Preventive Intervention to Prevent Delirium in Patients Hospitalized in Intensive Care Unit

Padideh Ghaeli¹, Fatemeh Shahhatami², Mojtaba Mojtahed Zade¹, Mostafa Mohammadi³, Mohammad Arbabi⁴

Abstract

Objective: Delirium is a clinical syndrome associated with multiple short- and long-term complications; therefore, prevention is an essential part of its management. This study was conducted to review the effective non-pharmacological interventions that can reduce the incidence or duration of delirium in critically ill patients.

Method: A search was made in PubMed, Scopus, Psych INFO and Google Scholar databases without any time constraints. The information available was collected and sorted, and a secondary study of narrative review was done. The views of specialists on this topic were received via email and included in the texts and recommendations.

Discussion: Delirium is a common, costly and potentially damaging illness in patients who are staying in hospitals, especially older patients in ICU. Thus, preventing delirium could be one of the most effective methods in preventing the complications. The present study aimed at conducting a review-validity study to generate a general view on the activities which might be effective in preventing delirium in patients.

Key words: Complication, Delirium, Intensive Care Unit, Non-Pharmacological, Prevention

Delirium is a disorder characterized by acute brain dysfunction that occurs frequently in patients who are admitted to acute care hospitals (1). Delirium is defined in Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) (2) as a global disturbance of consciousness characterized by fluctuating mental status, inattention, and disorganized thinking, which develops over a short period of time and tends to fluctuate throughout the day. Critically ill patients have an increased risk of developing delirium during their hospital stay. This often results from sepsis and disturbances in inflammation and coagulation pathways leading to microvascular thrombosis (3).

In addition, critical illness disrupts circadian rhythm and sleep patterns; moreover, along with sedatives such as benzodiazepines that are commonly used to treat delirium in septic patients, can impair immunity and contribute to delirium (4, 5).

The overall incidence of delirium in patients in critical care is reported to be about 30%, but it is 60% to-80% in sedated ventilated patients, excluding those admitted after major elective surgery (6-8). A point prevalence study of 497 patients in ICU in 11 countries showed that 68% of patients were either over sedated or had delirium (9).

The high occurrence rate of delirium among hospitalized patients and its consequences have made it a serious health concern.

1. Department of Clinical Pharmacy, School of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran.
2. School of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran.
3. Director of Intensive Care Section, Imam Khomeini Hospital, Tehran University of Medical Sciences, Tehran, Iran.
4. Director of Neuropsychiatry Section of Iranian Psychiatry Association, Roozbeh Hospital, Tehran University of Medical Sciences, Tehran, Iran.

*Corresponding Author:
Address: Director of Neuropsychiatry Section of Iranian Psychiatry Association Roozbeh Hospital, Tehran University of Medical Sciences, Post Code: 1333795914, Tehran, Iran.
Tel: 98-2155412222, Fax: 98-2155419113, Email: marbabid@gmail.com

Article Information:
Received Date: 2017/01/28, Revised Date: 2018/03/06, Accepted Date: 2018/03/22
Among patients requiring admission to an ICU, delirium is associated with an increased length of hospital stay, increased costs and complication rates (6, 10-14). Although causality between delirium and mortality is not established, critically ill patients who develop delirium are up to 3 times more likely to die within 6 months than those who do not (6), with each additional day of delirium being associated with a 10% increase in the risk of death (11). Importantly, in mechanically ventilated patients, delirium might be associated with long-term cognitive impairment (15).

To date, there has been no evidence to support this idea that pharmacological interventions can prevent delirium. However, several non-pharmacological intervention studies have been shown to be effective. Hence, preventing delirium is the most effective strategy to reduce its frequency and complications (16). In this article, a review of some of the evidence will be sought from published data in relation to non-pharmacological interventions.

Materials and Methods
This search was made in PubMed, Scopus, Psych INFO, and Google Scholar databases without any time constraints. The information available was collected and sorted, and a secondary study of narrative review was conducted. The views of specialists on this topic were received via email and were included in the texts and recommendations. The recommendations were scored as follows: systematic review of randomized clinical trials (RCT8), IA score, the RCT study (IB), systematic review of cohort (2B), cohort studies (2B), systematic review of case control (3A), case control (3B), systematic review of case series (4A), the case series or cross section studies (4B) and other studies (5).

Preventive Measures
Preventing delirium means using methods that can effectively decrease the risk of delirium incidents and ultimately, cause improvement in clinical outcomes in geriatric patients who show risk factors that may serve as the basis for delirium manifestation. To date, few clinical studies have been published on preventing delirium; nevertheless, they have already indicated that around 30% to 40% of delirium episodes are preventable (17-19).

Paying attention to risk factors that make grounds for delirium manifestation in individuals exposed to increasing risk of delirium (such as old patients) could prevent delirium incidence and could ultimately improve the clinical outcomes of these patients (19-21). Immobility, using physical constraints, using bowel catheter, malnutrition, psychedelics, some types of drugs, associated diseases, and dehydration in the individual can cause delirium symptoms (22). Old age, severe illness, dementia, physical frailty, infection and/or dehydration, vision impairments, drug interference caused by polypharmacy, surgery, and excessive use of alcohol are among other risk factors for delirium (23-26). The core of studying the non-pharmacological interventions in preventing delirium is based on identification, followed by managing the precipitating factors and/or delirium risk factors.

One of the most well-known studies on preventing delirium is the study of Inouye et al, also known as Yale Trial (18). In fact, Yale Clinical Trial was the first controlled clinical trial that showed there are other non-pharmacological ways to prevent delirium in geriatric patients. This intervention included employing a standardized protocol on taking medical measures to eliminate or reduce the 6 risk factors of delirium in individuals older than 70 years. The 6 delirium risk factors in this study were cognitive impairment, sleep deprivation, immobility, visual impairments, hearing impairment and dehydration. The results of this study showed that delirium symptoms were 9.9% in intervention group in comparison with the 15% in usual-care group. The total number of delirium and the total number of its episodes showed a significant decrease in the intervention group. Nevertheless, the intensity of delirium and its recurrence did not show any significant difference. This intervention was associated with considerable improvement in the degree of cognitive impairment manifested in patients with cognitive impairment at admission as well as significant reduction in the rate of use of sleep medications in all patients in the intervention group. Few years later, the study was modified and its defects were removed that changed it into a care model named HELP (Hospital Elder Life program), which is now practiced in hospitals by aiming at prevention of cognitive and functional disorders and defects in hospitalized geriatric patients (27, 28).

Mark Antonio et al in a similar study showed the effects of counseling services for geriatric patients in decreasing delirium syndromes in patients diagnosed with hip fracture (19). In their study was a prospective, randomized, and blinded study, they evaluated 126 patients aged 65 years and older who had a history of emergency hip surgical operations. The counseling targeted the 10 biggest risk factors in delirium in the geriatric patients including oxygen delivery to central nervous system (CNS), fluid and electrolyte balance, treatment severe pain, elimination of unnecessary drugs, regulating bladder and bowel function, adequate nutritional intake, early mobilization and rehabilitation, appropriate environmental stimuli, treatment agitated delirium, prevention, early detection, and treatment of postoperative complications. The results of their study revealed that the prevalence of delirium significantly decreased in the intervention group during hospitalization. The amount of delirium symptoms in a group who received adults counseling was 32% and in the control group who received the usual care was recorded to be 50%. In the intervention group, the risk of delirium and intensity of delirium decreased significantly. Therefore, a multi-purpose intervention can help reduce delirium in geriatric patients, improve
quality of their care and treatment, and reduce their dysfunction. The advantage of this plan is that it can be easily implemented without increasing the health associated costs (29, 30).

The effective role of early physical activity and rehabilitation in decreasing delirium risk, as claimed by both studies has been proved in both studies. Due to the importance of this factor, primary stimulation was performed as the first study on the non-drug prevention of delirium in the ICU patients to improve their performance. There were 2 other studies on this area that assessed the efficacy of combination of daily interruption of sedation with physical and occupational therapy and its effects in functional outcomes in patients receiving mechanical ventilation (31, 32). After the 2 studies were conducted, the researchers found that considerable reduction in delirium incidence, deep sedation, and reduction in the staying time in the intensive care unit and hospital were associated with increase in the number of ventilation-free days. Therefore, to decrease the prevalence and duration of delirium, it is recommended that geriatric patients in ICU perform primary mobility in the first possible opportunity.

Controlling environmental factors is one of the effective ways in delirium control and improvement. Although there is no empirical evidence to show that environment by itself can cause delirium, it seems specific environments might intensify delirium. In general, environmental factors play a significant role in creating risk factors in delirium development; therefore, if those factors can be managed by some approaches, it will be possible to decrease the risk of delirium symptoms (33-36).

Noise is one of the disturbing environmental factors. There are many noises in hospitals, especially in ICU, noises are caused by apparatuses, pumps, ventilators, alarms and/or the sounds of doing resuscitation. The noise in ICU has been recognized as a factor that disturbs sleep and disturbance in natural sleep, cycle might increase delirium symptoms (37). To prove this claim, the effects of noise on quality of sleep and delirium development was studied in a clinical trial in which headphones were used to protect the patients against hearing noise during night sleep. The results of the trial showed that the practice improved sleep and reduced confusion in patients (4). In addition to interference with patients’ sleep and rest, the noise might stimulate and intensify the symptoms for the delirium patients who are suffering from confusion and dizziness. Thus, efforts must be made to reduce those noises as much as possible. Furthermore, in patients who are in verge of seizure and might suffer from seizure attacks with the least number of stimuli including hearing stimulation, it is better to protect their ears by headphones so they cannot hear the noises around them. In another word, silence is the best sound for these patients. On the other hand, low environmental stimuli can leave the patient with his/her delirium state. Therefore, a completely calm atmosphere can cause delirium intensification and shall not be created unless in specific cases which have already been described (38).

In addition to efforts to eliminate disturbing noises in the environment, making the place soothing and peaceful by playing relaxing music, could help reduce confusion and delirium in patients, especially for mechanical ventilation treatment patients who receive sedatives and are provided with conditions to tolerate the system and stay relaxed. Because they are still attached to the surrounding environment through hearing, using soft music with no lyrics could be helpful in lowering their anxiety and confusion caused by their physical conditions (39-41).

Using pleasant scents and air fresheners can be helpful in making the environment desirable for the patient. Although no study with high statistical population and suitable planning has been published on this topic, it seems that efforts to reduce disturbing environmental smells such as detergents and disinfectors, which are common in hospitals and replacing them with scents and air fresheners, could be helpful in preventing delirium and reducing confusion in patients (38, 42).

Being placed in an environment where the changes in day and night hours are not noticeable contributes to sleep disorder and loss of alertness cycle, leading to, intensification of fatigue and confusion in patients. To improve these conditions, there are windows built in some ICUs to enable the patients to see changes in day lights and nights. In addition, in a room which might be dark at night, a dim light can reduce patient’s confusion at night. To help the patient on better perception of the 24-hour cycle, the patient should be provided with an analogue clock that shows the 24 hours of day and night and a calendar visible by the patient (38, 42).

Therefore, it is important to provide the patient with a fair amount of visual, hearing and speech mobility to save him/her from disconnection from the surrounding environment, as, this disconnection can cause confusion and delirium in the patient. Furthermore, delirium is intensified by sensory disorders including vision impairments (24) and hearing impairment (43). For this reason, returning patient’s glasses and/or hearing aid might help prevent delirium.

Unfortunately, although the value of environmental interventions has been recognized and proven to some extent, they are not practiced enough (44).

Along with environmental elements, the emotional reaction of the patient to delirium symptoms and understanding the cognitive impairments could also serve as intensive factors in delirium. The patients must be told that their delirium symptoms are temporary and reversible and they do not develop permanent psychological disorder. The patients should be informed that delirium symptoms are associated with a specific illness, surgery, or other treatments and those symptoms are common and reversible; of course, except in
conditions when delirium has been caused by brain stroke or major damages to the brain or other reasons which caused permanent brain damage to the individual and the patient is no longer able to understand and perceive words and sentences. Teaching patient’s friends and family about delirium is very useful as they might get concerned about delirium and its signs.

In addition, educational programs have been used for work therapy and care staff has been used to prevent delirium solely or as a part of a multi-purpose intervention (45-50). There is evidence that an educational plan as an independent intervention can lower delirium symptoms (43, 49). Providing basic information on delirium prevalence and outcomes, teaching methods of evaluating delirium, introducing guidelines on treatment measures of the diseases through workshops and educational rounds could have significant role in preventing delirium are of paramount importance (47). Nevertheless, the format, time, duration and contents of topics that must be presented, as well as the special target group on which intervention should be done have not yet been specified fairly; however, in general, an education program for hospital staff and nurses that focuses on the evaluation prevention and treatment of delirium could reduce delirium symptoms and subsequently reduce the number of hospitalization days.

**Recommendations**

To prevent delirium symptoms in ICU patients the followings are recommended:

1. The patient should be provided with the opportunity of receiving physical therapy, occupational therapy, and performing primary mobility in the first possible chance (IB).
2. Disturbing noises in the patient’s environment should be decreased too improve patient’s sleep and rest (IB).
3. Soft and soothing music should be played for the patient to make the environment pleasant and to reduce anxiety and confusion caused by his/her physical conditions (IB).
4. Pleasant fragrance and scents should be used to make the environment pleasant for the patient (5).
5. A clock should be placed in view of the patient along with a calendar to help him/her with lower confusion and improve communication with the surrounding environment. In addition, if possible, the patient’s bed should be placed close to the window so he/she can notice the change in the morning and night light, and if not, changes should be made in lighting based on the morning and night light (IB).
6. Glasses for patients with vision impairments and hearing aid in patients with hearing impairment will help them communicate better with the environment and reduce their confusion (IB).

7. Arranging for educational classes for work therapy on delirium recognition, prevention, and diagnosis is also very helpful (IB).

**Conclusion**

Delirium is a common, costly and potentially damaging. Thus, preventing delirium could be one of the most effective methods in preventing the complication. To help prevent delirium, try to minimize modifiable risk factors and precipitating factors that is discussed in detail in this article.

**References**

1. Skrobik Y. Delirium prevention and treatment. Crit Care Clin. 2009; 25: 585-591.
2. Association AP. American Psychiatric Association Practice Guidelines for the treatment of psychiatric disorders: compendium 2006: American Psychiatric Pub; 2006.
3. Kress JP. The complex interplay between delirium, sepsis and sedation. Crit Care 2010; 14: 164.
4. Van Rompaey B, Elseviers MM, Van Drom W, Fromont V, Jorens PG. The effect of earplugs during the night on the onset of delirium and sleep perception: a randomized controlled trial in intensive care patients. Crit Care 2012; 16: R73.
5. Pandharipande PP, Sanders RD, Girard TD, McGrane S, Thompson JL, Shintani AK, et al. Effect of dexmedetomidine versus lorazepam on outcome in patients with sepsis: an a priori-designed analysis of the MENDS randomized controlled trial. Crit Care 2010; 14: R38.
6. Ely EW, Shintani A, Truman B, Speroff T, Gordon SM, Harrell Jr FE, et al. Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit. Jama 2004; 291: 1753-1762.
7. Peterson JF, Pun BT, Dittus RS, Thomason JW, Jackson JC, Shintani AK, et al. Delirium and its motoric subtypes: a study of 614 critically ill patients. J Am Geriatr Soc 2006; 54: 479-484.
8. Pisani MA, Murphy TE, Van Ness PH, Araujo KL, Inouye SK. Characteristics associated with delirium in older patients in a medical intensive care unit. Arch Intern Med. 2007; 167: 1629-1634.
9. Salluh JI, Soares M, Teles JM, Ceraso D, Raimondi N, Nava VS, et al. Delirium epidemiology in critical care (DECCA): an international study. Crit Care 2010; 14: R210.
10. Milbrandt EB, Deppen S, Harrison PL, Shintani AK, Speroff T, Stiles RA, et al. Costs associated with delirium in mechanically ventilated patients. Crit Care Med 2004; 32: 955-962.
11. Pisani MA, Kong SYJ, Kasl SV, Murphy TE, Araujo KL, Van Ness PH. Days of delirium are associated with 1-year mortality in an older
intensive care unit population. Am J Respir Crit Care Med. 2009; 180: 1092-1097.

12. Shehabi Y, Riker RR, Bokesch PM, Wisemandle W, Shintani A, Ely EW. Delirium duration and mortality in lightly sedated, mechanically ventilated intensive care patients*. Crit Care Med 2010; 38: 2311-2318.

13. Iwashyna TJ, Ely EW, Smith DM, Langa KM. Long-term cognitive impairment and functional disability among survivors of severe sepsis. JAMA 2010; 304: 1787-1794.

14. van den Boogaard M, Schoonhoven L, Evers AW, van der Hoeven JG, van Achterberg T, Pickkers P. Delirium in critically ill patients: impact on long-term health-related quality of life and cognitive functioning. Crit Care Med 2012; 40: 112-118.

15. Girard TD, Jackson JC, Pandharipande PP, Pun BT, Thompson JL, Shintani AK, et al. Delirium as a predictor of long-term cognitive impairment in survivors of critical illness. Crit Care Med 2010; 38: 1513-1520.

16. Inouye SK. Delirium in older persons. New England Journal of Medicine 2006; 354: 1157-1165.

17. Siddiqi N, House AO, Holmes JD. Occurrence and outcome of delirium in medical in-patients: a systematic literature review. Age Ageing 2006; 35: 350-364.

18. 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: 669-676.

19. Marcantonio ER, Flacker JM, Wright RJ, Resnick NM. Reducing delirium after hip fracture: a randomized trial. J Am Geriatr Soc 2001; 49: 516-522.

20. Landefeld CS, Palmer RM, Kresevic DM, Fortinsky RH, Kowal J. A randomized trial of care in a hospital medical unit especially designed to improve the functional outcomes of acutely ill older patients. N Engl J Med 1995; 332: 1338-1344.

21. 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: 523-532.

22. Potter J, George J. The prevention, diagnosis and management of delirium in older people: concise guidelines. Clin Med (Lond) 2006; 6: 303-308.

23. Levkoff SE, Safran C, Gallop J, Phillips RS. Identification of factors associated with the diagnosis of delirium in elderly hospitalized patients. J Am Geriatr Soc 1988; 36: 1099-1104.

24. Inouye SK, Viscoli CM, Horwitz RI, Hurst LD, Tinetti ME. A predictive model for delirium in hospitalized elderly medical patients based on admission characteristics. Ann Intern Med 1995; 119; 474-481.

25. Schor JD, Levkoff SE, Lipsitz LA, Reilly CH, Cleary PD, Rowe JW, et al. Risk factors for delirium in hospitalized elderly. Jama 1992; 267: 827-831.

26. Pompei P, Foreman M, Rudberg MA, Inouye SK, Braund V, Cassel CK. Delirium in hospitalized older persons: outcomes and predictors. J Am Geriatr Soc 1994; 42: 809-815.

27. Inouye SK1, Bogardus ST Jr, Baker DI, Leo-Summers L, Cooney LM Jr. Models of geriatric practice; the hospital elder life program: a model of care to prevent cognitive and functional decline in older hospitalized patients. J Am Geriatr Soc 2000; 48: 1697-1706.

28. Zolfaghami A, Arabi M, Pedram Razi S, Biat K, Bavi A. [Effectiveness of a Multifactor Educational Intervention on Delirium Incidence and Length of Stay in Patients with Cardiac Surgery (InPersian)]. Journal of hayat 2012; 18: 67-78.

29. Vidán MT, Sánchez E, Alonso M, Montero B, Ortiz J, Serra JA. An intervention integrated into daily clinical practice reduces the incidence of delirium during hospitalization in elderly patients. J Am Geriatr Soc. 2009; 57: 2029-2036.

30. Bo M, Martini B, Ruatta C, Massaia M, Ricauda NA, Varetto A, et al. Geriatric ward hospitalization reduced incidence delirium among older medical inpatients. Am J Geriatr Psychiatry 2009; 17: 760-768.

31. Schweickert WD, Pohlmann MC, Pohlmans AS, Nigos G, Pawlik AJ, Esbrook CL, et al. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. Lancet 2009; 373: 1874-1882.

32. Needham DM, Korupolu R, Zanni JM, Pradhan P, Colantuoni E, Palmer JB, et al. Early physical medicine and rehabilitation for patients with acute respiratory failure: a quality improvement project. Arch Phys Med Rehabil 2010; 91: 536-542.

33. Budd S, Brown W. Effect of a reorientation protocol on postcardiotomy delirium. Nurs Res 1974; 23: 341-348.

34. Williams MA, Campbell EB, Raynor WJ, Mlynarczyk SM, Ward SE. Reducing acute confusional states in elderly patients with hip fractures. Res Nurs Health 1985; 8: 329-337.

35. Cole MG, Primeau FJ, Bailey RF, Bonnycastle MJ, Masiccelli F, Engelsmann F, et al. Systematic intervention for elderly inpatients with delirium: a randomized trial. CMAJ 1994; 151: 965-970.

36. Guidance N. Pirfenidone for treating idiopathic pulmonary fibrosis. Available from: https://www.nice.org.uk/guidance/ta504

37. Topf M, Bookman M, Arand D. Effects of critical care unit noise on the subjective quality of sleep. J Adv Nurs 1996; 24: 545-551.

38. Bannon L, McGaughey J, Clarke M, McAuley DF, Blackwood B. Impact of non-pharmacological interventions on prevention and treatment of delirium in critically ill patients: protocol for a systematic review of quantitative and qualitative research. Syst Rev 2016; 5: 75.
39. Chlan L. Effectiveness of a music therapy intervention on relaxation and anxiety for patients receiving ventilatory assistance. Heart Lung 1998; 27: 169-176.

40. Wong H, Lopez-Nahas V, Molassiotis A. Effects of music therapy on anxiety in ventilator-dependent patients. Heart Lung 2001; 30: 376-387.

41. Almerud S, Petersson K. Music therapy—a complementary treatment for mechanically ventilated intensive care patients. Intensive Crit Care Nurs 2003; 19: 21-30.

42. Rodin MB, Flaherty JH. Delirium Prevention: Update on Multidisciplinary, Non-drug Prevention of Delirium Among Hospitalized Elderly. Delirium in Elderly Patients: Springer; 2018.

43. Hashimoto H, Yamashiro M. Postoperative delirium and abnormal behaviour related with preoperative quality of life in elderly patients. Nihon Ronen Igakkai Zasshi 1994; 31: 633-638.

44. Meagher DJ, O’hanlon D, O’mahony E, Casey PR. The use of environmental strategies and psychotropic medication in the management of delirium. The British journal of psychiatry 1996; 168: 512-515.

45. ChrisBrymer MD, Paul Cavanagh MA, Eileen Denomy BScN, Karen Wells MSW, CynthiaCook MA. The effect of a geriatric education program on emergency nurses (CE). Journal of Emergency Nursing 2001; 27: 27-32.

46. 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: 152-156.

47. Naughton BJ, Saltzman S, Ramadans 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: 18-23.

48. Pierre JS. Delirium: a process improvement approach to changing prescribing practices in a community teaching hospital. J Nurs Care Qual 2005; 20: 244-250.

49. 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: 178-186.

50. Martinez F, Tobar C, Hill N. Preventing delirium: should non-pharmacological, multicomponent interventions be used? A systematic review and meta-analysis of the literature. An Age Ageing 2015; 44: 196-204.