

# The Importance of Hospital Dentistry in Improving the Quality of Life of Patients in the Intensive Care Unit (ICU)

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## Abstract

As from the admission of patients to the Intensive Care Unit (ICU), one must consider the increased risk of opportunistic infections, either stomatological or systemic. Subsequently, the need for pharmacological therapy, particularly antibiotic therapy, hospitalization costs, with possible increase in morbidity and mortality rates are increased. Considering also the post-pandemic period of COVID-19, in which prevention should be projected to the maximum, the aim is to reduce the permanence rate of patients in hospital bed occupation. Hospital Dentistry has been practiced in clinical and surgical hospital environments with the proposal of management and preventive and curative dental conducts to favor the oral health of hospitalized patients. In this perspective, the purpose of this article was to review the role of Hospital Dentistry in reducing the rates of ventilator-associated pneumonia, by the institution of oral hygiene protocols; reduction of antibiotic administration; reduction of morbidity, mortality rates and rates of hospital bed stays; reduction of costs (to the patient and to the hospital); and improvement of quality of life rates.

**Keywords:** Dentistry; Hospital; Intensive Care Unit; Oral Health; Oral Hygiene.

## Introduction

Currently, in the post-pandemic phase of COVID-19, old priorities and care - such as prevention - have been re-established in the admission and stay of patients at hospital environment, particularly regarding the risk of opportunistic infections. These infections, whether stomatological or systemic, may, in addition to worsening the general health condition of the patients, require other clinical, surgical or therapeutic needs, increasing costs, morbidity and mortality rates for patients and hospital quality control indexes<sup>1-9</sup>.

The relationship between poor oral hygiene and the development of respiratory infections such as nosocomial pneumonia or ventilator-associated pneumonia is widely known<sup>1-12</sup>. This perspective includes the studies of Periodontal Medicine. Periodontal Medicine is a branch of Periodontal Science that determines periodontal infection as a possible risk factor for other diseases and/or systemic conditions.

Thus, periodontal infections can become risk factors for infective endocarditis; atherosclerosis and other thromboembolic events and their consequences such as infarction and stroke; obstetric complications (premature birth, low birth weight and abortion); and other respiratory diseases (rhinitis; sinusitis; chronic obstructive pulmonary disease; pulmonary emphysema; septic pulmonary disease; embolism; empyema or pulmonary abscesses; and cystic fibrosis). The bilateral relationship between periodontal diseases and diabetes is still well highlighted. Recently, other lines of research in Periodontal Medicine have been addressed, such as the relationship between periodontal diseases and obesity, dermatological changes (alopecia), infections in orthopaedic appliances and prostheses, thyroid disorders and Alzheimer's disease<sup>5,6,10-14</sup>.

It is interesting to consider that Periodontal Medicine was based on the Theory of Focal Infection proposed by Rush and Hunter in the early nineteenth century, although we can consider postulations of Hippocrates already in the Ancient Age, remaining until today<sup>11,12</sup>.

Hospitalized patients with poor oral hygiene are more likely to develop respiratory infections (Figure 1). Given this scenario, it is believed that the lack of dental biofilm control is the main factor promoting increased colonization of pathological microorganisms in the oral environment. Additionally, it is known the relationship between poor oral hygiene and the increase of hospital stay, ranging from 6 to 30 days<sup>1-6,8-10</sup>.



**Figure 1:** Patient admitted to the ICU.

The Intensive Care Unit (ICU) acts in the hospital management of severely ill patients. The difficulty in the accomplishment of oral health care by the nursing professionals (Figure 1) justifies the necessity and presence of the dental surgeon in the hospital environment<sup>1-6,8,9,15</sup>. In this preventive perspective, and when necessary therapeutic, the Hospital Dentistry plays a fundamental role in the process of health of patients admitted to hospital or ICU<sup>1-6,8,15</sup>.

The purpose of this article was to review the benefits gained from the participation of the dental surgeon at hospital environment, by the institution of preventive or therapeutic measures to patients institutionalised in hospitals or in-patient units.

## Discussion

Periodontal Medicine does not dismiss the importance of Stomatology, even in the context of Hospital Dentistry, which traditionally presents oral manifestations resulting from systemic diseases. By contrast, interactions are observed between Periodontics and other medical specialties such as Neurology, Cardiology, Gynecology and Obstetrics, Otorhinolaryngology, Pneumology and Endocrinology. It is important to emphasize that these hospitalized patients are immunosuppressed, and therefore more susceptible to opportunistic infections<sup>9-12</sup>.

In Cardiology, the relationship between infective endocarditis and its origin has been demonstrated by the detection of *Streptococcus viridans* in the oral cavity. Invasive dental procedures may favor the risk of infection in susceptible patients. Atherosclerosis has been identified as a disease of infectious origin, and may be related to periodontal infections.

These, in turn, may generate bacteremia and increase leukocytosis, exposing the host to Gram-negative microorganisms - such as *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, *Tannerella forsythia* and *Prevotella intermedia* - and their cytokines and inflammatory mediators such as lipopolysaccharides, prostaglandins, interleukin and TNF- $\alpha$ . These by-products may affect endothelial integrity, promote changes in plasma lipoprotein metabolism, and cause vascular degeneration, platelet aggregation and blood coagulation, with elevated fibrinogen levels. This cascade of phenomena may initiate or exacerbate atherogenesis and other thromboembolic events. Subsequently, they would promote cardiovascular (infarction) and cerebrovascular (stroke) alterations<sup>5-7,11,12</sup>.

Periodontal infections may trigger or stimulate obstetric complications. In murine models, studies have demonstrated the relationship between preterm birth, low birth weight and abortion. High levels of prostaglandin E2 were observed in the gingival fluid of pregnant patients with obstetric alterations, associated with subclinical bacteremia resulting from periodontal infection. The inflammatory process may trigger alterations in the chorionic-amniotic membranes<sup>10-12</sup>.

In Endocrinology, the bilateral relationship between periodontal disease and diabetes is well known. The periodontal infection, like any other infectious focus, makes it difficult to control normoglycaemia. On the other hand, diabetic patients are at greater risk of developing peripheral infections and vasculopathies, such as periodontal disease. High levels of cytokines caused by subclinical bacteremia may cause complications in diabetic patients<sup>6,11,12</sup>.

In the respiratory tract, periodontal disease may be established as a possible reservoir of microorganisms in the oral cavity and oropharynx. By aspiration - the main contamination route - or by hematogenous dissemination through tissue contiguity, bacteremia or direct inoculation (traumatic or surgical), periodontal diseases may cause infections in the respiratory tract: rhinitis; sinusitis; chronic obstructive pulmonary disease (COPD); pulmonary emphysema; septic embolism; pulmonary empyema or abscesses; and cystic fibrosis<sup>5-7,9-12</sup>.

A significant increase of some species of bacteria (*Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Acinetobacter sp.*) is observed in the oral cavity, about 72 hours after endotracheal intubation, related to aspiration pneumonia by mechanical ventilation<sup>1-4,6,7,9</sup>. Patients hospitalized with edentulous teeth, in most cases, present a greater predisposition to colonization by *Candida albicans*, clinically presenting candidiasis lesions. Oral hygiene procedures aim at reducing and containing multiplication of microorganisms in the oral cavity, aiming at the general well-being of the patients and reducing hospital stay<sup>1-6,10</sup>.

Considering satisfactory oral hygiene prior to admission in elective procedures as a prerequisite for reducing possible risks during hospitalization, it is assumed that the implementation of periodontal treatment and other dental treatments in conditioning the oral environment may also favor a better experience of hospitalization to patients. It has been reported that periodontal treatment resulted in the reduction of serum inflammatory biomarkers, and may increase systemic activity. Levels of C-reactive protein, TNF $\alpha$ , interleukin-6, leukocytes and fibrinogen were reduced by periodontal treatment, showing beneficial effects on these biochemical parameters considered representative of cardiovascular risk<sup>1-4,10-12,15</sup>.

The control of the dental biofilm, by means of oral hygiene protocols associated with the use of mouthrinses with 0.12% chlorhexidine is determinant in the preventive success of Hospital Dentistry<sup>1-5,7,9,10,15</sup>. Chlorhexidine is the best indicated oral antiseptic, due to its bactericidal characteristics against Gram-positive and Gram-negative bacteria. It presents high substantivity (12 hours), and may be used twice a day, with gauze or swab. Secondly, cetylpyridine chloride, triclosan, povidone-iodine and hydrogen peroxide can be used<sup>1-4,7,9,10,15</sup>.

The presence of the dental surgeon in the ICU for preventive and curative procedures (when necessary) presents several benefits to the hospitalized patients and, subsequently, to the hospital administration<sup>1-12</sup>. This fact can be exemplified considering nosocomial pneumonia, whose treatment requires, on average, the administration of two distinct antibiotics and 10 days of hospitalization. Evaluating prospectively, the preventive action of the dental surgeon, by means of procedures and instructions of oral hygiene, can reduce in approximately 4 days of hospitalization and 40% of the mortality rate. In Brazil, a medium size hospital with 8 to 10 ICU beds, it is estimated an average reduction of GBP 390,000 per year<sup>11,15</sup>. Chart 1 summarizes the main steps of the protocol of care for patients in the ICU.

More studies are needed for qualitative and quantitative assessment of the life of hospitalised patients, as well as the reduction of public health costs, based on preventive and curative measures in hospital dental practice.

**Chart 1:** Simplified protocol for ICU patient care.

Protocol of care for patients in the ICU:
Patients without altered level of consciousness can and should perform their own oral hygiene.
Recording and evolution in medical records.
Professional biosecurity: avoid cross infection.
Evaluation of: lips, mucosa, tongue, palate, gums, teeth, presence of dentures, and salivary flow condition.
Elimination of infectious foci; check lesions in the oral cavity.
Intubated patients: oral and oropharyngeal aspiration.
Brushing: soft bristle brush.
Chemical control (chlorhexidine 0.12%) or hydrogen peroxide.
Oral moisturisation against xerostomia (artificial saliva), of the lips and the oral mucous membrane (lanolin or vaseline).

## Conclusions

The presence of the dental surgeon in the multiprofessional team in the ICU becomes essential, not only for oral hygiene care, but also in the prevention, treatment and follow-up of these patients aiming at improving quality of life during the period of hospitalization. Hospital Dentistry may help to reduce daily rates and costs of hospital admissions, reducing or controlling cross infection and ventilator associated pneumonia by establishing of oral hygiene protocols.

## Conflict of Interest

The author declare no conflict of interest.

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