Translating evidence from a systematic review to the development of an evidence-based fall prevention program in a tertiary psychiatric hospital

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Abstract

Falls have been a major safety concern in view of its high incidences and potential detrimental consequences. This article described a systematic review about effectiveness of interventions for the assessment and prevention of falls in adult psychiatric patients conducted previously. These patients possessed unique fall-related risk factors such as altered mental status, physiological symptoms, past history of falls, mobility and gait problems, concurrent medical conditions, and polypharmacy that might warrant specific tailored fall prevention interventions. Following the systematic review, a care bundle for fall prevention in a tertiary psychiatric hospital would be implemented, taking into account these risk factors and evidence relating to fall prevention.

Introduction

Falls occur in all clinical areas, with higher rates in geriatric, neurologic, psychiatric and rehabilitation units than in surgical, critical care, pediatric and obstetric units.[1,2] It has been reported that the average fall rate was between 3 to 5 falls per 1000 bed-days in multi-hospital studies, with 30%-50% of inpatient falls resulting in some forms of injuries, and 1%-5% resulting in serious injuries,[3-5] such as fractures, dislocations or intracranial bleeding.

Serious injuries resulting from falls could lead to detrimental outcomes, such as disability, dependence, admission to long-term care, or even death, especially for older adults.[6] In addition to physical injuries, falls could also lead to fear and anxiety to patients, their family members and health care staff. Fall could also incur significant financial burdens because of associated direct treatment costs, increased length of stay, complaints and litigation,[7] which could be additional burdens for both patients and healthcare organizations.

Awareness of the consequential effects of falls has led to the search for evidence-based fall prevention strategies. Most fall prevention research since the 1980s has focused primarily on general medical-surgical or long term care settings. To date, there have been several systematic reviews conducted on patients in acute or chronic care hospitals,[8-10] on the elderly,[11,12] or on nursing home residents.[13] However, patients in psychiatric setting have been largely neglected in fall prevention research; despite the fact that fall is also a major safety concern in psychiatric units. It has been reported that the fall rate in psychiatric unit is comparable to those of elder care and rehabilitation units, with a fall rate of 91 per 1000 admissions compared to 115 and 85 per 1000 admissions respectively for elder care and rehabilitation units.[14] This was echoed by a few studies reporting that fall rate in psychiatric units was 4.64 per 1000 patient-days accounting for about 15% of hospital incidents.[15,16] Among those patients who fell in psychiatric units, 60% were under age 65 and 37% of patients were aged 65 and above,[16,17] which meant that adult psychiatric patients were also at high risk of fall. Fall risk assessment and prevention strategies are considered important components of any fall prevention program in hospitals. The World Health Organization (WHO) has recommended that fall prevention strategies should be all-encompassing and diversified based on precise assessment and identification of fall risk patients.[18] Patients with mental illnesses in inpatient settings may require a different fall management program compared to other patient populations, in view of the inherent characteristics of mental illnesses and their corresponding medications. It is important to note that adult psychiatric patients have unique fall risk factors such as altered mental state that may impair judgment, psychotropic drugs that affect gait and proprioception, and disorders that alter awareness of environmental and safety hazards.[15] Therefore, fall prevention interventions that are specifically tailored to these unique risk factors are necessary for adult psychiatric patients. These fall prevention interventions may even be different from those for psychogeriatric patients due to confounding factors of aging, multiple medical conditions and primary diagnosis of dementia.[19] Hence, a systematic review was conducted to identify and synthesize the best available evidence related to fall risk assessment tools, unique risk factors and interventions to prevent falls specifically for adult psychiatric patients.[20] The evidence derived from the systematic review and the development of fall prevention interventions for adults with mental illnesses following the systematic review are reported in this paper.

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Evidence derived from systematic review

A summary of the systematic review conducted[20] is presented in Table 1 and Figure 1.

A summary of the included studies is presented in the Appendix. Main findings from the systematic review indicated that patients with mental illnesses had unique risk factors for falls and the fall risk assessment tool had to consider these risk factors. Moreover, fall prevention programs had to include multiple interventions.[20]

Risk factors

Falls can be due to many factors and are often the result of interplay between these factors. Systematic reviews of falls in acute general hospitals found that common risk factors for falls included age, history of falls, mental status, medical conditions (*e.g.*, stroke, epilepsy and diabetes), medications (*e.g.*, diuretics, anti-hypertensive), toileting needs, visual impairment and mobility difficulties.[8,21] These risk factors were also found to be commonly associated with falls in psychiatric units.[15,22-24] In addition, adult psychiatric patients were noted to present with unique risk factors associated with falls, such as psychiatric diagnosis, medications prescribed and mental status. Psychiatric illnesses could lead to perceptual changes and temporary impairment in their judgment and ability to recognize hazards. Patients who fell were commonly diagnosed with depression,[19,22-24] bipolar disorder,[24-26] and dementia or Alzheimer's disease.[22,25,27] Neglect of one's safety and unawareness of surround-

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ing environment in patients with depression were also identified as contributing factors to falls. Disruption of the sleep-wake cycle commonly associated with depression and bipolar disorder was also a possible reason for patients to fall as it could reduce their alertness and impair their awareness of the environment.[28] Bipolar disorder may increase the risk for falls due to negligent or impulsive behavior during the depressed and manic states respectively. Impaired judgment, perceptual changes and inability to detect and avoid potential dangers were among the manifestations of dementia, which increased the risk of falls.[29]

Fall risk assessment tools

There were only two studies examining fall risk assessment tool specifically for psychiatric patients. One of them was a before-and-after exploratory study conducted by Irvin,[30] which evaluated a fall risk assessment tool on psychiatric patients. The number of patient falls was compared 6 months before and after the introduction of a modified fall risk assessment tool, which had been developed through a process of literature review, retrospective chart review of a group of patients who fell and patients who did not fall, and consensus among the healthcare professionals. There was no significant difference in the fall rate before and after the introduction of the new fall risk assessment tool. However, it was worth noting that 85% of patients who fell and 28% of non-fallers obtained a positive score using the modified tool, compared to 53% and 57% of patients respectively using the old tool. The results suggested that the modified fall risk assessment tool could be more predictive of falls in psychiatric patients. However, major limitations include a lack of reliability measures and psychometric properties of the assessment tool, such as specificity, positive predictive value and negative predictive value.

Another fall risk assessment tool was developed and validated by Edmonson *et al*.[28] specifically for the psychiatric population. The Edmonson tool was constructed based on a literature review and an expert panel review. It consisted of common risk factors of age, history of fall, elimination and ambulation/balance and unique risk factors of mental status, diagnosis, medication, sleep disturbance and nutrition. The result showed that the Edmonson tool was more sensitive in assessing fall risk in the acutely ill psychiatric population compared to the *Morse fall scale*, with sensitivity reported to be 0.63 (27 patients were identified out of 43 fallers) and 0.49 (21 patients were identified out of 43 fallers) respectively. There was no significant difference in terms of specificity (0.86 and 0.85). The authors acknowledged the limitations of a lack of reliability and validity tests, and the small number of patients who fell that limited the performance of further psychometric testing. However, other limitations warrant caution when using this tool. Firstly, there was no analysis done to determine whether all factors were significantly contributing to falls or whether any factor was correlated to others. The weighting of each factor using the ratio between observed value and expected value defined by the developers of the tool was also unclear. Moreover, for the purpose of reducing confusion to nurses, the developers of the tool suggested adding 10 to the total score to offset any negative value. However, this made it difficult to interpret how an initial negative value (indicating a reduced risk of falling) became a positive value (indicating an increased risk of falling). In terms of a cutoff point to indicate whether patients were at risk of fall or not, it was not clearly indicated how the cutoff point of 90 was derived. Lastly, the final score attained using the tool was a relatively large number and required a lot of calculation, making it prone to human error and might not be user friendly.

Fall prevention interventions

Multi-intervention fall prevention programs

Three before-and-after exploratory studies were found to evaluate fall prevention interventions on psychiatric patients.[17,30,31] Two studies examined the effectiveness of multi-intervention fall prevention programs[17,30] whereas only one study examined a unifactorial intervention.[31]

Table 1. Summary of systematic review.

Objective	The objective of this review was to identify the best available evidence for the effectiveness of nursing fall risk assessment tools interventions to reduce incidence of falls, and common risk factors of adult psychiatric patients who fell
Inclusion criteria	Types of participants: Adults (19 to 64 years) diagnosed with mental illnesses Types of interventions: Evaluation of nursing fall risk assessment tools in adult psychiatric settings, and interventions, which minimized fall risk or fall rates Types of outcome measures: Number of patient falls during hospitalization was the main outcome Types of studies: Primary quantitative studies published in English language
Search strategy	The literature search sought published studies, and was limited to English language reports There were no date restrictions applied to the search. Electronic databases searched included the following: CINAHL PubMed Cochrane Central Register of Controlled Trials PsycINFO ScienceDirect Scopus Web of Science Wiley-InterScience ProQuest MedNar
Methodological quality	Studies retrieved were assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from JBI-SUMARI
Data extraction	Data including specific details about the methods, settings, purposes, populations, interventions, and outcomes significant to the review's objectives were extracted by two independent reviewers using standardized data extraction tools from JBI-SUMARI

JBI-SUMARI, the Joanna Briggs Institute System for the Unified Management, Assessment and Review of Information.

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In a study conducted by Irvin,[30] a *fall risk protocol* was piloted, which included fall risk assessment on admission, categorization of the fall risk assessment score and the interventions recommended under each category to prevent falls. With a fall risk assessment score of 11 to 16 and no history of falls or orthostatic hypotension, the protocol recommended half-hourly checking and documentation of on observation. If an assessment score of 17 to 26 was obtained with no history of falls but with orthostatic hypotension, bed sensor and half-hourly checking and documentation would be considered. If the patient obtained a score of more than 26, together with a history of falls and orthostatic hypotension, the protocol recommended half-hourly checking and documentation, bed sensor, ambulation for patient four times a day (200 feet if possible), discussion with the medical doctor on the need for physical therapy assessment and occupational therapy. However, the author suggested that the protocol did not provide adequate interventions as 85% of the patients who fell obtained a positive fall risk assessment score, and the fall rate remained approximately the same before and after implementation of the protocol.

Yates and Tart[17] also evaluated a revised *fall assessment and prevention policy*, consisting of simplified categories of fall risk assessment (Morse fall scale was used) and a revised set of fall prevention interventions in a psychiatry department of a community hospital. The interventions included a new type of nonskid slipper sock footwear, a fall prevention and awareness education brochure for patients upon their admission, a medical profile review by pharmacy and annual staff education. The results revealed that there was a 32% decrease in falls in psychiatric patients. Anticipated physiological (16%) and unanticipated physiological (8%) falls both decreased, and an increase in saved falls (13%) was noted. Fewer falls occurred for the patients identified as having mental states of *alert* and *confused*. A percentage of 97% of the nursing staff reported in a survey that the nonskid gripper socks were effective in preventing patient falls.

Blood pressure monitoring

Murdock *et al.*[30] focused on the effect of psychotropic medications on blood pressure, and examined whether the introduction of a mandatory blood pressure taking policy would result in a decrease in fall rate and repeat falls. Before the introduction of the policy, there were 528 fall incidents, where 259 of 2696 patients had fallen once (first falls), and 50.9% (n=269) were patients who fell more than once (repeated falls). Even though blood pressure was taken in 65.2% of patients who fell, only 8.3% of patients who fell had both their lying and standing blood pressure taken. During the six months following the introduction of the policy, there was a significant decrease in the percentage of repeat falls to 32.5% (P<0.01). Blood pressure was taken in 90.3% of patients who fell, while 27.9% of patients who fell had both lying and standing blood pressure taken. An average of 19.5 mmHg postural drop in blood pressure was noted in 51.1% of these patients. The authors attributed the decrease in repeated falls to increased occurrence of blood pressure monitoring, adjustments of medications related to postural hypotension, as well as an increased awareness of this problem.

In summary, these studies presented interventions undertaken in an attempt to reduce fall rates in people with mental illnesses. One of the two studies[17,30] which evaluated a multi-intervention fall prevention program, found that the program reduced fall rates in a psychiatric setting. The study,[31] which evaluated a unifactorial intervention, was found to reduce the rate of repeated falls but not first falls. Due to the heterogeneity of the interventions as well as the outcomes of the studies, it is difficult to determine which intervention is most effective. However, all of the interventions in these studies appeared to emphasize the detection and treatment of postural hypotension and the review of medications by physicians or pharmacists for patients considered to

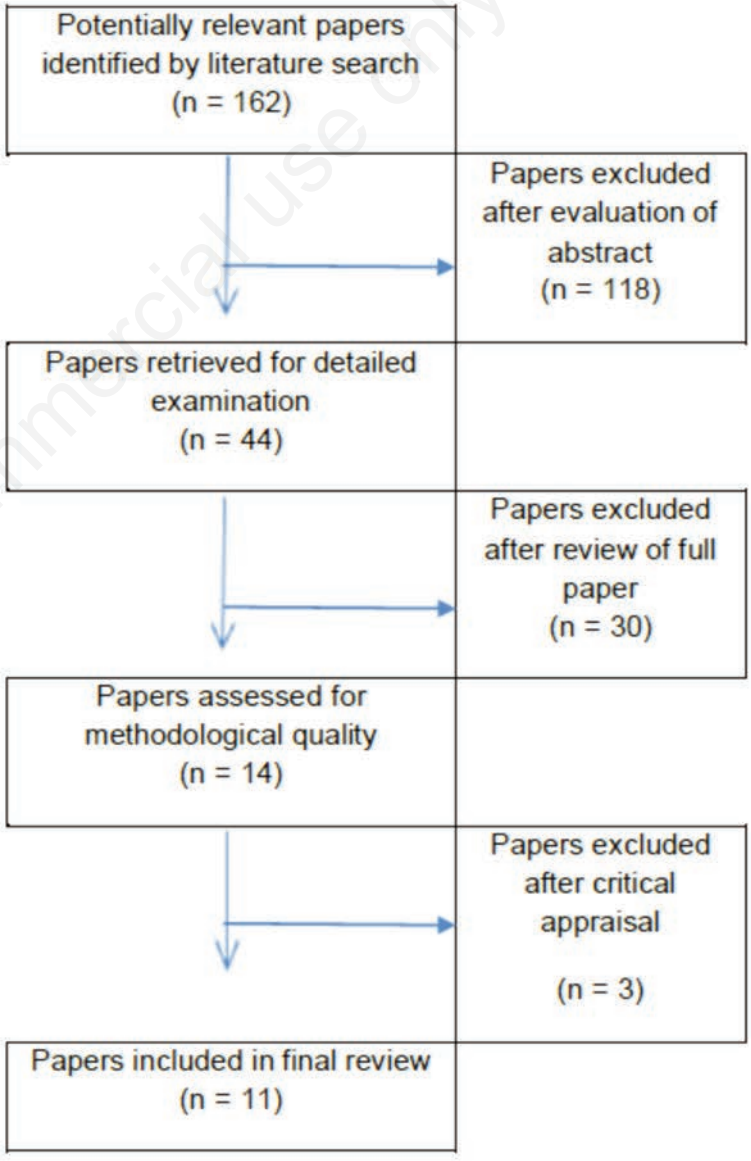


Figure 1. Search outcome.

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be at risk of falls. This could be an important strategy to prevent falls in psychiatric patients.

Discussion

Fall risk assessment tool has been considered an important component of fall prevention. Commonly used tools are: i) the Hendrich risk assessment tool;[32] ii) the Morse fall scale;[33] and iii) the St. Thomas risk assessment tool in falling elderly inpatients (STRATIFY).[34] These fall risk assessment tools are widely accepted and utilized by nurses upon patients' admission to various settings, such as acute or long term care settings, even psychiatric setting. However, the predictive accuracy of assessment scales varies when evaluated in different units with different patient population. Utilization of an assessment tool designed for non-psychiatric patients may incorrectly assess the fall risk of psychiatric inpatients. Unfortunately, this review showed that there is a lack of studies examining fall risk assessment tools specifically used in psychiatric settings. Major limitations, such as the lack of reliability test and complete psychometric properties tests existed, which limited its effectiveness and applicability.

Nevertheless, fall risk assessment tool is not the only vital part of fall prevention. Healthcare professionals are unable to prevent falls based solely on risk assessment tools as there are limitations to every tools. Several systematic reviews of risk assessment tools have shown that none of the tools is accurate enough to identify people at risk of falling due to its relatively low sensitivity and specificity.[23,35] Low sensitivity of the tool may not allow accurate identification of patients who are at high risk of fall, which means the tool has the potential to provide false reassurance to staff that patient is not at risk. Hence, appropriate interventions may not be directed to prevent falls.[12,36] A fall risk assessment tool with a low specificity may have a desensitizing effect on nursing staff as the majority of the patients are classified under high fall risk leading to the over-utilization of resources to prevent falls.[12] Thus, effective fall prevention should focus on routine screening of modifiable risk factors (*e.g.*, poor mobility, confusion, sedative medication or continence problems, *etc.*) and implementing interventions that specifically target these risk factors as opposed to over reliance on the fall risk score derived from a fall risk assessment tool.[36]

In addition, implementation of a universal multi-intervention fall prevention program with the involvement of the multidisciplinary team is important. This typically includes interventions for environmental safety and mobility. Studies that evaluated multi-intervention fall prevention program including close observation by nursing staff,[21] ambulating exercises with involvement of physiotherapist and/or occupational therapist,[21] modification of extrinsic factors, education for both patients and nursing staff,[17] medication profile review by doctors or pharmacists and monitoring of postural blood pressure.[30,31]

In recent years, researchers have attempted to find out if targeted multifactorial interventions, which are tied in with a fall risk assessment tool that identifies patients' risk factors, are effective in reducing fall as compared to the usual universal precautions taken. These tailored multifactorial fall prevention strategies based on the identified risk factors are believed to decrease the magnitude of risk by providing a more holistic approach since higher fall risk is associated with an increased number of risk factors present.[37,38] This is supported by Oliver[36] that systematic identification of common risk factors and routine screening for modifiable risk factors with interventions targeted at each risk factor are more pragmatic and effective for falls prevention in hospitals. Another study concluded that the monitoring of postural blood pressure led to a significant decrease in repeated falls.[31] In fact, the similarity in interventions between 3 studies indicated the importance of monitoring postural blood pressure and having patients' medication profile reviewed by doctors and pharmacist.[17,30,31] This aspect of fall prevention in patients with mental illnesses is important as orthostatic hypotension is the most common adverse autonomic side-effect encountered by patients taking psychotropic drugs.[39] Antipsychotics,[39] antidepressants including tricyclic antidepressants and monoamine oxidase inhibitors can cause orthostatic hypotension.[22,23] Dizziness is one of the complications of orthostatic hypotension. In severe cases, syncope results but this rarely happens.[39,40] Although tolerance towards the

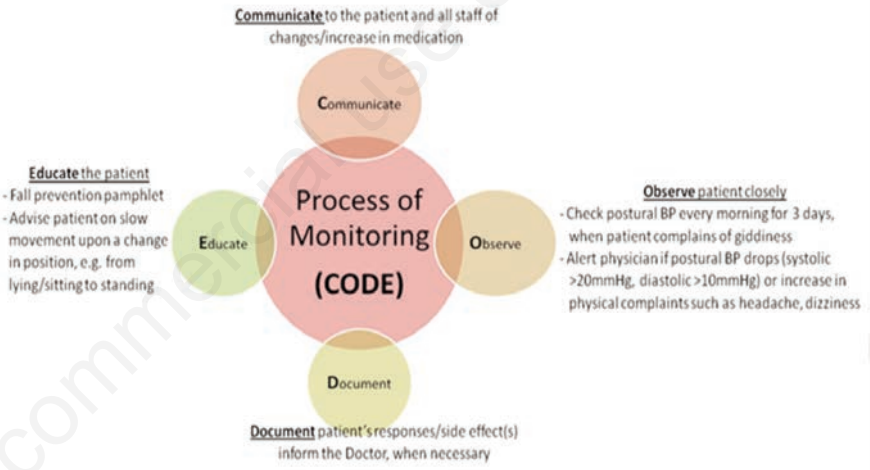


Figure 2. Guide to nursing actions to care for patients at risk of fall.

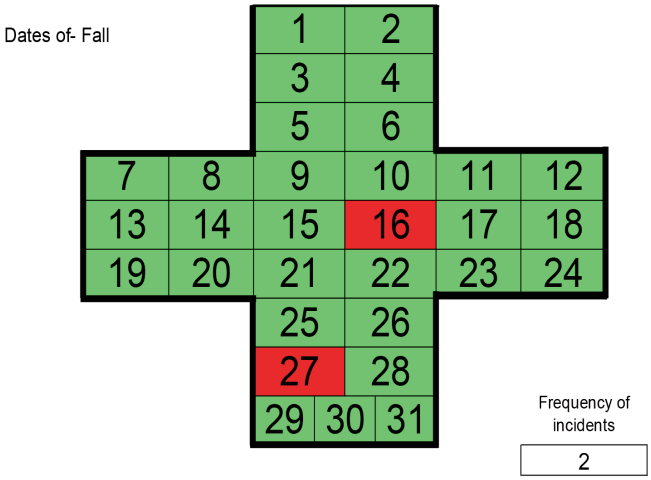


Figure 3. Safety cross.

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hypotensive effects of the drugs usually occurs in most patients, such side effects should always be treated with caution and vigilance as they increase the risk for falls. Thus, monitoring patients' postural blood pressure and having patients' medication profile reviewed by the doctor or pharmacist to avoid medications or combination of medications that may potentially increase the risk of falls is important.

Evidence and recommendations

Two recommendations are proposed based on the findings of the systematic review to be considered in the development of a fall prevention program in a tertiary psychiatric hospital: i) constant observation and identification of side effects of medications, particularly orthostatic hypotension and a review of medication profile by a pharmacist or doctor may be helpful in preventing falls in psychiatric patients; ii) awareness of risk factors commonly associated with falls may aid health care professionals in the identification of psychiatric patients who are at risk for falls. These risk factors include diagnoses of depression, bipolar disorder, and dementia/Alzheimer's disease, altered mental status, physiological symptoms, past history of falls, mobility and gait problems, concurrent medical conditions, polypharmacy, and taking of certain medications such as sedatives, antidepressants and mood stabilizers, particularly lithium. In addition, these can be incorporated into fall risk assessment for psychiatric patients.

Most importantly, this review suggested that all patients are at risk of fall. Hence, universal fall prevention interventions are recommended and beneficial to all patients. In addition, targeted interventions to address identified modifiable fall risk factors and the multidisciplinary approach are the keys to success for falls prevention in hospitals.

Development of care bundles

Evidence from the systematic review, as well as current clinical practices, were considered in the development of care bundles for patients admitted to the wards of a tertiary psychiatric hospital. Since the systematic review suggested for the implementation of universal fall prevention interventions for all patients with targeted interventions to address identified fall risk factors, care bundles were developed to guide the care with universal interventions for all patients and additional interventions for patients on high fall risk and for those who fell while nursed in the wards.

Care bundle for all patients

Universal falls prevention interventions are important to implement in all settings to all patients as falls can happen to any patients in hospitals. In the tertiary psychiatric hospital where the care bundle will be implemented, all patients will be assessed for fall risk upon an incident of fall, at the time of admission, when there is a change in their condition and at the point of transfer. This can be represented by the acronym FACT (F: fall, A: admission, C: change of condition, T: transfer).

Proper assessment of mobility, vision and cognition will be conducted to detect any impairments, which help to identify modifiable risk factors and guide nurses in developing targeted care plans to prevent fall. Patients will be orientated to their surroundings, including the location of bathroom, toilet and lights, and routines of the ward. Simple, but important measures, such as provision of safe environment, properly fitted nonskid footwear, and patient and family education on fall prevention, are part of existing practices and will be included in the care bundle. Medication review will be provided for all patients. Patients on medication with central sedative effects will have to be assessed whether the benefits outweigh the risks of falling.[2,24]

Care bundle for patients with high fall risk

Targeted interventions are instituted to address identified modifiable fall risk factors. A flagging system will be instituted for patients who are assessed to be at risk of fall. This serves to alert all healthcare workers about patient's fall risk status. Patients will be placed near the nurses' station and provided with supervision or assistance in their activities of daily living.

Since the evidence from the systematic review also suggested for the multidisciplinary approach, nurses will collaborate with other disciplinary team members (such as doctors, pharmacist, physiotherapist) and initiate care plans based on identified fall risk factors, such as medication, cognitive impairment, mobility impairment, visual impairment and toileting needs. The acronym CODE (C: communicate, O: observe, D: document, E: educate) (Figure 2) will be adopted to guide nurses to care for patients who are prescribed with medications or combination of medications that may potentially increase the risk of falls. For patients with cognitive impairment due to confusion or dementia, nurses will re-orientate patients to surrounding and alert medical professionals to assess patients for any underlying medical causes. Patients will also be referred to physiotherapist if they are assessed to have gait and mobility problems. Based on the recommendation of the physiotherapist, regular walking exercise or muscle strength training can be conducted to improve patient's condition. Patients will be advised to use walking aids or to call for assistance if needed. As per existing practices, patients' vision will be checked by a simple bedside test such as identification of pen/key at bed length away. If need be, patients will be referred to ophthalmologist for further assessment. Nurses will attend to patient's toilet needs regularly. Last but not least, physical restraint will be considered only as a last resort.

Post-fall care bundle

After a fall, nurses will assess for changes in mental and physical status, and the severity of injury. Nurses will have to inform doctors about the patient's fall, and carry out continuous observation and monitoring of patient's condition to detect any immediate or delayed occurrence of injury. Nurses will also be asked to inspect the environment to identify and rectify any environmental hazards. In addition, a post fall review will be conducted to investigate the reasons for the fall and take actions to reduce the risk of this patient falling again.

A safety cross (Figure 3), adapted from the Institute of Healthcare Improvement, will be displayed in each ward as a clear visual tool to capture the days which falls occur over a month [green: no fall, red: fall(s) occurred]. It makes it easier for ward nurses to know the frequency of falls and to have a clearer picture of the problem in the ward. Root cause analysis will also be carried out to prevent the next fall.

Conclusions

Reducing patients' risk and incidence of falls is fundamental to ensure safe care in the psychiatric setting. The systematic review conducted has provided insight into the evidence relating to the assessment and prevention of falls in patients with mental illnesses. Identifying unique risk factors and tailoring multiple fall prevention interventions to the risk factors is important in the psychiatric setting. Given the complex and multifactorial nature of falls, it is a challenge for any health care professional to achieve zero falls while maintaining patients' privacy, dignity and independence. Hence the multidisciplinary team approach coupled with systematic identification of common risk factors and meaningfully planning interventions targeted at each risk factor can be pragmatic and effective to prevent falls.

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