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## EFFECT OF CONFUSION ASSESSMENT TOOL APPLICATION ON CRITICAL CARE NURSES' KNOWLEDGE OF DELIRIUM RECOGNITION

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### Abstract

In critically ill patients, delirium is a serious and frequent disorder that is associated with a prolonged intensive care and hospital stay and an increased morbidity and mortality. The lack of education, knowledge of delirium and the lack of a delirium screening instrument makes delirium often overlooked by critical care nurses and physicians. The aim of this study was to examine the effect of Confusion Assessment Method-Intensive Care Unit (CAM-ICU) tool implementation on the recognition of delirium by critical care nurses. A Pre-Posttest research design was implemented; 40 critical care nurses at Clemenceau Medical Center at three critical care units participated in the study. The participants were surveyed regarding recognition of delirium before and after the application of CAM-ICU tool and after a CAM-ICU education program was implemented. Highly significant difference in the test scores of the nurses between pre and post intervention were noted. The training concerning delirium and the application of validated assessment tools CAM-ICU increases the knowledge of critical care nurses and effective in recognizing patients with delirium.

### Keywords

Delirium, Nurses, Intensive Care Units, Recognition

## 1. INTRODUCTION

Delirium is the unexpected incidence of mental confusion among adults and elderly patients (Inouye et al., 2000, Pisani et al., 2006). It is also recognized as acute brain malfunction or physiologic brain condition; a frequent situation, inflicting patients of all age groups in critical care units (Barr et al., 2013). Several common patient characteristics are associated with delirium in older Intensive Care Units (ICU) patients. Pisani et al. (2006) indicated four pre-existing risk factors for delirium in elder patients admitted to ICUs: dementia, benzodiazepines administration before ICU admission, high serum creatinine levels, and low arterial pH (Pisani et al., 2006).

In critical care areas, delirium is classified as a major problem (Barr et al., 2013), and the source of distress for both patients and families (Macullulich et al., 2013). In addition, it is considered as the cause for financial obstacles to hospitals (Boot, 2012). Estimations showed that a delirious incidence may occur in 30-80% of admitted patients and it arises in 60%-80% of mechanically ventilated patients and 20%-40% of non-ventilated patients in Intensive Care Unit (ICU) (Christensen, 2014). Moreover, patients who are admitted to ICU and developed delirium during their admission were at three time's higher risk of mortality within the next six months in relation to those without delirium. Each further day of delirium was associated with a 20% higher risk of prolonged hospitalization and a 10% higher risk of mortality (Pun, 2007; Svenningsen et al., 2013).

The recognition of delirium by health care workers (HCWs) remains a persistent problem. The health care workers including both physicians and nurses fail to recognize delirium in as many as 66-84% of their patients (Peter, Bea, Jose, & Johannes, 2009; Sanders, 2002). Barriers to recognizing delirium emerged at both the individual and the organizational levels in hospital settings. A lack of education and knowledge of delirium is one of the strongest individual barrier to diagnose delirium. Moreover, the lack of a screening tool reveal that delirium is not perceived as priority (Teodorczuk, Reynish & Milisen, 2012). The unfamiliarity with valid and reliable screening instruments used to diagnose delirium in the ICU may also lead to either missed diagnosis or under diagnosis (Balas et al., 2010).

Due to the high incidence and undesirable outcomes of delirium, prevention and early recognition should have the highest priority among HCWs. This is relatively important for nurses, who have the most contact with patients due to their front-line care position, making them the entitled professionals to observe and document changes in the behavior of patients.

Recognizing delirium can reduce Intensive Care Unit (ICU) stay, incidence of infections and Post ICU syndrome complications. In addition, it allows nurses to create another perspective on care to avoid and treat the dysfunction. Therefore, it is essentially important that the nurses are skilled in its recognition.

Yet, many nurses lack not only the knowledge but also the capability to detect and recognize delirium efficiently (Inouye, 1994; Sanders, 2002; Steis & Fick, 2008).

From an international perspective, a number of studies have found that there is a lack in training of nurses for delirium assessment (Devlin et al., 2008, Hamadan-Mansur et al., 2010, Flagg et al., 2012, Gesin et al., 2012). However, no studies has been conducted in Lebanon about this issue, which became the initiative for conducting the current study. Therefore, this study was the first in the nation that sought to examine the impact of Confusion Assessment Method (CAM) on recognition of delirious patients by critical care nurses.

## 2. METHODOLOGY

The aim of this study was to assess the knowledge of critical care nurses about delirium before and after the introduction of the CAM-ICU. The study hypothesizes that critical care nurses recognition of delirium will be improved after application CAM-ICU tool in critical care units. A pre-posttest research design was implemented in the study. This study was conducted in the critical care units of one university hospital in Beirut, Lebanon; namely intensive care unit and cardiac care units. An official permission to conduct this study was obtained from the responsible authorities referred to institutional review board (IRB) at Beirut Arab University, and the ethical committee at the relevant clinical site after explaining the aim of the study. All critical care nurses (40 nurses) who have worked at least for more than one year in Critical Care Units were included in the study. Newly employed ICU nurses, with experience of less than one year, were excluded due to preceptor-preceptee period. In addition, nurse managers were also excluded because they are not participating directly in patient care. The Confusion Assessment Method for the ICU (CAM-ICU) was utilized during the data

collection procedure. It was developed by Inouye and his colleagues in 1990 (Inouye et al, 1990), which they helped to improve the assessment of delirium. The CAM has four features, which are determined by the patient, nurse, and family interview. These features are as follows: 1) an acute onset of mental status changes or a fluctuating course; 2) inattention; 3) disorganized thinking; and 4) an altered level of consciousness (i.e., other than alert). The patient is diagnosed as delirious (i.e., CAM positive) if he or she has both features, 1 and 2 and either feature 3 or 4. The CAM-ICU was validated by Ely et al. (2001b) with a specificity of 89–100% and a sensitivity of 89–93%. The translated Arabic tool was adopted from previous study by Selim et al. (2018) for Critical Care nurses who preferred using the Arabic version. Data was collected on two occasions; before the CAM-ICU education program and 1month after the CAM-ICU education program by using the same self-reported questionnaires. Critical Care Nurses went through a CAM-ICU education program, involving formal in-service lectures, informal bedside teaching and feedback which was the key component of continuing medical education for medical professionals. Effective techniques were used in training staff to use the CAM-ICU, including: (1) explaining its rationale; (2) detailed features, examples of situations; (3) how the tool will be used; (4) defining the process for classifying and recording baseline mental status; and (5) defining how documentation will be performed. In addition to 6-step process was clarified to facilitate integrating the tool into the physical assessment practice: (1) putting it in context; (2) defining the features; (3) talking about complicated cases; (4) doing the assessment; (5) documenting the assessment; and (6) continuing to discuss (Nelson, 2009). Lecture was placed on the Moodle after the education. Same convenient sample of 40 critical care nurses were assessed regarding recognition of delirium after application of CAM-ICU tool using a locked envelope distributed by the investigator. The responses were collected by investigator after 4 weeks. The Statistical Package for Social Science (Corp, 2013) was used to analyze the data. Descriptive statistics were utilized to describe the characteristics of the participants. The inferential statistics were used to test the research hypothesis.

### 3. RESULTS

#### 3.1. Socio-demographic Characteristics of Critical Care Nurses

Table 1 Sociodemographic Data

Variable Category		Total n (%)
Gender	Male	24 (60)
	Female	16 (40)
Age	20-25	15 (37.5)
	26-30	9 (22.5)
	31-35	13 (32.5)
	36-40	2 (5.0)
	>40	1 (2.5)
Experience	Less than 1 year	3 (7.5)
	1-5 years	18 (45.0)
	6-10 years	11(27.5)
	11-15 years	8 (20)
Shifts	Day only	10 (25)
	Night Only	3 (7.5)
	Day and Night	27 (67.5)

Forty nurses participated in the current study. Table 1 showed that; 24 (60%) nurses were males, while 16 (40%) were females. The majority of the participant's ages ranged between 20 and 25 years (37.5%) as well as 31 to 35 years (32.5%). In addition, the results indicated that less than half of the participants (45%) had 1 to 5 years of experience in critical care units, while 11 of them (27.5%) had 6 to 10 years of experience. The findings showed that the vast majority of the nurses who participated in this study (67.5%) worked both day and night shifts, while one fourth of them (25%) worked only day shifts; while three staff only worked only night shifts.

### 3.2. Pre and Post-Test Scores Comparison

A 10-question pre and post-test was conducted to assess the nurses' recognition of delirium in addition to perception of delirium assessment and utilization of CAM-ICU. The results indicated that the participated nurses recorded a mean score of 4.15 (SD=1.67) with a minimum score of one and a maximum score of seven pre-intervention while they scored a higher mean of 8.53 (SD=1.76) with a minimum score of three and a maximum score of 10 post-intervention. A dependent t-test was carried out to determine the differences in the knowledge of the nurses regarding delirium assessment pre and post intervention. The results showed that there is a significant differences (P=0.00) in mean scores of the nurses between pre and post intervention (Table 2).

Table 2: Pre and Post-Test Scores Comparison

	Minimum Score	Maximum Score	Mean (SD)	P-Value
Pre-test Score	1	7	4.15 (1.67)	0.00
Post-test Score	3	10	8.53(1.76)	

### 3.3. Comparison of Nurses Perception

The participated nurses were asked three questions to evaluate the barriers of delirium assessment, and their perceptions on the matter, before and after administering the educational program on CAM-ICU. The results indicated that the nurses had diverse answers to the three questions, prior to the intervention; however approximately two third of the nurses (65%) reported that "delirium in the critical care unit is an underdiagnosed problem", around half of them (52.5%) reported that "the difficulty of evaluating intubated patients" as a common barrier to evaluation of delirium in critical care unit patients, and 18 nurses (45%) expressed the need for "effective screening tools for identification of ICU patients most at risk for developing delirium" (Table 3).

Table 3: Nurses Perception Pre and Post Intervention (N=40)

	Pre-intervention N (%)	Post-intervention N (%)
1. Nurses who rarely evaluated their patients for delirium were likely to agree with which of the following statements?		
Delirium in the critical care unit is an underdiagnosed problem.	14 (35%)	26 (65%)
The signs and symptoms of delirium are usually consistent throughout an entire nursing shift.	9 (22.5%)	3 (7.5%)
The initial intervention for patients with delirium should be removal of all sedating and narcotic medications.	13 (32.5%)	8 (20%)
Critical care unit patients with delirium are often hypoactive.	4 (10%)	3 (7.5%)
2. What was the most common barrier to evaluation of delirium in critical care unit patients that nurse respondents in the survey identified?		
Inability to complete delirium assessments in sedated patients	13 (32.5%)	10 (25%)
Lack of confidence in ability to use delirium assessment tools	9 (22.5%)	1 (2.5%)
Difficulty of evaluating intubated patients	15 (37.5%)	21 (52.5%)
Assessments too time-consuming to perform	3 (7.5%)	1 (2.5%)
In what area related to critical care unit delirium assessment is recommended?		
Effect of routine assessment of delirium by critical care unit nurses on patient outcomes and patient lengths of stay	12 (30%)	4 (10%)
Most effective medications for use in prevention and treatment of delirium	8 (20%)	2 (5%)
Effective screening tools for identification of ICU patients most at risk for developing delirium	15 (37.5%)	18 (45%)
Ideal treatment strategy for ICU patients with delirium	5 (12.5%)	16 (40%)

### 3.4. Differences in the nurses' delirium recognition before the intervention according to the nurses' characteristics

An independent t-test was carried out to determine the differences in delirium recognition between males and females prior to the administration of the educational program. The assumption of homogeneity of variance was assessed by the Levene test. The results showed that there was no significant difference in pre-test scores between males and females ( $P=0.61$ ,  $F=0.25$ ) (Table 4).

Table 4: Difference in pre-test scores according to gender

Variable		M	SD	t-test	p-value
Pre-test	Male	3.79	1.66	-1.69	0.61
	Female	4.69	1.58		

An ANOVA test was carried out to determine the differences in delirium recognition among the participating nurses in relation to various age groups, different academic degrees, different years of experience, and variations in the working shifts before introducing the educational program. The results indicated that there were no significant differences in the pre-test scores among the nurses with the different age, academic degrees, experiences, and working shifts.

These results indicated that the recruited sample were homogenous with regards to their level of delirium recognition which was measured by the pre-test despite of their varying characteristics (Table 5).

Table 5: Difference in pre-test scores according to nurses' characteristics

Variable		F	p-value
Pre-test	AGE	2.03	0.11
	Degree	0.13	0.94
	Experience	0.10	0.95
	Shifts	0.33	0.71

Further, a dependent t-test was carried out to determine the difference in the nurse's perception of delirium assessment between pre and post-intervention. The results indicated that there was a significant difference in the nurses' perception at the level of the first question which recorded a P-value of  $P=0.01$ , and the third question with a P-value of  $P=0.00$ , as shown in Table 6.

Table 6: Comparison of nurses' perception of delirium

	Pre-intervention Mean (SD)	Post-intervention Mean (SD)	P-Value
Nurses who rarely evaluated their patients for delirium were likely to agree with which of the following statements?	1.18 (1.03)	0.07 (1.04)	0.01
What was the most common barrier to evaluation of delirium in critical care unit patients that nurse respondents in the survey identified?	1.20 (0.99)	1.33 (0.88)	0.48
In what area related to critical care unit delirium assessment is recommended?	1.33 (1.04)	2.15 (0.92)	0.00

### 3.5. ANCOVA Test

ANCOVA test is employed to check if there is any interactional effects of the categorical variables on a continuous dependent variable. The ANCOVA test was carried out to determine the interactional effect of the independent variable (gender, age, degree, experience, working shifts) on the dependent variables (post-test results), setting the pre-test score as a covariate. Before running the ANCOVA test, the assumptions of ANCOVA have been tested and met. The analysis showed that there was no significant difference between genders (Table 7) on the level of change in their recognition of delirium ( $P=0.22$ ,  $F=1.54$ ).

Table 7: Results of ANCOVA in relation to gender

Source	Sum of Squares	df	Mean Square	F	P-value
Corrected Model	10.77 <sup>a</sup>	2	5.38	1.79	0.18
Intercept	257.36	1	257.36	85.62	0.00
PRETOTAL	8.75	1	8.75	2.91	0.09
GENDER	4.64	1	4.64	1.54	0.22
Error	111.20	37	3.00		
Total	3029.00	40			
Corrected Total	121.97	39			

Regarding the age, the results of the ANCOVA test showed that, there was no significant differences in delirium recognition mean score between the various age groups ( $P=0.89$ ,  $F=0.26$ ). This indicated that, there was no effect of age on the outcome effect of using the intervention on the scores of the participants (Table 8).

Table 8: Results of ANCOVA in relation to age

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Corrected Model	9.642 <sup>a</sup>	5	1.928	0.584	0.71
Intercept	258.716	1	258.716	78.306	0.00
PRETOTAL	7.992	1	7.992	2.419	0.12
AGE	3.518	4	0.879	0.266	0.89
Error	112.333	34	3.304		
Total	3029.000	40			
Corrected Total	121.975	39			

In addition, another ANCOVA test was carried out to determine the interactional effect of the academic degree on the recorded scores of delirium recognition. The results showed that there was no significant difference between the participating nurses' scores in regards to their various degree ( $P=0.10$ ,  $F=2.23$ ). Thus, there was no effect of the difference in academic degrees on the nurses' recognition of delirium (Table 9).

Table 9: Results of ANCOVA in relation to Degree

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Corrected Model	24.72 <sup>a</sup>	4	6.18	2.22	0.08
Intercept	233.16	1	233.16	83.91	0.00
PRETOTAL	4.48	1	4.48	1.61	0.21
DEGREE	18.60	3	6.20	2.23	0.10
Error	97.24	35	2.77		
Total	3029.00	40			
Corrected Total	121.97	39			

With regards to the experience in critical care units, the ANCOVA test delineated in Table 10, showed that, there was no significant interactional effect for the difference in the duration of experience of critical care nurses on the scores recorded ( $P=0.50$ )

Table 10: Results of ANCOVA in relation to Experience

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	13.57 <sup>a</sup>	4	3.39	1.09	0.37
Intercept	296.99	1	296.99	95.88	0.00
PRETOTAL	6.39	1	6.39	2.06	0.16
EXPERIENCE	7.44	3	2.48	0.801	0.50
Error	108.40	35	3.09		
Total	3029.00	40			
Corrected Total	121.97	39			

Furthermore, another ANCOVA test was carried out to determine the interactional effect of the difference in working shifts among the nurses on the recorded scores. The results indicate there was no significant interaction effect for the shifts on the nurses' recognition scores of delirium (Table 11).

Table 11: Results of ANCOVA in relation to Shifts.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	8.31a	3	2.77	0.87	0.46
Intercept	266.80	1	266.80	84.50	0.00
PRETOTAL	6.14	1	6.14	1.94	0.17
SHIFTS	2.19	2	1.09	0.34	0.70
Error	113.66	36	3.15		
Total	3029.00	40			
Corrected Total	121.97	39			

#### 4. DISCUSSION

The results of this study showed that Critical Care Nurses (CCNs) have low to moderate level of knowledge about delirium in critical care units. This finding is similar to that reported in international studies (McCrow et al., 2014; Akechi et al., 2010; Riekerk et al., 2009; Devlin, et al., 2008). For instance, these results were supported by AbuRuz (2016) who revealed that nurses lack sufficient basic knowledge to identify delirium in ICU. In addition, these results are consistent with prior studies about the same subject (Nidsa et al., 2015; Varghese, Macaden, Premkumar, Mathews, & Kumar, 2014) regarding general characteristics of delirium and its risk factors. Gesin et al. (2011) also conducted a study in Carolina and reported equivalent results. On the other hand, Christensen et al. (2014) showed that most nurses were able to detect delirium based on the signs and symptoms, risk factors, and negative outcomes and obtained moderate scores on knowledge about delirium. In addition, the findings of Elliott (2014) revealed that the critical care nurses had a high level of knowledge about delirium. In contrast, the results of Hamdan-Mansour et al. (2010) indicated that CCNs lack of knowledge and management skills of ICU delirium. Trogrlic et al. (2017) also showed that the majority of healthcare staffs had basic knowledge of delirium in patients hospitalized in ICUs. Moreover, Monfared, Soodmand and Ghasemzadeh (2017) estimated that the majority of nurses who works in ICU (68.3%) have intermediate knowledge about delirium and only 24.6 percent reported good knowledge.

On another note, the results indicated that there is a highly significant difference in the knowledge of the nurses regarding delirium assessment in the test scores between pre and post intervention. These results were supported by several similar nursing studies using quantitative research. Gesin, et al. (2011) established that nurses' delirium knowledge was significantly improved after the educational intervention. The results of this study are also consistent with a study by Van de Steeg, IJkema, Wagner & Langelaan (2015) who investigated the influence of e-learning on specific aspects of delirium knowledge in nursing staff in hospitals in the Netherlands, which showed that the e-learning course had a significant positive effect on nurses' knowledge on delirium, in all subgroups of nursing staff and for all question categories. Additionally the results of this study are consistent with a study by Dahl (2015) who carried out pre-post survey for ICU nurses including knowledge and perception of delirium, delirium-screening instruments, and sedation screening instruments to determine if educational intervention impacts nurse knowledge. Moreover, a recent study by Ramoo et al. (2018) showed a significant difference in intensive care unit nurses' knowledge of intensive care unit delirium and delirium assessment scores pre- and post-educational intervention sessions on the Confusion Assessment Method-Intensive Care Unit., after controlling for demographic characteristics. Thus, the findings from previous researches relate the importance of increasing educational efforts focused on delirium assessment.

Regarding the difference in the nurse's perception of delirium assessment between pre and post-intervention, our results indicate that there was a significant difference in the nurses' perception which recorded a P-value of  $P=0.01$ , and also the third question. Consistent with our findings, Dahl (2015) revealed when examining perception, the most commonly ranked barriers to assessment

including (i) difficult to interpret intubated patients; (ii) nurses do not feel confident in their ability to use delirium assessment instruments (iii) The mean score of nurses who agreed with the (true) statement, "Delirium is an under diagnosed problem", went from 4.36 to 4.77 (p-value 0.002) after the education. However, Xing, Sun, Jie, Yuan & Liu (2017) showed opinions of medical staff regarding the importance of ICU routine delirium screening is the premise of early detection and timely treatment of delirium in the ICU setting. A study by Pisani et al. (2006) found that ICU Nurses relate some barriers in delirium assessment comprise the difficulty of assessing intubated patients, the inability to identify the level of patient sedation, insecurity in the use of instruments, the time spent and the complexity of the instruments. Additionally, Ramoo et al. (2018) showed the two most common perceived barriers to the adoption of the intensive care unit delirium assessment tool were "physicians did not use nurses' delirium assessment in decision-making" and "difficult to interpret delirium in intubated patients". Moreover, consistent with our results, Scott, McIlveney & Mallice, (2013) showed that prior to education and training, 54% of nurses agreed that delirium was a significantly underdiagnosed. Following a simple educational intervention, 68% believed delirium was a very serious problem. In addition, Scott, McIlveney & Mallice, (2013) result showed that the most barriers to undertaking delirium assessment identified at the start of the project remained and included patient intubation (42%).

Furthermore, the results of this study showed that there is no significant difference in pre-test scores in the interaction effect of the sociodemographic characteristics, years of experience in critical care areas and working shifts on the previously presented results and the displayed changes in the nurses' recognition of delirium. These results were supported by Anbu (2017) who found that age, years of experience, top nursing qualifications, type of shift worked and present position of nurses has no influence on delirium assessment tool usage and delirium recognition. Hamdan-Mansour et al., (2010) also stated that there is no significant correlation between knowledge and age or years of experience. However, Thulthein (2015) showed significant differences in the mean scores of CCNs knowledge, towards delirium management and their educational level .Where CCNs who had a bachelor's degree had higher mean scores of delirium knowledge (M =64.6, SD = 5.78) towards delirium management compared to CCNs who had associate degree, delirium knowledge (M =62.05, SD =7.79). In contrast, the results showed no statistical differences between CCNs delirium knowledge and years of critical care clinical experience. Moreover, Thulthein (2015) showed no significant differences among CCNs knowledge and CCNs ages. This finding is in line with AbuRuz (2016) who found a significant relationship between age and nurse's educational level and knowledge about delirium recognition, where Nurses with master nursing since have significantly higher levels of knowledge concerning delirium recognition compared to those with BSN. Furthermore, AbuRuz (2016) found a significant positive relationship between years of experience in ICU and level of knowledge regarding delirium recognition. Similarly, Van de Steeg, IJkema, Wagner & Langelaan (2015) found relatively significant differences between baseline examination scores of diverse demographic groups. Nursing staff aged over 50 had a lower average baseline score than their younger colleagues. Besides, nursing staff with a bachelor's or master's degree had a significantly higher baseline score than staff with an occupational education.

## 5. CONCLUSION

- Critical care nurses work regularly with critically ill patients with delirium, thus there is a substantial need for the use of a standardized assessment tool for recognition of delirium. Therefore, the introduction of CAM-ICU forecasts an improvement in the provided care for patients with delirium, as this study has outlined a nursing knowledge deficit and the need for more training in relation to delirium recognition and the importance of delirium assessment tool.
- This study also approves that the quality of nursing care related to delirium detection, prevention and management is in need for further improvement. Unrecognized delirium has the susceptibility to undesirably affect the whole clinical ICU quality indicators. Hence, efforts must be made to potentiate delirium detection and reduce its incidence.
- The study also suggests that continuing delirium prevention programs are essential for all nurses regardless of their demographics. Acquiring basic knowledge regarding delirium recognition and remaining up to date with recent evidence based preventive practices in delirium care is important to CCNs who provide direct caring for critically ill patients who are having delirium. Researchers should continue to explore nurse detection of delirium using screening tools such as the CAM-ICU.

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