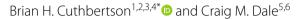
LESS IS MORE IN INTENSIVE CARE

Less daily oral hygiene is more in the ICU: yes



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Ventilator associated pneumonia (VAP) and halitosis can be considered to be the two scourges of the decade in the 2000s, one medical and one social of course. While these two problems may seem unrelated, both are conditions in which pressure to adopt oral therapies may result in more harm than good.

VAP was certainly seen as the scourge of Critical Care Medicine and was identified as having > 10% attributable mortality in early studies [1]. VAP prevention rapidly became the focus of Critical Care Quality Improvement Programs around the world [2] with healthcare organizations whose missions is "improving health and health care worldwide" jumping on the bandwagon and pushing the agenda forward with zeal [3]. They were supported in this odyssey by governmental and non-governmental organizations internationally, which described VAP as a treatable disease [4]. Oral care and ventilator care bundles came into vogue and all such guidelines contained the recommendation to prevent VAP using oral chlorhexidine solution. In sequence, chlorhexidine oral rinse became an accepted means to attenuate VAP and a social indicator of quality care [5].

The "social scourge" of halitosis was in fact a disease invented by pharmaceutical manufacturers to scare people into using their products—and it worked! Originally considered a surgical antiseptic, floor cleaner, and treatment for gonorrhea, listerine alcohol-based solution became the first over-the-counter mouthwash to "cure" bad breath [6]. The marketing transformation of a personal imperfection into an embarrassing medical condition changed personal oral hygiene practices worldwide. In organizing a desire to purchase the mouthwash, the manufacturer advertised bad breath as a widespread,

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serious, and treatable disease. In reality, alcohol-containing mouthwashes may contribute to dry mouth and make halitosis worse by reducing or eliminating saliva. Our mouths need saliva to control bacteria, minimize inflammation, and to stay fresh, meaning that the lack of saliva can cause bad breath and dental disease [7]. Nevertheless, the pursuit of the perfect smile and freshest breath is now a compulsion to millions around the world, so why should it not be so for the critically ill in critical care, right?

In these enlightened days, at the beginning of the 2020s, we know better of course (or we would do if we weren't trying to deal with a global pandemic). It turns out that the attributable mortality for VAP is probably closer to 1% and our previous studies were grossly confounded [8]. Further, and concerningly, it turns out that oral chlorhexidine may actually be causing more harm than good. Firstly, in most, but not all studies, oral chlorhexidine prevents VAP, but then again VAP is not the scourge it used to be. Secondly, meta-analysis of randomized evidence has suggested that oral chlorhexidine may be associated with increased mortality [9]. The reasons for this are unclear but they could be as simple as drug related toxicity. Further large, high-quality, randomised studies are underway to see whether this effect can be confirmed [10]. Thirdly, even if oral chlorhexidine doesn't kill you while preventing VAP, it may be harmful in other important ways related to direct toxic effects on the oral mucosa [11].

So, that said, here is the problem that we face. We have falsely conflated good oral care with the application of oral chlorhexidine; well it is an antiseptic after all just like our favorite mouthwash, so chlorhexidine application meant a job well done! But applying an antiseptic to a healthy mouth may be very different from applying it to the mouth of a patient who is critically ill. All critically ill patients suffer from severe oral dysfunction due to a variety of contributory factors such as xerostomia (dry mouth from inadequate salivary flow), abnormal

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Research area	Outcomes	Suggested approach
Mortality	ICU mortality	Randomized control trials
Mucosal adverse events	Oral mucosal lesions; dose response; patient predictors of oral lesions; sepsis; mortality	Prospective observational studies; controlled trials; validated oral health indexes
Pulmonary adverse events	Acute respiratory distress syndrome (ARDS); ventilator-associated events (VAEs); duration of mechanical ventilation	Retrospective and prospective observational studies
Bacterial resistance	Bacterial resistance; infection-related ventilator-associated complica- tions (IVACs); sepsis	Antimicrobial sensitivity testing
Patient experience	Behavioral pain scores; patient self-report of pain, dry mouth, bad taste	Prospective observational studies; qualitative studies

Table 1 Recommended research to investigate potential chlorhexidine-related adverse outcomes

oropharyngeal colonization, tube-related pressure injury, etc. [12, 13]. Further, if you ask patients after they are treated in a critical care unit, severe oral symptoms are their main complaint, more than cognitive, psychiatric and physical disorders that get more attention). Studies suggest that oral chlorhexidine is applied far more frequently than an evidence-based oral care bundle and this evidence also suggests that nurses believe that they have completed good oral care for their patient by quickly swabbing the mouth with this antiseptic solution [14]. We encourage research to elucidate the potential toxic effects of oral chlorhexidine prophylactic rinse, including but not limited to mucosal lesions, acute pulmonary distress syndrome and increased mortality (Table 1).

Good oral care actually involves a comprehensive set of interventions including oral hydration, lip moisturization, and careful toothbrushing to mechanically remove plaque, the sticky biofilm of bacteria that collects above and below the gum line; this does not, and should not include oral chlorhexidine [9]. Biofilm helps to protect bacteria from antiseptics rinses, increasing the likelihood of its survival. Eliminating interventions that may cause harm and focusing on those that promote oral health makes good sense. Further emphasizing the importance of comprehensive oral care is research demonstrating tooth loss among ICU survivors, placing them at risk of morbidity (e.g., malnutrition, depression) and reduced quality of life [15]. Good oral care, therefore, should attend to the prevention of debilitating oral disease-and not VAP alone. The appropriate application of a comprehensive oral care regimen is associated with better oral health outcomes in critically ill patients [12].

In conclusion, we support this motion (or at least support a modified version of the motion). Applying oral chlorhexidine is not the same as good oral care, in fact, it may be bad oral care. We need to stop conflating chlorhexidine application with good oral care. Good oral care (excluding oral chlorhexidine) is to be commended and recommended to relieve the severe symptoms suffered by critically ill patients and prevent dental disease. The state of the evidence base at this time suggest that we should place a moratorium on the use of oral chlorhexidine until high quality randomized trials have reported [10].

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Compliance with ethical standards

Conflicts of interest

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