



# Efficacy of Liaison Education and Environmental Changes on Delirium Incidence in ICU

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## Abstract

**Background:** Delirium is a disorder with disturbance of consciousness, cognitive process. The present study's aim is to evaluate the efficacy of liaison educational and environmental changes on the delirium rate in ICU patients.

**Methods:** This is a quasi-experimental study on 148 admitted patients (over 18 years of age) in the general ICU. A total of 69 patients in the group before implementing multidisciplinary interventions and 79 patients in the group after multidisciplinary interventions were evaluated. In the case and control group RASS level of consciousness were measured. Scale ICU-CAM (at morning and evening) is used to check the incidence of delirium in the ICU patient. In addition, the demographic questionnaire has been used and delirium duration and the length of hospitalization are also evaluated in both groups. Multifactorial interventions are included as staff physicians and nurses training through a workshop. It should be noted that a 3-hour workshop is used for training of all staff personnel in the ICU ward. The 2nd part is creating environmental intervention in the ICU to decrease delirium in admitted patients.

**Results:** In this study, 148 patients were studied, 69 patients in the group before implementing multidisciplinary interventions and 79 patients in the group after multidisciplinary interventions were evaluated. Incidence of delirium was 30 (37.97) in intervention and in 50 (72.46) control group ( $P = 0.01$ ). The mean percent day in ICU patients with delirium was  $26.18 \pm 35.38$  at intervention group and  $35.84 \pm 39.31$  in the control group ( $P = 0.001$ ).

**Conclusions:** We found that delirium can be reduced by some intervention, and also medical team orientation about delirium can be help to reduced the incidence; therefore, it is recommended that this factor be evaluated in future study.

**Keywords:** Early Detection, Delirium Screening, ICU

## 1. Background

Delirium is a disorder with disturbance of consciousness, a cognitive process that often happens suddenly and is associated with impaired orientation, short-term memory, changes in sensory perception (delusions), abnormal thinking, and inappropriate behavior. Increase in mortality, institutionalization, and length of hospitalization, physical morbidity, and costs for healthcare providers associated with delirium (1-3). Delirium is a common complication in hospitalized patients in the intensive unit and its incidence in patients with critical diseases is more than 80% (an overview of different studies), therefore, the incidence of delirium depends on the severity of causes of hospitalization scale used (1, 4, 5).

Today, particular attention is paid to the prevention,

treatment, and identification of the risk factors that help early prevention of delirium in order to reduce its risk factors (environmental interventions) and secondary prevention, which helps the early detection of delirium. On the other hand, early diagnosis of delirium needs the training of personnel (increasing their knowledge). It is recommended to screen patients' and caregivers' perspectives, and to reduce hospital costs, which can change the levels of prevention of delirium. Since the special nurses are frequently in a relationship with the patients, they play a key role in prevention, early detection, and treatment of patients with delirium (6-10). Although, the use of standard screening delirium patients in intensive care unit is not still common by physicians and nurses, it is necessary to screen delirium (3, 11-13). Therefore, the present study intends to early de-

tect delirium screening in ICU.

## 2. Methods

This is a quasi-experimental study on the admitted patients (over 18 years old) in General ICU. All patients or the patient's relatives signed the informed consent. All patients did not have the background of cognitive disorders such as dementia, no alcohol abuse, no impaired consciousness, no history of psychiatric drugs, and they did not interrupt the admission drug use.

In the intervention group, multifactorial intervention had been done on environmental conditions as well as physicians and nurses of general ICU ward; and in the control group, none of the patients had experienced any change in the ICU ward.

Multifactorial intervention included: staff nurses training and physician training through the workshop (about delirium importance, early and clinically identification of delirium by instruments like CAM-ICU, etiology and prevention methods, pharmacological treatment of delirium and non-pharmacologic intervention). It should be noted that a 3-hour workshop was used for training of all personnel in ICU ward.

The 2nd part intervention included creating environmental intervention in the ICU such as installing a clock and calendar (in order for the patient to see them), allowing the patient to meet his/her family members, using appropriate lighting in day and night, providing eyeglasses and hearing aids for the patient, using light alarms instead of audio alarms, encouraging staff to more interact with patients, encouraging patients to eat liquids for dehydration, and leaving the patient out of bed immediately, according to Yale Delirium Prevention (14).

In the intervention and control groups RASS level of consciousness was measured. Scale ICU-CAM (in the morning and evening) and also the demographic questionnaire were used to check the incidence of delirium in ICU patients. In addition, delirium duration and the length of hospitalization were evaluated in both groups. The 3rd part of intervention included the use of educational posters guidelines (about the approach of patients exposed to the risk of delirium and step by step guide management of delirium patients).

### 2.1. Instruments

CAM-ICU scale: The incidence of delirium was studied by a validated scale to measure, which can also be used for patients in intensive care unit, too. This scale is approved by the diagnostic and statistical manual of mental disorders, the 4th edition, text revision (DSM-IV-TR) and is used

for ICU patients twice a day (morning and evening from the day before surgery to hospital discharge). Four main features of delirium are included in this scale: sudden acute onset delirium, lack of concentration and attention, alteration of consciousness and unorganized thinking, which all had been checked; therefore, delirious patients had a positive CAM-ICU result. The website [www.icudelirium](http://www.icudelirium) is currently available for a manual of the CAM-ICU (1, 15).

RASS scale: Scale RASS is used to determine a patient's agitation or sedation level of consciousness. Score and classification for RASS scale include: combative (4), very agitated (3), agitated (2), restless (1), alert and calm (0), drowsy (-1), light sedation (-2), moderate sedation (-3), deep sedation (-4), and unarguable (-5) (16). All data has been analyzed by SPSS v. 19. P value < 0.05 was considered as significant.

## 3. Results

In this study, 148 patients were studied, 69 patients in the group before implementing multidisciplinary interventions and 79 patients in the group after multidisciplinary interventions were evaluated. To simplify the presentation of the results, the 1st group (pre-intervention) is called "control" and after intervention group is called the "intervention group".

According to result, all demographic information such as age, sex, location, treatment, medical services, length of staying in ICU, education, opium abuse, other drug abuse, alcohol consumption and smoking, history of mental disease, and previous history of hospitalization did not show any significant difference between the 2 groups.

According to our study, test results showed that the mean age and frequency of sex in 2 groups was not statistical. Most patients were located in the same city in both groups, (50.9 %) in the intervention and (49.1%) in the control group. Most of the subjects were under the follow up of surgery; that is to say that, (47.9%) in intervention group and (59.3%) in the control group. Most of the subjects in the control group (48.8%) and (51.2%) in the intervention group were alliterated. Most of the subjects in control group (58.3%) and in the intervention group (41.7%) were smokers. A total of 50% in the control group and 50% in the intervention group had a history of mental disease.

A total of 50.9% in the control group and 49.1% in the intervention group had a previous history of hospitalization. All demographic information has been demonstrated in Table 1.

The incidence of delirium was 30 (37.97) in the intervention group and in 50 (72.46) in the control group (P = 0.01).

**Table 1.** Demographic Parameters in Both Groups<sup>a</sup>

Demographic Parameters	Group		P Value
	Intervention	Control	
<b>Age</b>			0.217
< 35	17 (56.7)	13 (43.3)	
55 - 35	17 (37.0)	29 (63.0)	
55 >	35 (48.6)	37 (51.4)	
<b>Average age</b>	55.6 ± 14.5	56.3 ± 13.8	0.321
<b>Sex</b>			0.744
Male	46 (47.7)	42 (52.3)	
Female	33 (45.0)	27 (55.0)	
<b>Location</b>			0.675
Tehran	26 (49.1)	27 (50.9)	
Other cities	43 (54.7)	52 (45.3)	
<b>Treatment medical services</b>			0.698
Internal	11 (40.7)	16 (59.3)	
Surgery	58 (47.9)	63 (52.1)	
<b>Length of staying in ICU</b>	4.18 ± 3.67	4.56 ± 3.37	0.334
<b>Education</b>			0.202
Illiterate	43 (51.2)	41 (48.8)	
Literate	26 (40.6)	38 (59.4)	
<b>Smoking</b>			0.659
Yes	10 (12.7)	14 (20.3)	
No	69 (87.3)	65 (79.7)	
<b>History of mental illness</b>			0.520
Yes	6 (7.6)	6 (8.7)	
No	73 (92.4)	63 (91.3)	
<b>Previous history of hospitalization</b>			0.110
Yes	57 (72.15)	56 (81.16)	
No	22 (27.85)	13 (18.84)	
<b>Previous dementia</b>			0.893
Yes	5 (6.3)	4 (5.8)	
No	74 (93.7)	65 (94.2)	
<b>Alcohol consumption</b>			0.838
Yes	4 (5.1)	3 (4.3)	
No	75 (94.9)	66 (95.7)	
<b>Opium abuse</b>			0.505
Yes	4 (5.1)	2 (2.9)	
No	75 (94.9)	67 (97.1)	
<b>Other drug consumptions</b>			0.641
Yes	3 (3.80)	1 (1.45)	
No	76 (96.20)	68 (98.55)	
<b>Incidence of delirium</b>			0.016
Yes	30 (37.97)	50 (72.46)	
No	39 (49.37)	29 (42.03)	

<sup>a</sup>Values are expressed as No. (%).

According to the results, smoking, alcohol consumption, opium consumption, other drug abuse, previous psychiatric history, history of hospitalization, and the history

of dementia hospitalization did not show significant difference between 2 groups. Subjects in the intervention group (5.8%) and in the control group (6.3%) had previous dementia.

A total of 4.3% of subjects in the intervention group and 5.1% in the control group used alcohol. In total, 87.8% of subjects in the intervention group and 93.3% in the control group used the other drugs, more information is presented in [Table 2](#).

The average percent of days with delirium and the average percent of days in the ICU in both of the groups were demonstrated in [Table 3](#). The average percent of days of patients with delirium in ICU was  $26.18 \pm 35.38$  at the intervention group and  $35.84 \pm 39.31$  in the control group ( $P = 0.001$ ).

#### 4. Discussion

Delirium etiology includes environments in hospitals and aspects of the routine care. According to various studies, enough and necessary knowledge for the delirium is more needed, because delirium is often unnoticed and unrecognized ([2, 17-19](#)).

In the article of Inouye et al., ([3](#)), some interventions are done to reduce the delirium rate in patients who were in the hospital. According to another study, ([20](#)) standardized screening tools can be used for delirium assessment.

Multi-sectoral interventions such as training of personnel reform the sector and have been recommended in the early detection of delirium ([21](#)).

On the other hand, education for screening by physicians' team is so helpful. In the article written by Devlin and John W. it was shown that after physician education, agreement validated their judge for delirium identifying is more increased ([22](#)). In the article written by Gesin et al., ([23](#)) it is demonstrated that a multifaceted education program can affect the nurses' knowledge and their ability for screening of delirium. In this study, training nurses, the screening of delirium is more plausible. In another study by Devlin et al., ([24](#)) by using an educational intervention for intensive care unit (ICU) nurses, knowledge and judge of nurses for identifying delirium was increased ( $r = 0.71$ ,  $P < 0.0005$ ).

One of the best programs for education is educating the intensive care delirium screening checklist (ICDSC) ([22, 24](#)). It seems that it is more important to educate delirium detecting to medical teams (such as doctors and nurses). Therefore, in our study, the decreased level of delirium incidence is more plausible due to all interventions (more education especially for physicians and nurses). Knowing that it can be important, if the physician's team can be edu-

**Table 2.** Demographic Parameters in Both Groups with or Without Delirium

Parameters	Delirium	Intervention Group	Control Group	P Value
<b>Smoking</b>				
Yes	Yes	12 (15.0)	4 (13.3)	0.508
	No	68 (85.0)	26 (86.7)	
	Total	80 (100.0)	30 (100.0)	
No	Yes	12 (17.6)	6 (15.4)	0.400
	No	56 (82.4)	33 (84.6)	
	Total	68 (100.0)	39 (100.0)	
<b>Alcohol consumption</b>				
Yes	Yes	1 (2.0)	1 (3.3)	0.612
	No	49 (98)	29 (96.7)	
	Total	50 (100.0)	30 (100.0)	
No	Yes	3 (10.3)	2 (5.1)	0.360
	No	26 (89.7)	37 (94.9)	
	Total	29 (100.0)	39 (100.0)	
<b>Opium consumption</b>				
Yes	Yes	0 (0)	0 (0)	0.309
	No	80 (100.0)	30 (100.0)	
	Total	80 (100.0)	30 (100.0)	
No	Yes	6 (8.8)	2 (5.1)	0.309
	No	62 (91.2)	37 (94.9)	
	Total	68 (100.0)	39 (100.0)	
<b>Other drugs abuse</b>				
Yes	Yes	1 (1.27)	0 (0.0)	0.9
	No	78 (98.73)	30 (100.0)	
	Total	79 (100.0)	30 (100)	
No	Yes	3 (4.55)	1 (2.63)	0.9
	No	66 (95.65)	38 (97.44)	
	Total	69 (100.0)	39 (100.0)	
<b>Previous psychiatric history</b>				
Yes	Yes	4 (8.0)	3 (10.0)	0.528
	No	46 (92.0)	27 (90.0)	
	Total	50 (100.0)	30 (100.0)	
No	Yes	2 (6.9)	3 (7.7)	0.640
	No	27 (93.1)	36 (92.3)	
	Total	29 (100.0)	39 (100.0)	
<b>History of hospitalization</b>				
Yes	Yes	37 (75.51)	25 (83.33)	0.414
	No	13 (24.49)	5 (16.67)	
	Total	50 (100.0)	30 (100.0)	
No	Yes	20 (69.0)	31 (79.5)	0.400
	No	10 (31.0)	8 (20.5)	
	Total	29 (100.0)	39 (100.0)	
<b>Previous history of dementia</b>				
Yes	Yes	5 (10.0)	3 (10.0)	0.9
	No	45 (90.0)	27 (90.0)	
	Total	50 (100.0)	30 (100.0)	
No	Yes	0 (0.0)	1 (2.6)	0.9
	No	29 (100.0)	38 (97.4)	
	Total	29 (100.0)	39 (100.0)	

**Table 3.** The Average Percent of Days with Delirium and the Average Percent of Days in ICU in Both Groups

Variables	Mean $\pm$ SD	P Value
<b>Mean percent of days with delirium</b>		0.001
Intervention group	26.18 $\pm$ 35.38	
Control group	35.84 $\pm$ 39.31	
Total	31.34 $\pm$ 37.72	
<b>Mean percent of days in ICU</b>		0.1
Intervention group	5.26 $\pm$ 4.35	
Control group	5.76 $\pm$ 4.36	

cated for delirium screening, the incidence of delirium can also be prevented.

Another important factor in decreasing delirium incidence is environmental interventions (3). Thus, in the article written by Freedman et al., (25), it was demonstrated that mean noise arousal index in ICU environment was  $1.9 \pm 2.1$  arousals/h sleep. Therefore, ICU patients have experienced environmental noise more than the normal level. It may induce delirium in these patients. In some other studies such as I Abraha et al., (26), it is shown that non-pharmacological interventions can help prevent from delirium. In articles by Siddiqi et al., (27), Brummel et al., (28), and Cole et al., (29), it was demonstrated that non-pharmacologic interventions can modify the risk factors in preventing from delirium. Another review study by Clegg A. et al., (30) indicated that some interventions can prevent delirium in older individuals, especially in ICU care. In other studies, 4 types of interventions are reported for delirium including: general geriatric approaches, nursing care, family interventions, and physicians' team (3, 27-31).

We have some interventions to reduce the incidence of delirium risk factors, such as the placement of hearing aids and eyeglasses for patients who did not have impaired sight and hearing problems and so on.

In some studies, it is shown that delirium can be induced by some other patients' situation like drug abuse (narcotics) (20, 32, 33). In our study, it was demonstrated that from all patients with delirium (3.3%), in the intervention group and (2.0%) in the control group, have consumed alcohol. In addition, subjects who did not have delirium (5.1%) are in the intervention group and (10.3%) are in the control group who have consumed alcohol. From the subjects with delirium, 0% in the intervention group and 0% in the control group have consumed opium; 5.1% from the subjects who did not have delirium in the intervention group and 13.8% in the control group were taking opium. From all subjects who had delirium, 13.3% in the

intervention group and 16.0% in the control group were smokers and from all subjects who did not have delirium, 15.4% in the intervention group and 20.7% in the control group have been smokers.

In the article written by Kosten, it is shown that if we can manage the drug abuse, we may reduce delirium incidence and also, some prospective trials show that some drugs such as benzodiazepines can affect reducing delirium incidence more (RR= 4.9; P=0.04) (32).

It seems that it is so important to detect delirium early, especially in the ICU (2, 17-20, 32, 33). In some studies, it was demonstrated that delirium can increase the length of staying in the ICU (4, 34-38). In the article of Ley et al., the mean delirium duration was  $3.4 \pm 1.9$  days and the mean onset of delirium was 2.6 days (S.D.  $\pm$  1.7) (34). In the article of Ouimet S. et al., (35), the delirium patients had longer hospitalization ( $18.2 \pm 15.7$  days) as well as a longer ICU stay ( $11.5 \pm 11.5$  days).

In our study, we found that the average percent of days with delirium in intervention group was  $26.18 \pm 35.38$  and in control group, it was  $35.84 \pm 39.31$  (P = 0.001). The average percent of days in ICU in the intervention group was  $5.26 \pm 4.35$  and in the control group it was  $5.76 \pm 4.36$  (P = 0.1).

In sum, it is recommended that delirium can be reduced by education and environmental interventions. In addition, medical team orientation about delirium can help reduce its incidence.

One of the limitations in this study is the staffs' collaboration; therefore, with explanation of the goals of study, the whole physicians' team accepted to participate in our study; therefore, this education is more effective, however, some other variables such as leakage of an ICU bed can influence the delirium incidence. In our study, we did not evaluate the patients' waiting for the ICU, therefore, it is recommended that this factor be evaluated in future studies.

In addition, education for delirium screening may be helpful for patients who are exposed to the risk of delirium; hence, this education can help these patients to prevent from delirium recurrence.

#### 4.1. Conclusion

We found that delirium can be reduced by some interventions (such as educational and environmental changes), and also medical team orientation about delirium can help reduce the incidence of delirium.

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