

Critical Care Nurses' Knowledge and Practices regarding Intravenous Sedation for Mechanically Ventilated Patients: Suggested Nursing Guidelines

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Abstract

Background: The administration of sedation is an essential part of intensive care. Therefore, nurses must be up-to-date on the latest sedation knowledge and practice, as sedation is associated with serious dangers for patients. **The study aim:** Explore critical care nurses' knowledge and practices regarding intravenous sedation for mechanically ventilated patients. **Design and sample:** A cross-sectional descriptive exploratory design was used. A convenient sample of 105 nurses working at critical care units. **Setting:** The present study was carried out in Critical Care Units. **Tools of data collection:** Nurses' Knowledge Assessment Questionnaire that included basic knowledge to measure the level of knowledge held by nurses working in critical care units on sedative drugs, and 26 Items Survey Questionnaire to measure knowledge of sedatives, sedation assessment, and management, and nurses' practice observational checklist to assess nurses' practice regarding the administration of sedative medications via syringe pump. **Results.** 94.3% of the studied nurses had unsatisfactory knowledge regarding basic knowledge, while, 89.5% had unsatisfactory regarding sedation assessment and management. 73.3 % of nurses had incompetent practice regarding the administration of sedative medications. Also, regarding practice areas, the majority of nurses' practices regarding the preparatory phase, Propofol administration, ketamine& midazolam administration, general administration, and post-procedure phase was incompetent with percentage 100 %, 91.4% 84.8%,84.8%.75.2%, and 69.5 % respectively. There was a statistically positive correlation between nurses 'basic knowledge and total nurses 'practice regarding the administration of sedative medications with $r=.263$ and P value .02*. **Conclusion:** The majority of nurses had an unsatisfactory level of knowledge regarding intravenous sedation. Also, the majority of nurses had an incompetent level of practice regarding intravenous sedation. **Recommendations:** Educational nursing guidelines regarding intravenous sedation should be conducted.

Keywords: knowledge, intravenous sedation, and practice

Introduction

Sedatives are some of the most often prescribed medications in the critical care unit as a result of mechanical ventilation being the most widely utilized mode of life support in use worldwide. In actuality, sedation is recommended for more than 90% of patients during an ICU admission (Luz et al. 2022). It is standard of care to sedate critically ill patients to lessen anxiety and discomfort and to help them tolerate mechanical ventilation. Treatment strategies are generally dependent on focusing on the level of sedation because sedatives can have a variety of effects depending on a variety

of patient and pharmacological variables. The advantages of various levels of sedation must be weighed against any potential adverse effect, such as hemodynamic instability, delirium, a delayed awakening, and an extended stay in intensive care (Tejpal et al., 2022)

Critically ill patients with life-threatening conditions or injuries may need mechanical ventilation as well as ongoing intravenous sedation, and other pharmaceuticals to prevent delirium (Ceric et al., 2022). Maintaining patients in deeper sedation for a long period has been linked to complications and adverse events, which have been linked to

greater levels of patient mortality ranging from 30% to 52% (Barr et al., 2013; Nunes, et al., 2022). Mechanical ventilation's primary goals are to enhance pulmonary gas exchange and alleviate respiratory discomfort, which will speed up lung and airway repair while lowering the risk of iatrogenic consequences.

About 300 patients were hospitalized in Assuit University Hospital's critical care units with more than 50% of them attached to mechanical ventilation (Anwar Abdel ElAziz et al., 2020). Cairo, Egypt, and southern India likewise revealed that ventilated patients had higher mortality rates, 67.21% and 64%, respectively (Alemayehu et al., 2022).

Critical care nurses are increasingly in charge of ongoing assessment, monitoring, and titration of analgesia and sedation for critically sick intubated patients, even though the use of analgesia and sedation is not new (Varndell et al., 2015). Important aspects of the care for mechanically ventilated patients in the intensive care unit include sedation and analgesia. To create a sedation plan for specific individuals, it is imperative to have a thorough understanding of regularly utilized drugs. Critically sick patients may experience distinct physiological changes that have a direct impact on the pharmacology of medications, potentially resulting in patient-to-patient variations in response (Seo, et al., 2022).

Sedative medications are frequently administered to patients in the intensive care unit who are receiving mechanical ventilation to treat anxiety, agitation, and ventilator dyssynchrony. Sedation has been linked to undesirable effects including psychosis, prolonged mechanical breathing, and unfavorable psychosocial effects following critical illness. As a result, sedation recommendations have recommended restricting the use of sedatives during mechanical breathing to maintain light levels of sedation, unless doing so is clinically contraindicated (Vincent et al., 2016, Guttormson et al., 2019).

However, in practice, strategies that reduce the use of sedative drugs have low rates

of commencement and adherence. Lack of guidance or support from nursing supervisors is a barrier to using sedation protocols, sedation scales, and daily interruption of sedation. In addition, there are issues with patient comfort, staff resistance to change, and the perception that using sedation scales will take a long time (Rose et al., 2015; Anwar Abdel ElAziz et al., 2020).

Significance of the study

To successfully implement sedation guidelines in the ICU, nurses, who handle medication administration as the primary health care providers, are essential. Understanding nurses' existing knowledge and practices regarding sedation during mechanical breathing may help to identify obstacles to the usage and adherence to sedation standards and guide future sedation research. Critical care nurses' practice regarding intravenous sedation for mechanically ventilated patients become a great concern due to incompetent practice that reflects an increase in medication error, and poor standard of care. In addition, the lack of knowledge of critical care nurses regarding intravenous sedation for mechanically ventilated patients affects negatively on quality of critical care nurses' care. (Delvin et al., 2018; Guttormson et al., 2019).

Aim of the study:

This study aimed to explore critical care nurses' knowledge and practices regarding intravenous sedation for mechanically ventilated patients: Suggested Nursing Guidelines

Research questions:

1. Is critical care nurses' knowledge regarding intravenous sedation for mechanically ventilated patients satisfactory?
2. Are critical care nurses' practices regarding intravenous sedation for mechanically ventilated patients competent?
3. Is there a relationship between critical care nurses' knowledge and practices regarding

intravenous sedation for mechanically ventilated patients?

Subjects and Method:

Design and Sample:

A cross-sectional descriptive exploratory design was used. A convenient sample of 105 nurses working at critical care units affiliated to Suez Canal University hospitals. The sample size was calculated for nurses using the following equation: $n = (Z \alpha/2)^2 * P (1-P) / d^2$ (Dawson & Trapp, 2004), Where, $Z \alpha/2 = 1.96$, $E=0.1$, P (Prevalence) = (.50), $n = 96$; after adding 10% drop out, the total sample was 105

Setting:

The current research was conducted at the Critical Care Units that are associated with the Suez Canal University Hospital. These units include the Cardiac Care Unit, which is located on the first floor and has 12 beds, and the Intensive Care Unit, which is located on the second floor and has 20 beds.

Tools of Data Collection:

Data from the current study were collected by utilizing two tools nurses' knowledge assessment questionnaire, and the nurses' practice observational checklist.

TOOL (I): Nurses' Knowledge Assessment Questionnaire:

A knowledge questionnaire was prepared by the researcher following a review of recent relevant literature to measure the level of knowledge held by nurses working in critical care units on sedative drugs. It is divided into three sections: the first one focuses on demographic variables; the second one evaluates fundamental knowledge about intravenous sedation.

Part (1):

It was concerned with profile data of the studied nurses (e.g. age and education, and work-related data (department, years of experience, and attending training courses related to sedative medications).

Part (2):

It included 16 items concerned with the basic knowledge regarding these medications including pharmacological concepts, mechanism of action, indications, side effects, and nursing implications (Roach & Ford, 2018).

Scoring system:

The range of the nurses' knowledge scores on the 16 questions was 0 to 16. For each accurate response, the respondent received one point, whereas erroneous responses received zero points. A total score of less than 85% was deemed unsatisfactory, whereas one equal to or more than 85% was deemed satisfactory (Yousef et al., 2014).

Part III: 26 Items Survey Questionnaire:

A review of the literature and studies that have already been done on sedation evaluations, management, and practice led to the development of 26 items that measure knowledge of sedatives, sedation assessment, and management (Mehta et al., 2006). The items were positively and negatively worded and scored with a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The scoring of negative items was reversed. A total score was calculated, and it varied from 26 to 130. Higher scores indicated higher levels of sedation assessment and management knowledge; scores below 80 (the mid-point of the score is 78) indicated poor knowledge. The questionnaire was developed in English and then it was translated to Arabic language by a linguistic professional using a back-to-back translation approach.

TOOL (II): Nurses' practice observational checklist

It was developed by the researcher based on the literature (Kizior and Hodgson, 2021 & Skidmore-Roth, 2018) to assess nurses' practice regarding the administration of sedative medications via syringe pump including propofol, midazolam, and ketamine.

It was written in the English language to be collected by the investigator.

Scoring system:

The total score for the 39 steps in the nursing practices ranged from 0 to 39. For each option, there are completed and uncompleted options. Each nurse received a score of one for a step completed and a zero for one that had not been. A total score of 85% or higher was deemed competent, and a score of less than 85% was deemed incompetent. (Yousef et al., 2014).

Validity and Reliability of the Instrument:

The validity of the data-gathering tool's content has already been examined. Whether the included elements are complete, intelligible, appropriate, clear, and suitable to meet the study's goal is determined by five experts from the nursing and medical staff. The reliability coefficient was calculated using Cronbach's alpha. Cronbach's alpha for the knowledge scores was = 0.75, and Cronbach's alpha for practice scores was 0.71.

Fieldwork:

1. Preparatory Phase:

A review of current and past relevant literature using the available local and international books, magazines, and periodical to get acquainted with the research problem to develop the study tools and the content of the current study.

Permission for data collection and implementation of the study in Suez Canal University Hospitals in Ismailia was obtained from the hospital administrative personnel by the submission of a formal letter from the faculty of nursing, Ismailia, Suez Canal University. Meetings and discussions were held by the researcher and nurses to let them be aware of the aims, and the nature of the study, as well as to get better cooperation.

Implementation phase:

Data collection for this study was carried out over 6 months starting from the 1st of

August 2021 to the end of January 2022. The two study tools were completed. Tool I took about 20-30 min, completed by the nurses, and Tool II data collection was done by the researcher through observation during actual work over six months three days a week during the morning, afternoon, and night shifts.

Pilot study:

For 10% of the nurses being evaluated, the researcher conducted a pilot study. Study tool use was put to the test. The researcher can adjust the tools by using the data from the pilot study to make the necessary corrections or additions. As a result, changes were made, and the final form was created.

Ethical Considerations:

After getting approval from the Ethics Committee, the Suez Canal University Faculty of Nursing's letter of reference, and approval from those participants. Written consent is given by the nurses who participated in the trial. The researcher went into great depth about the goals and aims of the study. Nurses were safeguarded from dangers, confidentiality and anonymity were ensured, and participants had the choice to leave the study at any moment.

Data analysis:

The Statistical Package for the Social Sciences (SPSS) Version 20 for Windows was used to carry out the analysis. Numbers and percentages were used to portray numerical measures and categorical measurements, respectively. Mean and standard deviation were used to represent normally distributed variables (SD). Calculated descriptive statistics for the overall age of nurses' knowledge. To study the association between fundamental skills and overall nursing practice, Pearson correlation coefficients were used. The significant P value was 0.05

Results

Table (1): Reveals that 31.4% of studied nurses aged between 25 to less than 28 years with a mean of 26.09. Also, 53.3% had a

technical degree. 41% had less than three years of experience in critical care units. 84.8% hadn't attended any courses regarding sedative medication administration.

Table (2): Shows that 40% of the studied sample had correct answers regarding sedative medications with the highest correct answer being related to nursing assessment for patients receiving sedating agents with a percentage of 79%. Also, 60% of the studied sample had incorrect answers with the highest incorrect answer related to accurate pulse oximetry probe placement for patients receiving sedating agents, the aim of sedation in the critical care unit, candidates for sedation in most settings, and changing the IV tubing and solution, when using a continuous infusion of propofol with percentage 85.7%, 78.1, 78.1, and 72.5% respectively.

Figure (1): Illustrates 5.7% of the studied nurses had satisfactory knowledge regarding basic knowledge, while, 10.5% had satisfactory regarding sedation assessment and management

Table (3): Reveals that the majority of the nurses strongly agreed or agreed that sedation requirements vary from patient to patient, followed by taking into consideration

the Patient's illness severity when deciding the choice of sedative, and individualizing target level of sedation based on each patient's need with percentages 88.6, 83.8% and 76.9 % respectively. Conversely, one-third of nurses agreed that hypertension is a common side effect of propofol, considering the patient over-sedated if responding only to noxious stimuli, followed by considering patients are considered under-sedated if spontaneously moving their hands and feet, with a percentage of 29.5%, 41%, and 44.7 % respectively.

Figure (2): The majority of nurses' practices regarding the administration of sedative medications were incompetent with a percentage of 73.3 %. Also, regarding practice areas, the majority of nurses' practices regarding the preparatory phase, propofol administration, ketamine & midazolam administration, general administration, and post-procedure phase was incompetent with percentage 100 %, 91.4% 84.8%, 84.8%. 75.2%, and 69.5 % respectively.

Table (5): There was statistically positive correlation between nurses' basic knowledge and total nurses' practice regarding administration of sedative medications with P value .02*.

Table (1): Percentage distribution of the studied nurses according to their demographic characteristics (n=105)

Items	N (%)
Age (Years)	
a) 19:<22	8 (7.6)
b) 22:<25	28 (26.7)
c) 25:<28	33(31.4)
d) 28:<31	29(27.6)
e) >31	7(6.7)
$\bar{x} \pm SD$	26.09±3.29
Education	
a) Bachelor	32(30.2)
b) Technical	56(53.3)
c) Diploma	11(10.5)
d) M.S. or PHD	6(5.7)
Department	
a) ICU	84(80)
b) CCU	21(20)
Critical care unit experience	
a) <3y	43(41)
b) 3:<6	33(31.4)
c) 6:<9	19(18.1)
d) >9	10(9.5)
Courses	
a) Yes	16(15.2)
b) No	89(84.8)

Table (2): Distribution of nurses according to their basic knowledge regarding sedative medications (n=105)

Items	Correct		Incorrect	
	N	%	N	%
a. Definition of sedation	52	49.5	53	50.5
b. The aim of sedation in critical care unit	23	21.9	82	78.1
c. Candidates for sedation in most settings	23	21.9	82	78.1
d. Nursing assessment for patients receiving sedating agents	83	79.0	22	21.0
e. length of action of Intravenous midazolam	34	32.4	71	67.6
f. Changing the IV tubing and solution, when using a continuous infusion of propofol	29	27.6	76	72.4
g. Reversal of ketamine	77	73.3	28	26.7
h. Accurate pulse oximetry probe placement for patients receiving sedating agents	15	14.3	90	85.7
i. The action of sedative drugs	65	61.9	40	38.1
Total	42	40	63	60
$\bar{x} \pm SD$ (95%CI)	3.82±1.43(3.54,4.10)			

Figure (1): Total knowledge regarding both basic and sedative medications assessment and management of studied nurses (n=105).

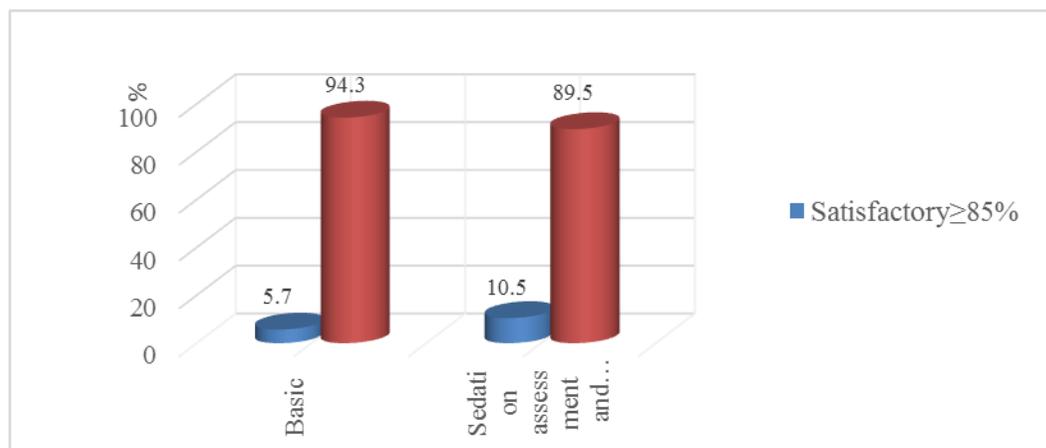


Table 3: Distribution of nurses' knowledge of sedatives, sedation assessment, and management (n=105)

Items	SA or A	Neutral	SD or DA
	N (%)	N (%)	N (%)
An essential nursing duty is sedation assessment.	53(50.4)	13(12.4)	39(37.2)
Patient comfort requires sedation	69(65.7)	29(27.6)	7(6.7)
Each patient has different sedation needs.	93(88.6)	9(8.6)	3(2.9)
Based on the requirements of each patient, a target level of sedation is established	81(76.9)	16(15.2)	8(7.6)
When selecting a sedative, the severity of the patient's condition must be taken into account.	88(83.8)	11(10.5)	5(4.8)
Sedation lowers the likelihood of experiencing delirium, delusional memories of the ICU, and depressive symptoms.	73(69.5)	22(21)	10(9.5)
An increased risk of patient mortality is linked to inappropriate sedation	62(59.1)	35(33.3)	8(7.7)
Due to the stress that mechanical ventilation causes to patients, all mechanically ventilated patients should be sedated.	62(59.1)	20(19)	23(22)
The use of a sedation scale is crucial because it allows medical personnel to adjust sedative therapy to meet predetermined clinical objectives.	70(66.7)	22(21)	14(11.4)
If a patient solely reacts to noxious stimuli, that is a sign of oversedation.	43(41)	32(30.5)	30(28.6)
Anxiety must be treated to treat pain.	41(39.1)	29(27.6)	35(33.3)
In a patient who is being ventilated mechanically, the absence of a cough response could signify profound sedation.	59(56.1)	24(22.9)	22(21)
Sedation can be considered inadequate if the patient's heart rate and blood pressure are elevated	50(47.6)	29(27.6)	26(24.8)
Withdrawal symptoms may develop if sedative infusion is abruptly stopped.	62(59)	29(27.6)	14(13.3)
If a patient is not easily aroused yet purposefully reacts to an unpleasant stimulus, sedation is regarded as moderate.	74(66.4)	20(19)	11(10.5)
Patients who are obese or have renal disease should use midazolam with caution since it could have cumulative and protracted sedative effects.	71(67.6)	26(24.8)	8(7.6)
After the administration of large doses for longer than about 7 days of continuous therapy, the possibility of opioid, benzodiazepine, and propofol withdrawal should be taken into consideration.	66(62.6)	29(27.6)	10(9.6)

Hypertension is a frequent adverse effect of propofol.	31(29.5)	26(24.8)	48(45.7)
The nursing report should include the patient's sedation aim and sedation score.	64(61)	23(21.9)	18(17.2)
Patients under profound anesthesia do not benefit from spontaneous breathing.	64(60.9)	20(19)	21(20)
If a patient is unintentionally moving their hands or feet, that indicates that they are under sedation.	47(44.7)	27(25.7)	31(29.5)
Because caring for patients requiring mechanical ventilation causes stress for nurses, all patients who are ventilated should be sedated.	62(59)	15(14.3)	28(26.7)
Nursing handover reports at shift changes should include the patient's sedation aim and sedation score.	64(60.9)	29(27.6)	12(11.4)
A nursing-implemented sedation protocol has been shown to reduce the duration of mechanical ventilation	51(48.6)	34(32.4)	20(19.3)
Systematic tapering of sedation dosages is necessary to prevent withdrawal symptoms.	82(78.1)	15(14.3)	8(7.7)
It has been demonstrated that daily stopping of sedative infusions can shorten the time needed for mechanical ventilation.	71(67.6)	22(21)	12(11.5)
Mean±sd (95%CI)	95.96±9.37(91.14,94.78)		

*SA (strongly agree); A (agree); SD (strongly disagree) & DA (disagree)

Figure (2): Practice level regarding intravenous sedation (n=105)

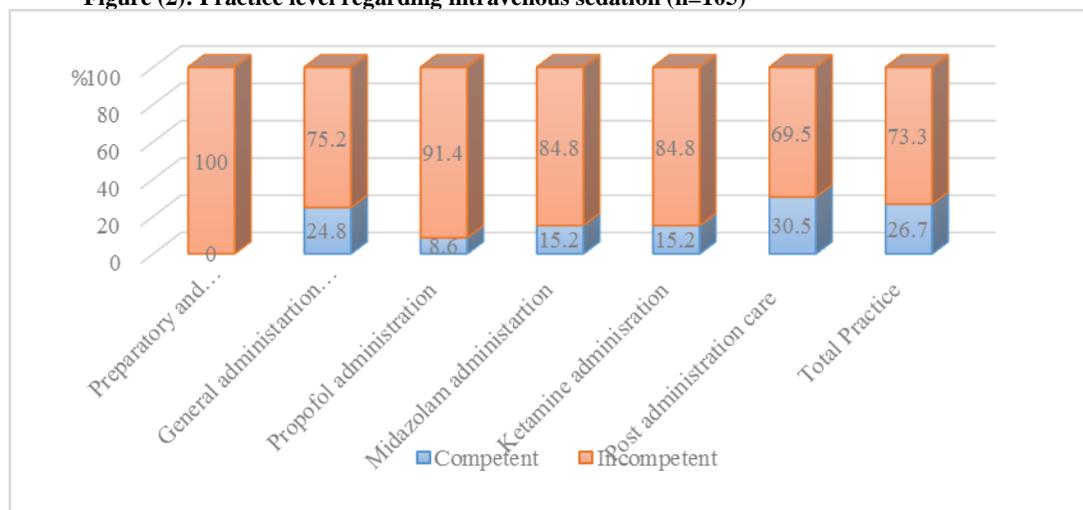


Table (5): Correlation between total nurses basic knowledge and their total practice regarding sedative medications administration (n=105)

Items	Practice	
	r	P value
Basic knowledge	.236	.02*

Discussion

The administration of sedation is an essential part of intensive care. It calls for the highest level of critical care. Due to the serious risks it poses to the patients. As a result, nurses

must understand the risks associated with sedative therapy and the state of the art in sedation practice. Optimal sedation levels for patients are achieved by the combined efforts of a multidisciplinary team, although nurses play a pivotal role in this process **Masih et al., (2020).**

It is the nurse's job to keep an eye on how deeply sedated a patient is, adjust the dosage of the injected medications as needed, and make sure that the patient stays at the desired level of sedation. The success of sedation is still heavily dependent on the nurse's level of education, skills, and experience.

Regarding basic knowledge about sedation medication most of the studied nurses had unsatisfactory knowledge. This in line with **Epstein, et al., (2020)** who indicated that a significant proportion of nurses lacked knowledge of the pharmacological effects of routinely prescribed sedatives. There is little doubt that safe sedation and analgesia courses need to be incorporated into the curriculum of any nurse's training and that addressing specific knowledge gaps of nurses is required. The fact that the same information gaps have persisted for almost 30 years, nevertheless, suggests that stricter "safeguards" may be necessary. Protocols for sedation and pain relief for patients undergoing mechanical ventilation may need to be refined across all relevant clinical services.

Consistent with the findings of a previous study done by **Ramoo, et al., (2016)**, the present investigation found that the majority of the nurses surveyed lacked adequate knowledge of sedation assessment and treatment. The poor grades nurses generally received were consistent with their little experience with sedation assessment. The majority of the nurses in this study had never been exposed to sedation assessment training previously, and they had never heard of any sedation management standards that were already in place. Since the educational intervention incorporated practical application, it has the potential to increase nurses' understanding of sedatives and sedation.

The present study clarified that the majority of studied nurses in competent practice regarding assessment and administration of sedation administration. This is in agreement with **Varndel, et al., (2015)** who study nurses' practices in assessing and administering continuous intravenous sedation for critically ill adult patients. Found that there are errors in the administration of intravenous sedation. Also **Lord, (2020)** identifies the need for

improvement in sedation assessment and administration practice. Moreover, **Di Muzio, et al., (2015)** showed that the majority of ICU medication errors are reported to happen during administration, as shown. Due to their severe situations, patients in intensive care units are at risk for medication errors since they are unable to engage in their healing process. They are often sedated and on artificial ventilation, and they are constantly in need of care.

Hetland, et al., (2018) emphasized the fact that nurses are largely responsible for assessing patients' needs and giving sedative medications, as well as the fact that nurses are an indispensable component in ensuring the successful delivery of sedative medication. Nonetheless, inconsistent adherence to practice continues to be a problem for critical care nurses due to challenges including a lack of awareness, familiarity, agreement, perceived utility, and previously taught methods.

The results of this study can serve as an initial step towards enhancing comprehension of the knowledge and practice of nurses about intravenous sedation for mechanically ventilated patients. Furthermore, it is important to note that there exists a knowledge deficit among nurses regarding intravenous sedation, specifically about fundamental concepts such as assessment and management of sedation. Given that nurses play a crucial role as primary healthcare providers responsible for medication administration, their understanding of sedation guidelines is vital for successful implementation. Consequently, it is recommended that educational nursing guidelines be developed to address the essential knowledge required for utilizing pulse oximetry in patients receiving intravenous sedation, identifying suitable candidates for sedation, and managing aspects such as changing IV tubing and solution when employing a continuous infusion of propofol. In addition, guidelines should encompass the evaluation and control of sedation, encompassing the utilization of sedation assessment scales, the risks associated with excessive sedation, the consequences of inadequate sedation, as well as the potential adverse effects linked to sedation.

The findings of this study revealed the incompetent practice of nurses regarding intravenous sedation. Furthermore, these study results in evidence support the urgent need to suggest guidelines regarding improving nurses' practice regarding intravenous sedation. These guidelines encompass the following; the preparatory and assessment phase of intravenous sedation, the procedure of the general administration phase, and techniques for the administration of sedative medications including technique of propofol administration, technique of midazolam administration, and technique of ketamine administration, and finally the post administration care of intravenous sedation.

Conclusion:

The great majority of the studied nurses had unsatisfactory knowledge regarding basic knowledge, while, the majority of studied nurses had unsatisfactory regarding sedation assessment and management. Most nurses had incompetent practice regarding the administration of sedative medications. Also, regarding practice areas, the majority of nurses' practices regarding the preparatory phase, propofol administration, ketamine & midazolam administration, general administration, and post-procedure phase were incompetent. There was a statistically positive correlation between nurses' basic knowledge and total nurses' practice regarding the administration of sedative medications.

Recommendations:

1. Educational nursing guidelines regarding intravenous sedation should be conducted.
2. Continuous monitoring of nurses' knowledge and practices regarding intravenous sedation.
3. Replication of study to other medications for mechanically ventilated patients.

Nursing Implications

- Add nursing role in sedation assessment and management for mechanically ventilated patients in the nursing curriculum.
- There should be a standardized protocol for sedation management that guides critical care nurses in their practice.
- There should be an educational program focusing on sedation assessment and management for nurses.
- There should be a management system for controlling and monitoring nurses' knowledge and practice regarding sedative medications.

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