

## ■ Review article

## Nursing preventive measures against the incidence of delirium in hospitalized patients: a narrative review

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### Abstract

**Background and Purpose:** Delirium is a clinical syndrome with cognitive disorder, which occurs within a short time in the admitted patients, specially the elderly. Regarding the fact that one third of the delirium incidences is preventable, applying nursing preventive measures is an issue of fundamental importance. The present study aimed to perform a systematic review over the nursing preventive measures and their impacts on delirium incidence in the critically ill patients.

**Methods:** This review was conducted on the studies published within early 1999 to late December 2014. The search was performed using the available databases including Google Scholar, Scopus, Science Direct, PubMed, Medline, and Persian databases including Magiran, IranMedex, and SID. The keywords used during the searching process entailed delirium, confusion, non-pharmalogical, multi-component, nursing preventive measures, adult patient, as well as education and nursing measures. A total of 2499 articles were obtained based on the inclusion criteria; however, 19 articles were found to be completely relevant to the topic of interest.

**Results:** The review of the retrieved studies demonstrated that the rate of delirium incidence is different depending on the severity of the disease, applied delirium assessment scales, and causes of hospital stay. A combination of multifactorial interventions including drug administration, preventive care, and modification of risk factors can prevent delirium, reduce the intensity of this medical condition, and decrease the duration of hospital stay.

**Conclusion:** Some measures should be taken in the surgical, elderly, and intensive care units in terms of the prevention and immediate diagnosis of delirium. Since the nursing personnel have the most patient contact, they have a strategic role in preventing and managing this medical condition. Accordingly, it is possible to reduce the delirium incidence and its complications by educating the nurses and spending little expenses.

**Keywords:** Cognitive impairment, Delirium, Nursing measures, Preventive measures

### Introduction

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), delirium is a clinical syndrome associated with impaired consciousness, concentration, and sensory perception, as well as delusions. This mental confusion spreads rapidly within a few hours to several days, and its intensity may fluctuate during the day (1).

Delirium has several symptoms including: 1) impairment of consciousness, which is the most

important symptom of delirium characterized by poor concentration and lack of awareness in terms of the time, place, and identification of other people; 2) attention disorder, which is characterized by distraction and inattention; 3) thought disorder, which entails confusion and disorganized thinking; 4) memory impairment, which causes disturbance in the recording, storing, and recalling that pose problems in learning new contents; 5) perception

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disorder, which includes the incapability to distinguish the reality from fantasy as well as experiencing hallucinations and delusions; 6) psychomotor disorders that is characterized by psychomotor slowness or agitation; 7) emotional disorders, which entail emotional confusion and inability to analyze the surrounding events; 8) sleep disorders including sleep cycle disorders, insomnia, and sleepiness; and 9) mood disorders entailing feeling anxious, irritable, and depressed (2-4).

These patients have self-destructive behaviors and confuse their families and nurses (5). The healthcare cost for this disorder is reported to be 41.8 USD per patient, which is expensive for the health and insurance organizations in comparison to the budget spent for non-delirium patients that is between 13.33 to 27.1 USD (6). In another study, the total cost for each patient was demonstrated to be between 16303 and 64421 USD, leading to a total of 38-152 billion dollars (7).

Delirium has poor prognosis (8). This mental condition has several risks and side effects including: increased mortality, prolonged hospital stay, increased amount and duration of sedative use, more need to mechanical ventilation, prolonged ventilation, higher admission cost, hospital pneumonia, the risk of delirium recurrence, urinary incontinence, impaired cognitive recognition, poor performance up to 12 months post-discharge, falling out of bed, increased nursery activities, risk of dementia, and low quality of life (5, 9-11).

Delirium is divided into hypoactive, hyperactive, and mixed subtypes based on the psychomotor activity level. In the hypoactive delirium, the patients are not aware of the environment, they are sleepy, their speech is slow and incomprehensible, and their psychomotor activities reduce. These patients are not diagnosed with delirium by the doctors and nurses in two thirds of the cases. They are often misdiagnosed with depression. On the other hand, the hyperactive type is more common in the hospital wards. Therefore, the health professionals should care about the prevention and recognition of this type during the patient care.

The mixed type is ascribed to a condition when the patient alternatively experiences the symptoms

of hypoactive and hyperactive delirium. This type has been reported to have the highest incidence rate. According to the literature, the incidence rates of the mixed, hypoactive, and hyperactive types are 54.9%, 43.5%, and 1.16%, respectively (8, 12, 13). The hyperactive delirium is associated with increased agitation, confusion, movement disorder, delusions, and inappropriate behaviors. Therefore, this type is easily recognizable due to its obvious cognitive and behavioral symptoms. On the contrary, the recognition of the hypoactive and mixed delirium is difficult without having knowledge about the symptoms and using standard tools (1).

Elderly patients admitted to the surgical and intensive care units should be assessed using standard tools such as Mini Mental State Examination (MMSE), Confusion Assessment Method Intensive Care Unit, (CAM-ICU), Delirium Observation Screening (DOS) Scale, and Neelon and Champagne (NEECHAM). Confusion Scale. Since the nursing personnel have the most patient contact, they are aware of the patients' behavioral, consciousness, and emotional changes. Regarding this, (NEECHAM). the nurses can play a significant role in preventing this mental state by applying proper management and taking preventive care measurements (4,14).

The causes of the delirium incidence are serious illness, dementia, aging, male sex, cancer, heart disease, respiratory disorders, brain and spinal cord disorders, malnutrition, burning, urinary infection, metabolic disorders, thyroid disorders, electrolyte imbalance, constipation, traumas, admission to the intensive care unit, thoracotomy, unfavorable social records, and taking some medications, especially anticholinergics, tricyclic antidepressants, antiparkinson, narcotics, analgesics, steroids, and benzodiazepines (11, 15).

The physical environment around the patient is recognized as an influential factor in the initiation of delirium. Precipitating factors for delirium are sleep disturbance, patient care by multiple staff, patient discomfort, dehydration, physical limitations, inactivity, lack of observing privacy policy, unknown environment, impaired vision and hearing, pain, different types of catheters attached to the patient, and isolation (7, 16). Other factors, which intensify this medical condition in the hospital

wards are ongoing changes in the patients, sensory deprivation, low education, stroke, atrial fibrillation rhythm, anemia, hypoxia, increased potassium, and uric acid (5, 14).

Early prevention and treatment of delirium is of high importance because one third of deliriums are preventable (2). Nowadays, preventive measures for the patients at the risk of delirium are poorly administered in the hospitals (7). Nursing preventive measures can play a vital role in reducing the incidence of delirium as well as early detection and treatment of this condition (5, 10). The present study aimed to identify the nursing preventive measures and investigate their impacts on delirium incidence in the emergency, surgical, internal, elderly, and intensive care units for the critically ill patients.

## Materials and Methods

In this review, the search was performed using such key terms as delirium, confusion, non-pharmacological, multi component, prevention nursing, effect, adult patient, and education. These keywords were selected based on those of the previous studies. These terms were searched in the international databases including Google Scholar, Scopus, Science Direct, PubMed, Medline, and Persian databases including Magiran, IranMedex, and SID.

The inclusion criteria entailed: 1) written in English and Persian, 2) the use of preventive nursing interventions by nurses, 3) availability in full text, 4) no use of pharmacological interventions either solely or with nursing preventive measures. A total of 2499 articles were retrieved, which were published from early 1990 to December 2014. However, after evaluation, only 32 articles were found to be related to the topic of interest. Following a secondary screening, 19 articles were identified to cover such issues as nursing preventive measures for delirium and nursing staff training in this regard; as a result, they were included in this review.

## Results

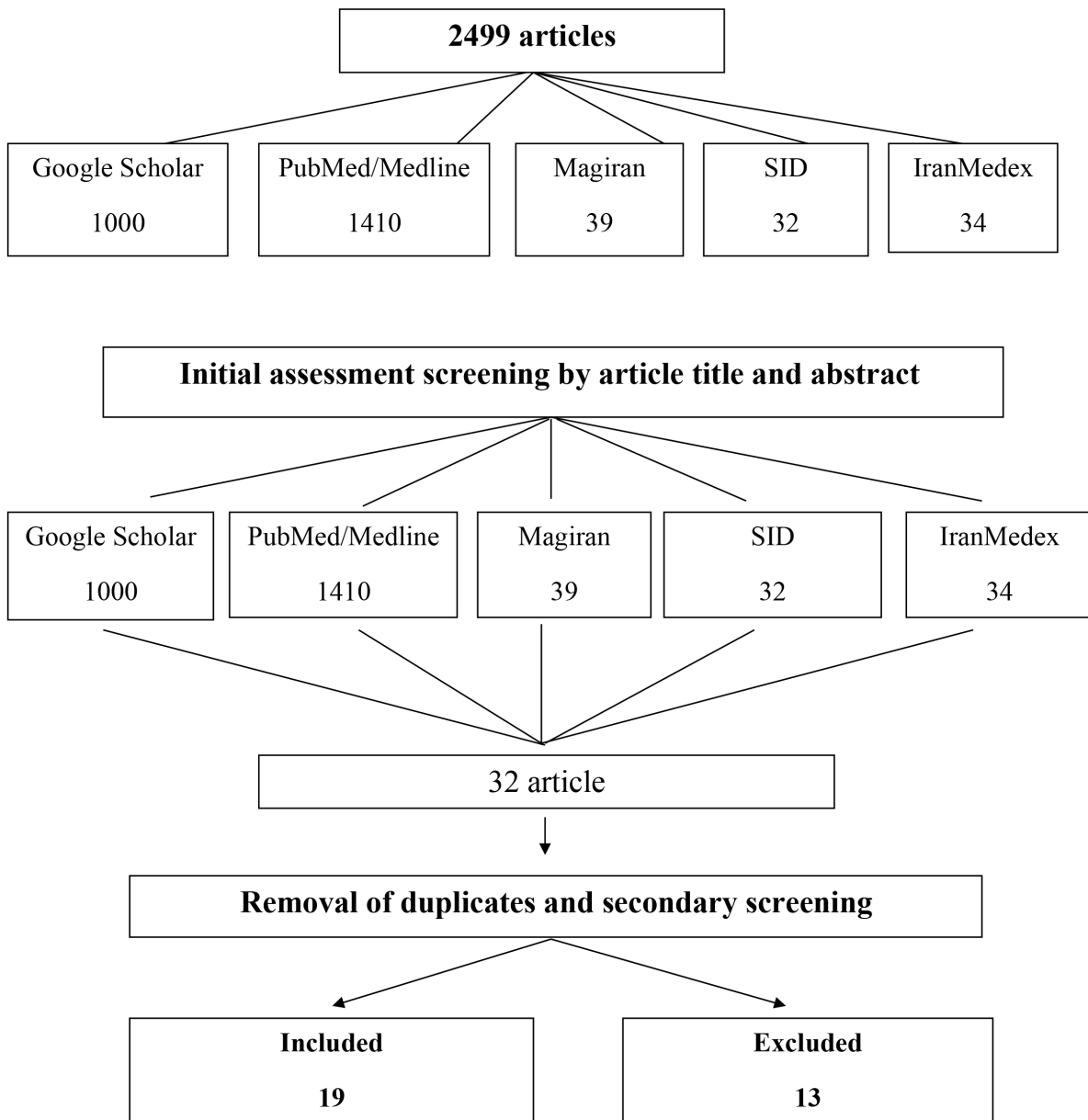
Delirium is potentially a preventable medical

condition. Nurses should take care of the patients using preventive interventions in different wards of hospital. They should prevent the abnormal physiological and environmental factors, which are related to delirium (17). Since the nurses have frequent contacts with the patients, they are more likely to see the patients' cognitive and behavioral changes; as a result, they can prevent delirium if they have a little knowledge in this regard (7, 18).

The delirium prevention programs are not administered properly. Delivering the same and repetitive care services as well as lack of a purposive protocol in removing the sensory deprivation in the health care organizations unintentionally leads to the increase of delirium incidence in the elderly people. Unfamiliar environments and unknown care, together with several stimulant factors, cause delirium to happen quickly. The policies of correcting the risky factors and performing the delirium prevention care plan cause early patient discharge and accelerate the rehabilitation process.

A combination of multifactor interventions including nursing care and environmental variations can prevent this mental state and reduce its intensity and duration (5). Regarding this, a collective effort is needed for the implementation of prevention protocol and delirium management. There is increasing evidence showing that we can prevent delirium using non-pharmacological interventions as well as educational and non-educational techniques (19). The preventive interventions are much more effective than those performed after the delirium incidence.

The impacts of the pharmaceutical and non-pharmaceutical interventions would be low if they are administered after the incidence of this condition since it spreads very fast. According to the literature, 50% of the delirium incidence occurs during the hospital stay due to inadequate care or hospital complications, which can be prevented. The management of the preventive nursing care reduces the risk of delirium incidence (13-19%) (20). As one third of the deliriums are preventable, scholars try to recognize the risk factors for this mental state in order to prevent them from happening (21).



**Figure 1.** A Literature search algorithm 1999-2014

Nurses play an important role in the management of delirium (5, 22).

Inouye et al. identified the quiet environment, higher patient's physical activity, and regular rest as effective factors reducing the delirium incidence. Walzer et al. decreased the incidence of this medical condition by reducing the duration of intubation and preventing sleep

and sensory deprivations (23). Other studies proposed some other preventive strategies such as drug consumption or taking behavioral and environmental measures (24, 25).

The results in the studies mentioned above suggest that the multisectional interventions including education, guidance, changes, and regulatory issues in common care can reduce the

**Table 1.** A summary of the characteristics of the included articles

Authors and year of publication	Title	Methods	Study type/design	Main findings
Lundstrom et al. 1999	Reorganization of nursing and medical care to reduce the incidence of postoperative delirium and improve rehabilitation outcome in elderly patients treated for femoral neck fractures	Implementing a training program for the nurses about the proper nutrition, improvement of surrounding environment, prevention of risk factors, and the problems associated with delirium for two weeks	A prospective cohort study	The rate of delirium incidence at the beginning of the study was 30.6%. However, this rate decreased to 16% one week after the intervention.
Bogardus et al. 1999	A multicomponent intervention to prevent delirium in the hospitalized older patients. <i>New England Journal of Medicine</i>	Holding a program about sleep improvement and proper exercises three times a day, use of audiovisual aids, intake of fluids if needed, and appropriate light	A clinical trial, in which the patients were randomly divided into two intervention and control groups	The results showed that these measures had no impact on the incidence or intensity of delirium (9.9% and 15% in the intervention and control groups, respectively). However, there was a significant difference between the two groups regarding the delirium duration ( $P=0.02$ ).
Brymer et al. 2001	The effect of a geriatric education program on emergency nurses (CE)	A one-day workshop for elderly about prevention, recognition, and management of delirium in the elderly	A prospective cohort study	The rate of delirium incidence was considerably reduced ( $P<0.01$ )
Inouye et al. 2001	Multicomponent targeted intervention to prevent delirium in hospitalized older patients	Increasing the of quality of life by removing excess noise, giving a back massage to the patients, drinking lukewarm milk at bedtime and balanced liquids, giving emotional support, and daily awareness of the surrounding environment	A clinical trial in which the patients were randomly divided into two intervention and control groups	The incidence of delirium in the intervention and control groups were 9.9% and 34%, respectively. As a result, there was a significant difference between the two groups in this regard.
Milisen et al. 2001	A Nurse-Led Interdisciplinary Intervention Program for Delirium in Elderly Hip-Fracture Patients	Educating the nurses in terms of evaluating cognitive disorders and consultation with the Department of Psychiatry and Pain Control	A prospective cohort study in which the patients were sequentially enrolled in the intervention and control groups	The results showed no significant difference in terms of the incidence of delirium in each group ( $P=0.82$ ). Nevertheless, the hospital stay duration ( $P=0.03$ ) and delirium intensity ( $P=0.049$ ) significantly reduced.
Marcantonio et al. 2001	Reducing delirium after hip fracture: a randomized trial	Controlling the blood oxygen levels and pain, preventing from dehydration and constipation, minimizing the use of catheters, reducing the environmental stimuli, and managing enough nutrition	A clinical trial in which the patients were randomly divided into two intervention and control groups	The rates of delirium incidence were 50% and 32% in the control and intervention groups, respectively, indicating a significant reduction ( $P=0.04$ ). However, no significant difference was observed between the two groups regarding the duration of hospital stay.
Tabet et al. 2005	An educational intervention can prevent delirium on acute medical wards	Implementing workshop for nurses about recognition, prevention, and treatment of delirium	A case-control study in which the patients were randomly divided into two intervention and control groups	The intervention caused a more significant reduction in the incidence of delirium in the intervention group (9.8%) in comparison to that in the control group (19.5%) ( $P<0.05$ ).
Naughton et al. 2005	A multifactorial intervention to reduce prevalence of delirium and shorten hospital length of stay	Training classes about improving the patients' nutritional status and sleep, increasing family visiting time, occupational therapy, and increasing patients' awareness of time and place	A prospective cohort study, which was conducted in three groups	The rate of delirium incidence and duration of hospital stay were 40.9% and 11.5 days in the baseline group, respectively. These rates were 22.7% and 19.1% in the four-month and nine-month groups ( $P<0.002$ , $P<0.001$ , respectively). The duration of hospital stay in these two groups was 8.2 days, which showed a significant difference, compared to that of the beginning of the study.
Hudson et al. 2006	Male gender influences response to an educational package for delirium prevention among older people	Training classes using one-hour lectures, forming small groups, and holding discussions about the prevention and early recognition of delirium, providing clinical guidelines concerning the prevention of delirium, and follow-up training sessions	A clinical trial in which the patients were randomly divided into two intervention and control groups	The results showed a significant reduction in the incident of delirium in the males ( $P=0.030$ ). However, no significant difference was observed between the females of the two groups.

## Continuous of Table 1.

Lundström et al. 2007	Postoperative delirium in old patients with femoral neck fracture: a randomized intervention study	A 4-day educational intervention for the nurses about evaluation, prevention, and treatment methods for delirium as well as planning for individual and team care for these patients	A clinical trial in which the patients were randomly divided into two intervention and control groups	The results showed a significant reduction in the delirium incidence in the intervention group (18%) in comparison to that in the control group (52%) ( $P < 0.01$ ). Furthermore, there was a reduction in the duration of hospital stay ( $P = 0.028$ ).
Robinson et al. 2008	Postoperative delirium in the elderly: diagnosis and management	Training classes about the recognition, prevention, and management of delirium as well as providing clinical and environmental guidelines about the prevention of delirium	A prospective cohort study	The rate of incidence of delirium was 37.5% at the beginning of the study, and it significantly reduced to 13.8% at the end of the study.
Nazeri et al. 2008	The impact of multipart intervention on prevention of delirium in Open heart surgery patients	Implementing the following interventions two days after the surgery: 1. Daily reorientation once for all patients and three times for patients at the risk of delirium 2. Planning for proper sleep such as removing excess noises and reduction of light 3. Appropriate movement three times a day 4. The use of hearing aids and glasses 5. Assisting patients for proper nutrition and receiving enough liquid	A randomized case-control study in which the patients were sequentially enrolled in the intervention and control groups	There was a significant reduction in the average number of risk factors in the intervention group (i.e., lack of sleep, dehydration, visual and hearing disorders, and inactivity) ( $P < 0.007$ ). Nevertheless, there was no significant difference in the rate of delirium incidence ( $P < 0.144$ ).
Beiranvand et al. 2008	The impact of music on the incidence of delirium in Hip surgery of elderly	Playing Bach music a day before surgery and five days post-surgery three times a day for 20 min	A quasi-experimental study in which the patients were randomly divided into two intervention and control groups	Average cognitive scores in the intervention group showed a significant increase ( $P = 0.018$ ), which indicated that the prevention of delirium was the most effective method.
Benedict L. et al. 2009	Prevention, detection and intervention with delirium in an acute care hospital: a feasibility study	Training one-day classes for nurses about the Neelon and Champagne Confusion Scale, introducing the preventive interventions for delirium, giving manuals to the personnel, and educating the patient's families	A clinical trial in which the patients were randomly divided into two intervention and control groups	There was no significant difference in terms of delirium incidence, duration of hospital stay, performance after discharge, and returning to daily activities in both groups ( $P = 0.368$ ).
Vidán et al.	An intervention integrated into daily clinical practice reduces the incidence of delirium during hospitalization in elderly patients	Training classes about the evaluation of the patients and teaching preventive measures (i.e., reawareness, enough hydration, proper movement, and appropriate nutrition)	A clinical trial in which the patients were randomly divided into two intervention and control groups	The results showed a significant difference in the rate of delirium incidence in the intervention group ( $P = 0.04$ ). However, there was no significant difference regarding the duration of hospital stay and patients' performance level.
Pretto M. et al. 2009	Effects of an interdisciplinary nurse-led Delirium Prevention and Management Program (DPMP) on nursing workload	A one-day training class for the nurses about the diagnosis of delirium and its risk factors and prevention	A prospective cohort study	The rates of delirium incidence were 29.3% and 22% at the beginning and end of the study, revealing a significant difference. Additionally, the workload of the nurses in the trauma unit significantly reduced ( $P = 0.004$ ).
Khalifezadeh A. et al. 2011	Reviewing the effect of nursing interventions on delirious patients admitted to intensive care unit of neurosurgery ward	Using nursing interventions such as emotional support for the patients, improvement of nurse-patient relationship, raise the patients' awareness, and regular planned meeting with families	A clinical trial in which the patients were randomly divided into two intervention and control groups	The results showed a considerable difference in the number of the patients with delirium in the intervention (15%) and control (60%) groups ( $P < 0.001$ ).
Martinez F.T. et al. 2012	Preventing delirium in an acute hospital using a non-pharmacological intervention	Installation of clock and calendar in the patient room, providing hearing aids and glasses, extension of visiting time for the patients, preparing familiar objects, and awaring the patient of the place and time	A clinical trial in which the patients were randomly divided into two intervention and control groups	The rates of delirium incidence were 5.6% and 13.3% in the intervention and control groups, respectively, showing a significant difference between the two groups in this regard.
Rahimi A. et al. 2013	Effectiveness of nursing interventions on incidence of delirium in patients hospitalized to intensive cardiac care units	Using nursing measures such as patient's favorite music and radio show three times a day and Establishing constructive interaction between patient and nurse	A clinical trial in which the patients were randomly divided into two intervention and control groups	There was no difference in terms of the delirium incidence in both groups ( $P = 0.315$ ). Furthermore, the average of cognition total score increased significantly ( $P = 0.003$ ).

duration of delirium and hospital stay as well as the mortality among the patients suffering from this mental state. Furthermore, according to the findings of the retrieved articles, the nurses' awareness of the risk factors for delirium leads to the prevention of this medical condition (26-33, 24, 34).

Additionally, in the studies conducted by Biranvand et al., Rahimi et al., and Lundström et al. (35-37), the mono-sectional interventions such as the use of music did not lead to effective improvements in the treatment of the patients with delirium (37). Furthermore, in the reviewed studies administering educational interventions for an hour or less, no prevention was reported in the admitted patients with delirium (38-40, 24).

## Discussion

According to the retrieved articles, not wearing eye glasses or watches, physical limitations, and absence of friends or relatives with the patients have effective roles in the occurrence of delirium (41, 42). Each Nursing of preventing measures has different effects and characteristics on the prevention of this mental state. Some of these preventive measures performable for the patients include fixing the clocks and calendars in front of the patients, making the patients aware of the place and time they are in and the events around them, visiting friends and relatives, listening to music and favorite radio programs, preventing dehydration, persuading the patients to move, helping them do their personal activities, planning for comfortable sleep, managing patients' pain and discomfort, preventing constipation, avoiding any changes in the environment around the patients, speaking to patients with various cultures in their native languages and dialects, minimizing the use of catheters, providing cognitive activities and movements compatible with each patient, and covering or hiding the catheters and equipment connected to the patients (2, 4, 5, 12).

The prevention and management of delirium have been poorly attended to in the health care systems despite the fact that this mental state will be more

prevalent in the future due to the aging of the society (23, 42, 43). Different studies demonstrated that using the preventive programs and reforming risk factors as clinical strategies can reduce the incidence of delirium (2, 5).

The discrepancies in the incidence rate of delirium reported in the mentioned studies can be due to the differences in the types of patients, intervention methods, delirium assessment scales, the patients' reception either as emergency or as elective, and their mean age. A review of the retrieved articles demonstrated that the rate of delirium incidence is different depending on the illness intensity, delirium assessment scales, and the causes of hospital stay (44). The prevalence rates of delirium were 14-60%, 15-8%, 5-10%, 70% ≥, and 40-50% in the surgery patients, general wards, emergency department, patients over 65 years of age in the Intensive Care Unit, and those required long time health care (2).

## Conclusion

Investigating the prevalence of delirium incidence among the admitted patients in different wards of hospital is a necessary issue. Regarding this, designing efficient systems to meet the basic needs is essential. Some processes should be administered in the routine care of the surgery, elderly, and intensive care units in terms of the prevention, intervention, and on time recognition of delirium.

Further studies are needed to focus on inducing changes in the health system, planning a strategy for the implementation of nursing preventive measures, and evaluating the related frameworks. As mentioned before, a staff educational strategy aiming at increasing the knowledge and awareness of delirium should be considered at all levels of health care. Furthermore, delirium management and prevention should be part of the educational curricula of medical and nursing students.

The nursing preventive measures, applied in different hospital wards and for patients with different conditions, is of high importance, especially in the Intensive Care Unit due to the critical conditions of the patients. According to the

frequent contacts of the nursing staff with patients, nurses have strategic roles in preventing and managing the patients with delirium. Accordingly, it is possible to reduce the delirium incidence and its complications by educating the nurses and spending little expenses.

The results reported in the present study can be helpful in educating different hospital staff, especially those working in the intensive care, surgery, internal medicine, orthopaedic, and elderly units. These kinds of trainings can reduce the delirium complications when used in the patient care and improve the quality of health care.

Performing studies on the challenges of nursing care in the medical centers facilitates the improvement of nurses' knowledge in this regard. The results of each study are the starting points for the future studies. Therefore, the findings of the present study can be helpful for performing other studies on the improvement of patient care in hospital wards. The weaknesses of the present study included the restriction of searching in only English and Persian and the uncertainty over the impact of each of the preventive measures on the delirium incidence.

### Conflicts of interest

The authors of the current study declare no conflicts of interest.

### Authors' contributions

All the authors equally contributed to the writing of the scientific proposal, data collection, and manuscript drafting. The final manuscript was also reviewed and approved by all the authors.

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### References

1. Kaplan RS, Atkinson AA. Advanced management accounting. New Delhi: PHI Learning; 2015.
2. Tropea J, Slee JA, Brand CA, Gray L, Snell T. Clinical practice guidelines for the management of delirium in older people in Australia. *Australas J Ageing* 2008; 27(3):150-6.
3. Michaud L, Büla C, Berney A, Camus V, Voellinger R, Stiefel F, et al. Delirium: guidelines for general hospitals. *J Psychosom Res* 2007; 62(3):371-83.
4. Young J, Murthy L, Westby M, Akunne A, O'Mahony R. Diagnosis prevention and management of delirium: summary of NICE guidance. *BMJ* 2010; 341:c3704.
5. Balas MC, Rice M, Chaperon C, Smith H, Disbot M, Fuchs B. Management of delirium in critically ill older adults. *Crit Care Nurse* 2012; 32(4):15-26.
6. Pun BT, Ely EW. The importance of diagnosing and managing ICU delirium. *Chest* 2007; 132(2):624-36.
7. Thomas E, Smith J, Forrester AD, Heider G, Jadotte YT, Holly C. The effectiveness of non-pharmacological multi-component interventions for the prevention of delirium in non-intensive care unit older adult hospitalized patients: a systematic review protocol. *JBI Database Sys Rev Implement Rep* 2013; 11(7):361-74.
8. Sadock BJ, Kaplan HI, Sadock VA. Kaplan & Sadock's synopsis of psychiatry: behavioral sciences/clinical psychiatry. Philadelphia: Lippincott Williams & Wilkins; 2007.
9. Devlin JW, Fong JJ, Howard EP, Skrobik Y, McCoy N, Yasuda C, et al. Assessment of delirium in the intensive care unit: nursing practices and perceptions. *Am J Crit Care* 2008; 17(6):555-65.
10. Leslie DL, Marcantonio ER, Zhang Y, Leo-Summers L, Inouye SK. One-year health care costs associated with delirium in the elderly population. *Arch Intern Med* 2008; 168(1):27-32.
11. Schofield I, Tolson D, Fleming V. How nurses understand and care for older people with delirium in the acute hospital: a critical discourse analysis. *Nurs Inq* 2012; 19(2):165-76.
12. Potter J, George J. The prevention, diagnosis and management of delirium in older people: concise guidelines. *Clin Med* 2006; 6(3):303-8.
13. Foreman MD, Milisen K. Improving recognition of delirium in the elderly. *Prim Psychiatry* 2004; 11(11):46-50.



14. Jannati Y, Sohrabi M, Bagheri-Nesami M. Delirium and its diagnostic tools: a new approach to nursing. *J Clin Excell* 2013; 1(2):85-96.
15. Schofield I. Delirium: challenges for clinical governance. *J Nurs Manag* 2008; 16(2):127-33.
16. Miller MO. Evaluation and management of delirium in hospitalized older patients. *Am Fam Physician* 2008; 78(11):1265-70.
17. Saczynski JS, Marcantonio ER, Quach L, Fong TG, Gross A, Inouye SK, et al. Cognitive trajectories after postoperative delirium. *N Engl J Med* 2012; 367(1):30-9.
18. Cole MG, Ciampi A, Belzile E, Zhong L. Persistent delirium in older hospital patients: a systematic review of frequency and prognosis. *Age Ageing* 2009; 38(1):19-26.
19. Tabet N, Howard R. Non-pharmacological interventions in the prevention of delirium. *Age Ageing* 2009; 38(4):374-9.
20. Wand APF. Evaluating the effectiveness of educational interventions to prevent delirium. *Australas J Ageing* 2011; 30(4):175-85.
21. Pretto M, Spirig R, Milisen K, Degeest S, Regazzoni P, Hasemann W. Effects of an interdisciplinary nurse-led Delirium Prevention and Management Program (DPMP) on nursing workload: a pilot study. *Int J Nurs Stud* 2009; 46(6):804-12.
22. Pandharipande P, Banerjee A, McGrane S, Ely EW. Liberation and animation for ventilated ICU patients: the ABCDE bundle for the back-end of critical care. *Crit Care* 2010; 14(3):157.
23. Allegri G, Costa CV, Bertazzo A. Recent advances in tryptophan research: tryptophan and serotonin pathways. Berlin, Germany: Springer Science & Business Media; 2012. P. 393-8.
24. Martinez FT, Tobar C, Beddings CI, Vallejo G, Fuentes P. Preventing delirium in an acute hospital using a non-pharmacological intervention. *Age Ageing* 2012; 41(5):629-34.
25. Yang FM, Inouye SK, Fearing MA, Kiely DK, Marcantonio ER, Jones RN. Participation in activity and risk for incident delirium. *J Am Geriatr Soc* 2008; 56(8):1479-84.
26. Inouye SK, Bogardus Jr ST, Charpentier PA, Leo-Summers L, Acampora D, Holford TR, et al. A multicomponent intervention to prevent delirium in hospitalized older patients. *N Engl J Med* 1999; 340(9):669-76.
27. Brymer C, Cavanagh P, Denomy E, Wells K, Cook C. The effect of a geriatric education program on emergency nurses (CE). *J Emerg Nurs* 2001; 27(1):27-32.
28. Marcantonio ER, Flacker JM, Wright RJ, Resnick NM. Reducing delirium after hip fracture: a randomized trial. *J Am Geriatr Soc* 2001; 49(5):516-22.
29. Tabet N, Hudson S, Sweeney V, Sauer J, Bryant C, Macdonald A, et al. An educational intervention can prevent delirium on acute medical wards. *Age Ageing* 2005; 34(2):152-6.
30. Naughton BJ, Saltzman S, Ramadan F, Chadha N, Priore R, Mylotte JM. A multifactorial intervention to reduce prevalence of delirium and shorten hospital length of stay. *J Am Geriatr Soc* 2005; 53(1):18-23.
31. Lundström M, Olofsson B, Stenvall M, Karlsson S, Nyberg L, Englund U, et al. Postoperative delirium in old patients with femoral neck fracture: a randomized intervention study. *Aging Clin Exp Res* 2007; 19(3):178-86.
32. Robinson TN, Eiseman B. Postoperative delirium in the elderly: diagnosis and management. *Clin Interv Aging* 2008; 3(2):351-5.
33. Khalifezadeh A, Safazadeh S, Mehrabi T, Mansour BA. Reviewing the effect of nursing interventions on delirious patients admitted to intensive care unit of neurosurgery ward in Al-Zahra Hospital, Isfahan University of Medical Sciences. *Iran J Nurs Midwifery Res* 2011; 16(1):106-12.
34. Inouye SK, Foreman MD, Mion LC, Katz KH, Cooney Jr LM. Nurses' recognition of delirium and its symptoms: comparison of nurse and researcher ratings. *Arch Intern Med* 2001; 161(20):2467-73.
35. Biranvand A, Fallahi M, Ashayeri H, Rahgozar M. The effect of music on post operative delirium in elder women undergoing hip surgery hospitalized in orthopaedic ward. *Yafte* 2007; 9(2):55-62 (Persian).
36. Kalani Z, Tavangar H, Rahimi A. Effectiveness of nursing interventions on incidence of delirium in patients hospitalized to intensive cardiac care units, Shiraz hospitals, 2012. *Med Surg Nurs J* 2013; 2(3-4):93-100.
37. Lundström M, Edlund A, Karlsson S, Brännström B, Bucht G, Gustafson Y. A multifactorial intervention program reduces the duration of delirium, length of hospitalization, and mortality in delirious patients. *J Am Geriatr Soc* 2005; 53(4):622-8.
38. Milisen K, Foreman MD, Abraham IL, De Geest S, Godderis J, Vandermeulen E, et al. A nurse-led interdisciplinary intervention program for delirium in elderly hip-fracture patients. *J Am Geriatr Soc* 2001; 49(5):523-32.
39. Tabet N, Stewart R, Hudson S, Sweeney V, Sauer J, Bryant C, et al. Male gender influences response to an educational

- package for delirium prevention among older people: a stratified analysis. *Int J Geriatr Psychiatry* 2006; 21(5):493-7.
40. Benedict L, Hazelett S, Fleming E, Ludwick R, Anthony M, Fosnight S, et al. Prevention, detection and intervention with delirium in an acute care hospital: a feasibility study. *Int J Older People Nurs* 2009; 4(3):194-202.
41. Rudolph JL, Inouye SK, Jones RN, Yang FM, Fong TG, Levkoff SE, et al. Delirium: an independent predictor of functional decline after cardiac surgery. *J Am Geriatr Soc* 2010; 58(4):643-9.
42. Young J, Leentjens AF, George J, Olofsson B, Gustafson Y. Systematic approaches to the prevention and management of patients with delirium. *J Psychosom Res* 2008; 65(3):267-72.
43. Fricchione GL, Nejad SH, Esses JA, Cummings Jr TJ, Querques J, Cassem NH, et al. Postoperative delirium. *Am J Psychiatry* 2008; 165(7):803-12.
44. Koster S, Hensens AG, Oosterveld FG, Wijma A, van der Palen J. The delirium observation screening scale recognizes delirium early after cardiac surgery. *Eur J Cardiovasc Nurs* 2009; 8(4):309-14.