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Major Article

Comparative study of 2 oral care protocols in intensive care units

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Background: The quality of oral care is important in limiting the emergence of ventilator-associated pneumonia (VAP) in intubated patients. Our main objective was to measure the quality improvement in oral care following the implementation of a new oral care protocol. We also monitored VAP rates.

Material/methods: This was a cohort study of patients in 5 adult ICUs covering different specialties. During period 1, caregivers used a foam stick for oral care and during period 2 a stick and tooth brushing with aspiration. Oral chlorhexidine was used during both periods. The caregivers rated improvement in oral health on the basis of 4 criteria (tongue, mucous membranes, gingivae, and teeth). Caregiver satisfaction was also assessed. The incidence of VAP was monitored.

Results: A total of 2,030 intubated patients admitted to intensive care units benefited from oral care. The patient populations during the 2 periods were similar with regard to demographic data and VAP potential risk factors. Oral health was significantly better from the third day of oral care in period 2 onward (period 1, 6.4 ± 2.1; period 2, 5.6 ± 1.8; $P = .043$). Caregivers found the period 2 protocol easier to implement and more effective. VAP rates decreased significantly between the 2 periods (period 1, 12.8%; period 2, 8.5%; $P = .002$).

Conclusions: Our study showed that the implementation of a simple strategy improved the quality of oral care of patients in intensive care units, and decreased VAP rates.

Ventilator-associated pneumonia (VAP) is among the most common and costly health care-associated infections in critically ill patients.[1] The burden of morbidity, mortality, and financial costs related to VAP calls for appropriate prevention measures.[2] There is an abundance of literature suggesting various associations between oral hygiene, oropharyngeal colonization, and VAP.[3] Reports have shown that oral chlorhexidine decreases the incidence of VAP but there is no evidence that it affects mortality outcomes, duration of mechanical ventilation, or duration of intensive care unit (ICU) stay.[3,4] Nevertheless, oral care is mentioned in most studies describing strategies for prevention of VAP.

Dental plaque biofilms in critically ill patients increase in volume and complexity and become colonized by respiratory pathogens from the hospital environment. The risk of colonization is heightened in the presence of poor oral hygiene. Other changes, such as dryness and xerostomia, can occur in the oral cavity during hospitalization. Because there is a scant amount of saliva present, normal self-cleansing does not occur and dental plaque biofilms thicken.[5] Each of these factors could be lessened if critical care patients had appropriate care to maintain oral health. Dental biofilms are fairly resistant to chemical action and therefore require mechanical action.[6] Such care could also help alleviate the discomfort of intubated patients. Thus, maintaining oral health in critically ill patients is an essential nursing activity, and the state of a patient's mouth can be

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considered as an indication of nursing care quality.[7] Regular oral care at least once a day for all patients receiving mechanical ventilation has become standard practice and is included in most bundles for the prevention of VAP.[8] However, the most effective regimen for orally intubated patients remains to be determined and evidence is needed to determine what should be included in standard practices: use or not of antiseptic mouth rinse or gel, concentration of antiseptic agents, manual or powered tooth brushing, aspiration of secretions, and frequency and combinations of these different cares.[9-11] Barriers to effective routine daily oral care practices also need to be addressed. It is important to develop oral care protocols to reduce VAP rates but numerous studies have shown that professional training and assessment of nursing oral hygiene practices are also essential.[10,12]

We studied the effect of an oral care protocol based on use of a toothbrush, a chlorhexidine-impregnated silicone stick, and aspiration on the oral health of intubated ICU patients. Caregivers' satisfaction with the protocol was assessed. VAP incidence rates were monitored throughout the study.

MATERIALS AND METHODS

Study location and patient population

This study was performed in 5 adult ICUs in the Clermont-Ferrand University Hospital, Clermont-Ferrand, France, which is a reference hospital for the Auvergne area: 1 neurosurgical ICU (13 beds), 1 medical ICU (10 beds), 1 cardiovascular ICU (13 beds), and 2 medical-surgical ICUs (15 and 16 beds). They received around 2,861 patients in 2015. Overall, the number of caregivers (nurses and nursing assistants) was about 300.

A total of 3,086 patients were admitted to ICUs between July 1, 2014, and August 31, 2015. Of these, 2,030 (65.8%) required mechanical ventilation and were enrolled in the study (Fig 1). The institutional review board was informed of the study and waived the need for informed consent because of the observational nature of the investigation. The study was approved by the ethics committee of the Clermont-Ferrand University Hospital. All information was kept confidential and all data were presented as group data to preserve anonymity.

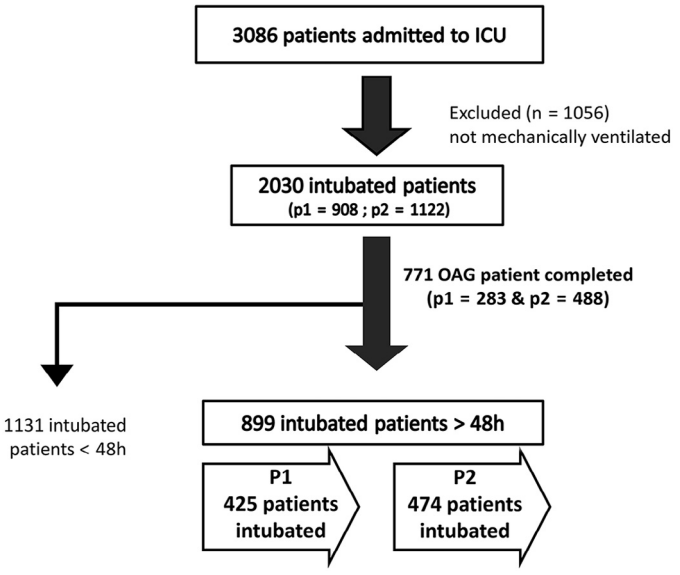

Fig 1. Flow chart of the study. Of a total of 3,086 patients admitted to intensive care units (ICUs), 2,030 intubated patients were included during period 1 (p1) (July 1-December 31) and period 2 (p2) (February 1-August 31). A total of 771 oral assessment guides (OAGs) were completed.

Study design

This study was a cohort study performed over 2 consecutive periods, a first period (p1) from July 1, 2014-December 31, 2014, and a second period (p2) from February 1, 2015-August 31, 2015 (ClinicalTrials.gov: NCT02400294).

During p1, oral care was performed 3 times a day with Toothette oral swabs (Sage Products, Cary, IL) and a compress soaked with a dilution of a 0.5% chlorhexidine solution. During p2, oral care was performed 3 times a day with Orocare Aspire, and OroCare Sensitive (Intersurgical, Fontenay sous-bois, France), which were directly attached to a suction line. OroCare Aspire is a toothbrush with soft bristles that was used for care of the teeth. OroCare Sensitive is a suction wand for cleaning gums and tissues in the mouth. These Orocare devices do not interfere with endotracheal tubes or other equipment.

Both devices were used with aspiration and the toothbrushes were soaked in a dilution of a 0.5% chlorhexidine solution. The use of these devices is straightforward but ICU nurses and nursing assistants were instructed during January 2015 on how to use them. Explanatory posters were put up in patients' rooms and in the ICU wards. The oral care devices were distributed in the 5 ICUs by an author (JO), who was therefore able to monitor their use. No other interventions were performed between study periods.

The following patient characteristics, comorbidities, and VAP risk factors were collected from the ICU software (Intellivue Clinical Information Portfolio; Philips Medical Systems, Eindhoven, the Netherlands): sex, age, type of admission, body mass index, Simplified Acute Physiology Score II, Glasgow score, ventilator days per patient, number of tracheotomy days, intubation at ICU admission, duration of stay, ICU mortality, alcoholism, anti-infectious treatment, chronic obstructive pulmonary disease, corticosteroids, chronic illness, diabetes, duration of antibiotic treatment, dyslipidemia, transfusion, and tobacco use.

Oral care assessment

Oral health was evaluated by an oral assessment guide (OAG) over 3 months during both periods. The guide we used was adapted from a previous study.[13] The caregiver scored the 4 criteria (A, tongue; B, mucous membranes; C, gingivae; and D, teeth) once a day after oral care on intubated patients on a scale ranging from 1-3 points (Fig 2). The overall score ranged from 4 (high quality) to 12 (low quality). We assessed the scoring of a subset of 34 nurses and 20 nursing assistants from the 5 ICUs. Photographs of oral cavities of 15 ICU patients with various oral health conditions were presented to the 54 caregivers, who then rated all 4 criteria. The overall agreements on the 3-point scales were 58.4% for the tongue, 61.3% for the mucous membranes, 74% for the gingivae, and 79.1% for the teeth. During March 2015, a questionnaire comparing the protocols and the devices used during the 2 periods was completed by the ICU caregivers (supplementary Figure S1). The questionnaire asked about the quality of the oral care, the ease of use of the devices, the saving of time during care, training with the new device, knowledge of the oral care protocol, and whether it was worth purchasing the new device.

Effect of oral care on VAP

VAP was diagnosed by a single physician in each ICU. Diagnosis was established on the basis of chest radiograph evidence of a new and persistent pulmonary infiltrate, combined with the clinical judgments of the physician and microbiologic criteria. The clinical