Evaluating the use of a targeted multiple intervention strategy in reducing patient falls in an acute care hospital: a randomized controlled trial

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Abstract

Aim. This article is a report of a randomized controlled trial to examine the effectiveness of a targeted multiple intervention strategy in reducing the number of patient falls in an acute care hospital.

Background. Prevention of patient falls remains a challenge that has eluded healthcare institutions. The effectiveness of targeted multiple fall prevention interventions in reducing the incidences of falling has not been established.

Methods. Patients who scored 5 and above on the Hendrich II Fall Risk Model, a fall assessment tool, were recruited in 2006. Patients who were randomized to the intervention group received targeted multiple interventions. Both the research groups received the standard fall prevention interventions from the ward nurses. The rates of fall incidences for both groups were reported with 95% CI, calculated using Wilson method and compared using the Chi-square test. The relative risk was estimated and 95% CI was calculated using the methods described by Armitage and Berry. The times to first fall events were constructed using the Kaplan–Meier method. The hazard ratio was reported at 95% CI and the comparison was made using the log-rank test.

Results. There were 912 and 910 participants in the control and intervention groups, respectively. The fall incidence rates were 1.5% (95% CI: 0.9–2.6) and 0.4% (95% CI: 0.2–1.1) in the control and intervention groups, respectively. The relative risk estimate of 0.29 (95% CI: 0.1–0.87) favours the intervention group.

Conclusion. This study showed that targeted multiple interventions were effective in reducing the incidences of falls in patients in the acute care setting.

Keywords: acute care facility, adults, falls, nursing, randomized controlled trial, research report, targeted falls intervention

Introduction

Accidental falls occurring in hospitals may result in injury and even death of patients. The deleterious effects of patient falls have warranted attention from influential advocates of patient safety such as the Joint Commission International (JCI) and the National Patient Safety Agency (NPSA). Reducing the risk of injury to patients from falls has been
made one of the international patient safety goals by the JCI (2007). Besides the physical impact, patients and their relatives may experience psychological and/or financial burden as a result of the fall.

Prevention of patient falls continue to remain a challenge that has eluded healthcare institutions. The most common approach to reduce falls in hospitals is by implementing universal multiple interventions, which include patient assessment, risk identification, education, medication review, addressing elimination needs, mobility and mental state problems and environmental issues (Evans et al. 1998). However, the universal multiple intervention approach has not demonstrated its effectiveness in reducing falls (Evans et al. 1999, Oliver et al. 2000). Would an individualized falls prevention approach, like the multiple targeted interventions programme, reduce the incidence of patient falls?

Background

Targeted multiple interventions is a strategy where interventions are instituted based on the patient’s identified risk. Findings from a systematic review of 22 studies revealed that targeted multiple interventions were effective in reducing the falls rate (rate ratio = 0.63; 95% CI: 0.49–0.83) and risk of falling [Relative risk (RR) = 0.82; 95% CI: 0.72–0.94] amongst elders in the community setting, including nursing homes, compared with usual care (Chang et al. 2004). Report of a meta-analysis of 11 studies on care homes contradicts the findings by Chang et al. where targeted multiple interventions were not important (Oliver et al. 2007). Nevertheless, such evidence is not generalizable to acute care populations who may be medically unstable and may also have a high incidence of cognitive impairment (Oliver et al. 2004).

Evidence on the effectiveness of targeted multiple interventions in hospital settings was contradictory (Evans et al. 1998, Joanna Briggs Institute 1998, Ministry of Health Singapore 2005). Nevertheless, programmes on specific interventions were described for elimination, medication review, mobility, mental states, education and use of restraints and bed rails. Unfortunately, the recommended specific interventions were based on expert opinion.

A systematic review on the effects of targeted multiple interventions in hospital settings found 13 studies comprising three randomized controlled trial, two cluster randomized controlled trials and eight prospective before and after studies (Oliver et al. 2007). The targeted multiple interventions included in these studies were on the aspects of nursing care, use of hip protectors, removal of physical restraints, environmental modifications, patient education, pharmacology and exercise programmes. The aggregated results showed a statistically significant reduction in the rate of patient falls per person year (log rate ratio = 0.82, 95% CI: 0.68–0.997). However, the incidence of fractures per 1000 person years (log rate ratio = 0.59; 95% CI: 0.22–1.58) and the log relative risk of falling (RR = 0.95; 95% CI: 0.71–1.27) were not important. The author concluded that targeted multiple interventions were effective in reducing the rate of falls in the hospitals but not the incidence of fractures or risk of falling. The extent of variability of the studies ($I^2$) was 80% for falls, 59% for fractures and 58% for fallers demonstrating heterogeneity between the studies. Based on the extent of variability, the findings from this systematic review may be questionable. The wide variability could be attributed to the different patient types, clinical setting in the hospital, Fall Risk assessment tools used and varied interventions instituted among the different studies.

The effectiveness of the use of targeted multiple interventions in the community and care home settings were inconclusive. However, the use of targeted multiple interventions in hospitals were encouraging in reducing the rate of patient falls but not the risk of falling. Three fall assessment tools were evaluated in this setting, where the Hendrich II Falls Risk Model was found to be the most sensitive and specific (Ang et al. 2007). According to Morse (2006), fall assessment alone does not prevent patient falls, and an intervention is the key to fall prevention. Targeted multiple interventions aim to give an individualized approach to patients’ risk for falls. Unfortunately, few studies have used identified risk factors to implement interventions for fall prevention. Thus, the intent of this study is to evaluate the effectiveness of targeted multiple interventions, where interventions are linked to the risk factors of the Hendrich II Falls Risk Model.

The study

Aim

The aim of this study was to examine the effectiveness of a targeted multiple intervention strategy in reducing the number of falls for patients identified as high-risk for falls.

Design

This study was a prospective randomized controlled trial conducted in an acute care hospital in Singapore between April 2006 and December 2006. We compared the effectiveness of two interventions (targeted multiple interventions with usual care vs usual care only) on patients identified as high-risk for falls over 8 months.
Participants
All the newly admitted patients from eight medical wards were included if they met the following criteria: ≥21 years of age and a score of ≥5 on the Hendrich II Fall Risk Model. Patients who were already in the study wards before the start of the study or who had fallen before the fall-risk assessment was carried out were excluded from the study.

Sample size calculation
The fall incidence rate during hospitalization in the setting under investigation was 2% for participants who were at risk of falling (Hendrich II Fall Risk Model cut-off score was at ≥5) (Ang et al. 2007). It was estimated that a total of 900 participants each were required for the control group and the intervention group to achieve a 95% CI of 1.4–2.8% (Wilson 1927).

Randomization procedure
Prior to randomization, the research nurses assessed the participants’ eligibility. Allocation of the participants to control or intervention groups was determined using block randomization with the aid of a computer program and stratified by ward to ensure an even mix in the ward. Stratification ensures that the number of participants receiving each intervention is balanced in each ward (Chan 2003). Sealed, opaque, serially numbered envelopes were produced from the randomization sequence separately for each stratum.

Research nurse training
Two nurses who had no direct involvement with participants in the study wards were recruited to implement the targeted multiple interventions. The nurses were given comprehensive information about the aim and purpose of the study, details of the targeted multiple intervention strategy, and training on the implementation strategy. The research nurses had the opportunity to assess 10 participants, and an evaluation of the implementation of the targeted multiple interventions was carried out. Further training was given before commencement of data collection if the research nurses were not confident and competent in the process of implementing the targeted multiple intervention strategy.

Recruitment
The Registered Nurses in the ward performed routine assessment of all participants within 4 hours of hospital admission using the Hendrich II Fall Risk Model tool (Hendrich et al. 2003), which had been validated in this setting (Ang et al. 2007). The completed assessment forms were placed into the designated boxes in the study wards. The two research nurses screened the completed assessment forms. Participants were recruited within 24 hours of admission during weekdays, and on the next workday for Saturdays, Sundays and public holidays. Eligible participants who met the inclusion criteria were randomized into the intervention or control groups.

Study protocol
Control group (usual care)
Participants in the control group received the usual care administered by the ward nurses. The usual care comprised general fall prevention measures in accordance with the Ministry of Health’s clinical practice guidelines (Ministry of Health Singapore 2005) which include falls risk assessment, placing the call-bell and bed locker within the patient’s reach, placing the bed rails raised and keeping the bed at the lowest position. The risk factors in the hospital’s existing falls assessment tool include a history of previous falls and seizures, patient age below 5 years, elimination, mental status, dizziness, effects of drugs and mobility, hearing and vision impairment (Ministry of Health Singapore 2005, National University Hospital 2006). Using the hospital’s existing falls assessment tool, participants were considered to be at risk for falls when any one risk factor was present. Participants who were identified to be at risk for falls had a green-coloured band tied around their wrist and a green-coloured notification of falls risk was placed at the head board. In addition, the ‘at risk’ participants received education related to falls which involved ward nurses instructing participants not to get out of bed without assistance, to press the call-bell for assistance and how to use the call-bell. As part of this study protocol, participants were also assessed for falls risk using the Hendrich II Falls Risk Model (HFRM). The HFRM is presently not employed in the current practice in the assessment of risk of falls. Using this instrument, a Hendrich score of 5 and above would identify patients who are at risk. This same group of participants would have probably been flagged out through the hospital’s existing falls assessment method. Thus, participants in both the control and intervention groups would have received the usual fall prevention interventions from the nurses.

Intervention group (usual care plus targeted multiple interventions)
Participants in the intervention group received the usual care and targeted multiple interventions based on their individual risk factors. For the targeted multiple interventions, the
Investigators drafted appropriate interventions specific to each risk factor of the Hendrich II Falls Risk Model. The relevant specific interventions were derived from the Singapore Ministry of Health’s nursing clinical practice guidelines on falls prevention (Ministry of Health Singapore 2005), resources from the Joanna Briggs Institute (Evans et al. 1998, Joanna Briggs Institute 1998), and existing literature (Mehagnoul-Schipper et al. 2001). The usual care received by the participants in the intervention group was similar to that received by the participants in the control group. In addition to the usual care, the participants in the intervention group received an educational session, lasting no more than 30 minutes, on targeted multiple interventions, according to the participants’ risk factors. The aim of the educational session was to increase the participants’ awareness of their specific risk of falling during hospitalization and to give strategies to reduce the specific risk. For example, a patient who has a risk factor of dizziness associated with postural hypotension, will have a discussion with the research nurse on the cause of the dizziness. In this situation, the nurse will advise the participant to stand up slowly when trying to get up from a sitting or lying position, and the rationale for taking the precautionary measure explained. The educational session was conducted in a language that the participants could comprehend; English, Malay or Mandarin. The educational session was also given to the relatives of participants who were confused and/or delirious.

Data collection

The research nurses reviewed the medical records of the participants to gather information about their medical history and treatment and documented the demographic data onto a data collection form. All participants in the intervention and control groups were followed up until the time of their first fall, discharge from the hospital or death, whichever occurred first. The research investigator scanned the electronic hospital occurrence report (eHOR) daily during weekday for entries of fall incidences reported by the nurses from the wards and ascertained if the entries were on participants involved in the study. The investigator obtained information on the circumstances surrounding the participant’s fall based on the eHOR report and participant’s medical records and nurses’ and participant’s account of the incident as necessary. The information was entered into the fall data collection form.

Ethical considerations

The research protocol was submitted to the appropriate review board for ethics approval to conduct the study in the hospital. In keeping with good practices for conducting research trials, the initial submission of the protocol included recruitment and obtaining written informed consent from the participants. We were also aware that disclosure of study-related information to the participants may cause Hawthorne effect and could influence the outcome of the study (Polit & Beck 2003). The local review board was aware of this effect and recommended that the investigator consider applying for waiver of consent/verbal consent to reduce bias when patients have the knowledge that they are research participants. Consequently, waiver of informed consent was sought and approved by the review board.

Data analysis

Data were analysed using SPSS (SPSS Inc., Chicago, IL, USA) version 14.0. All statistical analyses were carried out on an intention-to-treat basis. The incidence rates of falls during hospital stay in the intervention and control groups were reported with 95% CIs calculated using Wilson method (Wilson 1927) and compared using the Chi-square test. The relative risk was estimated and 95% CI was calculated using the methods described by Armitage and Berry (1994). In addition, the time from randomization to the first fall of the patients in the two groups was calculated in days. The time to event curves were constructed using the Kaplan–Meier method and the comparisons between the two groups were made using the log-rank test.

Validity and reliability

In the study, a falls assessment tool was used to identify patients at risk for falls. Patient’s who score 5 and above using the Hendrich II Fall Risk Model will be recruited into the study. The Hendrich II Fall Risk Model used in this study had been validated on 5489 patients in this setting (Ang et al. 2007). The study showed that the Hendrich II Fall Risk Model showed the best balance of sensitivity (70%, 95% CI: 57.5–80.1) and specificity (61.5%, 95% CI: 60.2–62.8). The accuracy of the Hendrich II Fall Risk Model at the published cut-off point, measured using Area under the Curve (AUC), was 73%.

The incidence of falls was used as a measurement of the outcome in this study. The information on the occurrence of the patient falls was retrieved from the entries made by the ward nurses into the hospital eHOR system. The assessment of the occurrence of a patient fall by the ward nurses forms part of the existing nursing practice. In addition, screening and enrollment of the patient into the study was conducted by the research nurses. The ward nurses were not aware about
which patient was recruited into the study, neither were they
informed about the study methodology, including the inter-
ventions received by the participants in both the control and
intervention groups. Thus, the ward nurses, who recorded the
patients’ outcome of falls incidences, were not aware of the
patients’ involvement in the study.

Results

Baseline characteristics
A total of 1822 participants with Hendrich score ≥5 were
recruited into the study from 6498 patients assessed for risk of
falls. Of these, 910 and 912 participants were randomized into
the intervention and control groups, respectively (Figure 1).
The baseline characteristics for both, the intervention and
control groups, were homogenous for mean age, race, current
condition and Hendrich score (Table 1). The intervention
group had slightly more women (52%) than men (48%)
whereas the control group had slightly more men (52%) than
women (48%). The highest proportion by race was that of
Chinese participants (72%). Participants presenting with
General Medicine (36%) condition made up the highest
disease condition. The mean Hendrich score of both groups
was 8, with a median of 7 and a standard deviation (sd) of 2.

Number of falls
A total of 18 (1%, n = 18/1822) high-risk participants fell at
least once during hospitalization. Of these high-risk partic-
ipants, four participants (n = 4/910, 0.4%, 95% CI: 0.2–1.1)
were from the intervention group, and 14 participants
(n = 14/912, 1.5%, 95% CI: 0.9–2.6) were from the control
group. The proportion of high-risk participants who fell was
significantly lower in the intervention group compared to that
in the control group (P = 0.018).

Relative risk estimate
The relative risk estimate was 0.29 (95% CI: 0.10–0.87) in
favour of the intervention group. The results remained the
same after adjusting for age and gender using logistic
regression analysis (risk estimate: 0.29, 95% CI: 0.10–0.89,
P = 0.031). The use of targeted multiple intervention strategy
reduced the risk of falling to about 71% relative to the usual
care fall prevention interventions.

Risk of falling
Figure 2 shows that participants in the intervention group had
a lower risk of falling than those in the control group. The
estimated hazard ratio (HR) was 0.29% (95% CI: 0.11–0.73,
P = 0.019; log-rank test) and accounting for age and gender
made no appreciable difference to this estimate (HR: 0.30,
95% CI: 0.10–0.91, P = 0.033; Cox proportional model).

Outcome, time, and type of falls
Majority of the participants who fell sustained no injury at
all, or had minor injuries such as a small skin tear or

<table>
<thead>
<tr>
<th>Enrolment</th>
<th>Assessed for eligibility (n = 6498)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excluded (n = 4676) Did not meet inclusion criteria (n = 4443)</td>
</tr>
<tr>
<td></td>
<td>Died (n = 8)</td>
</tr>
<tr>
<td></td>
<td>Discharged (n = 154)</td>
</tr>
<tr>
<td></td>
<td>Transferred to surgical ward (n = 71)</td>
</tr>
<tr>
<td>Allocation</td>
<td>Allocated to control group (n = 912)</td>
</tr>
<tr>
<td></td>
<td>Allocated to intervention group (n = 910)</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Followed up (n = 912)</td>
</tr>
<tr>
<td></td>
<td>Followed up (n = 910)</td>
</tr>
<tr>
<td>Analysis</td>
<td>Analyzed (n = 912)</td>
</tr>
<tr>
<td></td>
<td>Analyzed (n = 910)</td>
</tr>
</tbody>
</table>

Figure 1 Subject enrolment and flow of trial. Control group = received usual care; Intervention group = received usual care plus targeted multiple intervention.
laceration (Table 2). The times of falls were almost equally distributed to the different shift periods in both groups of participants who fell. The highest occurrences of falls were reported at the bedside (intervention group = 100%, control group = 57%) and when the participants attempted to get out of bed. The participants were found on the floor or having fallen from a chair/commode/shower chair/wheelchair.

**Table 1** Baseline characteristics for intervention and control groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention (n = 910)</th>
<th>Control (n = 912)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discipline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General medicine</td>
<td>327</td>
<td>328</td>
</tr>
<tr>
<td>Renal</td>
<td>99</td>
<td>120</td>
</tr>
<tr>
<td>Cardiology</td>
<td>112</td>
<td>100</td>
</tr>
<tr>
<td>Neurology</td>
<td>102</td>
<td>106</td>
</tr>
<tr>
<td>Oncology/hematology</td>
<td>103</td>
<td>94</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>83</td>
<td>76</td>
</tr>
<tr>
<td>Respiratory</td>
<td>37</td>
<td>40</td>
</tr>
<tr>
<td>Endocrine</td>
<td>37</td>
<td>38</td>
</tr>
<tr>
<td>Geriatric medicine</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>70·3 (14·2)</td>
<td>69·7 (14·7)</td>
</tr>
<tr>
<td>Median (range)</td>
<td>73 (22–100)</td>
<td>72 (21–101)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>433 (48%)</td>
<td>472 (52%)</td>
</tr>
<tr>
<td>Female</td>
<td>477 (52%)</td>
<td>440 (48%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>648 (71%)</td>
<td>664 (73%)</td>
</tr>
<tr>
<td>Malay</td>
<td>181 (20%)</td>
<td>153 (17%)</td>
</tr>
<tr>
<td>Indian</td>
<td>66 (7%)</td>
<td>76 (8%)</td>
</tr>
<tr>
<td>Others</td>
<td>15 (2%)</td>
<td>19 (2%)</td>
</tr>
<tr>
<td>Hendrich Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>7·6 (2·2)</td>
<td>7·5 (2·2)</td>
</tr>
<tr>
<td>Median (range)</td>
<td>7 (5–15)</td>
<td>7 (5–14)</td>
</tr>
</tbody>
</table>

**Table 2** Fall information

<table>
<thead>
<tr>
<th>Fall description</th>
<th>Intervention (n = 4)</th>
<th>Control (n = 14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity outcome of falls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No injury</td>
<td>1 (25)</td>
<td>9 (64)</td>
</tr>
<tr>
<td>Small skin tear or laceration</td>
<td>2 (50)</td>
<td>1 (7)</td>
</tr>
<tr>
<td>Contusion</td>
<td>1 (25)</td>
<td>4 (29)</td>
</tr>
<tr>
<td>Time of falls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day shift (7:01 AM to 2:00 PM)</td>
<td>1 (25)</td>
<td>5 (36)</td>
</tr>
<tr>
<td>Evening shift (2:01 PM to 9:00 PM)</td>
<td>1 (25)</td>
<td>4 (28)</td>
</tr>
<tr>
<td>Night shift (9:01 PM to 7:00 AM)</td>
<td>2 (50)</td>
<td>5 (36)</td>
</tr>
<tr>
<td>Location of falls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedside</td>
<td>4 (100)</td>
<td>8 (57)</td>
</tr>
<tr>
<td>Patient cubicle</td>
<td>0 (0)</td>
<td>2 (14)</td>
</tr>
<tr>
<td>Toilet</td>
<td>0 (0)</td>
<td>2 (14)</td>
</tr>
<tr>
<td>Ward corridor</td>
<td>0 (0)</td>
<td>1 (7)</td>
</tr>
<tr>
<td>Lift lobby</td>
<td>0 (0)</td>
<td>1 (7)</td>
</tr>
<tr>
<td>Patient activity at the time of falls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attempt to get out of bed</td>
<td>2 (50)</td>
<td>7 (50)</td>
</tr>
<tr>
<td>Dressing up</td>
<td>1 (25)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Toileting</td>
<td>0 (0)</td>
<td>2 (14)</td>
</tr>
<tr>
<td>Transfer self/assisted</td>
<td>1 (25)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Others</td>
<td>0 (0)</td>
<td>5 (36)</td>
</tr>
<tr>
<td>Type of falls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Found on floor</td>
<td>2 (50)</td>
<td>4 (29)</td>
</tr>
<tr>
<td>Fall from chair/commode/shower/ wheelchair</td>
<td>2 (50)</td>
<td>3 (21)</td>
</tr>
<tr>
<td>Lost balance/unsteady gait/fainted</td>
<td>0 (0)</td>
<td>3 (21)</td>
</tr>
<tr>
<td>Fall from bed/bed trolley/table</td>
<td>0 (0)</td>
<td>2 (14)</td>
</tr>
<tr>
<td>Climbed over bed rails</td>
<td>0 (0)</td>
<td>1 (7)</td>
</tr>
<tr>
<td>Others</td>
<td>0 (0)</td>
<td>1 (7)</td>
</tr>
</tbody>
</table>

Values in parentheses are expressed as percentages.

**Discussion**

The findings in this study appear to indicate that the targeted multiple intervention strategies for fall prevention may have played an important role in the overall prevention of patient falls. However, it was not possible to isolate which component(s) used in the targeted multiple intervention strategies were the most effective in preventing falls. The risk of falling is directly related to the number of risk factors present (Tinetti et al. 1988). Thus, interventions that decrease the magnitude of risk should be effective in fall prevention. It may not be possible to identify which specific component(s) are effective, as the component(s) that are important will vary with individuals (Hogan et al. 2001).
Estimated relative risk

The use of targeted multiple interventions, which showed an estimated relative risk of 0.29 favours the intervention group. The results appear to indicate that targeting interventions to the specific risk factors of individuals can be effective. The findings of this present study appears to contradict the findings of the systematic review which found that the targeted multiple interventions had no effect on the risk of falls (RR = 0.95; 95% CI: 0.71–1.27) (Oliver et al. 2007).

The present study also showed a relative risk reduction of 71% demonstrating high magnitude of the effect of the intervention. A lesser reduction of the relative risk was reported in the studies by Haines et al. (2004) and Healey et al. (2004) of about 20%. These favourable results could be attributed to several factors. The fall-risk assessment and targeted multiple intervention components of the study were well planned and systematically implemented. To ensure consistency in the approach, the ward and research nurses received training on how to conduct falls risk assessments, whereas only the research nurses received training on the implementation of the targeted multiple interventions according to the patient’s identified risk factor. In this study, the targeted multiple interventions were implemented by two research nurses who were not part of the nursing care team that was providing direct patient care in the study wards. This dedicated role allowed the research nurse to have sufficient time to adopt an individualized approach so as to give targeted multiple interventions to the participants based on the participants’ risk factor. Moreover, the participants who were recruited into the study were those with high risk for falls (cut-off score ≥5 on the Hendrich II Fall Risk Model), which constituted 20% of the participants. This allows scarce resources (e.g. the research nurses’ time) to be directed to the group that required the most attention. Nevertheless, the lower magnitude of the effect of the estimated relative risk in the earlier studies may have been attributed in part to the differences in population and among the interventions offered, which makes comparison extremely difficult.

As falls cause physical and psychological discomfort to the patients, a reduction in the risk of falling of this magnitude has important clinical implications. Fall reduction gives confidence to the patients and their relatives that the healthcare system has the ability to give safe care and services. Also, a statistically significant reduction in fall rates would be less tiring for ward nursing managers and administrators than having to deal with the additional care and costs resulting from falls (Grenier-Sennelier et al. 2002 & Lee et al. 2002). Moreover, it could help in changing the perceptions of nurses and lead them to believe that it is possible to reduce or prevent falls in hospitals (Hill et al. 2005).

Time to first fall

Participants in the intervention group experienced a significantly longer risk time to first fall (HR = 0.29) compared to the participants in the control group. This result appears to indicate that a targeted multiple intervention strategy was successful in preventing patients from falling during their early days of admission to the hospital. Similar findings were reported in a previous study reporting longer mean time until first fall in the intervention group; these findings were attributed to similar patient profiles such as medical condition and mean age (Schwendimann et al. 2006).

Outcome, time and type of falls

The number of participants who fell into both groups was too small and insignificant to make any analysis or comparison. Thus, the overall result of fallers will be described. Participants who fell were mostly close to the bedside, and fell while attempting to get out of the bed. The falls occurred from places such as a chair, commode, trolley or bed. However, only minor injuries were sustained. No particular pattern on the time of fall could be inferred from this study. This finding differed from that of an earlier study, where highest falls in the participants in the usual care group occurred during the evening shift, and highest falls in the participants in the intervention group occurred during the day shift (Schwendimann et al. 2006).

Study limitation

A limitation of this study is that this is a single-center study. Thus, these findings cannot be generalized to other patient groups or settings. The number of participants who fell in both the groups was small. Hence, there was insufficient evidence to conduct a detailed analysis of the fallers. The study showed that the targeted interventions were effective compared to the usual care given to the participants under controlled research conditions. The magnitude of the effect may not be as important and sustainable when the targeted multiple interventions are implemented into actual clinical practice. Under research conditions, research nurses had adequate time to dedicate their attention to providing an individualized approach to implementing the targeted multiple interventions. However, in reality, nurses in the ward have multiple, concurrent roles in patient management and may have limited capacity to give individualized approach to implementing the
What is already known about this topic

- Patient falls frequently occur in acute care hospital environments.
- Universal interventions are a common preventive strategy to reduce patient falls in acute care environments but their effectiveness in reducing falls is not conclusive.
- Targeted multiple intervention strategy seems to be effective in reducing patient falls, especially for elders living in the community and residential facilities, or those admitted to sub-acute hospitals.

What this paper adds

- Usual care in addition to targeted multiple interventions strategy is more effective than usual care alone in reducing the number of patient falls in an acute care setting.
- Patients exposed to targeted multiple interventions have a longer time to first fall in an acute care setting, compared to patients who are exposed just to the usual care.

Implications for practice and/or policy

- Routine universal approach is inappropriate as an intervention in preventing patient falls.
- Individualized targeted multiple fall interventions should be implemented in an acute care setting in addition to the usual fall prevention methods.

targeted multiple interventions to a similar extent as given during the research study. Having a specialized ‘falls nurse’ or increasing the staffing hours may be some of the strategies that healthcare facilities might consider to make provisions for a dedicated individualized approach to fall prevention.

Conclusion

The study showed that a universal approach is inadequate in preventing falls in an acute care setting. The challenge for healthcare institutions is to implement an effective fall prevention strategy that targets the patients’ risk factor that contributes to their falls. Individualized targeted multiple intervention strategy, in addition to usual care, seems to be more effective than usual care alone, in reducing the number of falls in patients hospitalized in the general medical wards. The use of the Hendrich Fall Risk assessment tool had enabled the nurses to give individualized education to the participants who were identified as ‘at risk for falls’. Based on the important positive findings from this study, it is recommended that the targeted multiple intervention strategy be piloted for use in this healthcare setting and its effectiveness be evaluated. However, as this study was conducted in single-site medical wards, extension of the use of the targeted multiple intervention strategy warrants further research in other centres and healthcare institutions.

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Conflict of interest

No conflict of interest has been declared by the authors.

Author contributions

ANK & SZM were responsible for the study conception and design. ANK & SZM performed the data collection. ANK, SZM & WHB performed the data analysis. ANK & SZM were responsible for the drafting of the manuscript. ANK & SZM made critical revisions to the article for important intellectual content. SZM & WHB gave statistical expertise. ANK & SZM obtained funding. ANK & SZM gave administrative, technical or material support. ANK & SZM supervised the study.

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