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Consensus based clinical guideline for oral hygiene in the critically ill

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Summary
Objectives: Oropharyngeal colonisation has been identified as a factor contributing to ventilator associated pneumonia (VAP) in the Intensive Care Unit (ICU). We sought to develop a clinical practice guideline for providing oral hygiene in the critically ill.
Research methodology: Following a systematic literature review a prospectively derived consensus development conference was convened and sponsored by a clinical governance unit.
Results: The consensus development conference generated 12 recommendations for tools and solutions; frequency and duration of cleaning; oral assessment tools and oral hygiene protocols. These recommendations underwent a validation process.
Conclusions: In light of sparse high level evidence to inform guidelines, further research is needed inform clinical practice. Oral hygiene is a critical element of nursing care and a standardised approach has the potential to improve clinical outcomes.

Introduction

The colonising of the oropharynx by microorganisms is a potential contributor to the development of nosocomial pneumonia in the Intensive Care Unit (ICU) (Stonecypher, 2010; Garcia et al., 2009; Fields, 2008; Fourrier et al., 2000). Oral care is an essential element of nursing care in the ICU, yet the relationship of this nursing practice in reducing oropharyngeal colonisation is not well described (Berry and Davidson, 2006; Berry et al., 2007). This lack of recognition may be attributed to limited knowledge and perception of the importance of this relationship. Oral hygiene is often relegated to a lower priority in the ICU where nurses face multiple priorities (Grap et al., 2003).

Implementing processes and systems, including clinical guidelines and methods for monitoring practice can improve clinical outcomes (Bingham et al., 2010; Black et al., 1999).

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The Guidelines for Preventing Health-Care-Associated Pneumonia (Tablan et al., 2004) list the developing and implementing of a comprehensive oral hygiene programme, potentially with the inclusion of an antiseptic agent, for patients in acute care settings who are at risk of developing hospital acquired pneumonia. In support of this recommendation, a number of studies (Garcia et al., 2009; Cason et al., 2007; Houston, 2002; De Riso et al., 1996) advocate oral hygiene to reduce the colonisation of dental plaque as a strategy critical in the prevention of ventilator associated pneumonia (VAP).

The development of clinical guidelines is based upon the systematic identification and synthesis of the best available scientific evidence determined by a systematic appraisal of the levels of evidence, quality of evidence, relevance of evidence and strength of evidence (NHMRC, 2005). Finn and Jacobs (2005) state that clinical guidelines should be:

1. *Valid and reproducible*: based on best available evidence and focus on link between recommendations and clinical outcomes;
2. *Representative:* development teams should include all disciplines involved in the particular practice;
3. *Flexible:* adaptable to local settings, cultures and environments;
4. *Cost-effective*: sensitive to local financial constraints;
5. *Reliable and applicable:* patient outcomes regularly evaluated and utilisation monitored;
6. *Reviewed* and revised as new evidence is identified.

Where high level evidence is available, based upon well designed and adequately powered studies, guideline development is a relatively straightforward process. In instances where there are minimal data and/or conflicting results the process is more complex and often uses a process of consensus methods.

The role of consensus methods in guideline development

A number of strategies can be undertaken to develop guidelines using a consensus process. These approaches include the nominal group technique (NGT), the Delphi technique, the RAND appropriateness method and the consensus development conference (Campbell and Cantrill, 2001). The NGT involves generating and prioritizing ideas, which are then ranked using the Delphi technique. The Delphi technique employs a panel of experts to determine the optimal solution to a specific question. The respondents are posted questionnaires and then through a repetitive process of subsequent mailings derive a consensus (Campbell and Cantrill, 2001). The RAND method originally developed clear guidelines in an attempt to reduce the potential for discrepancies in care. It combines expert opinion and scientific evidence which is rated by a formal panel of experts (Campbell and Cantrill, 2001).

The consensus development conference attempts to integrate clinical practice with scientific evidence (Lomas et al., 1988). The process follows sequential steps of (1) defining specific questions for the panel based on a disparity between practice and available research evidence; (2) facilitating a discussion following appraisal of the best available evidence within the context of the agreed questions and finally developing recommendations for clinical practice guidelines (Lomas et al., 1988).

Therefore since developing rigorous evidence-based clinical guidelines is resource intensive and imposes a significant burden on busy clinicians, the NSW Health Intensive Care Coordination and Monitoring Unit in collaboration with clinicians and academics in the area of critical care developed the following oral hygiene guidelines.

Method

A review of the literature was undertaken using the method of a systematic review. Whilst the methods of this review and findings have been reported elsewhere (Berry et al., 2007), a brief summary follows. The systematic literature review focused on determining the best method for oral hygiene for ventilated intensive care adult patients which would result in a reduction of colonisation of dental plaque with respiratory pathogens. There were clearly stated inclusion and exclusion criteria. The review examined types of intervention and outcome measures such as microbial counts, plaque indices, oral assessment scores and validation of tools used in the provision of oral care. The databases CINAHL, Medline, Joanna Briggs Institute, Cochrane Library, Embase, DARE and the World Wide Web search engine, Google were searched using the keywords oral hygiene, oral hygiene practices, oral care, mouth care, mouth hygiene, intubated, mechanically ventilated, intensive care and critical care.

A collaborative, comprising experienced critical care nurses and academics, was assembled to develop evidence based clinical practice guidelines. Following orientation and instruction on the process, the collaborative members met to formulate and review the question to inform the development of the clinical guideline. A wide-ranging search of the literature and extensive consultation with experts in oral health and critical care, resulted in the following primary review question:-

What clinical practices are effective in maintaining oral health in the critically ill? Specifically:

1. *What are the potential consequences of inadequate mouth care in the critically ill patient?*
2. *What assessment strategies are effective in providing optimal mouth care?*
3. *What methods are effective in providing optimal mouth care?*
4. *What solutions are effective in providing optimal mouth care?*
5. *What is the optimal frequency for the provision of oral hygiene?*
6. *What is the optimal duration of an intervention* e.g. *brushing?*
7. *How should individual patient oral hygiene tools be stored following use?*

The literature review upon which these guidelines are based identified a limited number of adequately powered randomised controlled trials for the provision of oral hygiene

Table 1 Designation of levels of evidence.

Level of evidence	Study design
I	A systematic review of randomised controlled trials
II	A randomised controlled trial
III-1	A pseudorandomised controlled trial (i.e. alternate allocation or some other method)
III-2	A comparative study with concurrent controls: Non-randomised, experimental trial Cohort study Case-control study Interrupted time series with a control group
III-3	A comparative study without concurrent controls: Historical control study Two or more single arm studies Interrupted time series without a parallel control group
IV	Case series with either post-test or pre-test/post-test outcomes

NHMRC 2005.

Table 2 Grade of recommendation.

Grade of recommendation	Description
A	Body of evidence can be trusted to guide practice
B	Body of evidence can be trusted to guide practice in most situations
C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
D	Body of evidence is weak and recommendation must be applied with caution
Consensus opinion	Where no evidence could be applied consensus opinion developed by: 1. Formulation of recommendation through discussion 2. Assignment of agreement by individual participants (Likert 1—9) Consensus set at median of 7

NHMRC.

in the critical care setting. Due to the heterogeneity of the patient populations and the solutions and techniques used in the clinical trials identified, meta-analysis could not be undertaken. Therefore using the classification system developed by the NHMRC (Coleman et al., 2005), outlined in Table 1, to determine the level of evidence, 11 prospective control trials, 21 observational studies and 24 descriptive papers were reviewed.

These articles were distributed to the oral care guideline development collaborative together with a summary table. Members of the collaborative then met to formulate the recommendations according to the NH&MRC guide described in Table 2. Using a modified nominal group technique debate and discussion was facilitated by an experienced facilitator around the negotiated questions to inform guideline development. Discussion was conducted around the quality and applicability of research findings to critical care nursing practice as well as current practices being undertaken in critical care units. A voting procedure using a Likert scale was used to achieve group consensus and develop the following guideline. Finally, external validation of the guideline was conducted using a single Delphi round with the guideline and systematic review distributed to an external validation panel of experts in critical care and dental health. This additional process of validation was considered necessary due to the scarcity of quality publications.

Recommendations

Based on the assessment of a systematic literature review (Berry et al., 2007) and the current literature the following levels of evidence and recommendations were assigned to the specific questions outlined in the review question, *''What clinical practices are effective in maintaining oral health in the critically ill?''*

Recommendation 1

The provision of effective oral care is an important strategy in reducing nosocomial pneumonia. **Grade C**

Rationale: Based on Level III studies with strategies to minimise bias it would appear that effective oral care is an important strategy to reduce the risk of nosocomial pneumonia in the critically ill (Bingham et al., 2010; Rello et al., 2010; Stonecypher, 2010; Weireter et al., 2009; Koeman et al., 2006; Mori et al., 2006; Fourrier et al., 2005; Houston, 2002).

Recommendation 2

The use of a designated oral care protocol can increase compliance and assessment of mouth care. **Grade D**

Rationale: Across a range of conditions an organisational commitment to guideline development and implementation has a favourable impact on patient outcomes (Garcia et al., 2009, Cason et al., 2007, Ross and Crumpler, 2007; Cutler and Davis, 2005; Harris, 2004; Trau, 2004; Schleder et al., 2002; Fitch et al., 1999). **Level III-3 evidence.**

Recommendation 3

Systematic clinical assessment of the oral cavity using standardised methods is important in the planning and evaluation of oral care in the critically ill. Assessment should include the condition of the teeth, gums, tongue, mucous membranes and lips. **Grade D**

Rationale: A small number of studies with limited sample sizes infer that systematic assessment is an important factor in assessment of the critically ill (Garcia et al., 2009; Ross and Crumpler, 2007; Fitch et al., 1999; Treloar & Stechmiller, 1995). However a standardised assessment tool that had been evaluated for reliability and validity in the critically ill could not be identified. **Level III-3 evidence.**

Recommendation 4

The use of a soft bristled brush can remove debris and subsequent plaque and therefore assist in decreasing microbial colonisation. **Grade C**

Rationale: Based upon a small number of studies (Garcia et al., 2009; Fields, 2008; Harris, 2004; Taylor-Piliae et al., 2004; Schleder et al., 2002; Fitch et al., 1999) the use of a soft-bristled brush can assist in reducing microbial colonisation but larger studies are recommended. **Level III-1 evidence**.

Recommendation 5

Mouth swabs (foam and cotton) should be used where there is a contraindication to brushing (e.g. bleeding gums associated with thrombocytopaenia). **Grade Consensus Opinion**

Rationale: Based upon expert opinion the use of brushing is recommended in comparison to other methods, however in the ICU population brushing may predispose or exacerbate bleeding in a select group of patients (Ransier et al., 1995).

Recommendation 6

At the present time there is no evidence to support the use of one oral rinse over another in mouth care. The exception is the use of chlorhexidine gluconate 0.12% in the cardiac surgical patient population. **Grade A**

Rationale: In spite of a metanalysis (Pineda et al., 2006), the small number of trials and effect sizes make it difficult to totally discount the benefit of chlorhexidine gluconate 0.12% as it has been demonstrated in smaller, randomised studies to be an effective agent (Gastmeier and Geffers, 2007; Houston, 2002; Genuit et al., 2001; De Riso et al., 1996). The possible benefits of chlorhexidine oral rinse still requires further study (Silvestri et al., 2010). **Level II evidence**.

Recommendation 7

Tap water should not be used for oral hygiene in the critically ill. **Grade C**

Rationale: Due to colonisation of microbial organisms in hospital pipes and taps, hospital tap water should not be routinely used for oral care in critically ill patients (Muscarella, 2004; Anaissie et al., 2002; Trautmann et al., 2001) **Level III-2 evidence**.

Recommendation 8

Subglottic suction is recommended to decrease the risk of VAP in the critically ill and should be part of the mouth care regimen. **Grade A**

Rationale: Subglottic suctioning is an important strategy in decreasing the risk of VAP (Tablan et al., 2004). **Level I evidence**.

Recommendation 9

At present there is no evidence to support an optimal frequency for oral hygiene however the guideline committee recommend brushing at least twice a day. **Grade Consensus Opinion**

Rationale: Brushing is the best method for plaque removal from the tooth surfaces (Garcia et al., 2009; Fields, 2008; ADA, 2005).

Recommendation 10

In the absence of strong evidence based on quality trials the recommended duration of an intervention e.g. brushing should be 3—4 minutes using a brush which allows access to all areas of the mouth. **Grade Consensus Opinion**

Rationale: To ensure teeth are cleaned effectively it is important to undertake a thorough cleaning routine (Fields, 2008; Peterson, 2006).

Recommendation 11

At the present time there is no evidence to support the use of individual, clean storage devices for oral hygiene tools however the guideline committee recommend the use of designated containers. **Grade Consensus Opinion**

Rationale: It is important to use individual storage containers to minimise the risk of contamination of oral hygiene tools by other objects such as shaving items and other general hygiene objects.

Discussion

Within the context of these recommendations, it is important to remember that a comprehensive care plan for the critically ill patient incorporates many facets of dynamically complex and fundamental nursing practices. That is, general principles of hand washing and the observation of universal precautions should be observed. As with any device used in the care of patients, strict attention to the prevention of contamination is essential. That is, objects used for oral hygiene such as tooth brushes and suction devices should be thoroughly cleaned following use and stored in clean containers to prevent contamination. As is the practice for many medical solutions, oral rinses should be clearly marked with first day of use and accessed only with a clean syringe or decanted into a clean container.

Although consensus methods for the development of clinical practice guidelines are broadly accepted, limiting factors should be considered. These include the expertise and appropriateness of the panel, the comprehensiveness of the scientific evidence and the manner in which this evidence was synthesised by the panel, and the efficacy of the validation process (Black et al., 1999). We consider that these limitations have been minimised in the development of these guidelines through a process of extensive consultation across a range of clinical, academic and specialty areas.

As discussed above, the evidence to inform these guidelines is limited by the small number of randomised controlled studies and the heterogeneity of oral hygiene solutions, tools and techniques (Berry et al., 2007). In spite of this limitation these guidelines present a knowledge base upon which to guide practice and attempt to improve the oral

health of critically ill patients. Ongoing monitoring and evaluation within a quality improvement framework should be undertaken to assess not only adherence to protocol recommendations but also the impact of guidelines on nosocomial infections, particularly VAP.

Conclusion

Developing guidelines in oral care is challenged by two major factors. Firstly there is an absence of large, well-controlled clinical trials upon which to build quality, evidence based guidelines. Secondly, the ability to evaluate the effectiveness of evidence based guidelines is compounded by the difficulty of isolating the impact of oral care in relation to improved clinical outcomes within the context of multifaceted critical care interventions. In spite of these challenges it is important to develop, implement and evaluate comprehensive oral care protocols and programmes particularly in critical ill populations at a high risk of nosocomial pneumonia. Ongoing research is needed to provide definitive evidence for oral care protocols.

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