

The Effectiveness of Oral Care Guideline Implementation on Oral Health Status in Critically Ill Patients

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Abstract

Intubated patients need specific oral care due to the use of endotracheal tubes. An oral nursing care guideline needs to be implemented to guide nurses in oral care in intubated patients. To test the effectiveness of oral nursing care guideline implementation. The Rogers' Diffusion of Innovations Theory was used to introduce an oral nursing care guideline to 28 nurses working in an intensive care unit in a hospital within 2 months, using mass and private communication within a hospital management system. The oral care guideline was introduced to 47 intubated patients. The accuracy of oral care practice was assessed by nurse research assistants, and patients' oral health status was examined by dental nurse research assistants. The accuracy of practice among nurses was found between 88% and 100%. Total 97.47% ($n = 46$) of patients had an acceptable oral health status after receiving oral care based on the oral nursing care guideline. The oral nursing care guideline was effectively implemented with high accuracy and could increase patient oral integrity after its implementation.

Keywords

intensive care unit, medical or surgical, application of evidence

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Introduction

Oral care is a vital procedure for critically ill patients in the intensive care unit (ICU). Oral care may affect the clinical result as well as the wellness of intensive care patients (Atay & Karabacak, 2014). The primary goal of oral care is to promote oral hygiene, to decrease microbial colonization in the oropharynx and dental plaque, and to reduce aspiration of contaminated saliva (Feider, Mitchell, & Bridges, 2010). In addition, oral care also helps to promote holistic patient care to increase patient comfort (Adib-Hajbaghery, Ansari, & Azizi-Fini, 2013) and prevent halitosis (Coker, Ploeg, Kaasalainen, & Fisher, 2013).

An oral nursing care guideline (ONCG) is required to guide nurses in delivering appropriate oral care. Guideline for oral care in intubated patients is widely available and followed in developed countries (Batiha et al., 2015). The study also mentioned that ventilator-associated pneumonia (VAP) rates could be reduced by 50%, the mechanical

ventilator use was reduced from 7.3 days to 5.0 days, the VAP onset was delayed from 2.3 days to 4.9 days, and the mortality rates were reduced from 20% to 13.9% by following an oral care guideline (Batiha et al., 2015). Many organizations recommended the application of oral care guideline for critically ill patients. For example, American Association of Critical-Care Nurse and Centers for Disease Control and Prevention recommended oral care practice, which includes the use of chlorhexidine gluconate (0.12%) in oral care to reduce risk of VAP (American Association of Critical Care Nurses, 2017; Tablan, Anderson, Besser, Bridges, & Hajjeh, 2004), suctioning subglottic secretion before brushing the teeth

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(Tablan et al., 2004), and brushing the patient's teeth for 3 to 4 minutes (American Association of Critical Care Nurses, 2017; Tablan et al., 2004).

While evidence of oral care practice in intubated patients in most developed countries is widely available, the availability of evidence about oral care practice in intubated patients in Indonesia is very limited. Research has shown that oral care in Indonesia was delivered by approximately 60% of the nurses due to an imbalance in nurse-to-patient ratio, inadequate equipment, and nurses did not understand how to perform oral care based on the procedure (Setianingsih, Riandhyanita, & Asyrofi, 2017). The nurse-to-patient ratio in the ICU of the same study was 1:4, lower than the required standard at 1:1, and there was a shortage of oral solutions and oral equipment. Furthermore, nurses' knowledge and use of evidence-based oral care practices remained variable for oral care in ICU patients (Setianingsih et al., 2017).

In addition, a published ONCG for intubated patients in Indonesia is not available as of today. Therefore, in this study, an ONCG for intubated patients with mechanical ventilators modified to fit with the local context has been introduced to nurses in an ICU in Indonesia using Rogers' Diffusion of Innovations Theory.

Literature Review

Poor oral health has been recognized to have consequences of some systemic diseases including respiratory diseases (Coker et al., 2013), specifically VAP (Yurdanur & Yagmur, 2016). VAP was a complication in 8% to 28% of patients receiving mechanical ventilation (Cirillo et al., 2015). The mortality rate of VAP was found between 24% and 60.90% and can reach 84.3% (Ganz et al., 2013; Inchai et al., 2015). The hazard from VAP had been increased by intubation since the primary reflects of the human body to dissipate aspirated microbes has been reduced by the intubation (Khan et al., 2017). Microbes in the oral cavity, such as *A. baumannii*, cause VAP and can be controlled by regular oral care (Feider et al., 2010; Safdar, Crnich, & Maki, 2005). The oral care must be managed to prevent these microbes to recolonize the mouth in critically ill patients admitted to ICU.

Intubated patients with mechanical ventilators need specific oral care due to their condition. Careful consideration should be given to the technique, equipment, solution, and frequency of oral care. The endotracheal tube may cause debris accumulation and provides a perfect environment for microbial growth, causes the mouth to be open continuously and leads to xerostomia, drying of the mucous membrane, accumulation of dental plaque, and reduction of the distribution of salivary immune factor (Blot, Vandijck, & Labeau, 2008).

The endotracheal tube can limit oral inspection and access to oral care and cause hypersalivation by inducing a hyperactive gag reflex (Blot et al., 2008).

Management of oral care in intubated patients includes oral assessment, selection of oral care equipment, solutions, and frequency (Yurdanur & Yagmur, 2016). Oral assessment resembles diagnostic procedures which provide valuable information to nurses for effective and efficient treatment and the possibility of complication. First, the equipment for oral care must be selected based on benefit, conveniences, harms, and other features, for example, its ability to remove plaque (Yurdanur & Yagmur, 2016). Toothbrush as part of standard oral care is preferred (Ames et al., 2011; Liao, Tsai, & Chou, 2015; Lorente et al., 2012; Prendergast, Jakobsson, Renvert, & Hallberg, 2012) in the removal of dental plaque in the oral cavity as dental plaque is proven to be effectively removed by mechanical disruption (Needleman et al., 2011; Scannapieco et al., 2009). Second, it is recommended that solutions for oral care should not irritate the mucosa, should not cause dry mouth, and should be able to remove plaque. Solutions for oral care may use chlorhexidine, saline solution, and purified water. Studies showed that even a concentration of 0.12% to 0.2% chlorhexidine was still effective for prevention of VAP (Ames et al., 2011; Liao et al., 2015; Needleman et al., 2011; Zuckerman, 2016). Third, the frequency of oral care varied between different studies. Recent study delivered oral care 2 times per day with a significant result of VAP reduction (Yao, Chang, Maa, Wang, & Chen, 2011). To increase the effectiveness of oral care, the frequency should be determined by daily oral assessment (Ames et al., 2011; Yurdanur & Yagmur, 2016).

Rogers' Diffusion of Innovations Theory has been used in nursing practices to introduce new innovations. This theory composes of four main elements including the innovation, communication channel, time, and social system (Rogers, 2003). Rogers (2003) described the innovation-decision process as "an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation" (p. 172). Then, the innovation would be adopted into the organization by innovation-decision process, which involves five steps of knowledge, persuasion, decision, implementation, and confirmation. These stages typically follow each other in a time-ordered manner with the influencing of social system. The Rogers' Diffusion of Innovations Theory has been used to introduce delirium screening test in mechanically ventilated patients (Bowen, Stanton, & Manno, 2012). Furthermore, the theory was also successfully used as a framework in the adoption of peripheral nerve block for orthopedic ambulatory surgery (Leggott et al., 2016). A study of evaluating Braden Pressure Ulcer Screening Scale implementation has also been

successfully done in Bangladesh (Banu, Sae-Sia, & Khupantavee, 2014). It was believed that the innovation-decision process and the four main elements of Rogers' (2003) Diffusion of Innovations Theory would be successfully used as a framework to implement the innovation of ONCG for nurses working in an ICU context in Indonesia.

Objectives of the Study

The major aim of this study was to test the effectiveness of the implementation of ONCG for intubated patients in the ICU. The specific objectives were to examine nurses' accuracy of practice and patients' oral health status.

Methods

Design

This study used developmental research design where an ONCG for intubated patients was implemented within 2 months using mass and private communication within a hospital management system.

Research Questions

The research questions are as follows: (a) How many percentages of oral care practices were accurately performed? and (b) How many percentages of patients have good oral health status?

Sample

Participants in this study consisted of 28 nurses working in the ICU as nurse participants and 47 intubated patients admitted to the ICU during the study period as patient participants. All ICU nurses from the study site were included as nurse participants except the head nurse and five nurses who were research assistants (RAs).

Inclusion or Exclusion Criteria

For patient participants, all patients admitted in the study setting with the following inclusion criteria were recruited for this study: (a) aged 17 years or more and (b) orally intubated with a mechanical ventilator. The exclusion criteria were (a) edentulous, (b) facial fracture or trauma affecting the oral care cavity, (c) unstable cervical fracture, and (d) unstable vital signs.

Ethical Considerations

This study was approved by the institutional review board at the university with Certificate of Approval No. 2017 NSt – Qn 048 and the Research Committee

at the hospital in which this study was performed. Permissions from the head of the ICU department, the head nurse, and nurses' participants were obtained prior to the study. Patient consent was obtained from patients or patients' family using consent forms that followed the hospital's standardized format.

Settings

This study was done in an ICU with 17 beds in a hospital in Indonesia. The ICU is a general ward with mixed cases from surgical and medical cases which are considered as life-threatening conditions and required ventilator support. Each bed is equipped with mechanical ventilator and bedside monitor. Heart rate, oxygen saturation, blood pressure, and cardiac rhythm were continuously monitored. In the ICU, every shift has six nurses in which one nurse is specialized for one cardiac surgery patient, whereas the other four nurses are responsible for three patients and one nurse is responsible for four patients.

Guideline Development

The ONCG used in this study consisted of six components, which were oral assessment, preparation of equipment and patients, oral care procedure, oral reassessment, patient monitoring and care, and documentation. The ONCG was developed from the American Association of Critical Care Nurse's Endotracheal Tube and Oral Care (AACN's ETT & OC) procedure (Wiegand, 2011) and current evidence (Feider et al., 2010; Munro & Grap, 2004; Prendergast, Hagell, & Hallberg, 2011) with adjustments to local conditions. During the guideline development, the department head, the head nurse, and staff nurses of ICU were contacted to obtain information about the current situation in the study setting, particularly on how nurses deliver oral care in intubated patients. This information was used to adjust the ONCG to be suitable for use in the study setting. The ONCG makes use of equipment available in the study setting. Furthermore, the ONCG has been translated into Bahasa Indonesia, which ensures the easy understanding by nurses and hospital management without language barriers. The ONCG has been validated by five experts of lecturers in nursing and dentistry, nurse practitioner, and dentist. The validity was checked using internal validity with a result of 1.0, and the reliability was checked by interrater reliability with a Kappa value of .96. The ONCG was tested for interrater reliability between researcher and five nurses RAs in 10 intubated patients with mechanical ventilators.

Measurement Tools

Four questionnaires were used in this study: Nurse Demographic Data Questionnaire (Nurse-DDQ),

Patient Demographic Data Questionnaire (Patient-DDQ), Accuracy of Oral Nursing Care Practice was assessed using the Checklist Form of Accuracy of Oral Nursing Care Practice (AOP), and the oral health status was examined by mucosal-plaque score (MPS). The Checklist Form of AOP had 25 items. Each item had three responses format as *correctly practiced oral care*, *incorrectly practiced oral care*, and *not practiced*. The score of "1" was given to correct practice, and a score of "0" was given to an incorrect practice and not practiced for each item. The total score of AOP was transformed into a percentage by dividing the total score of correctly performed practice by total score of 25 and multiply by 100. The AOP was observed by nurse RAs once in the fifth week to the eighth week to evaluate the accuracy of oral nursing care practice for each nurse participant, while the MPS was assessed by dental nurse RAs once before receiving the first oral care, and once in fifth week to eighth week to assess patient's oral integrity after receiving oral care. The MPS describes the oral integrity condition, where the total MPS ranges from 2 to 8. A score of 2 to 4 indicates a good or acceptable oral integrity status and a score of 5 to 6 indicates an unacceptable oral integrity status, while a score of 7 to 8 indicates a poor oral integrity status. The ONCG, the Checklist Form of AOP, and the MPS were originally written in English and were translated into Bahasa Indonesia. The translation was performed using the back-translation technique.

The Checklist Form of AOP and the MPS validity were assessed by five experts with S-CVI results both equal to 1.0. The reliability of the AOP was tested by the researcher and nurse RAs in 10 patients and resulted in a Kappa value of .96. The reliability of the MPS was evaluated by dental nurse RAs and the researcher in 10 patients and yielded a Kappa value of .92.

Implementation Strategies

This study used Rogers' (2003) Diffusion of Innovation Theory to guide the implementation of an ONCG in intubated patients in the ICU. The implementation of the ONCG in this study used four elements as mentioned in Rogers' (2003) Diffusion of Innovation Theory: (a) the ONCG as the innovation; (b) workshop, booklet, printed presentation slides, demonstration, and private coaching as communication channels; (c) a period of 2 months as the time; and (d) hospital management as a social system. The ONCG consists of six steps: oral assessment, preparation for equipment and patients, oral care procedure, oral reassessment, monitoring and care, and documentation. The workshop was arranged as two 1-day workshops for two groups of nurses in the first week. All nurse participants were required to attend the workshop according to their shift schedules. During the

workshop, a dentist delivered a presentation about the definition of oral care, its purposes, a complication of irregular oral care, the importance of oral care in intubated patients, and techniques in oral care. The researcher identified oral assessment and details of ONCG to the nurse participants. Booklets and printed presentation slides were provided for all workshop attendants at the end of the workshop. The booklets contained the ONCG and accompanied by an image-guided oral assessment tool for easy implementation and common understanding by all participants. Demonstrations were arranged after the workshop to show the oral assessment and the oral care process according to the ONCG in a real-life situation. All participants were required to attend this demonstration session. Private coaching sessions were provided for all participants to ensure that the innovation has been clearly understood by the participants. The coaching sessions were provided during the first to the fourth week by accompanying participants one-to-one and discussing the oral assessment and the oral care process step-by-step according to the ONCG. The time used in this research was 2 months, with the first month was focused on the implementation process, and the second month was dedicated for evaluation with the data collection process. An ICU in a hospital in Indonesia as the hospital management system was used in this research as the target system for implementation of the ONCG. Nurses in the ICU were the target for implementation, while the ICU's head nurse and department head were the support system. The ICU's head nurse was actively involved to support the research by encouraging implementation of oral care in intubated patients based on the guideline.

Data Collection

Seven RAs consisted of five nurse RAs and two dental nurse RAs were recruited for data collection. Five nurse RAs among ICU nurses were recruited to assess the accuracy of oral nursing care practice and thus were excluded from the study. In addition, two dental nurse RAs from another department of the hospital were recruited to assess the oral integrity of intubated patients. After finishing the workshop, in the first week to the fourth week, all nurse participants practiced delivering oral care based on the guideline under supervision. Nurses were accompanied when performing oral care to boost their confidence and to give detailed explanation until all nurses understood and were confident in performing oral care by themselves.

Patient participants were given oral care by nurse participants based on the ONCG on the first day of intubation until the extubation time. The daily oral care frequency was determined using oral assessment as

practiced in a study (Chalmers, King, Spencer, Wright, & Carter, 2005). Patient in a healthy oral condition needs oral care 2 times a day, patient in a poor oral condition needs oral care 3 times a day, and patient in an unhealthy oral condition needs oral care every 4 hours. The data of AOP and MPS were collected during the fifth week to the eighth week.

Data Analysis

Data obtained from data collection were analyzed using descriptive statistics: percentage, mean, minimum–maximum, and standard deviation. Data were analyzed using computer statistical software.

Results

Nurse Participant Demographic Characteristics

There were 28 nurses who participated in this study. The mean age of participants was 32.75 years ($SD = 5.60$) of which 19 nurses (67.9%) were females. The majority of nurse participants held an associate degree or diploma in nursing (60.7%). The duration of service of nurses in ICU was 4 months to 17.83 years with a mean age of 5.12 years ($SD = 4.17$ years). All nurses had never received formal training in oral care in intubated patients (Table 1).

Patients' Demographic Characteristics

There were 47 intubated patients who participated in this study. The mean age of patient participants was 48.43 years ($SD = 16.11$). Most of the patient participants were postsurgery (89.4%). Eighty-five percent of participants ($n = 40$) were intubated and supported with mechanical ventilators for 1 to 3 days with a median of 2 days ($SD = 1.61$). The characteristics of the patient participants are presented in Table 2.

The Accuracy of Oral Nursing Care Practice in ICU

The result showed that 50% of nurse participants ($n = 14$) had 100% accuracy of practice, followed by 42.9% of nurses ($n = 12$) had 90% to 99% of the accuracy of practice and 7.1% of nurses ($n = 2$) had 88% of the accuracy of practice. The complete presentation of the accuracy of oral nursing care practice per dimension is available in Table 3.

Patients' Oral Health Status

The result showed that before application of ONCG, the majority of patient participants ($n = 41$, 87.2%) had a good or acceptable status of the MPS. Meanwhile, four

Table 1. Nurse Participants' Demographic Characteristic ($N = 28$).

Variable	<i>n</i> (%)
Age (years) ($M = 32.75$, $SD = 5.60$, minimum–maximum = 23–44)	
Gender	
Male	9 (32.1)
Female	19 (67.9)
Academic qualification	
Associate degree or diploma in nursing	17 (60.7)
Bachelor of nursing	3 (10.7)
Bachelor of nursing with a professional degree	8 (28.6)
Duration of service as a nurse at current location	
Less than 1 year	3 (10.7)
1–5 years	12 (42.8)
6–10 years	8 (28.6)
10–15 years	5 (17.9)
Receiving formal training workshop or short course on oral care	
Yes	0 (0)
No	28 (100)

Note. SD = standard deviation.

Table 2. Patients' Demographic Characteristic ($N = 47$).

Variable	<i>n</i> (%)
Age (years) (mean = 48.43, $SD = 16.11$, minimum–maximum = 17–89)	
17–30	6 (12.8)
31–50	15 (31.9)
51–89	26 (55.3)
Gender	
Male	21 (44.7)
Female	26 (55.3)
Medical diagnoses	
Postsurgery	42 (89.4)
Brain injury	2 (4.3)
Chronic kidney diseases	1 (2.1)
Eclampsia post forceps	1 (2.1)
HHD, piquant syndrome	1 (2.1)
Duration of intubated (days)	
1–3	40 (85.0)
4–5	5 (10.6)
>5	2 (4.2)

Note. SD = standard deviation; HHD = hypertensive heart disease.

patients (8.5%) had abundant amounts of confluent plaque (Table 4). After ONCG was delivered to patient participants, the result showed that the majority of patient participants ($n = 46$, 97.9%) had a good or acceptable status of the MPS. For the plaque condition, none of the patient (0%) had abundant amounts of confluent plaque (Table 4).

Table 3. Frequency and Percentage of Nurse Participants Correctly Performing Oral Care Using Oral Nursing Care Guideline Categorized by Each Dimension.

Percentage of the accuracy of practice categorized by each dimension	<i>n</i> (%)
Oral assessment	25 (89.3)
Preparation	18 (64.3)
Procedure	23 (82.1)
Reassessment	28 (100.0)
Monitoring and care	28 (100.0)
Documentation	27 (3.6)

Table 4. Patients' Oral Health Status Before and After Receiving Oral Care (MPS Scores).

Oral integrity condition	Before <i>n</i> (%)	After <i>n</i> (%)
Mucosal score		
Normal appearance of gingiva and oral mucosa	41 (87.2)	44 (93.6)
Mild inflammation	2 (4.3)	2 (4.3)
Moderate inflammation	4 (8.5)	1 (2.1)
Severe inflammation	0 (0.0)	0 (0.0)
Plaque score		
No easily visible plaque	12 (25.5)	33 (70.2)
Small amounts of hardly visible plaque	23 (48.9)	14 (29.8)
Moderate amounts of plaque	8 (17.0)	0 (0.0)
Abundant amounts of confluent plaque	4 (8.5)	0 (0.0)
Mucosal-plaque score		
Good or acceptable status	41 (87.2)	46 (97.9)
Unacceptable status	5 (10.7)	1 (2.1)
Poor status	1 (2.1)	0 (0.0)

Discussion

The results of the study showed that the implementation of ONCG using Rogers' Diffusion of Innovation Theory helped to increase the accuracy of oral care practice and improve patients' oral integrity.

Accuracy of Practice

Accuracy of practice of the ONCG implementation in the ICU was high. There are several factors that influenced the results and are explainable from the perspective of Rogers' Diffusion of Innovation Theory. The attributes of the innovation itself may contribute to the adoption process. This is similar to that stated by Rogers

(2003), which mentioned the perceived attributes of innovation, such as relative advantages, compatibility, complexity, trialability, and observability would affect its rate of adoption. First, the innovation itself is probably of low complexity and simple enough for easy understanding. The ONCG as the innovation in this study contains only six basic elements including oral assessment, preparation, oral care, patient monitoring, oral reassessment, and documentation. Moreover, the ONCG has a high trialability, contains elements of regular oral care procedures, and based on up to date evidence-based practice. Second, the communication channel used in this study might also play an important role in the success of implementation. The five steps of diffused innovation including knowledge, persuasion, decision, implementation, and confirmation were incorporated into the communication channel. For example, mass media in this study included workshop, booklet, presentation printout, and demonstration, while interpersonal communication included private coaching and consultative sessions. Private coaching and consultative sessions were strategies used to increase nurse participants confidence in performing oral care based on the guideline. Private coaching and consultation were believed as the most powerful and effective approach to communication (Rogers, 2003). Third, the time dimension used in this study is believed to be appropriate for the successful implementation of the ONCG. This is similar to recent studies (Banu et al., 2014; Bowen et al., 2012) that used the time of 2 months for implementation of innovations in a limited single health-care setting with a successful result. In addition, the persuasion from the head nurse, senior nurses, and the researcher during the workshop and implementation phase also promote a positive attitude toward oral care in intubated patients. Senior nurses in each shift were encouraged to motivate and inspire other nurses to follow the oral care guideline in their shift. This method had also been used in a recent study (Bowen et al., 2012) and has had good results.

In this study, the results showed that nurse participants had 88% to 100% accuracy of oral care practice. The high percentage could be used to identify that nurses had adopted this ONCG into the ICU context in Indonesia. This successful oral care practice is due to the process of enhancing knowledge and practice of oral care to the ICU nurses. In addition, the private coaching and consultative sessions provided by the principle researcher would enhance the confidence of nurses in performing oral care practice in critically ill patients with ventilator.

The main obstacle for most nurse participants was in the preparation part, specifically in the step of putting tissue or towel across the patients' chest during oral care. This is because some nurses were not accustomed to

using towel or tissue in any health-care procedure. It can be easily understood that when a nurse was not used to supply tissue or towel in their regular services, they tend to skip this step in the ONCG. The remaining 7.1% of nurse participants had an accuracy of 80% to 89%. This result is probably due to nurses' inability to remember all steps in sequence because the ONCG is newly implemented in the ICU. Although previous studies (Ibrahim, Mudawi, & Omer, 2015) showed that working experience and educational background were related to nursing care practice, this claim is not found in this study. The result showed that 50% of junior nurses who had working experience less than 5 years had a high accuracy of practice as compared with senior nurses (50%) who had working experience of 5 years or more. Moreover, the education level also did not relate to the accuracy of practice.

Patients' Outcome

The results of this study showed that patients' oral health status was improved after receiving oral care based on the guideline. The number of patients with a good or acceptable status of the mucosal score, plaque score, or MPS increased after receiving oral care. Furthermore, the number of patients with unacceptable or poor status was reduced after oral care delivery. This result might be caused by the implementation of the ONCG, particularly from continuous oral care and monitoring which ensured that oral condition of patients could be maintained. This is similar to a study by Ames et al. (2011) who used oral assessment to determine the frequency of oral care, where the oral assessment scores were improved after oral care. In this study, oral care was delivered according to the result of the oral assessment. During the study, all patients received oral care for a minimum of twice a day as recommended (Ames et al., 2011; Prendergast et al., 2011).

In this study, oral care was delivered following the ONCG which required an oral assessment prior to oral care delivery, to determine the oral care frequency as practiced in previous studies (Ames et al., 2011; Prendergast et al., 2011). The combination of chlorhexidine 0.12% and the toothbrush was effective to remove dental plaque as shown by the result of oral reassessment after oral care delivery. The plaque score of patients was greatly improved with the reduction of patients with visible plaque depositions. In addition, the mucosal score of patients was slightly improved with a small increase in the number of patients with normal gingiva and mucosa. This is in accordance to previous studies (Khan et al., 2017; Needleman et al., 2011) which mentioned that oral care was effective to eliminate the bacteria colonization in dental plaque and to prevent and treat gingivitis.

Strengths and Limitations

This study has several strengths. First, this is the first reported study to implement ONCG for intubated patients in Indonesia. Second, the ONCG as the innovation was easy to use, very detailed, simple, and cost-effective. Third, the tools used in this study were available in English and Bahasa Indonesia and have been validated and tested for reliability with high validity and high reliability. Finally, the data were collected by RAs without interference from the researcher.

There are limitations attributable to this study. This study had a small-sample size, and thus, the result of this study cannot be generalized to other hospital settings. In addition, this ONCG has been developed for use in a hospital in a developing country where the context may be different from other settings.

Implications for Practice

The ONCG was found to be effective to increase the patients' oral integrity condition. Therefore, it is recommended that the ONCG should be formally adopted as a standard procedure in intubated patients' care. Furthermore, it is highly recommended that an oral assessment should always be done before doing oral care, and oral care should always be based on the result of the assessment, with a minimum of 2 times a day.

Conclusions

Results of this study showed that ONCG for intubated patients with mechanical ventilators was implemented effectively in the ICU. The ONCG could be implemented with an accuracy of practice of 90% or more. Oral health status, as patient outcome measures, was found to be acceptable after receiving oral care based on the ONCG. Due to these facts, it is recommended that hospitals could formally ratify the ONCG as a standard procedure in their ICUs. In addition, hospital management could follow Rogers' diffusion theory of adopting modern health-care technologies or innovation. Furthermore, it is highly recommended that nurses perform an oral assessment before doing oral care.

Declaration of Conflicting Interests

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References

- Adib-Hajbaghery, M., Ansari, A., & Azizi-Fini, I. (2013). Intensive care nurses' opinions and practice for oral care of mechanically ventilated patients. *Indian Journal of Critical Care Medicine*, *17*(1), 23–27. doi:10.4103/0972-5229.112154
- American Association of Critical Care Nurses. (2017). Oral care for acutely and critically ill patients. *Critical Care Nurse*, *37*(3), e19–e21. doi:10.4037/ccn2017179
- Ames, N. J., Sulima, P., Yates, J. M., McCullagh, L., Gollins, S. L., Soeken, K., & Wallen, G. R. (2011). Effects of systematic oral care in critically ill patients: A multicenter study. *American Journal of Critical Care*, *20*, e103–e114. doi:10.4037/ajcc2011359
- Atay, S., & Karabacak, U. (2014). Oral care in patients on mechanical ventilation in intensive care unit: Literature review. *International Journal of Research in Medical Sciences*, *2*, 822–829. doi:10.5455/2320-6012.ijrms20140876
- Banu, A., Sae-Sia, W., & Khupantavee, N. (2014). Evaluation of the Braden Scale implementation by nurses: A case study in a specialized hospital in the Dhaka city. *Bangladesh Journal of Medical Science*, *13*, 411–414. doi:10.3329/bjms.v13i4.20587
- Batiha, A.-M., Alhalaiqa, F. N., Bashayreh, I., Saifan, A., Al-Zaru, I. M., & Omran, S. (2015). Comprehensive oral care program for intubated intensive care unit patients. *Advanced Studies in Biology*, *7*, 259–273. doi:10.12988/asb.2015.5213
- Blot, S., Vandijck, D., & Labeau, S. (2008). Oral care of intubated patients. *Clinical Pulmonary Medicine*, *15*, 153–160. doi:10.1097/CPM.0b013e3181729250
- Bowen, C. M., Stanton, M., & Manno, M. (2012). Using Diffusion of Innovations Theory to implement the confusion assessment method for the intensive care unit. *Journal of Nursing Care Quality*, *27*, 139–145. doi:10.1097/NCQ.0b013e3182461eaf
- Chalmers, J., King, P., Spencer, A., Wright, F., & Carter, K. (2005). The oral health assessment tool—Validity and reliability. *Australian Dental Journal*, *50*, 191–199. doi:10.1111/j.1834-7819.2005.tb00360.x
- Cirillo, F., Hinkelbein, J., Romano, G. M., Piazza, O., Servillo, G., & De Robertis, E. (2015). Ventilator associated pneumonia and tracheostomy. *Trends in Anaesthesia and Critical Care*, *5*, 184–187. doi:10.1016/j.tacc.2015.10.003
- Coker, E., Ploeg, J., Kaasalainen, S., & Fisher, A. (2013). A concept analysis of oral hygiene care in dependent older adults. *Journal of Advanced Nursing*, *69*, 2360–2371. doi:10.1111/jan.12107
- Feider, L. L., Mitchell, P., & Bridges, E. (2010). Oral care practices for orally intubated critically ill adults. *American Journal of Critical Care*, *19*, 175–183. doi:10.4037/ajcc2010816
- Ganz, F. D., Ofra, R., Khalaila, R., Levy, H., Arad, D., Kolpak, O., . . . Benbenishty, J. (2013). Translation of oral care practice guidelines into clinical practice by Intensive Care Unit nurses: Translation of ICU oral care guidelines. *Journal of Nursing Scholarship*, *45*, 355–362. doi:10.1111/jnu.12039
- Ibrahim, S. M., Mudawi, A. M., & Omer, O. (2015). Nurses' knowledge, attitude and practice of oral care for Intensive Care Unit patients. *Open Journal of Stomatology*, *5*, 179–186. doi:10.4236/ojst.2015.57023
- Inchai, J., Pothirat, C., Bumroongkit, C., Limsukon, A., Khositsakulchai, W., & Liwsrisakun, C. (2015). Prognostic factors associated with mortality of drug-resistant *Acinetobacter baumannii* ventilator-associated pneumonia. *Journal of Intensive Care*, *3*(1), 68–78. doi:10.1186/s40560-015-0077-4
- Khan, M., Mohamed, Z., Ali, S., Saddki, N., Masudi, S. M., & Sukminingrum, N. (2017). Oral care effect on intubated patient with 0.2% chlorhexidine gluconate and tooth brushing in Intensive Care Unit. *Journal of Advanced Oral Research*, *8*(1), 1–8.
- Leggott, K. T., Martin, M., Sklar, D., Helitzer, D., Rosett, R., Crandall, C., . . . Mercer, D. (2016). Transformation of anesthesia for ambulatory orthopedic surgery: A mixed-methods study of a diffusion of innovation in healthcare. *Healthcare*, *4*, 181–187. doi:10.1016/j.hjdsi.2015.09.003
- Liao, Y.-M., Tsai, J.-R., & Chou, F.-H. (2015). The effectiveness of an oral health care program for preventing ventilator-associated pneumonia: Effectiveness of an oral health care program for ventilator-associated pneumonia. *Nursing in Critical Care*, *20*, 89–97. doi:10.1111/nicc.12037
- Lorente, L., Lecuona, M., Jiménez, A., Palmero, S., Pastor, E., Lafuente, N., . . . Sierra, A. (2012). Ventilator-associated pneumonia with or without toothbrushing: A randomized controlled trial. *European Journal of Clinical Microbiology & Infectious Diseases*, *31*, 2621–2629. doi:10.1007/s10096-012-1605-y
- Munro, C. L., & Grap, M. J. (2004). Oral health and care in the intensive care unit: State of the science. *American Journal of Critical Care*, *13*(1), 25–34.
- Needleman, I. G., Hirsch, N. P., Leemans, M., Moles, D. R., Wilson, M., Ready, D. R., . . . Wilson, S. (2011). Randomized controlled trial of toothbrushing to reduce ventilator-associated pneumonia pathogens and dental plaque in a critical care unit: Toothbrushing and VAP. *Journal of Clinical Periodontology*, *38*, 246–252. doi:10.1111/j.1600-051X.2010.01688.x
- Prendergast, V., Hagell, P., & Hallberg, I. R. (2011). Electric versus manual tooth brushing among neuroscience ICU patients: Is it safe? *Neurocritical Care*, *14*, 281–286. doi:10.1007/s12028-011-9502-2
- Prendergast, V., Jakobsson, U., Renvert, S., & Hallberg, I. R. (2012). Effects of a standard versus comprehensive oral care protocol among intubated neuroscience ICU patients: Results of a randomized controlled trial. *Journal of Neuroscience Nursing*, *44*, 134–146. doi:10.1097/JNN.0b013e3182510688
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.

- Safdar, N., Crnich, C. J., & Maki, D. G. (2005). The pathogenesis of ventilator-associated pneumonia: Its relevance to developing effective strategies for prevention. *Respiratory Care*, *50*, 725–741.
- Scannapieco, F. A., Yu, J., Raghavendran, K., Vacanti, A., Owens, S. I., Wood, K., & Mylotte, J. M. (2009). A randomized trial of chlorhexidine gluconate on oral bacterial pathogens in mechanically ventilated patients. *Critical Care*, *13*(4), 1–12.
- Setianingsih, S., Riandhyanita, F., & Asyrofi, A. (2017). Description of implementation of oral hygiene practices in patients in the ICU room. *Jurnal Perawat Indonesia*, *1*(2), 48–53.
- Tablan, O. C., Anderson, L. J., Besser, R., Bridges, C., & Hajjeh, R. (2004). *Guidelines for preventing Health-Care-Associated Pneumonia, 2003: Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee*. doi:10.1037/e548652006-001?
- Wiegand D. J. L.-M., (Ed.). (2011). *AACN procedure manual for critical care* (6th ed.). Amsterdam, the Netherlands: Saunders-Elsevier.
- Yao, L.-Y., Chang, C.-K., Maa, S.-H., Wang, C., & Chen, C.-H. (2011). Brushing teeth with purified water to reduce ventilator-associated pneumonia. *Journal of Nursing Research*, *19*, 289–297. doi:10.1097/JNR.0b013e318236d05f
- Yurdanur, D., & Yagmur, F. N. (2016). A recent view and evidence-based approach to oral care of intensive care patient. *International Journal of Caring Sciences*, *9*, 1177–1185.
- Zuckerman, L. M. (2016). Oral chlorhexidine use to prevent ventilator-associated pneumonia in adults: Review of the current literature. *Dimensions of Critical Care Nursing*, *35*(1), 25–36. doi:10.1097/DCC.000000000000154