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Original Article

Effect of Oral Care Bundle Educational Sessions on Critical Care Nurses' Practice

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ABSTRACT

Background: Critical care nurses are direct care providers for patients in the intensive care unit, particularly oral care. An oral care bundle has been depicted to lower ventilator-associated pneumonia and maintain oral health. Nurses' practice of oral care is not consistent, highlighting the need to receive training and education to narrow the gap between evidence and practice and improve patient outcomes. **Aim:** The aim of this study was to investigate the effect of oral care bundle educational sessions on critical care nurses' practice. **Method:** Using a quasi-experimental research design, we assessed the practice of a convenience sample of 41 critical care nurses from a university-based hospital in Egypt pre- and post-educational sessions. Data were collected using the nurses' practice of oral care bundle tool. **Results:** The overall nurses' practice of oral care bundle interventions was significantly improved post-educational sessions than pre-educational sessions ($p< 0.001$). **Conclusion and Recommendations:** The oral care bundle educational sessions can improve overall nursing practice. Therefore, nurses need to continue learning and incorporate recent evidence into their practice.

Keywords: *Critical care nurses Oral care bundle, Practice, Sessions*

Introduction

An intensive care unit (ICU) is a part of a hospital where the critical care nurses (CCNs) use technology, invasive and noninvasive monitoring, and provide rigorous therapy for critically ill patients **(Varon, 2021)**. A literature review by **Braun (2019)** concluded nurses play a major role in preventing hospital-acquired infections, particularly ventilator-associated pneumonia (VAP).

The **Centers for Disease Control and Prevention (2023)** defined VAP as pneumonia of a mechanically ventilated (MV) patient for more than two consecutive calendar days. Although VAP increases mortality and morbidity, it is preventable (**Sarangi, Sarangi & Solaman, 2021)** by providing oral care to MV patients **(Singh et al., 2022)**. Additionally, oral care is crucial in preventing oral infections **(Lombardo et al., 2022**; **Musdalipah, Syam & Tahir, 2021)**. Oral care practices can significantly relieve the symptoms of dry mouth, remove plaque, and lessen the number of oropharyngeal bacteria among MV patients **(Choi et al., 2022; Shen, Dai, Zhu & Lang, 2022)**.

The personal, administrative, and ministry-level barriers hinder nurses from applying standardized oral care **(Dagnew et al., 2020)**. In an Egyptian study by **(Abdelhafez, & Tolba 2021),** the major nursing challenges to provide oral care involved the patient's risk of aspiration, inadequate nurse-to-patient ratio, lack of oral care guidelines, and limited time. According to the philosophy of the **Canadian Association of Critical Care Nurses (2023)**, continuous learning and the spirit of inquiry are essential to enhance the CCNs' professional competencies and practice. **Braun (2019)** in his literature review concluded nurses must apply preventative evidence-based practice to improve patient outcomes.

A prospective, randomized study by **de Lacerda Vidal et al. (2017)** called for defining optimal oral care practices for ICU patients. Moreover, ongoing evidence-based education, reinforced with evidence-based practice are prerequisite for CCNs **(Jong & Mortell, 2020)**. Evidence proposed by **Dale et al. (2019)** that the oral care bundle includes assessment of the oral

cavity, tooth brushing, moisturization of the mouth and lip, and suctioning oropharyngeal secretions. According to the **Institute for HealthCare Improvement (n.d.),** a care bundle is a set of three to five evidence-based practices that are regularly and consistently carried out in combination to enhance the care processes and patient outcomes.

The CCNs should initially follow a standardized oral care assessment tool as an initial for providing oral care to ICU patients **(Collins et al., 2020; Khasanah, Sae-Sia & Damkliang, 2019)**. Second, tooth brushing is essential for MV patients as it removes plaque and bacteria **(Collins et al., 2020)**. Oral care including tooth brushing can prevent VAP in patients with ventilatory support **(Singh et al., 2022)**. Next, CCNs should moisturize the mouth and lips of MV patients to maintain the oro-mucosal integrity. Moisturization of the mouth and lips prevents sequala including bacterial colonization, foul smell, cracked lips, stomatitis, and absence of saliva **(Yurdanur & Yagmur, 2016)**.

Finally, bronchial hygiene therapy is crucial to MV patients in which suctioning is considered to aspirate the pulmonic secretions of a patient's artificial airway **(American Association for Respiratory Care, 2010)**. Tracheal suctioning is indicated for patients who have unclear breath sounds, apparent secretions, a saw tooth waveform on the mechanical ventilation **(Blakeman, Scott, Yoder, Capellari & Strickland, 2022)**.

A systematic review by **Al-Mugheed et al. (2022)** showed that nurses had a lower level of knowledge and insufficient compliance with the practices for VAP prevention in the eastern Mediterranean region than in Europe. A cross-sectional descriptive study by **Abdelhafez,** and **Tolba (2021)** concluded the studied nurses were mindful of the significance of oral care. However, most of them did not attend oral care training programs and need skills improvement. Consequently, many studies called for the necessity of nursing adherence to evidence‐based oral care practices through education, training, and alleviation of workload to prevent VAP in ICU patients **(Isac, Samson & John, 2021; Jun, 2022; Pechilis, 2019; Sánchez Peña, Orozco Restrepo, Barrios Arroyave & Suárez Brochero, 2021)**.

After reviewing 21 studies in a systematic review by **Lombardo et al. (2022)**, they stated that the most effective evidence for providing oral care remains unclear due to the heterogeneity in interventions, designs, delivery methods, and outcome measures. Consequently, a need for experimental study designs to evaluate the effect of evidence for transforming the nursing practice of oral care increases.

Aim of the Study

aimed to assess the effect of oral care bundle educational sessions on critical care nurses' practice.

Research Hypothesis

hypothesized that the implementation of oral care bundle would improve the critical care nurses' practice.

Method

Study Design

A quasi-experimental, single-group with interrupted time series methodology which includes several observations over a defined time, and the dependent variable is measured before and after an intervention **(Handley, Lyles, McCulloch & Cattamanchi, 2018)**.

Setting

The primary investigator (PI) collected data from three surgical ICUs at a university hospital in Egypt. The technology and personnel required for MV patients' care were available. The nurse-to-patient ratio is about 1:2 in these units.

Participants

A convenience sample of 41 nurses with more than 6 months of working in the selected ICUs, applied direct patient care, and accepted to participate in the study was recruited.

Data Collection Tool

Tool I: Nurses' practice of oral care bundle

This tool was applied before and following the implementation of the oral care bundle educational sessions to evaluate the nurses' demographic characteristics and practice. It included two parts:

Part I: Nurses' Demographic Characteristics

We developed this section to collect data about the nurses' age, gender, education, shift, years of work experience in the ICU, and attendance at any oral care training.

Part II: Nurses' Practice of Oral Care Bundle Observation Checklist

We adopted the oral care bundle from **Dale et al. (2019)** and more details were added following revising related literature **(Barnason et al., 1998; Collins et al., 2020; Mwakanyanga, Masika & Tarimo, 2018)**. The PI used this part to assess nurses' practice of the oral care bundle domains including oral assessment (10 practices), tooth brushing (15 practices), oral and lip moisturization (10 practices) and suctioning (27 practices).

Scoring system: The PI scored the intervention that was done correctly with 1 point and the item that was done incorrectly or not done

with zero point. The total maximum score for CCNs' practice was 62. The overall scoring system included two categories: Satisfactory level of practice: ≥ 80% and unsatisfactory level of practice: < 80% **(Abd Alraheem, Mohamed & Gendy, 2020)**.

Validity and Reliability

Seven experts from the critical care and emergency nursing and medical fields assessed the validity of the tool. Additionally, the overall reliability of the oral care bundle observation checklist was tested by Cronbach's alpha test and its value was 0.894.

Pilot Study

We piloted the tool on 4 nurses to test its clarity, feasibility, and applicability. Participants in the pilot study were excluded from the main sample. Based on the pilot study findings, necessary modifications were made. Such modifications included adding the steps of standard precautions (e.g., hand washing and wearing personal protective items) and reporting any unusual findings after performing each domain of the bundle.

Ethical Considerations

We obtained approval from the Research Ethics Committee of the Faculty of Nursing – Mansoura University **"No. P.0222"**. Further, the proposal was registered in the Clinical Trials. gov public website **(Clinical Trials. gov Identifier: NCT05351619)**. The PI informed the studied nurses about their voluntary participation in the study and confirmed they can withdraw at any time without any accountability. The PI confirmed the observed practice of the participant nurses was not a part of their annual appraisal and their data were coded and kept confidential.

Data Collection Process

The PI collected data throughout the period from November 2021 to December 2022 in three phases incorporating the preparation, intervention, and evaluation.

1. **Preparation Phase**

This phase was conducted from November 2021 to January 2022. The PI held an introductory session for 15 minutes with the participant nurses and provided them with an overview of the study's title, aim, and procedure.

2. **Intervention Phase**

This phase was conducted from February to June 2022. The PI collected the demographic characteristics of the participant nurses using part I of the tool. The non-participant observation approach was followed by the PI to assess the nurses' practice of standard oral care using part II of the tool. The PI prepared the oral care bundle practices educational booklet based on the empirical observation and after reviewing related literature **(Boltey, Yakusheva & Costa, 2017; Dale et al., 2019; DeToye, 2019; Labeau, Conoscenti & Blot, 2021)**. It covered the theoretical and practical components of oral care bundle practices. A panel of critical care nursing and medicine specialists reviewed its content validity. The booklet was prepared in a simple form of Arabic language and the necessary illustrations and images were included. Each trained nurse received a hard copy.

The PI conducted educational sessions between July and August 2022 through four sessions a week and every session lasted about 15-20 minutes. Each nurse attained 4 educational sessions to fulfill the theoretical and practical content. The nurses were distributed into small groups according to their availability in the shift. The educational sessions were organized at the end of the night shift and throughout the morning shift after the patients received standard care. The PI reassessed the nurses' practice of oral care bundle domains from September to December 2022.

3. **Evaluation Phase**

All participant nurses were evaluated for their practice before and immediately after implementing the oral care bundle educational sessions. A comparison between nurses' practice pre- and immediately post-the-session was statically conducted.

Data Analysis

All statistical analyses were performed using Statistical Package for the Social Sciences for Windows version 20.0 (SPSS, Chicago, IL). Categorical data were expressed in numbers and percentages. Fisher's exact test was used for the comparison of variables with categorical data. The correlation coefficient test was used to test for correlations between two variables with continuous data. The statistical significance was set at $p<0.05$.

Results

Table 1 presents the demographic characteristics of the participant nurses.

Significant differences were noted in participant nurses' practice of the oral care bundle pre- and post-teaching sessions (p <0.001). As illustrated in Table 2, the overall mean practice scores showed an improvement after the training (pre-training: 23.6 ±5.4 and post-training: 42.1 ±13.9). These results support the study hypothesis.

It can be noticed in Figure 1 that there is an increase in the score of nurses' practice regarding the bundle domains post-educational sessions. Only 17.1% of the participant nurses assessed the patients' oral health status pre-educational sessions

but after the teaching sessions, 68.3% of them assessed the oral health. Moreover, the participant nurses' practice of tooth brushing and oral and lip moisturization improved post-educational sessions. The percentage of nurses performing suctioning increased from 22% pre-educational sessions to 73.2% post-sessions. Statistically significant differences (p<0.001) were noted in nurses' practice of oral care bundle domains pre- and post-educational sessions.

Among the participant nurses, no statistically significant difference was noted between the demographic characteristics and the practice scores pre-educational sessions. On the other hand, statistically significant differences were observed between the nurses' practice scores and the nurses' education, years of ICU experience, and shift time post-educational sessions, as depicted in Table 3.

Table 1. *Nurses' Demographic Characteristics*

Variables	Participant Nurses (n=41)	
	n	%
Age (Years)		
20 – < 30	21	**51.2**
30 – < 40	16	39.0
40 – < 50	4	9.8
Mean ±SD 30.1 ±6.2		
Gender		
Male	21	**51.2**
Female	20	48.8
Educational level		
Secondary Nursing School	18	**43.9**
Technical Nursing Institute	14	34.1
Bachelor's Degree	9	22.0
Years of work experience in the ICU		
1 – < 5	20	**48.8**
5 – < 10	4	9.8
≥ 10	17	41.4
Mean ±SD 12.5 ±6.1		
Attending in-service training on oral care practices for mechanically ventilated patients		
Yes	1	2.4
No	40	**97.6**

*ICU: Intensive Care Unit
*Data are expressed as numbers (n) and frequency (%), SD= Standard Deviation

Table 2. *Total Mean Practice Scores of the Participant Nurses Concerning Oral Care Bundle Pre- and Post-Educational Sessions*

Statistic	Participant Nurses' Practice Score (n=41)			
	Pre-Educational Sessions	Post- Educational Sessions	Student's T-test	
			T	*P*-Value
Mean ± SD	23.6 ±5.4	42.1 ±13.9	7.924	**<0.001***

SD= Standard Deviation; p by Student's T-test, significant if p-value ≤ 0.05

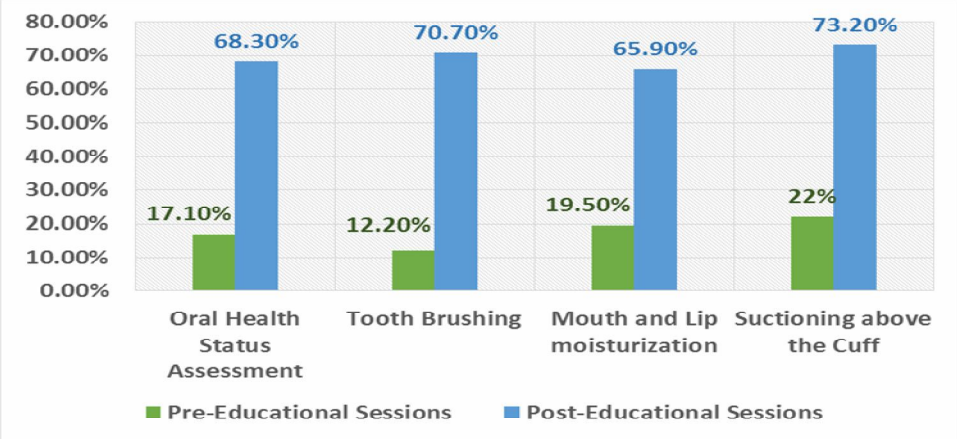

Figure 1. *The Participant Nurses' Practice of the Oral Care Bundle Domains Pre- and Post-Educational Sessions*

Table 3 *Association Between the Nurses' Total Practice Score of the Oral Care Bundle and Their Demographic Characteristics Pre- and Post-Educational Sessions*

Demographic Characteristics	Pre-Educational Sessions				Post-Educational Sessions			
	Unsatisfactory (n=34)		Satisfactory (n=7)		Unsatisfactory (n=12)		Satisfactory (n=29)	
	n	%	n	%	N	%	n	%
Age (Years)								
20 – < 30	15	44.1	6	85.7	4	33.3	17	58.6
30 – < 40	15	44.1	1	14.3	6	50.0	10	34.5
40 – < 50	4	11.8	0	0.0	2	16.7	2	6.9
Fisher's exact test	X^2=4.108, P=0.128				X^2=2.414, P=0.299			
Gender								
Male	17	50.0	4	57.14	5	41.67	16	55.2
Female	17	50.0	3	42.86	7	58.33	13	44.8
Fisher's exact test	X^2=0.119, P=0.730				X^2=0.620, P=0.431			
Educational level								
Secondary Nursing School	16	47.1	2	28.57	9	75.0	9	31.0
Technical Nursing Institute	11	32.4	3	42.86	2	16.7	12	41.4
Bachelor's Degree	7	20.5	2	28.57	1	8.3	8	27.6
Fisher's exact test	X^2=0.808, P=0.667				X^2=6.688, **P=0.035***			
Years of work experience in the ICU								
1 – < 5	17	50.0	3	42.86	6	50.0	14	48.3
5 – < 10	2	5.9	2	28.57	4	33.3	0	0.0
≥ 10	15	44.1	2	28.57	2	16.7	15	51.7
Fisher's exact test	X^2=3.462, P=0.177				X^2=12.188, **P=0.002***			
Shift time								
Morning Shift	23	**67.6**	3	42.9	8	**66.7**	27	**93.1**
Night Shift	11	32.4	4	**57.1**	4	33.3	2	6.9
Fisher's exact test	X^2=1.538, P=0.215				X^2=4.749, **P=0.029***			
Attending in-service training on oral care practices for mechanically ventilated patients								
Yes	1	14.3	0	0.0	0	0.0	1	3.4
No	33	97.05	7	100.0	12	100.0	28	96.6
Fisher's exact test	X^2=0.211, P=0.645				X^2=0.424, P=0.515			

Discussion

Patients' lives and financial resources can be saved when nurses and hospital management properly comprehend the significance of providing oral care **(Gupta, Singh & Saxsena, 2016)**. A cross-sectional study in Upper Egypt by **Abdelhafez,** and **Tolba (2021)** highlighted the significance of conducting oral care training programs to transform the CCNs' practice. Therefore, we evaluated the effect of oral care bundle educational sessions on CCNs' practice.

The current findings displayed that more than half of the participant nurses were between 20 to less than 30 years old. This may be attributed to the hospital's tendency to appoint newly graduated nurses in ICUs. This is consistent with a previous study by **El-Assy, Kandeel,** and **Abd ElRahman (2022)**.

The current study depicted that more than half of the participant nurses were males. This finding corresponds with a study using a developmental research design by **Khasanah et al. (2019)**. On the other hand, a recent quasi-experimental study by **Mohammed,** and **Badr (2023)** revealed the majority of the participant nurses were females. The disparities in the nurses' gender may be due to the small sample size. Additionally, although the nursing profession was known previously as a female profession, there is currently an increase in male admission to the nursing major.

There is availability of recent graduates with Bachelor's degrees and highly educational nursing programs, however, the current results illustrated that more than one-third of the studied nurses graduated from secondary nursing schools. This may be because nurses with a Bachelor's degree in

nursing science were given administrative duties a short time after being hired instead of working as staff nurses. This is supported by the results of an Egyptian study by **El-Assy et al. (2022)**. On the contrary, an Egyptian study by **Mohammed,** and **Badr (2023)** revealed about two-thirds of the studied nurses graduated from the technical institute. Also, a study by **Khasanah et al. (2019)** found most of the studied nurses had associate degree or diploma in nursing.

Nurses should have sufficient training regarding evidenced oral care **(Gupta et al., 2016)**. A quasi-experimental Egyptian study conducted in two ICUs of the main teaching hospital in Upper Egypt by **Abdelhafez,** and **Tolba (2021)** highlighted the significance of creating in-service oral care training programs to enhance the skills of ICU nurses. However, the findings of the current study depicted that the vast majority of the nurses did not attend any in-service training on oral care practices for MV patients. This finding is in harmony with a cross-sectional descriptive study by **Abdelhafez,** and **Tolba (2021)**. This may be attributed to the shortage of nursing staff, which hinders their attendance at training programs.

The present findings depicted a significant difference regarding the participant nurses' total practice of oral care bundle pre- and post-educational sessions. The practice of most of the participant nurses improved following the training and became satisfactory. This transformed nurses' practice is probably due to the educational sessions provided by the PI that enhanced the confidence and skills of nurses in performing oral care bundle practices for MV patients. In addition, the main cause for the unsatisfactory practice of the remaining participant nurses may be attributed to the nurses' heavy workload and the recent application of the oral care bundle in the ICU. This finding is congruent with a quasi-experimental study by **Mohamed et al. (2020)** which presented that all nurses' practice level was unsatisfactory before training while it was improved to good after training.

The current findings revealed highly statistically significant differences in nurses' practice of assessing oral health status, tooth brushing, mouth, and lip moisturizer, and suctioning pre-and post-training. A quasi-experimental study by **Dale et al. (2021)** reflected the significant differences in the initial three practices of the oral care bundle with no difference in suctioning practices, which may be due to the routine application of evidence-based oral care. Another quasi-experimental study by **Aboalizm & Abd Elhy (2019)** investigated the effect of tracheal suctioning training programs on nurses' total practice scores and found a significant improvement in the nurses' practice following the training.

Among the studied nurses, statistically significant relationships were noted between their practice scores and the nurses' education, and years of experience post-educational sessions. This means that nurses with more experience and high educational level had a better practice of oral care bundle than the other studied nurses. A quasi-experimental study by **Mohamed et al. (**2020**)** revealed a statistically significant relationship between the nurses' total performance scores, and their education, while no significant difference between years of experience and nurses' total practice scores was noted.

A descriptive study by **Abd-Elkader, Abd-Elmegeed,** and **Abed (2019)** stated that nurses play a crucial role in patients' safety through long shifts for 12 hours because they provide direct and continuous patient care. Therefore, errors occur because of these long shifts. Our findings revealed that the nurses' total practice improved in the morning shift post-training. This may be due to that the nurses' number is more sufficient in the morning shift than in the other shifts.

Limitations

This study was conducted in only one ICU with a small sample size, therefore the potential for generalization may be limited.

Conclusion and Recommendations

According to the study's findings, the oral care bundle educational sessions were effective and improved the CCNs' practice. Continuous training programs about the oral care bundle are required for CCNs. Further research may be required to focus on the nurses' compliance with the oral care bundle practices.

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Declaration of competing interests

There are no disclosed conflicts of interest.

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