduction: This study aimed to develop a multifaceted strategy using tailored interventions to implement a fall prevention programme, and to achieve a change in fall prevention practices and a reduction in fall incidence at an acute care hospital in Singapore.

Methods: A comparative study was conducted at two acute care hospitals (intervention and control) in Singapore. Pre-intervention, post-intervention and six-month follow-up knowledge assessments of 641 nursing staff, and audits of fall rates and fall prevention practices were performed to determine the effectiveness of a multifaceted strategy with targeted interventions in supporting the implementation of a fall prevention programme.

Results: The mean post-knowledge test scores at six months were statistically significantly higher (t[516] is −3.3, p-value is less than 0.01) at the intervention hospital (10.3 +/− 2.3) compared to the scores at the control hospital (9.8 +/− 1.8). Increased compliance with the use of fall risk assessment tools was evident in 99.4 percent and 99.3 percent of all patient records at the control and intervention hospitals, respectively. Following the implementation strategy for a fall prevention programme, there was a non-significant reduction in fall rates from 1.44 to 1.09 per 1,000 patient days at the intervention hospital. No reduction in the fall rate was observed at the control hospital.

Conclusion: A multifaceted strategy for the implementation of a fall prevention programme was effective in increasing nurses' knowledge and the use of the fall risk assessment, but did not have a statistically significant impact on a reduction in the fall rate. The increase in nurses' knowledge and change in nursing practice were important markers of success in terms of fall prevention at the acute hospitals.

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INTRODUCTION

Inpatient falls and fall-related injuries continue to be a complex challenge that healthcare organisations face, extracting a heavy burden in terms of social, medical and financial outcomes. In Australian hospitals, falls make up the largest category (38%) of all reported patient incidents.[1] Undoubtedly, falls are related to increased treatment costs and increased length of patient stay. In the United States, it is predicted that the total number of falls resulting in injury will be 17,293,000 by the year 2020 at a projected cost of USD 85.37 billion per year.[2] In Singapore, published data is non-existent.

Although the international research community has spent a sizeable amount of effort and numerous publications on this issue, it is undisputed that falls among inpatients continue to present a threat to patient safety in hospital settings. The need to apply the current best evidence to reduce falls is clear, yet currently there is no national guidance on fall prevention programmes in Singapore, and evidence is lacking from the literature on the effectiveness of fall prevention interventions in hospitals.[3,4] Furthermore, there has been no national report or study on falls and fall prevention at general hospitals in Singapore. In the midst of the plethora of literature on fall prevention programmes in the community setting,[1,5,6] numerous guidelines have been developed.[7-9] However, research on fall prevention programmes and the implementation of fall prevention guidelines in the acute hospital setting is lacking. Only four published studies exist,[10-13] and all failed to show a significant reduction in the fall rate. Moreover, published work on the effectiveness of fall prevention programmes is non-existent in Singapore. There is an imperative to ensure that the interventions are carefully tailored to complement the environment and address the nurses' perceived barriers to implementation of the fall prevention programme.

Extensive research has led to recommendations for multifaceted interventions to change existing practice.[14-18] Implementing change involves an active, well-planned

Table I. Interventions in the fall prevention programme.

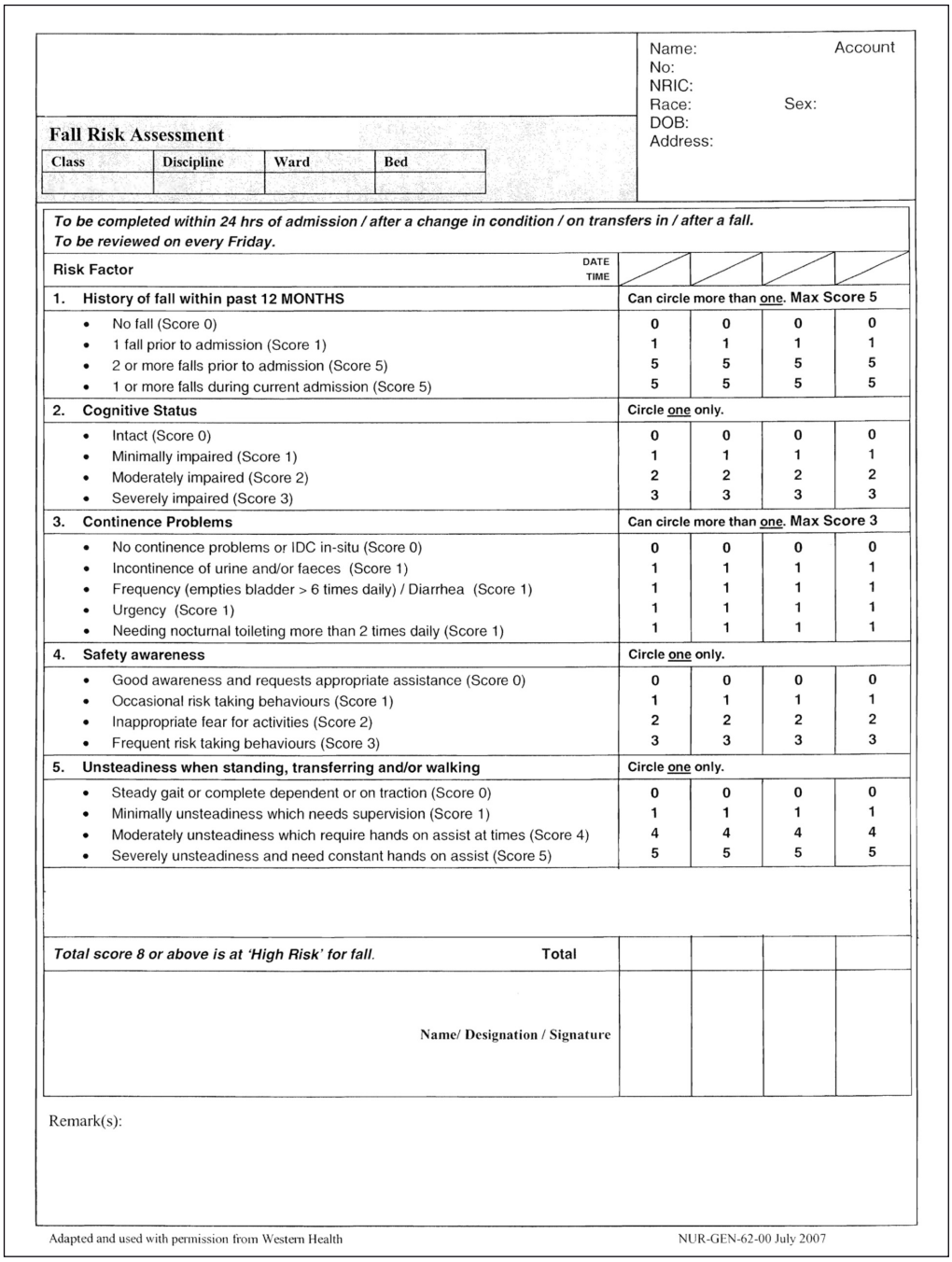
Strategy	Targeted interventions
Revision of the hospital's fall prevention policy	The hospital's fall prevention policy, 'Nursing Care Plan on Prevention and Management of Inpatient Falls', was revised with recommendations that followed those outlined in the MOH Fall Prevention CPG. A quick reference guide to strategies on fall prevention was developed.
Change champions	A fall prevention work group, comprising a team of multidisciplinary members such as senior nursing staff, a geriatric physician, a physiotherapist and a occupational therapist, oversaw the programme in terms of planning and implementing of the interventions. Senior nursing staff and a fall nurse clinician were engaged as change champions to reinforce and encourage nurses to adhere to the strategies recommended in the fall prevention programme.
Educational sessions	Educational sessions with videos were aimed at promoting and supporting the adoption of the recommendations in the fall prevention programme. These interactive workshops included discussion of the importance of fall prevention, the role of a fall risk assessment and identification of fall risk factors, skills required to do a fall risk assessment, and interventions for preventing falls.
Reminders and identification systems	Reminder methods included the mandatory fall risk assessment tool (Fig. 1) incorporated in nursing assessment notes, prompting nurses to perform a fall risk assessment upon admission and at every change of shift. 'Stand by me' posters on fall prevention (Fig. 2) were posted in the toilets of all the participating wards. Identification systems were used to alert staff to patients assessed as being at risk of a fall These systems included: (1) pink name cards above the bed (Fig. 3); (2) pink stickers on clinical/nursing notes; and (3) pink identification bracelets on a high-risk patient (Fig. 4).
Audit and feedback	Audit and feedback strategies were employed with aggregate audit data on the incidence of falls and compliance with the use of the fall risk assessment tool, being posted in the department tea room at monthly intervals. The data was presented as simple tables and text, with feedback highlighting good practice, areas requiring improvement and suggestions on how to achieve the change.

stepwise process, including a combination of interventions, tailoring strategies to the needs of the target audience and overcoming barriers to behavioural change.[19-21] Two reports concluded that multifaceted intervention strategies are effective in prompting physicians to translate evidence into practice when they include a combination of: (1) reminders, (2) education sessions, and (3) barrier-oriented interventions tailored to specific barriers.[22,23] However, in a recent systematic review, Grimshaw et al found that across all combinations of interventions, multifaceted interventions did not appear to be more effective than single interventions.[24] The results of the review were not straightforward; strategies that were effective in one study were ineffective in others. The researchers concluded that it is plausible that multifaceted interventions built upon a careful assessment of barriers and a coherent framework may be more effective than single interventions under different circumstances. However, there is still insufficient rigorous evaluative research on the effectiveness of strategies for the implementation of evidence or innovations to change clinical practice in hospitals.

A conceptual framework[25] and a similar five-step model[20,21] both provide a framework for targeting strategies and linking interventions to needs, facilitators and barriers to change in order to maximise the effectiveness of the implementation of a fall prevention programme. Another conceptual framework suggests that successful implementation occurs when evidence is scientifically robust, the context is receptive to change with strong leadership and appropriate monitoring and feedback systems, as well as when there is appropriate facilitation to change.[26-31] However, empirical work evaluating these frameworks for the implementation of a fall prevention programme in the real world of clinical practice is lacking. It is hypothesised that a multifaceted strategy for the implementation of a fall prevention programme would improve patient outcomes and the quality of care. However, empirical work to examine this issue is non-existent in the Singaporean context. The present study aimed to develop and evaluate the effectiveness of a tailored, multifaceted strategy for the implementation of a fall prevention programme in acute care hospitals in Singapore. The goal of the strategy was to improve fall prevention practices and reduce fall incidence.

METHODS

Two acute care hospitals in Singapore with closely-matched perceived barriers to implementation of



Name: Account No:
NRIC:
Race: Sex:
DOB:
Address:

Fall Risk Assessment

Class	Discipline	Ward	Bed

To be completed within 24 hrs of admission / after a change in condition / on transfers in / after a fall.
To be reviewed on every Friday.

Risk Factor (DATE / TIME)				
1. History of fall within past 12 MONTHS	**Can circle more than one. Max Score 5**			
• No fall (Score 0)	0	0	0	0
• 1 fall prior to admission (Score 1)	1	1	1	1
• 2 or more falls prior to admission (Score 5)	5	5	5	5
• 1 or more falls during current admission (Score 5)	5	5	5	5
2. Cognitive Status	**Circle one only.**			
• Intact (Score 0)	0	0	0	0
• Minimally impaired (Score 1)	1	1	1	1
• Moderately impaired (Score 2)	2	2	2	2
• Severely impaired (Score 3)	3	3	3	3
3. Continence Problems	**Can circle more than one. Max Score 3**			
• No continence problems or IDC in-situ (Score 0)	0	0	0	0
• Incontinence of urine and/or faeces (Score 1)	1	1	1	1
• Frequency (empties bladder > 6 times daily) / Diarrhea (Score 1)	1	1	1	1
• Urgency (Score 1)	1	1	1	1
• Needing nocturnal toileting more than 2 times daily (Score 1)	1	1	1	1
4. Safety awareness	**Circle one only.**			
• Good awareness and requests appropriate assistance (Score 0)	0	0	0	0
• Occasional risk taking behaviours (Score 1)	1	1	1	1
• Inappropriate fear for activities (Score 2)	2	2	2	2
• Frequent risk taking behaviours (Score 3)	3	3	3	3
5. Unsteadiness when standing, transferring and/or walking	**Circle one only.**			
• Steady gait or complete dependent or on traction (Score 0)	0	0	0	0
• Minimally unsteadiness which needs supervision (Score 1)	1	1	1	1
• Moderately unsteadiness which require hands on assist at times (Score 4)	4	4	4	4
• Severely unsteadiness and need constant hands on assist (Score 5)	5	5	5	5
Total score 8 or above is at 'High Risk' for fall. **Total**				
Name/ Designation / Signature				

Remark(s):

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Fig. 1 Fall risk assessment form.

evidence/innovations[32] were recruited into this study. The two study hospitals were randomly allocated either to the "intervention" site, receiving a tailored, multifaceted implementation strategy for the fall prevention programme; or the "control" site, where routine dissemination strategies were used to implement the Ministry of Health (MOH) Fall Prevention Clinical Practice Guideline (CPG). The intervention was conducted between June 2005 and September 2006. The interventions included in this implementation strategy of the fall prevention programme (Table I) were based on five barriers to implementation of evidence/innovations most frequently nominated by nurses. The MOH Fall Prevention CPG was launched in February 2006 and was disseminated in both the intervention and control hospitals.

All nursing staff (n = 641) working in the medical, surgical and geriatric units in the two hospitals during the study period were recruited to participate in the study. Pre-CPG, immediate post-CPG and six-month follow-up knowledge assessments and audits on fall rates and fall prevention practices pre- and post-intervention were conducted in both hospitals. A knowledge assessment

Fig. 2 'Stand By Me' poster posted in the toilets of all the participating wards to serve as reminders.

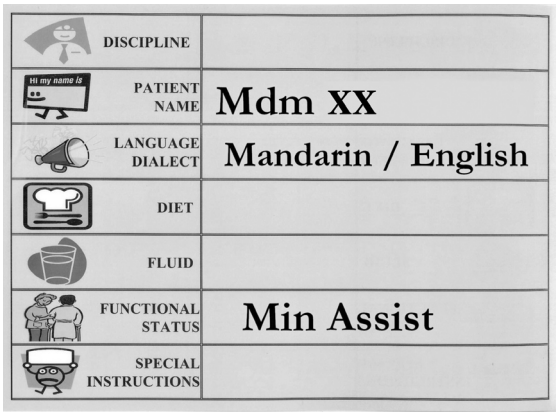

Fig. 3 Photograph shows a patient's pink name card above the bed.

Fig. 4 Photograph shows the pink identification bracelet of a patient with a high fall risk.

test developed by the MOH as part of the Fall Prevention CPG was used to measure nurses' knowledge about falls and their prevention. There were 14 multiple-choice questions in the knowledge test, which was administered before and immediately after staff education following implementation of the CPG in April 2006, and at six months post-implementation of the CPG in the intervention hospital (September 2006). At the control hospital, education sessions were not conducted; however, knowledge tests were administered simultaneously to those at the intervention hospital, immediately before and following the implementation of the CPG, and at six months post-implementation.

Data on all documented risk assessments for falls was collected via retrospective chart audit and compared at baseline and post-intervention. Medical records for medical, surgical and geriatric inpatients at the intervention (n = 612) and control (n = 510) hospitals were randomly sampled and reviewed over a period of six months from June 1 to November 31, 2006. Fall incidence and fall-associated injury rates were obtained from the hospitals' fall incidence database in 2006, and compared with the baseline data collected in 2004.[33] Data was analysed using the Statistical Package for Social Sciences version 14.0 (SPSS Inc, Chicago, IL, USA). Frequencies and descriptive statistics were employed to describe the demographical characteristics of respondents, as well as the fall incidence. Percentages were reported for the use of risk assessments for falls, and fall-associated injury rates. Frequencies, reported as the percentage of responses, and descriptive data, reported as means, were used to analyse the percentage of correct questions from the knowledge test. Mean knowledge test scores were statistically compared using an independent *t*-test and level of significance. The study was approved by the Institutional Review Boards of the two participating hospitals.

RESULTS

Table II shows the demographical characteristics of the nurses who answered the knowledge assessment test questions. The majority were female, and worked as registered nurses. The mean age of respondents at the control hospital was 30.2 ± 8.8 (range 18–59) years, and at the intervention hospital, 34.2 ± 10.2 (range 19–64) years. The mean number of years working as a nurse was 8.5 ± 8.9 years and 12 ± 11.1 years for the control and intervention hospitals, respectively. Table III summarises the knowledge test scores. The maximum possible score was 14. The mean pre-test scores (9.6 ± 1.9) were equal for

Table II. Demographics of the control and intervention groups.

Characteristics	No. (%) of control group		No. (%) of intervention group		
	Pre‡ (n = 278)	Six months post‡ (n = 214)	Pre (n = 311)	Post (n = 284)	Six months post‡ (n = 263)
Gender					
Female	277 (99.6)	213 (99.5)	304 (97.7)	281 (98.9)	259 (98.5)
Age* (years)	30.25 ± 8.74	30.15 ± 8.83	34.35 ± 10.29	33.91 ± 10.16	34.27 ± 10.26
Years as a nurse*	8.50 ± 8.95	8.28 ± 8.79	12.03 ± 11.04	11.76 ± 11.06	12.15 ± 11.18
Qualification					
Basic	173 (62.2)	135 (63.1)	146 (47.0)	134 (47.2)	126 (47.9)
Post-basic	93 (33.5)	69 (32.2)	136 (43.7)	124 (43.6)	114 (43.4)
Others†	12 (4.3)	10 (4.7)	29 (9.3)	26 (9.2)	23 (8.7)
Grade employed					
Enrolled nurse	96 (34.5)	71 (33.2)	80 (25.7)	71 (25.0)	66 (25.1)
Registered nurse	146 (52.6)	117 (54.7)	131 (42.1)	123 (43.3)	110 (41.9)
Nurse unit managers	22 (7.9)	17 (7.9)	62 (20.0)	55 (19.4)	54 (20.5)
Others	14 (5.0)	9 (4.2)	38 (12.2)	35 (12.3)	33 (12.5)

* Data is expressed as mean ± standard deviation
† Include advanced diploma, Bachelor and Masters in Nursing.
‡ Only valid responses are included in the n values

the control and intervention hospitals. However, the mean post-test scores at six months post-implementation were statistically significantly higher ($t[516] = -3.33$, $p < 0.01$) at the intervention hospital (10.3 ± 2.3) compared to the scores at the control hospital (9.8 ± 1.8).

At the control hospital, there was no statistically significant difference in pre- and post-six months knowledge test scores ($t[506] = -1.23$, $p = 0.22$). Conversely, at the intervention hospital, the knowledge test scores increased significantly ($t[593] = -3.84$, $p < 0.01$) from a mean of 9.6 ± 1.9 to 10.3 ± 2.3 immediately following the education and training sessions. In addition, at six months post-implementation, the higher scores were sustained and remained significantly higher ($p < 0.01$) at a mean of 10.3 ± 1.8.

Medical records (n = 1,122) were examined in both the control (n = 510) and intervention (n = 612) hospitals at 15 months following implementation of the fall prevention programme, and compared with the results of audits undertaken in 2004 to determine the extent to which fall risk assessments had been conducted. Between 2004 and 2006, changes in fall risk assessment practices and the use of fall risk assessment tools were evident in both hospitals, when comparing nurses' documentation of fall history screening and the percentage of records containing fall risk assessment tools. Following implementation of the fall prevention programme at the intervention hospital, the documentation of fall history screening in the nursing records increased from 97.3% to 99.3%.

Compliance with the fall risk assessment, measured by a completed fall risk assessment tool in the medical records, also increased significantly from 50.2% in 2004 to 99.3% in 2006 ($p < 0.05$). A similar trend was observed for all records reviewed at the control hospital. Fall history screening increased from 60.9% in 2004 to 99.0% in 2006 ($p < 0.05$), and the use of the fall risk assessment tool increased from 60.6% in 2004 to 99.4% in 2006 ($p < 0.05$) for all the medical records audited. Table IV illustrates the incidence of falls and fall-associated injury rates at each hospital in the years 2004 and 2006, before and after the implementation of the fall prevention programme. There was no change in the fall rate at the control hospital. Following the implementation of the fall prevention programme in the intervention hospital, there was a non-significant decrease in the fall rate from 1.4 to 1.1 falls per 1,000 patient days. There was a non-significant increase in the percentage of injury-associated falls in the two hospitals.

DISCUSSION

A tailored, multifaceted implementation strategy to support the implementation of a fall prevention programme was effective in increasing nurses' knowledge of fall prevention practices, increasing compliance with fall risk assessment, and reducing the incidence of falls. There is empirical evidence to suggest that addressing barriers to change with tailored interventions may promote changes in professional behaviour.[22] Successful implementation is mediated by strong leadership and environmental support, which are integral to building positive attitudes among nurses, ensuring that the sociocultural environment is conducive to the process of change.[34] In our study, the multifaceted strategy targeting barriers to change exemplified the commitment of the leadership and environmental support

Table III. Knowledge test scores.

	Mean ± SD	95% confidence intervals	p-value
Control hospital:			
Prior to implementation (Pre)	9.6 ± 1.9	–	–
Six months following implementation (Post)	9.8 ± 1.8	–	–
Pre vs. Post	–	−0.52 – 0.12	0.22
Intervention hospital:			
Prior to intervention (education) (Pre)	9.6 ± 1.9	–	–
Immediately following intervention (Post-immediate)	10.3 ± 2.3	–	–
Six months following intervention (Post)	10.3 ± 1.8	–	–
Pre vs. Post	–	−0.98 – −0.39	< 0.001
Intervention vs. Control (Post)	–	−0.83 – −0.21	0.001

Table IV. Patient fall rate and fall-associated injury rates.

	Control		Intervention	
Indicators	2004	2006	2004	2006
No. of patient falls	148	67	391	193
Fall rate per 1,000 patient bed-days	0.6	0.6	1.4	1.1
Injury-associated falls (%)	16.9	25.4	32.5	39.9

of the intervention hospital, including facilitation and support by change champions comprising a senior nursing staff, a geriatrician and therapists as well as ward nurses, and a revision of the hospital fall policy, to facilitate implementation of the fall prevention programme.

Many of the barriers perceived by nurses were related to a lack of knowledge and could be addressed through educational interventions. Unlike other studies addressing the implementation of fall prevention programmes,[12,13,35,36] which did not specifically measure nurses' knowledge, our study showed that nurses' knowledge on fall prevention increased significantly ($p < 0.01$) and was sustained following education sessions. The use of structured education sessions, facilitated by change champions, has been shown to consistently increase the nurses' awareness of the importance of a fall prevention programme, which leads to improved professional behaviour.[22]

Fonda et al found an increased staff compliance rate from 42% to 70% with the use of a risk assessment tool following a multistrategy prevention approach in an aged care hospital.[34] Similarly, we report a statistically significant increase in compliance with the use of a fall risk assessment tool and fall history screening in both the intervention and control hospitals. Increased compliance in both hospitals could be attributed to policy revisions to be in line with the CPG recommendations, mandating fall risk assessment, and including it as a part of the patient admission nursing care plan. However, the baseline compliance was different for the two hospitals and thus a comparison cannot be made. In fact, the control hospital had a higher baseline than the intervention hospital. Nonetheless, this increase in compliance in the intervention hospital could be explained by the use of a simplified assessment tool and by integrating the process into the normal nursing outline. Additionally, the presence of change champions, education sessions together with feedback promoted an increase in acceptance of the fall risk assessment tool and appropriate application of the programme. Similar to the study by Lee et al,[12] the audit and feedback of patient outcome data, coupled with motivation provided to teams that achieved positive results, in all likelihood motivated and encouraged the nurses towards a change in their practice.

Our results support the evidence in the literature that effective implementation of a fall prevention programme can lead to a reduction in patient fall rates in an acute care setting.[10,34,37-39] However, some studies have demonstrated no differences in fall rates following the implementation of a fall prevention programme.[11-13] The inability to identify a statistically significant decrease in the incidence of falls in our study could be explained by the low fall rate before implementation of the fall prevention programme, compared to fall rates cited in international studies.[35,40-42]

The success of the implementation of the Fall Prevention CPG in the two hospitals could possibly be explained by the pursuit of Joint Commission International (JCI) accreditation during the study period. Furthermore, accreditation provided a visible commitment by both hospitals to improve clinical quality and patient safety, to ensure a safe environment and to continually work to reduce risks to patients and staff. Organisations deemed to be compliant with all applicable standards and national patient safety goals are accredited. One of the national patient safety goals was the requirement for a hospital to demonstrate a commitment towards fall prevention by

reducing the risk of patient harm resulting from falls, and implementing a fall reduction programme, including an evaluation of the effectiveness of the programme.[43] As such, in order to meet accreditation criteria, both hospitals had to demonstrate the above. Coincidentally, the MOH Fall Prevention CPG was implemented during this time period and both acute care hospitals implemented and complied with the CPG recommendations to meet the JCI requirements. This confounding event might explain the consistent results reported for fall risk assessment and a lack of significant differences in fall incidence between the two hospitals.

There are weaknesses inherent in our approach. The audit conducted in 2004 failed to explore the type and extent of injuries resulting from falls. This information may have helped to explain the increased percentage of injuries reported following the implementation of the guidelines. Secondly, the 15-month follow-up audits may not have been of sufficient length to measure sustained adherence to such a complex programme. Thirdly, the mandated policy revision and changes in the control hospital attributed by JCI therefore increases the complexity of understanding the true effect of the intervention and confounds the results of this study.

In conclusion, following the implementation of a multifaceted strategy fall prevention programme, the incidence of falls did decline. A sustained increase in nurses' knowledge and change in fall prevention practice were important outcomes of the fall prevention intervention at the intervention hospital. The results of this study show that understanding local barriers, a local evidence-based guideline, a tailored, multifaceted strategy involving facilitation by change champions, monitoring of outcomes, and provision of feedback to staff, are important ingredients for the successful implementation of a fall prevention programme in a hospital in Singapore.

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