



Effectiveness of dental care for prevention of nosocomial respiratory tract infections among intensive care patients: a randomized clinical trial



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Introduction and Purpose

Respiratory tract infections (RTI) are one of the most frequent nosocomial infections among patients admitted to intensive care units (ICU), leading to an increased length of stay and in-hospital mortality.¹

It is well known that the pathophysiology of RTI begins in most cases with the migration of pathogenic bacteria from the oral cavity to the airways and the lungs. In this sense, poor oral health and hygiene are considered relevant risk factors for nosocomial RTI.²

A recent national survey of the Brazilian population oral health status has shown that caries and periodontal disease are highly prevalent in adults, which may partially explain why Brazilian RTI rates in ICU for adults are systematically higher than those rates reported elsewhere.³

We have previously studied the application of chlorhexidine solution as an oral antiseptic for RTI prevention, which was ultimately ineffective, on the context of a poor oral health and hygiene.⁴

So, we decided to study whether a dental care program, directly implemented by a dental surgeon, could be of any help in RTI prevention among intensive care patients.

Methods

This is a randomized single-blind clinical trial, since patient's blindness was unfeasible. Inclusion started in January, 1, 2011 and finished in November, 10, 2012.

All adults patients admitted to a single ICU located in a tertiary university public hospital were eligible to the study, if they have a perspective of staying at least two days. Exclusion criteria were pregnancy and blood dyscrasia.

After giving written consent, patients were randomised by the dental surgeon using a dice. Experimental arm was submitted to dental and periodontal care provided by a dental surgeon, as needed by the patient, at least three times a week until discharge from the ICU, additionally to the routine oral hygiene.

Routine oral hygiene was provided by the ICU nurse staffing three times a day and consisted of mechanical cleaning of the oral

cavity, followed by topical application of Chlorhexidine 0.12% solution for fully conscious patients or Chlorhexidine 2% gel for semi-conscious and unconscious patients.

Nosocomial RTI were diagnosed during ICU stay and until 48h after ICU discharge, by the hospital infection control team, who was blinded to the patient's allocation in the study, following the Centers for Disease Control and Prevention (CDC) criteria.

Data was analyzed using the Pearson's corrected chi-square or bi-tailed Fisher's exact test and Wilcoxon test, on the Stata® program (version 9.0).

Results

We included 203 patients in the study, 101 of them in the experimental arm and 102 in the control arm, but full data could not be obtained for 26 patients who died or got discharged in the first 48h of the ICU stay. Both groups displayed similar baseline clinical features, as demonstrated on Table 1, except for age, which was slightly superior in the control arm of the study.

Table 1: Baseline clinical features of patients submitted to dental treatment or routine oral care, during ICU stay

| Baseline clinical features | Routine care n=88 | Dental treatment n=89 |
|---|----------------------|--------------------------|
| Male sex - n (%) | 43 (48.9) | 42 (47.2) |
| Mean age in years ± SD | 60.2 ± 18.6 | 54.9 ± 18.5 |
| APACHE II score at ICU admission (mean ± SD) | 22.8 ± 7.8 | 21.3 ± 7.2 |
| Length of stay prior to ICU admission (mean ± SD) | 10.5 ± 12.0 | 13.3 ± 15.8 |

Abbreviation: ICU: Intensive care unit; SD: standard deviation; APACHE II: Acute Physiology and Chronic Health disease Classification System II.

Outcome analysis of the 177 patients fully evaluated revealed a RTI incidence of 21.6% (19/88) in the control group versus 11.2% (10/89) in the experimental group (p=0.06), as demonstrated on Table 2. Length of stay in the ICU, infection free survival, crude mortality and mortality attributable to RTI were not significantly affected by the experimental intervention, which is also detailed on Table 2.

Table 2: Clinical outcome of patients submitted to dental treatment or routine oral care, during ICU stay

| Clinical outcome | Routine care n=88 | Dental treatment n=89 | p* |
|-------------------------------------|----------------------|--------------------------|------|
| RTI - n (%) | 19 (21.6) | 10 (11.24) | 0.06 |
| LOS in the ICU (mean ± SD) | 10.6 ± 8.2 | 11.1 ± 10.1 | 0.81 |
| RTI free survival (mean ± SD) | 8.7 ± 6.4 | 9.6 ± 8.3 | 0.86 |
| Crude mortality - n (%) | 33 (37.5) | 31 (34.8) | 0.71 |
| Mortality attributable to RTI -n(%) | 7 (7.9) | 4 (4.5) | 0.37 |

*p value refers to Pearson's corrected chi-square or bi-tailed Fisher's exact test, for discrete variables, and Wilcoxon for continuous variables. Abbreviation: ICU: intensive care unit; RTI: respiratory tract infections; SD: standard deviation; LOS: length of stay.

Adverse events related to oral hygiene procedures, such as oral mucosa irritation and/or bleeding, were more frequent among experimental arm of the study (15.7% versus 1.1%, p=0.001), but they were mild in most cases. Only 1 patient had to be withdrawn from dental care, because of major oral bleeding, which was thought to be related to the disseminated intravascular coagulation diagnosis. No severe adverse event specifically related to dental care was detected during the study.

Conclusion

Dental treatment was considered safe in the ICU setting and we detected a trend toward its effectiveness for RTI prevention, but, due to our insufficient sample size, larger studies are necessary to confirm this finding.

References

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