Video-based fall prevention education for cognitively impaired inpatients: a pilot study

Jun Dai1, MBBS, MClinEpi, Sibgat Saleheen1, MBBS, Anita Ko1, RN, PhD, Ishrat Jahan1, MBBS, FRACP, Nady Braidy2, BMedSci, MPharm, PhD, Daniel KY Chan1*,3, MD, FRACP, MHA

ABSTRACT

Background. Inpatient falls complicate and lengthen hospital admissions for older adults. Cognitive impairment is a risk factor for falls. Current fall prevention education is ineffective for people with cognitive impairment. We aimed to investigate whether an educational video is a better mode of delivery than verbal education for individuals with cognitive impairment in terms of recall and fall prevention.

Methods: In a randomised controlled trial, patients were assigned at random to receive fall prevention education either verbally or through an educational video. The co-primary outcomes were recall at 1 day and number of falls.

Results: Of 21 and 31 participants assigned to receive video education (intervention) and verbal education (active comparator), respectively, 19 and 31 completed the study, respectively. The percentage of participants who recalled the fall prevention message was significantly higher in the intervention group than in the active comparator group (31.5% [6/19] vs 9.7% [3/31], p=0.03). There was no significant difference in the fall rate between groups.

Conclusion: Fall prevention education delivered using a video may be better retained by individuals with cognitive impairment when compared with the standard practice of verbal fall prevention education. Larger studies are needed to confirm our findings.

Key words: Accidental falls; Cognitive dysfunction; Dementia; Video-audio media

INTRODUCTION

Falls are a leading cause of fatal and non-fatal injuries among older adults, associated with direct medical costs exceeding $754 million (fatal) and $50 billion (non-fatal) in the United States.1 Inpatient falls complicate and lengthen hospital admissions. About 2 to 67 inpatient falls occur per 1000 occupied bed days, depending on the type of hospital ward; 30% to 51% of inpatient falls result in some type of injury, and 1% to 3% of inpatient falls result in a fracture.2,4

Cognitive impairment is a risk factor for falling. Those without dementia but with deficits in executive function are at three times higher risk of sustaining any fall.5 Having a Mini-Mental Status Examination score of <26 is associated with serious fall-related injuries (odds ratio=2.13, 95% confidence interval=1.56-2.90).6 Those with dementia have almost 10 times more incident falls than age-matched controls without dementia, and their falls are more likely to result in injury.7 When injuries are sustained, people with dementia are less likely
than cognitively intact older people to recover well. The prevalence of dementia is expected to increase exponentially over the next 10 years.

Fall prevention interventions such as home safety assessment and modification, management of polypharmacy, exercise programmes (home, group, or Tai Chi), pacemakers in people with carotid sinus hypersensitivity, and anti-slip shoe devices in icy conditions can prevent falls in the community. In the inpatient setting, multifactorial interventions may prevent falls in those without dementia, especially in sub-acute, rehabilitation hospitals or in those with an average length of stay >10 days.

Patient education is a component of fall prevention interventions. Education is usually delivered face to face by nursing staff or a delegated ‘falls champion’ in the hospital setting. However, verbal education is ineffective in preventing inpatient falls for patients with cognitive impairment. Older adults with cognitive impairment may have difficulty understanding and remembering educational material, as dementia can result in impairments in language and memory domains. Educational videos are a potential solution. Visual stimuli are better retained than words in older adults with cognitive impairment. Quasi-experimental (pre- and post-intervention) studies have reported a decrease in the fall rate following the addition of an educational video to existing fall prevention programmes. Studies evaluating the effectiveness of educational videos often exclude individuals with cognitive impairment.

We designed an educational video that encouraged patients to seek help when ambulating. It was reported to reduce the fall rate among inpatients in an acute geriatric ward (30% of them had dementia). We aimed to examine whether our fall prevention educational video performs better than the standard verbal fall prevention education for individuals with cognitive impairment in terms of retention of the fall prevention message and reduction in fall rate.

METHODS

Patients with cognitive impairment at the Bankstown-Lidcombe Hospital, Australia, were recruited by two researchers. They were diagnosed by the treating clinician based on any one of the three validated cognitive screening tools: the Mini Mental State Examination, the Rowland Universal Dementia Assessment Scale, and the Montreal Cognitive Assessment. The cut-offs of the respective tools were <24, <23, and <26. The tools have comparable sensitivity (87%-94%) and specificity (82%-90%), but the Montreal Cognitive Assessment has less specificity (50%). Patients were excluded if they could not participate owing to drowsiness (eg, hypoactive delirium), communication difficulties (eg, aphasia or abulia) or severe confusion (eg, unable to follow 3-step command). However, patients with delirium, as diagnosed with the Confusion Assessment Method or by a clinician, were eligible for inclusion, as were non-English-speaking patients if interpretation was available (by the carer, professional interpreter, or healthcare worker).

Multifactorial fall prevention interventions were provided, including falls risk screening by nursing staff, Lo-Lo adjustable hospital beds, falls alarms for selected patients, non-slip socks, a falls champion on aged care wards, ensuring buzzer and walking aids are within reach, and face-to-face patient education by nursing staff.

Recruited participants were randomly allocated to receive fall prevention education through either a video or verbally. Allocation was concealed from the two researchers. In the intervention arm, a silent video was delivered to each participant by either researcher using the ‘computer on wheels’ (Figure 1). The video encourages the participant to call for nursing assistance if he/she wish to get out of bed. Most inpatient falls in older adults occur around the bed area and in the toilet when patients attempt to transfer and ambulate without asking for nursing assistance. The video was created by an experienced adult educator in collaboration with the study team. The video uses universal body language and symbols (ticks and crosses) to overcome language barriers in the culturally and linguistically diverse geriatric population. The visual instruction was strengthened by the scenes of broken bones to arouse emotional memory (emotional scenes are better remembered). The researcher then checked the participant’s understanding of the video’s message and explained the message to the participant. Participants were instructed to remember the message and to recall it the following day.
In the active comparator arm, fall prevention education was delivered by either researcher to each participant who was verbally instructed to call for nursing assistance if he/she wish to get out of bed. Wording was standardised: “If you (need/want/would like) to (go/walk) (to the bathroom or toilet/anywhere), please (call or ask the nurses for assistance/press the buzzer), to avoid (a fall/falling over).” Participants were instructed to remember this message and to recall it the following day.

Standardised questions of the respective arms were: “Do you remember watching a video yesterday? What was it about?” or “I showed you a video yesterday, what was it about?” and “I gave you an instruction to remember yesterday, what was it?” Remembrance was defined as being able to recall the instruction of calling for assistance if they wish to get out of bed. Appropriate responses included: “I should/need to/must ask for help/press or ring the buzzer/call or ask a nurse to help me if I need to go anywhere/go to the bathroom or toilet/get out of bed.” Incorrect responses lack the key message. For example, “The video was about not falling/avoiding falls/don’t fall over” without extrapolating on how to achieve this by asking for assistance when mobilising.

Other variables were collected, including demographic parameters, delirium status, length of stay, and fall incidents during admission.

The z-test for two proportions was used because the two groups were unequal in size. It only requires a minimum of five participants in each group for comparison. This eliminates the unequal power effect on sample size differences. The null hypothesis was tested ($Pi = Pc$) to determine differences in the number of people remembering the fall prevention message between the two groups. Alpha (statistical significance) was set at 0.05. Based on previous studies, video education was more memorable than verbal education so a 1-tailed z-test was used to maximise statistical power. The risk ratio for remembering the fall prevention message was calculated by dividing the probability of the event occurring in the intervention group by the probability of the event occurring in the active comparator group. The fall rate was calculated by dividing the number of fall-related clinical incidents by the number of beds occupied by patients each day (occupied bed days). Negative binomial regression was used to compare the fall rate within groups (pre vs post-intervention) and between groups (verbal education vs video education).
vs video education). STATA 16 (StataCorp) was used for statistical analysis.

**RESULTS**

Of the 54 patients screened, two were excluded: one was so dysarthric that his speech was unintelligible and another declined to participate. The remaining 52 participants were randomised to either the intervention arm (n=21) or the active comparator arm (n=31). Two participants in the intervention arm were lost to follow up: one was discharged from hospital the next day and another deteriorated overnight such that she was too drowsy. 50 participants from 10 different wards completed the study (Figures 2 and 3). Seven (36.8%) of 19 participants in the intervention arm and 13 (41.9%) of 31 participants in the active comparator arm were from a culturally and linguistically diverse background (Table).

The percentage of participants who remembered the fall prevention message was significantly higher in the intervention arm than in the active comparator arm (31.5% [6/19] vs 9.7% [3/31], p=0.03, 1-tailed z-test for two proportions). The risk ratio for remembering was 3.26 (95% confidence interval=0.92-11.54, p=0.07).

Eight (42.1%) of 19 patients in the intervention arm and eight (25.8%) of 31 patients in the active comparator arm were diagnosed with delirium. Of them, 50% (4/8) and 0% (0/8) remembered the fall prevention message, respectively (p=0.01, 1-tailed z-test for two proportions).

There was no significant difference in the fall rate after fall education between the respective arms (0 vs 1.93 falls per 1000 occupied bed days, p=0.41) or before and after fall education within the intervention arm (0 vs 0 fall per 1000 occupied bed days) or within the active comparator arm (12 vs 1.93 falls per 1000 occupied bed days, p=0.38).

**DISCUSSION**

Inpatient falls can lead to serious injury, long-term complications, and even death. More than a third of...
Video-based fall prevention education for cognitively impaired inpatients

Inpatient falls are preventable. In the present study, the fall prevention message was better retained by individuals with cognitive impairment when delivered by video than by verbal education. This may be because visual memory is usually affected later than verbal memory in patients with dementia.9 Verbal fall prevention education has been reported to be ineffective in patients with cognitive impairment.11,12

In the present study, potential confounders such as delirium status and culturally and linguistically diverse backgrounds of patients were accounted for. Patients with delirium had decreased attention span that can result in poorer engagement with verbal education. Although the proportion of participants recalling the fall prevention message was significantly higher in those with video education than in those with verbal education, the zero event rate and small sample size make it difficult to calculate an effect size. In addition, culturally and linguistically diverse background may also affect the understanding and effectiveness of educational interventions. The small sample size and low event rate limited the generalisability of the findings. We used randomisation of individual participants rather than cluster randomisation, which is subject to confounders. Blinding of participants and investigators was impractical, as participants may inadvertently un-blind the investigators when recalling the educational material.

Two researchers were involved in delivering verbal education, and inter-observer variation may have occurred. The two researchers had meetings to standardise the wording of the educational content to ensure consistency. However, the conversational nature of the education may result in some patients receiving additional education. For example, if the patient asked a question, the researcher would be obliged to answer it.

Participants were assessed for cognitive impairment with a variety of screening tools at the discretion of the treating clinicians. The lack of standardisation may lead to variability in cognitive assessment. Nonetheless, even if a single screening tool were used, inter-rater variability would be inevitable. None of the tools was meant to be used as the gold standard for diagnosis. The diagnosis was based on overall evaluation by clinicians.

Evaluation of participant’s memory of fall prevention message was made the day after education. There was no evaluation on subsequent days and no repeated education sessions. Therefore, the ‘optimal dose’ of intervention is unknown.

In the present study, the sample size was small and the fall rate was low. Larger studies are needed to confirm our findings. Randomisation of a small sample of individual participants resulted in unequal group sizes. Block randomisation can yield more even groups despite potential bias. Our study was underpowered to detect any difference in fall rate between the two arms.

### Table: Patient characteristics at baseline

<table>
<thead>
<tr>
<th></th>
<th>Intervention arm (n=19)*</th>
<th>Active comparator arm (n=31)*</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean patient age, y</td>
<td>83.2</td>
<td>82.6</td>
<td>0.79</td>
</tr>
<tr>
<td>Male:female</td>
<td>10:9</td>
<td>15:16</td>
<td>0.77</td>
</tr>
<tr>
<td>Cognitive testing score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini Mental State Examination score</td>
<td>15.5 (7-20)</td>
<td>19 (2-22)</td>
<td>0.41</td>
</tr>
<tr>
<td>Rowland Universal Dementia Assessment Scale score</td>
<td>16 (10-20)</td>
<td>16 (8-22)</td>
<td>0.22</td>
</tr>
<tr>
<td>Montreal Cognitive Assessment score</td>
<td>20 (20)</td>
<td>13.5 (13-14)</td>
<td>0.84</td>
</tr>
<tr>
<td>Delirium</td>
<td>8 (42.1)</td>
<td>8 (25.8)</td>
<td>0.23</td>
</tr>
<tr>
<td>Culturally and linguistically diverse</td>
<td>7 (36.8)</td>
<td>13 (41.9)</td>
<td>0.72</td>
</tr>
<tr>
<td>Length of hospital stay, d</td>
<td>34 (4-75)</td>
<td>38 (6-159)</td>
<td>0.34</td>
</tr>
</tbody>
</table>

* Data are presented as no. (%) or median (range) unless otherwise indicated.
CONCLUSION

Patients with cognitive impairment may remember fall prevention education messages better when the education is delivered visually via video rather than verbally.

CONTRIBUTORS

DKYC, JD designed the study. JD, SS acquired the data. JD analysed the data. JD, NB drafted the manuscript. All authors critically revised the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

CONFLICTS OF INTEREST

All authors have disclosed no conflicts of interest.

FUNDING/SUPPORT

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

DATA AVAILABILITY

All data generated or analysed during the present study are available from the corresponding author on reasonable request.

ETHICS APPROVAL

The study was approved by the South West Sydney Local Health District (Ref HREC/14/LPOOL/530). The patients were treated in accordance with the tenets of the Declaration of Helsinki. The patients provided written informed consent for all treatments and procedures.

TRIAL REGISTRATION

Australian New Zealand Clinical Trials Registry number ACTRN12621000582853.

REFERENCES