

# Oral care practices for patients in Intensive Care Units: A pilot survey

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## Abstract

**Objective:** To assess the level of knowledge and difficulties concerning hospitalized patients regarding preventive oral health measures among professionals working in Intensive Care Units (ICUs). **Study Population and Methods:** A cross-sectional survey was conducted among 71 health professionals working in the ICU. A self-administered questionnaire was used to determine the methods used, frequency, and attitude toward oral care provided to patients in Brazilian ICUs. The variables were analyzed using descriptive statistics (percentages). A one-sample *t*-test between proportions was used to assess significant differences between percentages. *t*-statistics were considered statistically significant for  $P < 0.05$ . Bonferroni correction was applied to account for multiple testing. **Results:** Most participants were nursing professionals (80.3%) working 12-h shifts in the ICU (70.4%); about 87.3% and 66.2% reported having knowledge about coated tongue and nosocomial pneumonia, respectively ( $P < 0.05$ ). Most reported using spatulas, gauze, and toothbrushes (49.3%) or only toothbrushes (28.2%) with 0.12% chlorhexidine (49.3%) to sanitize the oral cavity of ICU patients ( $P < 0.01$ ). Most professionals felt that adequate time was available to provide oral care to ICU patients and that oral care was a priority for mechanically ventilated patients (80.3% and 83.1%, respectively,  $P < 0.05$ ). However, most professionals (56.4%) reported feeling that the oral cavity was difficult to clean ( $P < 0.05$ ). **Conclusion:** The survey results suggest that additional education is necessary to increase awareness among ICU professionals of the association between dental plaque and systemic conditions of patients, to standardize oral care protocols, and to promote the oral health of patients in ICUs.

**Keywords:** Dental hygiene, education, hospital dental services, Intensive Care Unit, nursing services, oral care, oral health, ventilator-associated pneumonia

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## Introduction

Hospitalized patients, especially those in Intensive Care Units (ICUs), require specialized care. Their critical health conditions make them more dependent on a multidisciplinary team able to provide ethical, humane,

and clinical help, especially in their daily activities. Most of these patients are not able to perform the simplest activities, including their own oral hygiene. Thus, providing oral care to these patients is very important.<sup>[1,2]</sup>

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Oral hygiene is necessary for patients in ICUs because it helps to maintain the health of their stomatognathic systems. Without proper assistance, the health conditions of critical patients in the ICU may be aggravated. In addition, oral hygiene is often precarious in ICU patients. Finally, changes in salivary flow caused by medications that worsen and unbalance the oral environment may increase biofilm formation.<sup>[2-4]</sup>

Previous reports have suggested that professionals working in Brazilian hospitals give little credibility to dental activities such as oral hygiene, and do not usually recognize the close association between oral hygiene and prevention of systemic diseases. Health care professionals must be made aware that oral hygiene may improve the health conditions of hospitalized patients.<sup>[3]</sup>

Dentistry practice in hospitals aims to prevent and eliminate potential infection sources, including inflammation and painful symptoms caused by oral problems that may directly affect systemic conditions of critically ill patients and jeopardize their recovery.<sup>[5,6]</sup>

Most dentistry performed in hospitals focuses on curative and rehabilitative treatments. However, education and prevention are equally important, and require interdisciplinary approaches.<sup>[7]</sup>

Dentists working in ICUs play an important role in patient oral health. They assess the accumulation of biofilm, tongue coating, dental caries, halitosis, oral lesions, partial or full prosthetics, periodontal disease, and residual fungal diseases within the oral cavity.<sup>[3,8,9]</sup>

Gram-positive bacteria often constitute the oral microflora of healthy individuals. However, the balance of oral microflora of patients hospitalized in ICUs for more than 48 h tends to change. These changes lead to a prevalence of Gram-negative bacteria such as *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Acinetobacter baumannii*, *Haemophilus influenzae*, and *Pseudomonas aeruginosa*. These bacteria have all been associated with nosocomial pneumonia.<sup>[8,9]</sup>

Studies have correlated biofilm on the tongue with increased levels of Gram-negative bacteria. Biofilm on tooth surfaces, coated tongues, and periodontal disease tend to aggravate patient clinical conditions because they offer an optimal environment for growth of Gram-negative bacteria. This growth results in more virulent oral microflora. Therefore, dentists and other professionals involved in caring for critically ill patients should be aware of the need for effective elimination of

these factors and prevention of bacterial development in the mouth.<sup>[3,5,8,9]</sup>

Nursing technicians are mostly responsible for performing oral hygiene in critically ill patients in ICUs. These professionals are supervised in the promotional activities of oral health for nurses and medical staff. However, the daily activities of care and work require a lot of attention to intensive care patients.<sup>[1,6,10]</sup>

The current study evaluated measures used by healthcare professionals to promote oral health in critically ill patients in ICUs. It also assessed the major difficulties encountered while carrying out preventive protocols for oral health promotion in ICUs of hospitals in Brasilia, Brazil.

## Study Population and Methods

### Study design

This cross-sectional survey was conducted with health professionals in the ICUs of hospitals in Brasilia, Brazil.

The selected hospitals are the largest private hospitals in Brasilia, the capital of Brazil, with satisfactory quantity and high turnover of patients. Thus, the sample of these two hospitals gave more credibility to the study, can demonstrate the real situation of private hospitals in the country. The hospital 1 has 24 ICU beds, whereas the hospital 2 has 30 ICU beds.

Eighty-three professionals work in these ICUs. Of these, 71 participated in the survey and answered the questionnaire. According to Flick *et al.*,<sup>[11]</sup> renowned author in the area, and O'Reilly and Parker<sup>[12]</sup> a sample size of 71 professionals was estimated. Study participants were selected randomly, according to the availability of time (shift) and working day in ICUs.

A sample size of 71 subjects was recruited at random. The survey included all healthcare professionals in the ICUs of two private hospitals.

### Survey

A self-administered validated questionnaire adapted from a Malaysian study by Soh *et al.*,<sup>[13]</sup> was used in this study. This questionnaire reflected the practice of oral hygiene in ICUs. The questionnaire consisted of a section focused on the oral hygiene protocol performed in the ICU, the oral care practiced by these healthcare professionals, the frequency of oral hygiene, and the equipment used for oral hygiene, such as cotton, gauze, spatulas, forceps, and toothbrush.

The questionnaire was peer reviewed by experts with Post-Basic Critical Care qualification. The expert panel agreed on the survey items and supported the number, format, and validity of the questions posed. Only one question in the demographic profile (the nurses' highest qualification) was rephrased for greater clarity. Experts also agreed that the sampling of the questions was adequate and reflected the nurses' practice of oral care and supported the face validity.

Adaptation of the validated questionnaire was made to the reality of behaviors and knowledge of the specific topic in Brazil in an attempt to the better approach of the participants of the study and research activities carried out in ICUs by these professionals [Questionnaire].

The professionals were also asked to identify the type of mouthwash used for oral care. They also responded to questions regarding the support provided by the hospital and their attitudes toward these topics. Finally, the participants were asked to provide demographic data such as age, level of qualification, type of ICU where they currently worked, and length of service.

Knowledge of nosocomial pneumonia and its repercussions for the health of critically ill patients are essential for professionals working in ICUs. The ratio of biofilm, cleaning deficiency, coating buildup lingual, and lung disease exists due to microbial reservoir formation in the oral cavity and oropharynx. The training of these professionals should prioritize these types of information in the ICU context.

The questionnaire sought information based on protocol published by the Department of Dentistry and Nursing at the Brazilian Association of Intensive Medicine, the largest professional society on the subject in Brazil.

### Procedures

Data were collected during the first half of 2015. The head researcher distributed a package of envelopes, each containing the questionnaire and guidelines for completing the questionnaire, in a single room of the hospital. Participation in this survey did not negatively affect the care of patients in the ICUs in which the health professionals worked.

All health professionals working in the ICUs were invited to participate.

It was a convenience sample, and the participation of health professionals working in ICUs was made according

to the work period and interest of professionals in the study. Only five professionals refused to participate.

### Ethical considerations

Ethical approval for this study was granted by the Ethical Committee of the Catholic University of Brasilia, CAAE number 44578215.0.0000.0029, and hospitals authorized to conduct this survey, according to ethical principles of the declaration of Helsinki. All participants signed an informed consent form to participate in the study.

### Data analysis

Data were analyzed using the SPSS Statistics for Windows, version 17.0 software (SPSS Inc., Chicago, IL, USA). The variables were analyzed using descriptive statistics reported as proportions (percentages). A one-sample *t*-test between proportions was performed to identify significant differences between the percentages. *t*-statistic values were considered statistically significant for  $P < 0.05$ . Bonferroni correction was applied for multiple simultaneous tests.

### Results

The study sample consisted of 71 health professionals working in the ICUs of two private hospitals in Brasilia, Brazil. Among these professionals, the majority (80.3%) were nurse technicians and nurses (41; 57.8% and 16; 22.5%, respectively). Doctors, physiotherapists, and speech therapists were also included in the total sample. The professionals' characteristics are shown in Table 1. Most professionals reported working in the ICU between 1-3 (45.1%) and 4-6 years (24%), with a typical 12-h workday (70.4%). There was a wide distribution in their qualifications.

Table 2 summarizes the professionals' knowledge about coated tongue, biofilms, and nosocomial pneumonia. A significant proportion reported knowing about coated tongue (87.3%) and nosocomial pneumonia (66.2%) ( $P < 0.05$ ). However, a similar proportion of professionals had no knowledge about biofilms ( $P > 0.05$ ).

Most professionals (97.2%) reported performing activities to promote patient health, 83.1% cleaned the oral cavities of patients in the ICU, and 83.7% cleaned the oral cavities of patients with orotracheal intubation ( $P < 0.05$ ). Approximately 46.5% of professionals reported practicing oral care at least twice daily, and 33.8% reported practicing oral care three times daily [Table 3].

The methods for oral care varied [Table 3], and more than one method was often used. Spatulas, gauze, and

**Table 1: Characteristics of professionals responding to the survey**

Characteristics	n	Percentage
Profession (n=71)		
Doctor	6	8.5
Nurse	16	22.5
Practical nurse	41	57.8
Physiotherapist	7	9.9
Speech therapist	1	1.4
ICU experience (n=71) (years)		
<1	7	9.9
1-3	32	45.1
4-6	17	24.0
7-9	8	11.3
>10	7	9.9
Qualifications (n=71)		
N/A	10	14.1
Graduate degree	5	7.0
Postgraduate	25	35.2
ICU certified	19	26.8
Postbasic critical care	12	16.9
Shift length (n=71)		
6 h/day	12	16.9
8 h/day	8	11.3
12 h/day	50	70.4
24 h	1	1.4

N/A: No answer; ICU: Intensive Care Unit

**Table 2: Knowledge about coated tongue, biofilm, and nosocomial pneumonia**

Knowledge	n	Percentage	P
Knowledge about coated tongue (n=71)			
N/A	2	2.8	0.0000
Yes	62	87.3*	
No	7	9.9	
Knowledge about biofilm (n=71)			
N/A	3	4.2	NS
Yes	42	59.2	
No	26	36.6	
Knowledge about nosocomial pneumonia (n=71)			
N/A	6	8.5	0.0002
Yes	47	66.2*	
No	18	25.4	

\*Significant one-sample t-test result between percentages of agree and disagree ( $P < 0.05$ ).  
N/A: No answer; NS: Nonsignificant ( $P > 0.05$ )

toothbrushes were the primary materials used by the majority (49.3%) of professionals ( $P < 0.017$ ). Some (28.2%) used only toothbrushes. Among 71 professionals, 49.3% reported using a 0.12% chlorhexidine mouthwash ( $P < 0.017$ ), whereas 16.9% used only toothpaste, and 11.3% used both chlorhexidine and toothpaste. Only 1.4% of the professionals did not use a chemical for biofilm control.

The *t*-statistic was significant at the 0.05 critical alpha level. However, it was used Bonferroni's theorem to adjust the critical alpha level (0.05) because the plan involved multiple tests of the same type ( $0.05/2$ ) –  $P < 0.025$  and ( $0.05/3$ ) –  $P < 0.017$ .

Most professionals reported having a positive attitude toward providing oral care for ICU patients [Table 4], with 83.1% agreeing that oral care is a high-priority procedure for mechanically ventilated patients ( $P < 0.05$ ). Approximately 80.3% agreed that they had adequate time to perform oral care procedures ( $P < 0.05$ ), and 76.1% confirmed that they used an aspiration vacuum to perform oral hygiene procedures on ICU patients ( $P < 0.05$ ). However, 56.4% of the professionals felt that the oral cavity was a difficult body area to clean ( $P < 0.05$ ).

## Discussion

This study describes the knowledge of health professionals working in the ICUs of two private hospitals in Brasilia, Brazil. The results indicate that the frequency and methods for providing oral care differed among nurses and nursing technicians. Although research has been conducted in ICUs of these hospitals, this study provides important information regarding oral hygiene practices in ICUs and identified difficulties in providing this care to hospitalized patients.

The results showed that over 80% of the professionals in this study were nurses and nursing technicians who performed tasks associated with oral health in patients in ICUs [Table 1]. Other studies have also reported that daily oral hygiene, mainly the removal of plaque and tongue coatings, is important for health promotion in patients in ICUs patients; this care is usually performed by qualified nursing staff who have been trained in specific oral hygiene methods and protocols.<sup>[14-17]</sup>

This study [Table 2] observed that 87.3% and 66.2% of the professionals had knowledge regarding tongue coating and nosocomial pneumonia, respectively ( $P = 0.00$  and  $P < 0.05$ , respectively). These results are similar to those reported by Barnes<sup>[18]</sup> in which the majority of health professionals were aware of the clinical conditions most frequently present in the oral cavity of ICU patients, including tongue coating and systemic problems, especially nosocomial pneumonia.

The difficulty of maintaining oral hygiene in intubated patients was a major problem reported by more than 83% of the respondents ( $P = 0.00$ ) [Table 3]. Oral health is a constant concern in ICUs, especially in intubated patients;<sup>[10]</sup> inadequate hygiene can contribute to the accumulation of microbial reservoirs associated with biofilm and tongue coatings, which may lead to systemic harm in these patients.

Oral health care in the ICU is a routine procedure in hospitals [Table 3], representing 83.1% of the sample ( $P = 0.00$ ); however, in a study by Berry *et al.*,<sup>[19]</sup> there is no standardization for the frequency, technical preparation, clinical management, time for execution, motivation, and professional capacities, based on information provided by the majority of the study participants.

Most of the professionals in this study performed oral hygiene at least twice daily [Table 3], a significant difference compared to other routines ( $P = 0.025$ ) [Table 3]. This frequency of oral hygiene in the ICU was also reported by Sona *et al.*,<sup>[4]</sup> Soh *et al.*,<sup>[13]</sup> and Munro *et al.*,<sup>[20]</sup> with the aim of reducing biofilm formation and tongue coating, and subsequently reducing the number of hospital infections.

Mechanical cleaning is an essential activity in oral health care in ICUs,<sup>[2,13,19]</sup> including the use of toothbrushes, gauze, and wooden spatulas ( $P = 0.017$ ); this method was most commonly used by the professionals in this study [Table 3], along with chemical cleaning with 0.12% chlorhexidine (83.7% of professionals).

**Table 3: Oral care practices in patients in Intensive Care Units**

Oral care practices in patients in ICUs	n	Percentage	P
Health promotion activities (n=71)			
Yes	69	97.2*	0.0000
No	2	2.8	
Oral hygiene of patients (n=71)			
Yes	59	83.1*	0.0000
No	12	16.9	
Frequency of oral hygiene (n=71)			
N/A	8	11.3	<0.025
Once a day	6	8.5 b	
Twice a day	33	46.5** <sup>a</sup>	
Three times a day or more	24	33.8 <sup>a</sup>	
Mechanical control of biofilm (n=71)			
N/A	6	8.5	<0.017
Spatulas and gauze	9	12.7 <sup>b</sup>	
Spatulas, gauze, and toothbrushes	35	49.3** <sup>a</sup>	
Toothbrushes	20	28.2 <sup>a, b</sup>	
Forceps, spatulas, gauze, and toothbrushes	1	1.4 c	
Chemical control of biofilm (n=71)			
N/A	15	21.1	<0.017
Nothing	1	1.4 <sup>c</sup>	
Toothpaste	12	16.9 <sup>b</sup>	
0.12% chlorhexidine	35	49.3** <sup>a</sup>	
0.12% toothpaste and chlorhexidine	8	11.3 <sup>b, c</sup>	
Oral hygiene of patients with orotracheal intubation (n=71)			
N/A	6	8.5	0.0000
Yes	63	83.7*	
No	2	2.8	

\*Significant one-sample t-test result between percentages of agree and disagree ( $P < 0.05$ ); \*\*Bonferroni-corrected. Different letters (a, b, c) between the groups at baseline indicate statistically significant differences ( $P < 0.01$ ). N/A: No answer; ICUs: Intensive Care Units

Combined chemical (0.12% chlorhexidine) and mechanical cleaning should be performed on all hospitalized patients in the ICU, as it has been shown to decrease the incidence of opportunistic infections such as nosocomial pneumonia.<sup>[7,20-22]</sup> This practice is primarily indicated for intubated patients because the tube and feeding ducts are niches for the accumulation of Gram-negative bacteria.<sup>[12,18,19]</sup> The findings of the current study are similar to those of previous reports.<sup>[3,4,7,8,10,15,20,22]</sup>

Knowledge about the importance of maintaining oral health for prevention of respiratory diseases in the hospital environment, particularly the ICU, was also observed in this study [Table 4], similar to that observed in other studies.<sup>[6,8,9]</sup>

These hygienic practices should be standard treatments performed by all professionals working in ICUs to provide adequate care to hospitalized patients.<sup>[15,16,18,20]</sup>

**Table 4: Professionals' attitude towards oral care practices in Intensive Care Units**

Professionals' attitude towards oral care practices in ICU	n	Percentage	P
I have adequate time to provide oral care (n=71)			
N/A	4	5.6	0.0000
Agree	57	80.3*	
Disagree	10	14.1	
I have been given adequate training in providing oral care (n=71)			
N/A	6	8.5	NS
Agree	40	56.3	
Disagree	25	35.2	
Oral care is a very high priority for mechanically ventilated patients (n=71)			
N/A	7	9.9	0.0000
Agree	59	83.1*	
Disagree	5	7.0	
Cleaning the oral cavity is an unpleasant task (n=71)			
N/A	7	9.9	NS
Agree	25	35.2	
Disagree	39	54.9	
The oral cavity is difficult to clean (n=71)			
N/A	8	11.3	0.03
Agree	40	56.4*	
Disagree	23	32.4	
I need better supplies and equipment (n=71)			
N/A	8	11.3	NS
Agree	34	47.9	
Disagree	29	40.4	
When I perform tooth brushing in patients I also use the aspiration vacuum (n=71)			
N/A	7	9.9	0.0000
Agree	54	76.1*	
Disagree	10	14.1	

\*Significant one-sample t-test result between percentages of agree and disagree ( $P < 0.05$ ); N/A: No answer; NS: Nonsignificant ( $P > 0.05$ ); ICUs: Intensive Care Units

The majority of health professionals working in the ICU in the current study (80.3%) associated oral hygiene activities with other care practices for critical patients [Table 4] and reported having adequate time to execute these tasks. Although they reported some difficulties in performing proper oral hygiene ( $P = 0.03$ ), most performed them with the help of vacuum aspiration ( $P < 0.05$ ), a finding similar to those reported in previous studies.<sup>[2,11,12,19,22]</sup>

It is important for healthcare professionals to seek training on measures and protocols that promote the oral health of patients in ICUs.<sup>[5,18]</sup> The results of the current study reveal differences in practices and knowledge among the healthcare professionals evaluated in this study, indicating the need for additional educational and preparatory activities to improve oral health services performed in the ICUs evaluated in this study.

## Conclusion

The results of this study suggest that is necessary to educate ICU professionals about the association between dental plaque and systemic condition of patients, improve training of ICU professionals, and standardize oral care protocols to promote oral health of patients in ICUs.

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## Conflicts of interest

There are no conflicts of interest.

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## Questionnaire

### Questionnaire applied to health professionals from hospitals I and 2

Age  
 Gender  
 Profession  
   Doctor  
   Nurse  
   Practical nurse  
   Physiotherapist  
   Speech therapist  
 ICU professional experience (time) (years)  
   < 1  
   1-3  
   4-6  
   7-9  
   > 10  
 Professional qualification  
   N/A  
   Graduate degree  
   Postgraduate  
   ICU certified  
   Postbasic critical care  
 Shift length  
   6 h/day  
   8 h/day  
   12 h/day  
   24 h  
 Knowledge about coated tongue  
   N/A  
   Yes  
   No  
 Knowledge about biofilm  
   N/A  
   Yes  
   No  
 Knowledge about nosocomial pneumonia  
   N/A  
   Yes  
   No  
 Oral care practices in patients in ICUs  
   Health promotion activities  
     Yes  
     No  
   Oral hygiene of patients  
     Yes  
     No  
   Frequency of oral hygiene  
     N/A  
     Once a day

### Contd...

Twice a day  
 Three times a day or more  
 Mechanical control of biofilm  
   N/A  
   Spatulas and gauze  
   Spatulas, gauze, and toothbrushes  
   Toothbrushes  
   Forceps, spatulas, gauze, and toothbrushes  
 Chemical control of biofilm  
   N/A  
   Nothing  
   Toothpaste  
   0.12% chlorhexidine  
   0.12% toothpaste and chlorhexidine  
 Oral hygiene of patients with orotracheal intubation  
   N/A  
   Yes  
   No  
 Professionals' attitude toward oral care practices in ICU  
   I have adequate time to provide oral care  
     N/A  
     Agree  
     Disagree  
   I have been given adequate training in providing oral care  
     N/A  
     Agree  
     Disagree  
   Oral care is a very high priority for mechanically ventilated patients  
     N/A  
     Agree  
     Disagree  
   Cleaning the oral cavity is an unpleasant task  
     N/A  
     Agree  
     Disagree  
   The oral cavity is difficult to clean  
     N/A  
     Agree  
     Disagree  
   I need better supplies and equipment  
     N/A  
     Agree  
     Disagree  
   When I perform tooth brushing in patients I also use the aspiration vacuum  
     N/A  
     Agree  
     Disagree

Contd...

\*Questionnaire adapted to the reality of Brazil - Soh et al., 2012. N/A: No answer; ICU: Intensive Care Unit