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Nurses' Performance Regarding ABCDE Bundle for Mechanically Ventilated Patient at the Intensive Care Unit

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Abstract

Background: Mechanically ventilated patients suffer from serious complications**.** Implementing ABCDE bundle has positive impact on patients' outcomes. Intensive care unit nurses must be aware about all the component of the bundle and how to implement it in a correct way.

Aim: the current study aimed to assess nurses' performance regarding ABCDE bundle for mechanically ventilated patients at the intensive care unit

Research design: A descriptive exploratory design was utilized to conduct this study.

***Setting*:** This study was conducted at the adult intensive care unit Cardio-thoracic hospital affiliated to Sednaoui hospital**.**

Type of the sample: A convenient sample of (70) nurses and a purposive sample of mechanically ventilated patients(80) were included in the study **Four tools were used: Tool I:** A structured interview questionnaire

Tool II: Nurses' practices observational checklist **Tool III:** Sedation Scale of Richmond-Agitation

Tool IV: Confusion Assessment Method for the ICU **Result:** reveals that only 7.1% of the studied nurses had satisfactory level of knowledge regarding ABCDE bundle and delirium and its management, also, only 13% of the studied nurses had total competent level of practices. The study illustrated that 36.3% of the studied patients had sever delirium, while, 30.0% of them mild or moderate delirium. Finally, there were statistically significant negative correlations between total delirium scores of the studied patients and knowledge and practices scores of the studied nurses. More than two thirds of the studied nurses didn't attend any training programs regarding ABCDE bundle.

Conclusion: The majority of studied nurses to all of them had unsatisfactory knowledge regarding ABCDE bundle and delirium and its management and more than four fifths of them had total incompetent practices scores regarding ABCDE bundle implementation, more than one third of the studied patients had sever delirium, while, about one third of them mild or moderate delirium.

Recommendations: The hospital should encourage cooperation among health care members regarding implementation of ABCDE bundle for better results.

Key words: ABCDE bundle, delirium, Intensive Care Units, Mechanical ventilation

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INTRODUCTION:

Prolonged mechanical ventilation and weaning failure are factors associated with prolonged hospital length of stay and increased morbidity and mortality. Pain, agitation, delirium, acquired muscle weakness and lack of sleep are common distressing symptoms in critically ill patients. Delirium is a frequent complication of ICU admissions manifesting as acute confusion with inattention an disordered thinking ***(Ibrahim et al.,2021)***. Patients at the ICU who develop acute delirium are more likely to experience long term disability and mortality. Clinical guidelines recommend the use of the awakening and breathing coordination of daily sedation and ventilator removal trials, delirium monitoring and management, and early mobility and exercise (ABCDE) bundle as an evidence based multicomponent strategy to optimize patients' recovery and outcomes ***(Trudzinski et al., 2022)***.

Preventing, recognizing and managing pain, agitation and delirium at the ICU is significant to the field of nursing practice. Delirium, in particular, has a significant impact on both the patient and the health care system, with triple the costs of care and the risk of mortality for each episode of delirium ***(sultan&Faruq,2022)***.

Nurses play a role in preventing and managing delirium with interventions including managing pain, promoting regular sleep-wake cycles, frequent reorientation, optimizing the patients' environment and advocating for early mobility. Improved care by utilizing evidence based guidelines has a positive impact by decreasing incidence of delirium and associated negative outcomes. Prevention is the most effective strategy for decreasing incidence of delirium. Bedside nurses are best equipped for this role due to the nature of their interactions and therapeutic relationships with their patients ***(Sweeney, 2018)***.

The ABCDE bundle is a key treatment model combining evidence-based practices for the treatment of intensive care patients. Therefore, it enables the graded use of existing practices and improves interdisciplinary cooperation between specialist medical personnel. For the implementation of ABCDE bundle, it's very important to raise awareness of team members ***(Frade et al., 2022)***.

The implementation of the ABCDE bundle is achievable and may be seen as necessary because of professionals' high awareness of the patient complications resulting from bed rest, delirium and prolonged mechanical ventilation. So increasing awareness of health care team members' behaviors may be a mechanism to improve the implementation of complex care bundles like ABCDE as well as improving quality of care ***(Boltey et al., 2019)***.

Significance of the study:

Intensive care unit delirium is a phenomenon where patients admitted to intensive care units don't receive adequate rest to support normal cognition, which results in an acute form of psychosis. ICU delirium is a common occurrence among patients, affecting as much as 80% of those receiving mechanical ventilation. ICU nurses are expected to complete hourly assessment to assess for delirium. While, assessment helps diagnose delirium, it doesn't prevent it. The ABCDE bundle is used to prevent, early detect, or shorten the duration of ICU delirium and has been implemented in selected ICU's ***(Belsley et al., 2022)***.

According to the society of critical care medicine's, ABCDE bundle is unique because it can be used to every patient by the all caregivers. Implementation of ABCDE bundle has proven to minimize the mortality rate by 68% , reduce delirium and coma days by 25%-50% , reduce physical restraint use by 60% , cut ICU readmission in half and reduce discharges to nursing home and rehabilitation centers by 40% ***(Devlin et al., 2018)***.

Aim of the study:

This study aimed to assess nurses' performance regarding ABCDE bundle for mechanically ventilated patients at intensive care unit through the following objectives:

I) Assess nurses' level of knowledge regarding ABCDE bundle for mechanically ventilated patients at the intensive care unit.

II) Assess nurses' level of practices regarding ABCDE bundle for mechanically ventilated patients at the intensive care unit.

III) Assess incidence of delirium among mechanically ventilated patients at the intensive care unit.

Research question:

To fulfill the aim of the current study, the following research questions were formulated:

I) What is the level of nurses' knowledge regarding ABCDE bundle for mechanically ventilated patients at the intensive care unit?

II) What is the level of nurses' practices regarding ABCDE bundle for mechanically ventilated patients at the intensive care unit?

III) What is the incidence of delirium among mechanically ventilated patients at the intensive care unit?

The subject and methods for this study were portrayed under the four main items follows:

I- Technical item.

II- Operational item.

III- Administrative item.

IV- Statistical item

I- Technical item:

The technical items included research design, setting, subjects and tools for data collection.

Research design:

A descriptive exploratory research design was utilized to achieve the aim of this study.

Descriptive design involves direct exploration, analysis and description of a particular phenomenon. Exploratory design doesn't aim to provide the final and conclusive answers to the research questions, but merely explores the research topic with varying levels of depth **(Hunter et al., 2019)**.

Setting:

This study was conducted at the adult intensive care unit in Cardio-thoracic hospital affiliated to Sednaoui hospital,

Zagazig University Hospitals, Sharqia Governorate Egypt.

Subjects:

-A convenient sample of all available 70 nurses working at the previously mentioned setting was included in the study.

-A purposive sample of 80 mechanically ventilated patients who were admitted to the previously mentioned setting was included in the study. According to formula adopted from ***(Suresh and Chandrashekara, 2012)***.

Sample size calculation:

$$n = \frac{N \times p(1-p)}{\left[\left[N-1 \times \left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

N x p(1-p)	=100x 0.5 x (1-0.5)
N-1	=(100-1)x
d^2/z^2	=0.0025 / 3.8416+
p(1-p)	=0.5x (1-0.5)
N	= 80

n= sample size
N= community size
z= class standard corresponding to the level of significance equal to 0.95 and 1.96
d= the error rate is equal to 0.05
P= ratio provides a neutral property = 0.05
Based on the above equation, the sample size is 80 patients participated in the study.

Inclusion criteria:

- Adult patients
- Semiconscious patients.

Tools for data collection:

Four tools for data collection were used as follow:

Tool I: A structured interview questionnaire:

This questionnaire was developed by the investigator based on literature review ***(Al harbi et al., 2020 and Bardwell et al., 2020)***.It was translated into Arabic language and divided into three parts:

-**Part I: Demographic characteristic of nurses:**

It concerned with demographic and work related characteristics of nurses: including (age, gender, educational level, previous attendance of training programs regarding ABCDE bundle, duration after training and years of experience at ICU.

-**Part II: Demographic characteristic of patients:**

It concerned with demographic and medical characteristics of patients: including (age, gender, length of stay at ICU and cause of connection to mechanical ventilator).

-**Part ΠI: Nurses' knowledge assessment questionnaire:**

It was developed by the investigator based on literature review **(Ho et al., 2021; Marra et al., 2017)** to assess nurses' level of knowledge regarding ABCDE bundle and delirium. It included 24 multiple choice questions with main 3 categories; nurses' knowledge regarding ABCDE bundle, nurses' knowledge regarding delirium and its risk factors, and nurses' knowledge regarding delirium management.

Scoring system of knowledge assessment questionnaire:

Nurses' level of knowledge was evaluated by giving (1) score for each correct answer and (0) score for incorrect answer. The total scores of nurses' level of knowledge were 24 scores and converted to one hundred percentages (100%).

The total level of knowledge ranged from 0-24 and was categorized as:

- Satisfactory if the total score is ≥ 85% or more (≥21 grade).
- Unsatisfactory if the total score less than 85% (≤ 21 grade) ***(Ismaiel, 2022)***.

Tool Π: Nurses' practices observational checklist:

This tool was adapted from ***(EL-kady et al., 2021)*** to assess nurses' practices regarding implementation of ABCDE bundle for mechanically ventilated patients.

This tool consisted of 8 items covering three main domains (awakening and breathing coordination trials steps (ABCs) (4 steps), delirium monitoring and management (2 steps), early mobility and exercise (2steps). Each domain has steps with done or not done.

Scoring system for nurses' practices observational checklist:

Nurses' level of practice was evaluated by giving score (1) for each step that had been done and score (0) for each step hadn't done. The total scores of nurses' level of practice were 8 scores and converted to one hundred percentages (100%). Total practices score ranged from 0 to 8 degrees and were categorized as:

- Competent level of practice if the total score is 85% or more.
- Incompetent level of practice if the total score is less than 85% ***(Ismaiel et al., 2022)***.

Tool III: Sedation Scale of Richmond-Agitation (RASS):

This scale was adopted from ***(Bardwell et al., 2020)*** and consisted of 10 states to assess patients' level of sedation or agitation at ICU.

Scoring system of RASS:

According to the patient current condition during assessment, the score is given to describe patients' sedation or agitation level.

The scale included 10 states:

A positive score that describe level of anxiety or agitation (+1 to +4).

- If the patient anxious but there is no vigorous movements, the patient was given score (+ 1).
- If the patient has frequent no purposeful movement, given score (+ 2).
- If the patient has vigorous movement and actions, given score (+ 3).
- If the patient was over combative or violent, given score (+4).

A stable status, when patient was alert and calm, given score (0).

A negative score that describe level of sedation (-1 to -5).

- If the patient was not fully alert, sustained >10sec awakening, was given score (-1).
- If the patient was sustained <10sec awakening with eye contact to voice, given score (-2).
- If the patient has any movement but no eye contact with voice, given score (-3).
- If the patient has no response to voice, any movement to physical stimulation, given score (-4).
- If the patient has no response to voice or physical stimulation, given score (-5).

Tool IV: Confusion Assessment Method for the ICU (CAM-ICU):

This tool was adapted from ***(Krewulak et al., 2020)*** and consisted of four steps to assess delirium among patients at ICU.

Scoring system:

This tool consisted of (4 steps) with a total score 7.

- First step: to detect if the patient had any fluctuation in mental status in the past 24 hours, given score (0) if absent and given score (1) if present.
- Second step: to assess attentiveness, ask the patient raise hand if hear the number (1) then say ten numbers, if patient raise hand when hearing only the number (1) at least 8 times, given score (0), while if the patient was correct (4-7) times, given score (1) and if was correct only (0-3) times, given score (2).
- Third step: to assess presence of altered level of consciousness, if the patient was alert and calm, given score (0), while if RASS score was (1 or -1), given score (1) and if RASS score was (>1 or < -1), given score (2).
- Fourth step: to assess clear thinking and judgment, asked the patient (4) question and gave one command, if patient gave at least 4 correct answer, given score (0), while if the correct answer was (2:3), given score (1) and if gave one correct answer or no correct answer, given score (2).

Finally collect the score that was ranged from 0-7 and categorized as:

-No delirium if patient has score 0–2.

-Mild to moderate delirium if patient has score 3–5.

-Severe delirium if patient has score of 6–7.

Validity:

Content validity was conducted to determine whether the content of the tools cover the aim of the study. It was measured by a jury of 5 experts: 3 Assistant professors and 2 lecturers of medical surgical nursing at faculty of nursing - Helwan University, who revised the content of the tools for clarity, relevance, accuracy, comprehensiveness, simplicity and applicability and minor modifications, were done.

Reliability:

It's the consistency of the measurement instrument; the degree to which an instrument measures the same way each time; it's used under the same condition with the same subjects. Reliability of the tools was tested to determine the extent to which the questionnaire items are related to each other. The Cronbach's alpha was used to test reliability of the study tools. It's normally ranges between 0 and 1with higher value more than 0.7 denotes acceptable reliability. The tools showed good reliability, it was (0.724) for nurses' knowledge regarding ABCDE bundle and delirium, (0.747) for observational checklist regarding ABCDE bundle, (0.703) sedation scale of Richmond-agitation and (0.819) for confusion assessment method for the ICU.

Ethical considerations:

An official permission to conduct the proposed study was obtained from the scientific research ethics committee at Faculty of nursing, Helwan university. Participation in the study was voluntary and subjects were given complete full information about the study and their role before signing the informed consent. The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where they weren't be accessed by any other party. Ethics, values, culture and beliefs were respected.

II- Operational item:

Preparatory phase: -A

It included reviewing of past, current, national and international related literature and theoretical knowledge of various aspects of the study using books, articles, internet and periodicals to develop tools for data collection.

Pilot study: -B

The pilot study was done on 10% of the sample (8 patients, 7 nurses) to examine the clarity of questions and time needed to complete the study tools. No modifications were done, so the participants in the pilot study were included in sample size.

Field Work: -C

-1 Data were collected within 6 months in the period from the beginning of October 2022 to the end of March 2023.

-2 At the beginning of the interview, the aim of the study was explained to nurses and patients and care givers.

-3 The investigator obtained the patients and nurses' oral consent for participating in the study.

-4 The investigator visited the cardiothoracic hospital 3 days per week during the morning shift (8:00 am to 2:00 pm). Each day the investigator interviewed 1- 2 nurses and observed their practices and collected data from 1-2 patients.

-5 The investigator assessed nurses' demographic characteristics and their knowledge through sending google form to the nurses to assess knowledge about ABCDE bundle and delirium and then assessed their practices by using observational checklist during caring for patients with mechanical ventilation.

-6 Patients' data were collected through a structured interview questionnaire and the investigator filled demographic characteristics data after obtaining oral consent from patient or patient's care giver.

-7 The investigator assessed level of consciousness by using Richmond agitation-sedation score, the patient was assessed by using this tool for three continuous days to detect if the patient had any fluctuation in mental status or presence of altered level of consciousness. Assessing RASS after holding sedation at the morning shift, using this tool took about 30-60 sec for every patient,

-8 At the third day after using RASS tool , the investigator used the second tool confusion assessment method for the ICU (CAM-ICU) for assessing presence of delirium and its severity.

- First step, the investigator was assessing if there were altered mental status or fluctuating course, this step depend on the results of 3 days of using RASS if the patient had no change at RASS score then the test was negative for delirium but the investigator needed to complete other steps of CAM-ICU to confirm the test, if the patient had different RASS score for 3 days, move to next step assessing for inattention if the patient had 0 or 1 error answer then the test was negative for delirium if had more than 1 error answer then moving to next steps, assessing for presence of altered level of consciousness by using RASS score and presence of disorganized thinking by asking patient 4 questions and giving one command.
- CAM-ICU took from 3-5 minutes with total score (0-7) the presence of delirium scored from (3-7).

III-Administrative item:

After explanation of the study aim and objectives, an official permission was obtained from the dean of Faculty of Nursing Helwan University and directors of governmental hospitals (Cardio-Thoracic hospital at Sednaui hospital-Zagazig university hospitals) asking for cooperation and permission for data collection.

IV-Statistical Item:

Upon completion of data collection, collected data were organized, tabulated and analyzed using Statistical Package for the Social Science (SPSS), version 24 for analysis. For quantitative data, numbers, percentage, mean, and standard deviation (SD) were used to describe the results. For qualitative data which describe a categorical set of data by frequency, percentage of each category was calculated. Appropriate significance was adopted at $P< 0.05$ for interpretation of results. The observed associated differences were considered as not significant if $p>0.05$ and significant if $p<0.05$. Appropriate inferential statistics such as chisquare and "r" test was used as well.

Results:

Table (1): Frequency and percentage distribution of the studied nurses according to their demographic characteristics (N=70).

	Nurses' characteristics	No	%
Age (in years)	20 > 30	39	**55.7**
	30 > 40	28	40.0
	40 > 50	3	4.3
	≥ 50 years	0	0.0
Mean ± SD			**30.70 ± 5.131**

Gender	Male	25	35.7
	Female	45	**64.3**
Educational level	Nursing diplome	9	12.9
	Technical institute	28	40.0
	Bachelor's degree	29	**41.4**
	Post graduate	4	5.7
Attendance of training program regarding ABCDE bundle	Yes	18	25.7
	No	52	**74.3**
Duration after training (n= 18)	Less than 1 year	15	**83.3**
	1-2 years	3	16.7

Table 1: shows that 55.7% of the studied nurses aged from 20 to less than 30 years with a mean age 30.70 ± 5.131, 64.3% of them were females and 41.4% of the nurses had bachelor's degree as educational level, as well, 74.3% of them didn't attend any training programs regarding ABCDE bundle, while, only 25.7% of the studied nurses attended training programs with 83.3% of them attended since less than one year.

Figure (1): Percentage distribution of the studied nurses according to years of experience at intensive care unit (N=70).

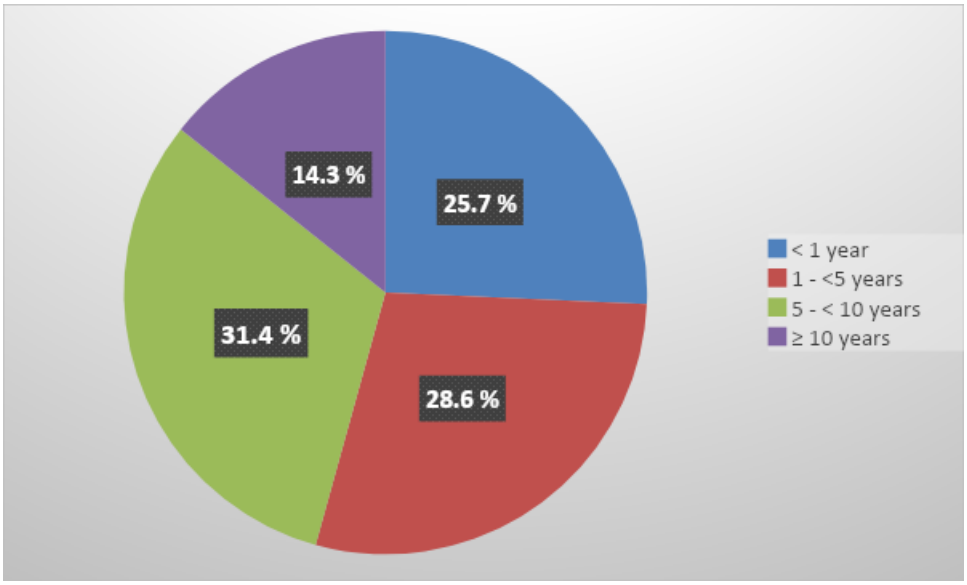

Figure (1): illustrated that 31.4% of the studied nurses had 5 to less than 10 years of experience at intensive care unit.

Table (2): Frequency and percentage distribution of the studied patients according to their demographic and medical characteristics (N=80).

	Patients' characteristics	No	%
Age (in years)	18 > 30	28	**35.0**
	30 > 40	10	12.5
	40 > 50	9	11.2
	50 > 60	11	13.8
	≥ 60	22	27.5
Mean ± SD			**44.11 ± 18.594**
Gender	Male	49	**61.2**
	Female	31	38.8
Length of ICU stay	1- < 5 days	28	35.0
	5- <10 days	43	**53.8**
	10- 15 days	9	11.2
Mean ± SD			**6.012 ± 3.008**

Cause of connection to mechanical ventilator	Acute respiratory failure.	34	**42.5**
	Abnormalities of pulmonary gas exchange.	14	**17.5**
	Cardiac insufficiency	10	12.5
	Road traffic accidents	7	8.75
	Head trauma	3	**3.75**
	Other causes (toxemia, COVID 19, stroke)	12	15.0

Table (2): reveals that 35.0% of the studied patients aged from 18 to less than 30 years with a mean age 44.11 ± 18.594 and 61.2% of them were males. 53.8 % of the patients stayed at ICU for 5- <10 days with a mean duration 6.012 ± 3.008 days. Regarding cause of connection to mechanical ventilator, acute respiratory failure was the most common cause among 42.5% of the studied patients, followed by abnormalities of pulmonary gas exchange among 17.5% of them. While, head trauma was the least common cause with a percentage 3.75% of them.

Figure (2): Percentage distribution of the studied nurses according to total knowledge scores (N=70).

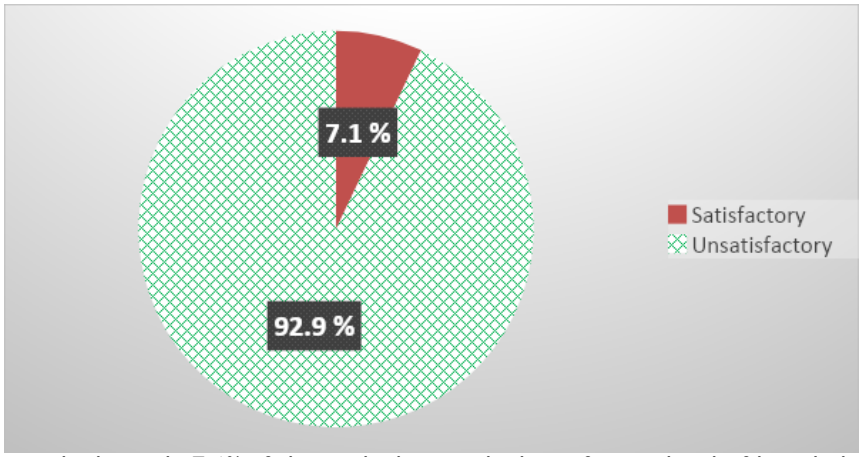

Figure (2) reveals that only 7.1% of the studied nurses had satisfactory level of knowledge regarding ABCDE bundle and delirium and its management, while, 92.9% of them had unsatisfactory level of knowledge.

Figure (3): Percentage distribution of the studied nurses according to total competent level of practices (N=70).

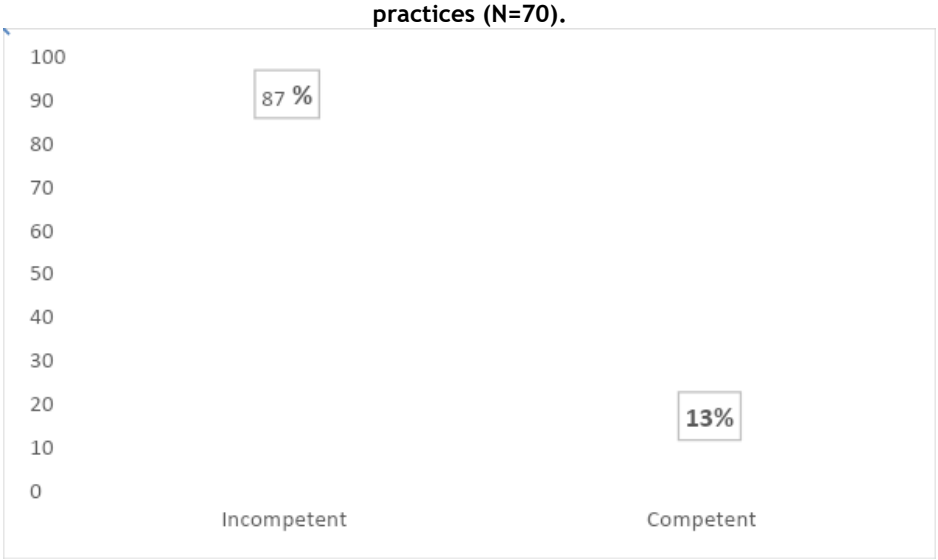

Figure (3): illustrates that only 13% of the studied nurses had total competent level of practices, while, 87% of them had total incompetent level of practices regarding ABCDE bundle implementation.

Figure (4): Percentage distribution of the studied patients according to their total Richmond agitation sedation scale (RASS) scores through 3 days (n=80).

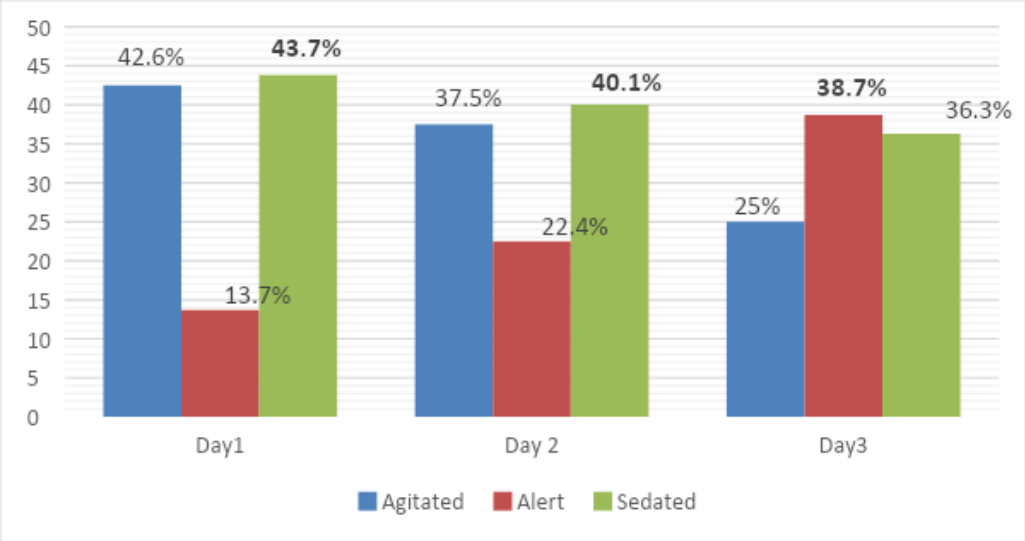

Figure (4): illustrates that 43.7% of the studied patients were sedated on the first day, while, only 13.7% of them were alert. On the second day, 40.1% of the patients were sedated, while, 22.5% of them alert.

On the third day, 38.7% of the patients were alert and calm, while, 25% of them were agitated

Figure (5): Percentage distribution of the studied patients according to their total delirium scores (N=80).

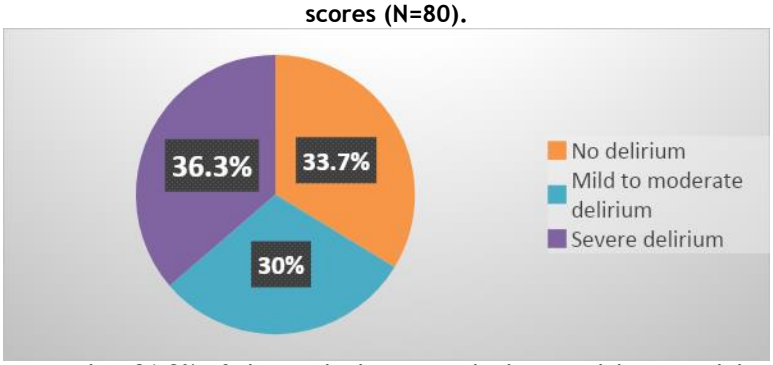

Figure (5) illustrates that 36.3% of the studied patients had sever delirium, while, 30.0% of them mild or moderate delirium and 33.7% had no delirium.

Table (3): Correlations between total RASS score of the studied patients, total knowledge and practices scores of the studied nurses.

Items	Total RASS score	
	Correlation coefficient (r)	P value
Total knowledge scores	0.020	0.867
Total practices scores	0.071	0.559

Not significant (S) p > 0.05 *Significant (S) p ≤ 0.05 *Highly significant (S) p ≤ 0.001

Table (3): shows that there were no statistically significant correlations between total Richmond agitation sedation scores of the studied patients and knowledge and practices scores of the studied nurses.

Table (4): Correlations between total CAM- ICU score of the studied patients, total knowledge and practices scores of the studied nurses.

Items	Total CAM ICU score	
	Correlation coefficient (r)	P value
Total knowledge scores	-0.274	0.022*
Total practices scores	-0.270	0.025*

Not significant (S) p > 0.05 *Significant (S) p ≤ 0.05 * Highly significant (S) p ≤ 0.001

Table (4): shows that there were statistically significant negative correlations between total Confusion Assessment Method for the ICU scores of the studied patients and knowledge and practices scores of the studied nurses with p value (0.022 & 0.025) respectively.

Discussion:

Regarding the demographic characteristics of the studied nurses, the present study showed that more than half of the studied nurses' age was between 20 to less than 30 years. This can be explained that the most of the nurses were newly graduated. This is consistent with **Ismaiel et al., (2022)** in their Egyptian study entitled "Assess nursing performance during implementation of care " and reported bundle for critically ill patients that more than half of the studied nurses were newly graduated.

The present study revealed that about two thirds of the studied nurses were female. This can be interpreted by the nature of nursing profession in Egypt as a feminine job. This finding agrees with a study conducted in china by **Wang et al., (2020)** about "Intensive care unit nurses' knowledge, attitudes and perceived barriers regarding early mobilization of patients" and showed that the majority of participations were female.

Relating to studied nurses' educational level, this study result indicated that less than half of studied nurses had bachelor's degree as level of education. From investigators' point of view, this could be due to nurses having bachelor degree are usually assigned to intensive care units at governmental hospitals. This is similar to the study of **Mu-hsing et al., (2022)** who carried out a study in Taiwan entitled " Recognizing intensive care unit delirium: are critical care nurses ready?" and mentioned that the most of nurses were registered nurses.

Concerning to attending previous training programs, the present results showed that the majority of the studied nurses hadn't attend previous training courses; this may be due to shortage of nursing staff and their workload at ICU. This result matches with a cross sectional survey in china conducted by **Zhang et al., (2022),** titled "Early mobilization implementation for critical ill patients: A cross-sectional multi-center survey about knowledge, attitudes, and perceptions of critical care nurses" and revealed that more than half of participated nurses didn't attend training programs.

The present study illustrated that less than one third of the studied nurses had 5 < 10 years of experience at intensive care unit. This can be explained by the age of the majority of nurses was less than 30 years. This finding agrees with a American study conducted by **Boehm et al., (2017)** about "Organizational domains and variation in attitudes of intensive care providers toward the ABCDE bundle" and showed that about half of participations had 9 years of ICU experience range from 4:19 years. While, this result is incongruent with a study conducted by **Boehm et al., (2020)** about "A multisite study of nurse-reported perceptions and practice of ABCDEF bundle components" and revealed that participants had a mean of 2.4 total years of ICU experience.

Regarding the demographic characteristics of the patients, the present study revealed that less than third of studied patients aged less than 30 year old, less than two thirds of them were male patients, more than half of patients stayed for 5 to ten days at ICU and acute respiratory failure was the common cause for their connection to mechanical ventilation among less than half of them. These finding are consistent with study of **Tilouche et al., (2018)** who conducted a study in India about "Delirium in the intensive care unit: incidence, risk factors, and impact on outcome" they found that the majority of the patients were male and stayed for more than one day with acute respiratory failure.

According to total knowledge scores, the present study revealed that the minority of the studied nurses had satisfactory level of knowledge regarding ABCDE bundle and delirium and its management, while, the majority of them had unsatisfactory level of knowledge. These can be explained by absence of training programs regarding ABCDE bundle. These findings are inconsistent with study of **Negro et al., (2022)** who conducted a study about "The ABCDE bundle implementation in an intensive care unit: Facilitators and barriers perceived by nurses and doctors" and found that most participants considered they had good awareness and knowledge about delirium, ABCDE bundle, its components and effectiveness.

On summary, the result of this study answered the first question that the nurses' level of knowledge regarding ABCDE bundle for mechanically ventilated patients at the intensive care unit was only 7.1% had satisfactory total level of knowledge and the majority of studied nurses had unsatisfactory level of knowledge.

According to total competent level of practices, the present study illustrated that more than four fifth of the studied nurses had total incompetent level of practices. From investigator's point of view, this could be due to deficit nurses' knowledge regarding components of ABCDE bundle. This finding agrees with a study of **Ismaiel et al., (2022)** who found that more than three quarters of the studied nurses had unsatisfactory level of practices regarding care bundle for critically ill patients.

As well, this result is in agreement with **Boehm et al., (2017**) who showed that the compliance of the ABCDE bundle was reduced by 53%. While, this result disagrees with

Chinese study of **Huang et al., (2021**) who stated that the overall awareness and compliance rate of the ABCDE bundle was more than half of participants. Also, this result is inconsistent with **Boltey et al., (2019)** who conducted study in Michigan hospital about "Ability to predict team members' behaviors in ICU teams is associated with routine ABCDE implementation" and found that the majority of participants were implementing ABCDE bundle.

On summary, the result of this study answered the second question that the nurses' level of practices regarding ABCDE bundle for mechanically ventilated patients at the intensive care unit was more than four fifths of the studied nurse had incompetent total level of practices.

In the present study, the level of ICU sedation was assessed using the standardized Richmond Agitation and Sedation Scale, the current study illustrated that less than half of the studied patients were sedated, while, minority of them were alert, on the first and second days of assessment. While, on the third day, more than one third of the patients were alert and calm, while, one quarter of they were agitated. These results are similar to **Wang et al., (2017)** who conducted a prospective study about "Bispectral index can reliably detect deep sedation in mechanically ventilated patients" and found that the majority of patients had at least 1 episode of deep sedation. Where as, these findings are inconsistent with **Lalithapriya et al., (2019)** in their study in India entitled "Prevalence of ICU delirium among patients admitted to intensive care unit" they found that more than one third of patients were calm and alert, more than one third were drowsy, and the minority of studied patients were restless, agitated and light sedation.

Regarding distribution of the studied patients according to their total delirium scores, the study illustrated that more than one third of the studied patients had sever delirium, while, third of them had mild or moderate delirium and this may be due to shortage of knowledge delirium and it's risk factors and incompetent practices regarding ABCDE bundle, As well, absence of protocol for delirium monitoring and management. This study finding is the same of many previous studies as **Malik et al., (2021)** in their Indian study about "A new ICU delirium prevention bundle to reduce the incidence of delirium" who found that about half of the studied group had delirium. As well, American study of **Stollings et al., (2021)** about "Delirium in critical illness: clinical manifestations, outcomes, and management" found that about the majority likely to developed delirium, and **Smonig et al., (2019)** in their study at Paris about "Impact of natural light exposure on delirium burden in adult patients receiving invasive mechanical ventilation in the ICU" who found the incidence of delirium of about two thirds on different two groups.

On the other hand, these results is dissimilar to **Sileshy et al.,(2022)** who carried out a study in Ethiopia about "Magnitude and associated factors of delirium among patients attending emergency department at Jimma medical center" and revealed that the minority of patients had mild and moderate delirium and the majority of patients had sever delirium.

On summary, the result of this study answered the third question that more than one third of the studied patients had sever delirium, while, about one third of them had mild or moderate delirium and more than one third of them had no delirium.

Regarding correlations between total RASS score of the studied patients, total knowledge and practices scores regarding ABCDE bundle of the studied nurses. The current study showed that there were no statistically significant correlations between total Richmond agitation sedation scores of the studied patients and knowledge and practices scores of the studied nurses. This result is incongruent with **Beaulieu (2022)** who carried out a study about "Increasing nurses' knowledge of Richmond-agitation sedation score assessment and documentation through education" and found that insufficient RASS assessment and score affected by insufficient nurses' knowledge and practices. As well, **Dyer (2022)** in a study about" Sedation assessment and management in the intensive care unit" and found that nurses' knowledge and practices regarding sedation assessment affected on RASS assessment.

Regarding correlations between total CAM-ICU score of the studied patients, total knowledge and practices scores of the studied nurses, the current study showed that there were statistically significant negative correlations between total CAM ICU scores of the studied patients and knowledge and practices. This can be explained that when the nurse being unaware about the care bundle and protocol of care which is different from routine care, especially the part of delirium monitoring and management, this lead to increased incidence of delirium.

This results as the same of a prospective study conducted in France by **Alaterre et al., (2023)** about "Monitoring delirium in the intensive care unit: Diagnostic accuracy of the CAM-ICU tool when performed by certified nursing assistants" and found that certified nursing assistants who had enough knowledge and practices and received training in delirium care had great performance for detecting delirium using the CAM-ICU tool with best results. Also **Demir et al., (2023)** who conducted a study in turkey about "Delirium awareness of intensive care nurses before and after education" they found that the knowledge level of nurses about delirium were significant for the prognosis of delirium.

As well, American study of **Powell et al., (2019)** about "Nursing understanding and perceptions of delirium: assessing current knowledge, attitudes, and beliefs in a burn ICU", they found that increasing staff compliance and awareness with CAM-ICU and other delirium assessment tools decreased CAM-ICU positive days and nurses' awareness and general knowledge about delirium have great impact on CAM-ICU score and delirium incidence. Also **Talhouk et al., (2019)** in their study in Lebanon about "Effect of confusion assessment tool application on critical care nurses' knowledge of delirium recognition" they found that training concerning delirium and routinely application of validated assessment tools have positive impact on CAM-ICU score and effective recognizing of patients with delirium.

Conclusion

In the light of the current study findings, it can be concluded that

The majority of studied nurses to all of them had unsatisfactory knowledge regarding ABCDE bundle and delirium and its management and more than four fifths of them had total incompetent level of practices regarding ABCDE bundle implementation, more than one third of the studied patients had sever delirium, while, about one third of them mild or moderate delirium. Additionally, there were statistically significant negative correlations between total CAM ICU scores of the studied patients and knowledge and practices of nurses.

Recommendations

On the light of the study findings, the following recommendations are suggested:

A-According to organization:

The hospital should establish clear policies and protocol for ABCDE bundle and how to deal appropriately with critically ill patients on mechanical ventilation at ICU.

The hospital should encourage health care members regarding implementation of ABCDE bundle for better results.

The hospital should provide continuous supervision and ensure that nurses monitoring delirium daily.

The hospital administration should focus on improving nursing knowledge and performance regarding ABCDE bundle.

B- Educational recommendation:

Providing educational program and continuous training for nurses about implementing the bundle, monitoring and managing delirium.

C-Further research:

Future researches are recommended to assess the effect of educational program for ICU nurses regarding implementing ABCDE bundle.

Further studied are recommended to examine the factors that effect on delirium incidence.

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