British Association of Critical Care Nurses:

Evidence-based consensus paper for oral care within adult critical care units

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2. Abstract:

Aim: To provide an evidence-based British Association of Critical Care Nurses (BACCN) consensus paper for best practice relating to implementing oral care with the intention of promoting patient comfort and reducing Hospital Acquired Pneumonia (HAP) & Ventilator Associated Pneumonia (VAP) in the critically ill patient. The paper aims to provide direction for critical care practitioners on how to perform comprehensive oral care which can be used as part of a VAP/HAP reduction strategy in conjunction with the ventilator care bundle approach.

Design: A consensus committee of critical care nurses and experts from around the countries of the United Kingdom (UK) held a meeting to evaluate the literature relating to oral care and its application in reducing the incidence of VAP/HAP. The committee consisted of a variety of disciplines within critical care nursing consisting of front-line nurses, managers, educators, consultant nurses and academics. The committee participants responded to an advertisement through the BACCN communication networks and expressed interest to take part in the consensus document. The group all had professional and or academic expertise relating to oral care and its relationship to VAP. The round table discussion was chaired by an elected national board member for the BACCN who has experience in generating national guidelines and consensus documents.

Methods: The committee focused upon 5 oral care practices relating to the Level 1, 2 (High Dependency Units [HDU]) & Level 3 (Intensive Care Units [ICU]) critically ill patient. The evidence was evaluated for each practice within the context of reducing VAP in the ventilated patient or HAP in the non-ventilated patient: frequency for oral care; tools for oral care; oral care technique; solutions used and oral care in the non-ventilated patient who is critically ill and is at risk of aspiration. The group searched the best available evidence and evaluated this using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system (Table 1) to assess the quality of evidence from high to very low, and to formulate recommendations as strong, moderate, weak, (Table 2) or best practice consensus statement when applicable.

Results: The consensus group generated 5 recommendations, delineating an approach to best practice for oral care in critically ill patients.

Conclusion: Oral care is an important part of the care of critically ill patients, both ventilated and non-ventilated. An effective oral care programme reduces the incidence of VAP/HAP and promotes patient comfort.

Key words: Consensus statement, Oral care, Ventilator-associated pneumonia, Hospital acquired pneumonia, Mouth care, Oral hygiene, Oral assessment.

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3. Introduction:

Critically ill patients who are unconscious or sedated in critical care units often need to have mechanical ventilation which exposes them to the risk of developing Ventilator Associated Pneumonia (VAP). The definition for VAP is a new onset pneumonia that has developed in patients who have been mechanically ventilated for more than 48 hours via an endotracheal (ET) tube or tracheostomy tube (American Thoracic Society, 2005; National Institute for Health and Clinical Excellence [NICE], 2007). Hospital Acquired Pneumonia (HAP) is an acute lower respiratory tract infection that is acquired at least 48 hours after hospital admission and is not incubating at the time of hospital admission, but patients are not mechanically ventilated and often present to hospital with another underlying condition (Kalil et al., 2016 & NICE, 2019). VAP/HAP significantly increases mortality and complications, resulting in increased duration of ventilation, longer intensive care unit (ICU) stay, increased hospital length of stay, and increased hospital costs (Safdar et al., 2005; Speck et al., 2016; Zimlichman et al., 2013). Evidence suggests that approximately 10-28% of ventilated patients acquire VAP, making it the most common fatal nosocomial infection in critical care patients (Urli, et al., 2002; Wagh & Acharya, 2009). Studies suggest that VAP increases length of ICU stay by 6 days and can generate additional costs of between £6000-22000 per VAP episode (Safdar et al., 2005; Speck et al, 2016; Wagh & Acharya, 2009). The diagnosis of VAP is complex and not straightforward because there are no firm diagnostic criteria for VAP. The diagnostic criteria are frequently debated (Hua et al., 2016; NICE, 2007; Speck et al., 2016). The diagnosis of VAP is based on the history, clinical signs and symptoms, chest x-ray findings, and microbiology results, but the literature provides no consensus for criteria for establishing a VAP diagnosis (NICE, 2007; Wagh & Acharya, 2009). For the purpose of this consensus paper, it was acknowledged that there are differences in VAP diagnosis definitions in the literature, but a specified VAP diagnosis definition was not felt to be essential for the generation of this consensus document.

Numerous studies have demonstrated that implementing evidence-based interventions (for example, elevating the head of the bed, implementing daily sedation holds, and effective oral hygiene) can prevent VAP (Hellyer et al., 2016). These studies prompted NICE, the National Patient Safety Agency (NPSA), and the United Kingdom (UK) Department of Health to release guidance on high impact interventions with the aim of reducing the incidence of VAP in UK Critical Care Units. The findings from the studies on interventions have also led to the widespread adoption of the Ventilator Care Bundle, which is defined as a grouping of evidence-based practices, with the goal of encouraging a consistent delivery of care to improve clinical outcomes (Hellyer et al., 2016). The ventilator care bundle increases compliance to evidence-based interventions and has demonstrated a significant reduction in VAP (Berenholtz et al., 2011; Bouadma et al., 2010; Damas et al., 2015; Hellyer et al., 2016; Heimes et al., 2011; Sinuff et al., 2013). The ventilator care bundle currently consists of the following interventions: head of bed elevation to 30-45 degrees; daily sedation interruption and assessment of readiness for extubation; use of subglottic secretion drainage; effective oral hygiene and avoidance of scheduled ventilator circuit changes (Hellyer et al., 2016). This consensus document aims to focus specifically on the oral care interventions that are necessary to reduce the development of VAP.

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4. Table 1 Determination & hierarchy of quality of evidence:

Underlying research methodology:

1: High evidence   Randomised Controlled Trial (RCT)
2: Moderate evidence   Downgraded RCT or upgraded observation studies
3: Low evidence   Good quality observational studies with randomisation
4: Very low evidence   Downgraded controlled studies or expert opinion

Factors that may decrease strength of evidence from GRADE criteria

a.   Methodology issues of RCTs that suggest high likelihood of bias
b.   Inconsistency of results, including problems with subgroup analysis
c.   Indirectness & variability of evidence (e.g. variation in population, intervention, control, outcomes, comparisons, sample size)
d.   Imprecision of results, data and subsequent conclusions
e.   High likelihood of reporting bias

(Guyatt et al., 2008; Rhodes et al., 2017)

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Grading of Recommendations	Descriptor
Strong	Strongly recommended intervention is implemented in practice
Moderate	Recommend intervention is implemented in practice
Weak	Consider implementing intervention in practice
What should be considered?	Recommended process
Is there high or moderate evidence?	The higher quality the evidence and publications then the more likelihood a "strong recommendation" for the best practice statement
Is there certainty about the balance of benefits versus harm/burdens?	The larger the difference between the desirable and undesirable consequences and the certainty around that difference, the more likely a strong recommendation. The smaller the net benefit and the lower the certainty for that benefit, the more likely a weak recommendation.
Is there certainty or similarity?	The more certainty or similarity in values and preferences, the more likely a strong recommendation.
Are resources worth the expected benefits?	The lower the cost of an intervention compared to the alternative and other costs related to the decision (i.e., fewer resources consumed, staff manpower), the more likely a strong recommendation.

(Guyatt et al., 2008; Rhodes et al., 2017)

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Consensus statement regarding oral care assessment in the ventilated patient:

1. In a ventilated patient, an oral care assessment should be completed within 6 hours of admission (Strong, 4). All critically ill patients should be assessed using a standardised oral care assessment tool used in the critical care unit and the results of the assessment should be documented. Assessment every 12 hours is encouraged (Strong, 4).

2. Non-ventilated patients should have an oral assessment completed within 6 hours of admission using a recognised oral care assessment tool and the results of the assessment documented. The tools suggested for ventilated patients are also appropriate for non-ventilated patients (Strong, 4).

3. The consensus group agreed that there are numerous, different oral assessment tools available, most of which have limited researched validity. The group acknowledges that critical care units often have created their own oral assessment tools. While the group agreed they could not endorse an assessment tool, there was agreement that it is imperative to have and use such an assessment tool (Moderate, 4).

4. The chosen oral assessment tool should be validated internally, and all critical care staff should be trained in its use. There should be a standardised training and assessment across all staff on the designated oral assessment tool, to ensure familiarity with the tool (Moderate, 4). Examples of acceptable oral care assessment tools include Mouth Care Matters from National Health Service Health Education England (NHS HEE)(2016), the Beck oral care assessment tool (Beck, 1993, p.28), the assessment tools noted in the Registered Nurses' Association of Ontario's (RNAO) Nursing Best Practices Guideline (RNAO, 2008, p.30), the Ministry of Health (MOH) Nursing Clinical Practice Guidelines (MOH, 2005, p.53), and the Bedside Oral Exam (Prendergast et al., 2013). The Beck guidelines suggest assessment of ventilated patients every 4

hours, but assessment can be done more frequently, if needed.

Discussion:
Oral assessments on either ventilated or non-ventilated patients should include assessing the oral cavity, including the tongue, lips, teeth, gums, saliva, hard palate, soft tissues, and dentures (Chalmers et al., 2011; Mallett, 2013, p.401; Prendergast et al., 2013). An oral assessment should be performed frequently as part of a systematic patient assessment and should be used to identify those at increased risk of oral complications (RNAO, 2008, p.30). However, there is wide variability in assessment and oral care assessment tools between institutions as well as within institutions (Feider et al., 2010; Sole et al., 2003), and inconsistent performance of and documentation of oral assessment and care (Grap et al., 2003; Labeau et al., 2008). Introducing a standardised training and testing program may help improve performance and adherence to use of assessment tools (Cutler & Sluman et al., 2014; Jones et al., 2004; Kaier et al., 2014; Lee et al., 2001; Nicol et al., 2005; Rello et al., 2007; Smith et al., 2017). In an attempt to address this, NHS HEE launched its Mouth Care Matters assessment and recording tool which aims to promote the implementation of a standardised oral care programme into hospitals within the NHS (NHS HEE, 2016). Whilst there is limited research validity of these tools, they provide a comprehensive assessment tool that has been endorsed by the NHS. However, its focus on the mechanically ventilated patient is limited but the assessment tool does provide a thorough holistic resource for health care professionals (NHS HEE, 2016).

In a literature review on best practices for prevention of VAP, Hillier et al. (2013) found that the use of oral care protocols and staff education reduced VAP, but there was no one best practice for oral hygiene found (Hillier et al., 2013). Many studies show benefit from oral assessment and oral care (Koeman et al., 2006; Labeau et al., 2011; Liao et al., 2015; Paju & Scannapieco, 2007; Scannapieco, 2006; Schleder et al., 2002; Shi, et al., 2013), while other studies suggest that we need more evidence to establish efficacy and best practice

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(Klompas et al., 2014a; Klompas et al., 2014b; Munro & Grap, 2004).

There are several recommended assessment tools that are available for use for assessing oral care (Beck, 1993, p.28; Chalmers & Pearson, 2005; MOH, 2005; Prendergast et al., 2013). The Beck assessment tool provides a comprehensive system that includes measures on a numerical scale (Beck, 1993, p28). In 2016, NHS HEE launched its Mouth Care Matters campaign. This involves a comprehensive resource guide relating to mouth care and involves resources which can be used and endorsed by the NHS (NHS, 2016). This also includes a mouth care assessment protocol and record which can be used within the clinical setting. The website from NHS HEE provides comprehensive resources for adult, child and neonatal patients including assessment tools, protocols and online learning which can all be used within the NHS hospital environment (NHS HEE, 2016).

Consensus statement regarding tooth brushing:

5. The teeth of ventilated patients should be brushed twice daily, for a minimum of 2 minutes.

Additionally, oral cleansing with swabs, suctioning, and moisturisation of the mouth should be done every 2 to 4 hours (Strong, 1).

6. Non-ventilated patients should have the same oral care done with the same intervals of frequency, with accommodation in the schedule as needed to accommodate the patient's condition, preferences (consent), and sleep patterns (Strong, 1).

Discussion:
Numerous protocols for oral care include toothbrushing, with recommendations that the teeth of ventilated patients should be brushed twice daily, for at least 2 minutes (Berry et al., 2007; Cuccio et al., 2012; Heck, 2012; Hillier et al., 2013; Hutchins et al., 2009; Liao et al., 2015; Quinn et al., 2014; Sole et al., 2011; Tantipong, et al., 2008). Oral cleansing with swabs, suctioning, and moisturisation of the mouth should be done more frequently, with recommendations suggesting cleansing every 2 to 4 hours (DeWalt, 1975; Garcia, 2005; Quinn et al., 2014; Schleder et al., 2002; Shibly et al., 1997; Sole et al., 2011; Tantipong et al., 2008; Vollman, 2006).

7. What tools should be used and why?

Consensus statements regarding what tools to use and why in both ventilated and non-ventilated patients:

7. The teeth should be brushed with a paediatric or soft small headed toothbrush to remove plaque. Use suction to remove the secretions and debris after brushing. If available, a suction toothbrush may be ideal to help remove secretions and debris at the same time the teeth are brushed (i.e. one step rather than brush then suction). Consider using a single-use disposable toothbrush (Strong, 1).

8. A swab is recommended for cleaning and moisturising the oral cavity and teeth between brushings. If available, a suction swab offers the advantage of concurrent suction to remove secretions and debris (Strong, 3).

9. Oral foam head swabs can be used for cleaning and moisturising, but they must be used as per manufacturers recommendations. Foam swabs should not be stored in liquid as this will affect the strength of the attachment of the foam to the stick, increasing the likelihood of the foam detaching and creating a possible choking hazard. Each foam head swab should be moistened immediately before use and the attachment of the foam head to the stick checked before use (Strong, 4).

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10. After cleaning, moisturise the oral mucosa throughout the oral cavity and the lips with an artificial saliva/lubricant. Apply additional moisturiser as needed and consider using a water-soluble moisturiser. (Weak, 4)

11. Consider using oral care tools and supplies that can be kept at the bedside, to enhance workflow and support compliance with the oral care protocol (Moderate, 4)

Discussion:

Dental plaque has been shown to serve as a reservoir for respiratory pathogens (El-Solh et al., 2004), suggesting that improving oral care may reduce rates of VAP by reducing the amount of plaque present (Heo et al., 2008; Ishikawa et al., 2008; McCormack et al., 2015). Many studies have suggested benefits from toothbrushing as part of the oral care of ventilated patients (Cuccio et al., 2012; Heck, 2012; Heo 2008; Hua et al., 2016; Ishikawa et al., 2008; Liao et al., 2015). Current literature is conflicting, with some data showing reduction in the risk from VAP with protocols including tooth cleaning (Liao et al., 2015) and others showing either equivocal data (Berry et al., 2007), or data that suggests no benefit (Alhazzani et al., 2013; Shi et al. 2013). Several authors have suggested that more studies addressing the many variables of oral assessment and toothbrushing are still needed (Berry et al., 2007; Klompas et al., 2014b; Quinn et al., 2014; Scannapieco, 2006).

Study data have supported use of paediatric or soft toothbrush to remove plaque, followed by suction to remove the secretions and debris after brushing (Berry et al., 2007; Cuccio et al., 2012; Heck, 2012; Hillier et al., 2013; Liao et al., 2015; Munro & Grap, 2004; Quinn et al., 2014; Voelker et al., 2013; Vollman, 2006). Using a suction toothbrush can help remove secretions and debris at the same time the teeth are brushed; minimising the use of water may reduce the volume of aspirated material (Hellyer et al., 2016). A single-use disposable toothbrush may be beneficial, since devices used in the mouth can become colonised with oral pathogens (Brown and Willms, 2005; Sole, et al., 2002). In some studies, use of a toothbrush is superior to a swab in maintaining oral health and removing plaque from the teeth (DeWalt, 1975; Pearson & Hutton, 2002), but swabs are recommended for cleaning and moisturising the oral cavity and teeth between brushings (DeWalt, 1975; Garcia, 2005; Quinn, et al., 2014; Schleder et al., 2002; Shibly et al., 1997; Sole et al., 2011; Tantipong et al., 2008; Vollman, 2006). If available, a suction swab offers the advantage of concurrent suction to remove secretions and debris.

Dryness in the oral cavity leading to mucositis is associated with an increase in oropharyngeal colonisation with pathogenic microorganisms (Dennesen, et al., 2003). Several study protocols have included the step of moisturisation throughout the oral cavity and the lips with agents such as chlorhexidine, artificial saliva, and other moisturisers (Klompas et al., 2014b; Munro & Grap, 2004; Pneumatikos et al., 2009; Tablan et al., 2004).

Oral foam head swabs can be used to moisturise the mouth but should not replace teeth brushing and an effective holistic oral care programme. In 2012, the Medicines and Healthcare Products Regulatory Agency (MHRA) issued an alert relating to using oral foam head swabs in that they may detach from the stick during use. This may present a choking hazard for patients. The alert did not ban the use of foam sticks but provided clear guidance for their future use in line with manufacturers guidance for use. MHRA (2012) specifically advised that foam head swabs should not be left to soak in liquid prior to use as this may affect the strength of the foam head attachment from the stick and that swabs should be moistened immediately prior to use and should be discarded after each use. Prior to using a foam stick it should be checked that the foam head is firmly attached to the stick and if the patient is likely to bite down a small headed toothbrush with soft bristles could be used instead (MRHA, 2012). Having the oral care supplies at the bedside has been proposed to enhance workflow, in turn supporting compliance with protocols for oral care and assessment (Garcia et al., 2009; Heck, 2012; Hutchins et al., 2009; Schleder, et al., 2002).

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8. Oral cleansing solution

Consensus statement regarding oral cleansing solution:

12. Using an antiseptic oral rinse, such as chlorhexidine or cetylpyridinium chloride, after brushing or in combination with comprehensive oral care can help reduce the risk of VAP particularly in adult cardiothoracic ICU populations. A meta-analysis suggests that chlorhexidine use may increase mortality risk especially in non-surgery patients (Moderate, 1).

13. Due to meta-analysis evidence, at present we advise caution with the routine use of chlorhexidine as part of an oral care programme. There may be individual patient, clinical circumstances where use of oral chlorhexidine is necessary, but this decision should be made in consultation and agreement with the multi-professional team and in line with local hospital policies which should include the prescribing of the chlorhexidine on the prescription chart (Moderate, 1).

Discussion:

Many different types of oral antiseptics have been studied to combat changes to the oral flora that occur in intubated patients. A range of oral antiseptics, oral antibiotics and selective digestive decontamination have all been proposed as potential methods to reduce nosocomial pneumonia. The use of chlorhexidine has been widely debated and there are conflicting results in the literature. Evidence suggests that the use of an antiseptic oral rinse added after brushing or done in combination with comprehensive oral care may help reduce the risk of VAP (Cuccio et al., 2012; Labeau et al., 2011; Shi et al., 2013; Tantipong et al., 2008). Twice-daily application of chlorhexidine gluconate oral rinse within 2 hours of tooth brushing was shown to reduce the rate of VAP (Chan et al., 2007; DeRiso et al., 1996; Grap et al., 2004; Houston et al., 2002; Hua et al., 2016; Shi et al., 2013; Tantipong et al., 2008), with the strongest supportive evidence demonstrated in cardiac surgery patients (Hellyer et al., 2016). The Cochrane Review by Hua et al. (2016) concludes that effective oral hygiene care including chlorhexidine mouthwash or gel reduces

the risk of developing VAP in critically ill patients from 25% to about 19%. However, there is no evidence of a difference in the outcomes of mortality, duration of mechanical ventilation or duration of ICU stay.

Whilst the evidence appears to suggest that chlorhexidine used in conjunction with effective oral care reduces the incidence of VAP, the literature does need to be evaluated with caution. Firstly, the use of chlorhexidine should not be singled out as the sole intervention or silver bullet to reduce VAP and it should be used in conjunction with providing effective oral hygiene that involves teeth brushing. Secondly, further subset analysis of the research found that the use of chlorhexidine for the prevention of VAP was significant in adult populations specifically in cardiothoracic ICU and is unclear in populations within the non-cardiothoracic ICU (Hellyer et al., 2016; Houston et al., 2002; Segers et al., 2006; Tran & Butcher., 2019). Tran and Butcher (2019) suggest that the increase benefit of chlorhexidine use maybe due to the shorter intubation period of below 24 hours compared to the longer intubation periods in general ICUs. A meta-analysis by Price et al. (2014) found the use of chlorhexidine with oral care in a patient population outside of the cardiothoracic ICU may increase mortality risk with an odds ratio of 1.25 (95% CI 1.05-1.50). The reason for the possible increase in mortality is unclear but it has been speculated that this may be due to some patients developing Acute Respiratory Distress Syndrome (ARDS) from aspiration of the chlorhexidine solution into the lungs which increases mortality, but this has not been empirically proven (Rello et al., 2010; Tran & Butcher, 2019). In order to reduce the risk, it may be advised to utilise tools that incorporate suction (for example, suction toothbrush and suction swabs) when utilising oral chlorhexidine.

The literature is inconclusive relating to the effectiveness of chlorhexidine strengths, preparation or frequency of use for the prevention of VAP (Hua et al., 2016 & Tran & Butcher, 2019). There is no evidence that chlorhexidine was associated with significant reductions in duration of mechanical ventilation or length of ICU stay (Hellyer et al., 2016; Houston et

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al., 2002; Hua et al., 2016; Segers et al., 2006; Tran & Butcher, 2019). Whilst the literature indicates chlorhexidine is effective in oral care for reducing VAP there is evidence suggesting that there is an increased mortality rate using chlorhexidine in the non-cardiothoracic ICU patient, therefore at present the routine use of chlorhexidine is not recommended. Further research maybe necessary to investigate the potential risks or benefits of chlorhexidine including the dose, frequency, application and across the wider ICU population. At present we recommend the use of undertaking effective oral care as detailed in these standards but avoiding the routine use of chlorhexidine. There may be individual patient, clinical circumstances where the use of oral chlorhexidine is necessary, but this decision should be made in consultation and agreement with the multi-professional team and in line with local hospital policies which should include the prescribing of chlorhexidine on the prescription chart.

Cetylpyridinium chloride oral rinse has been found to be effective in removing plaque and preventing gingivitis (Chan et al., 2007; Mankodi et al., 2005; Sole et al., 2015). This may also be considered for an oral care cleaning solution.

Consensus statement regarding use of toothpaste for ventilated and non-ventilated patients:

14. There is limited evidence to suggest toothpaste can reduce the bacterial bioburden in the oral cavity, however toothpaste can reduce the risk of plaque formation and cavities. If toothpaste is used, ensure it is effectively removed from the oral cavity. Between episodes of brushing, consider using a debriding agent to assist in removal of dental plaque (Weak, 4).

Discussion:

There is limited evidence to suggest toothpaste can reduce the bacterial bioburden in the oral cavity, but toothpaste has been shown to aid in the breakdown of oral debris (DeWalt, 1975; Ishikawa et al., 2008; Koeman et al., 2006; Pearson & Hutton, 2002). Hydrogen peroxide can also be used as a debriding agent; solutions of greater than 1% and less than 3% have been proven to be safe and effective for removal of plaque and maintaining gingival health (Grap et al., 2003; Paju & Scannapieco, 2007; Pearson & Hutton, 2002).

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9. Technique for oral care for the ventilated patient

The Consensus Group recommends the following steps for performing oral care:

- Perform oral care assessment and ensure oral care is performed by a competent practitioner
- Oral care frequency in the ventilated patient is determined based on the individual, specific patient needs.
- Gather appropriate oral care supplies and place at bedside
- Apply appropriate Personal Protective Equipment (PPE) and perform hand hygiene
- Brush the patient's teeth with a paediatric or soft toothbrush to remove plaque from the teeth. Suction secretions after brushing (Berry et al., 2007; Cuccio et al., 2012; Heck, 2012; Hillier et al., 2013; Liao et al., 2015; Munro & Grap, 2004; Quinn et al., 2014; Voelker et al., 2013; Vollman, 2006)
- If available, consider using a suction toothbrush to help remove secretions and debris.
- Rinse oral cavity with sterile water but minimise the use of water, to reduce the volume of potentially aspirated material (Hellyer et al., 2016).
- Remove secretions with deep oropharyngeal suction or a subglottic suctioning or subglottic irrigation (Masterton et al., 2008).
- Ensure the ET tube and ties are secure. Assess the skin under and around the ET tube and ties to reduce risk of pressure injury.

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- Mouth care outside of tooth brushing is recommended every 2-4 hrs with foam oral swabs with sterile water and with consideration for either, Cetylpyridinium chloride oral rinse or, 1.5% hydrogen peroxide solution to clean the mouth*(DeWalt, 1975; Grap et al., 2003; Paju & Scannapieco, 2007; Pearson & Hutton, 2002; Quinn et al., 2014; Schleder et al., 2002; Shibly et al., 1997; Sole et al., 2011; Tantipong et al., 2008). Consider using a suction swab, if available.

- After cleaning, moisturise the oral mucosa throughout the oral cavity and the lips with an artificial saliva (Klompas et al., 2014b; Munro & Grap, 2004; Pneumatikos et al., 2009; Tablan et al., 2004). Apply additional moisturiser as needed and consider using a water-soluble moisturiser.

See Table 3 for detailed oral care equipment, and procedure including rationale.

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10. Technique for oral care for the non-ventilated patient

Consensus statement regarding oral care in the non-ventilated patient:

15. Oral care should be provided for patients who are unable to manage their own oral care or who cannot safely manage their own secretions (Strong, 1).

16. Non-ventilated patients should have an oral assessment completed within 6 hours of admission using a recognised oral care assessment tool and the results of the assessment documented. The tools suggested for ventilated patients are also appropriate for non-ventilated patients (Strong, 3).

17. Oral care for non-ventilated patients should be the same as oral care for ventilated patients with the same intervals of frequency, with accommodation in the schedule as appropriate for the patient's condition, preferences (consent), and continuity of sleep (Strong, 3).

The Consensus Group recommends the following steps for preforming oral care in non-ventilated patients who are unable to manage their own oral care or secretions safely:
- Perform oral care assessment and ensure oral care is performed by a competent practitioner.
- Oral care frequency in the non-ventilated patient is determined based on the individual, specific patient needs.
- Gather appropriate oral care supplies and place at bedside.
- Apply appropriate Personal Protective Equipment (PPE) and perform hand hygiene
- Brush the patient's teeth with a paediatric or soft toothbrush to remove plaque from the teeth. Suction secretions after brushing (Berry et al., 2007; Cuccio et al., 2012; Heck, 2012; Hillier et al., 2013; Liao et al., 2015; Munro & Grap, 2004; Quinn et al., 2014; Voelker et al., 2013; Vollman, 2006).
- If available, consider using a suction toothbrush to help remove secretions and debris.
- Rinse oral cavity with sterile water but minimise the use of water to reduce the volume of potentially aspirated material (Hellyer et al., 2016).
- Mouth care outside of tooth brushing is recommended every 2-4 hrs with foam oral swabs with sterile water and with consideration for either Cetylpyridinium chloride oral rinse or, 1.5% hydrogen peroxide solution to clean the mouth*(DeWalt, 1975; Grap et al., 2003; Paju & Scannapieco, 2007; Pearson & Hutton, 2002; Quinn et al., 2014; Schleder et al., 2002; Shibly et al., 1997; Sole et al., 2011; Tantipong et al., 2008). Consider using a suction swab, if available.
- After cleaning, moisturise the oral mucosa throughout the oral cavity and the lips with an artificial saliva (Klompas et al., 2014b; Munro & Grap, 2004; Pneumatikos et al., 2009; Tablan et al., 2004). Apply additional moisturiser as needed and

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consider using a water-soluble moisturiser.

See Table 3 for detailed oral care equipment, and procedure including rationale.

Discussion:
Most studies cited have focused on oral care in hospitalised patients who are either critically ill or mechanically ventilated. However, oral care in patients who are unable to manage their own oral health care has also been shown to be of benefit. In a study of nursing home patients, it was found that regular oral care helped reduce the rates of cheilitis and stomatitis

(Nicol et al., 2005).
Recommendations on plaque removal are not significantly different between ventilated and non-ventilated patients who are unable to perform oral care for themselves. A paediatric or soft toothbrush is recommended to remove plaque, and suction is recommended to remove the secretions and debris after brushing (Berry et al., 2007; Cuccio et al., 2012; Heck, 2012; Hillier et al., 2013; Liao et al., 2015; Munro & Grap, 2004; Quinn et al., 2014; Voelker et al., 2013; Vollman, 2006).

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11. Technique for cleaning dentures

Consensus statement regarding cleaning dentures:

18. *Daily cleaning using mechanical action – brushing with a toothbrush or denture brush and an effective, non-abrasive denture cleanser (Strong, 3). Frequency maybe increased depending on patient needs.*

19. *Soaking dentures daily in a denture-cleansing solution seems to deliver additional chemical breakdown of the remaining plaque with some further level of disinfection of the denture (Moderate, 3). It is important that denture cleansing solutions are only used outside of the mouth and that manufacturers recommendations are followed.*

20. *Denture wearers should not keep their dentures in the mouth overnight, unless there are specific reasons for keeping them in (Moderate, 4). This may reduce the risk of fungal infection and allow the tissues time to heal (Oral Health Foundation, 2018).*

21. *Soaking dentures in a denture cleanser solution after mechanical cleaning seems to be beneficial for preventing denture stomatitis and the potential risk of pneumonia events, for patients at higher risk of developing stomatitis, for example the frail or*

institutionalised older people (Weak, 4).

22. *For the specific care of dentures refer to the Oral Health Foundation 2018 guidelines. https://www.dentalhealth.org/denturecareguidelines*

Discussion:
Regular cleaning and maintenance of dentures is vital for the oral care of denture wearers. There is limited evidence concerning the process of cleaning dentures and there are inconsistent practices relating to denture cleaning. There is huge variation between countries and limited high-level evidence to support guidelines with dental opinion leaders providing different recommendations (Oral Health Foundation, 2018). A Cochrane review supported inconsistencies in denture care and the lack of evidence to support high quality evidence-based recommendations (De Souza et al., 2009). This has led to the Oral Health Foundation in 2018 providing best practice recommendations for the care of dentures which involved an expert clinical group that reviewed the limited research available and provided recommendations.

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12. Table 3 Procedure for oral care:

Equipment	Paediatric soft, small headed toothbrush Mouth swabs/foam stick Fluoride/non-foaming toothpaste Sterile water Low volume syringe Soft suction catheter Rigid oropharyngeal suction catheter Lubricant If available, proprietary mouth care kit If available, suction small headed toothbrush
Procedure	**Rationale**
All critically ill patients should be assessed using a standardised oral care assessment tool used in the critical care unit within 6 hours of admission. This should be documented accordingly.	This will ensure consistency between staff and will assist with a comprehensive oral examination. This will provide care planning and may reduce the incidence of nosocomial pneumonia.
A formal oral care assessment should occur at least every 12 hours and documented accordingly.	Provides reassessment of oral cavity and provides consistency between staff.
Prepare all the necessary equipment.	To ensure all the equipment for the procedure is available.
Ensure sufficient light is available.	This will ensure suitable visualisation of the oral cavity.
Where possible, explain the procedure to the patient or the family member. If the patient lacks capacity to make decisions such as sedated and ventilated, then the practitioner must act in the patient's best interests for providing oral care.	This will ensure the patient and their relatives understand the procedure and its significance to care management and valid consent is obtained. Abiding to the patient's best interests are maintained as per the Mental Capacity Act 2005.
Apply appropriate PPE and hand hygiene.	Protect both clinician and patient from potential infection and spread of micro-organisms.
If not contraindicated, sit patient up and support their head with pillows.	This will help with fluid removal and reduce the accumulation of fluid in the oropharyngeal region.
Brush teeth with a small headed soft bristled toothbrush with fluoride/non-foaming toothpaste and sterile water.	The paediatric or small headed toothbrush will facilitate easier movement around oral cavity and ET tube. Toothpaste will help reduce the incidence of plaque formation.
Brush teeth a minimum of twice a day for at least 2 minutes. Consider patients sleep patterns and patient preferences if patient is conscious and able to communicate.	Physical brushing of the teeth will remove plaque and bacteria which may reduce VAP. Cleaning the teeth aids patient comfort.
Brush teeth away from the gums.	This will reduce incidence of plaque accumulating into the gum crevices.
If tongue is heavily coated, gently brush with toothbrush.	This will assist with the removal of biofilm that maybe coated on the tongue and increase patient comfort.
Rinse oral cavity with sterile water after teeth brushing. Use a low volume syringe (e.g. 5mls) to remove any tooth paste & debris from the mouth. Use suction to remove secretions and debris after brushing.	This will remove toothpaste and debris from the mouth and reduce aspiration of accumulating fluid. Minimise the volume of water to reduce the volume of potentially aspirated material.

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Suction and remove any fluid or secretions in the trachea using a soft suctioning catheter. A suction toothbrush and suction swab could also be used to assist with oral care fluid removal.	This will reduce aspiration of fluid and microorganisms which may increase the incidence of VAP.
If a patient has bleeding gums, assess patient for co-agulopathy or low platelet count. Unless contrain-dicated, continue to brush bleeding gums as this is often gingivitis and gum brushing is required.	The leading cause of gum bleeding is gingivitis. Dental plaque irritates the gum causing gingivitis, so rigorous brushing of bleeding gums removes the plaque and re-solves the bleeding gingivitis. With coagulopathies, liver failure or low platelet count over rigorous teeth brushing may create bleeding gums.
An oral foam stick can be used to clean and mois-turise the oral cavity between teeth brushing. This is recommended every 2 to 4 hours.	This will moisten the mouth preventing mucosa break-down. Moistening of the oral cavity promotes patient comfort. Foams sticks soaked in water reduce their strength and the foam may dislodge from the stick and create a chok-ing hazard.
Moisten foam stick with sterile water immediately before use and dispose of foam stick after single use.	
A water-soluble moisturiser maybe used through-out the oral cavity and lips. Moisten lips frequently with lubricant.	This reduces drying of the mucosa and promotes patient comfort.
Consider using oral care tools and supplies that can be kept at the bedside.	This will enhance workflow and compliance to an oral care protocol.
Caution should be given with the routine use of chlorhexidine as part of an oral care programme. There may be individual patient clinical situations that oral chlorhexidine is necessary, this decision should be made in consultation with the multi-pro-fessional team in line with local hospital policies which should include the prescribing of chlorhex-idine on the prescription chart.	Using an antiseptic oral rinse, such as chlorhexidine or cetylpyridinium chloride, after brushing or in combination with comprehensive oral care can help reduce the risk of VAP particularly in adult cardiothoracic ICU populations. A meta-analysis suggests that chlorhexidine use may increase mortality risk especially in non-surgery patients (Price et al., 2014). Until further conclusive research is undertaken we advise caution with the routine use of chlorhexidine.
Ensure the ET tube ties are secure and the ET tube is in the correct position. Assess the skin around un-der and around the ties and the ET tube to reduce the risk of pressure damage. Avoid pressure on the corners of the mouth as this may cause pressure damage. If possible, change ET tube position on lips at least daily. Change ET tube ties as per local policy.	To ensure that the airway is maintained and the ET tube remains insitu. That the ties correctly position the ET tube to enable effective airway and ventilatory management. Avoid too much direct pressure of the ET tube and ties which will increase the incidence of pressure damage.
If available aspirate fluid from sub-glottic suction device from ET tube or Tracheostomy as per manu-facturer's instructions.	Ensure that secretions above the cuff of the tube are re-moved to reduce micro-aspiration of fluid into lungs.

Dentures - If applicable – minimum daily tooth-brush cleaning of dentures. Daily soaking with denture cleansing solution. Remove dentures overnight.	Removes debris & plaque and promotes patient comfort. Provides additional chemical breakdown of plaque and additional disinfection of denture. May reduce the risk of fungal infection and allow the tissues time to heal.
Document oral care and record assessment and any abnormalities.	Ensure accurate assessment records and documentation is maintained.
Ensure effective handover of oral care and assessment at shift changes.	This provides a point of reference and comparison between handover of care and promotes effective ongoing care management.

13. Conclusion

The greatest challenge of developing evidence-based guidelines is identifying well-designed, large studies to support the guidance. This consensus group met to review and choose literature representing best-available evidence and used their collective experience in nursing care to develop a consensus statement on best practices for oral care in the critically ill patient. While acknowledging that more study is needed, it is important to take advantage of what is available and use that to enhance patient care. Whilst literature may be limited in its hierarchy, oral care is an important part of the care of critically ill patients, both ventilated and non-ventilated. An effective oral care programme reduces the incidence of VAP/HAP, promotes patient comfort and is a vital hygiene procedure. Critical care units need to ensure that policies and practices are in place to promote effective oral care programmes and health care professionals need to be provided with education and training to ensure compliance to an oral care programme.

* Disclaimer: Unless otherwise stated, guidance referred to in the bulletin has not been commissioned or endorsed by the Department of Health - it is evidence that organisations and professionals may find helpful in improving practice. The National Institute for Health and Clinical Excellence is the Department's provider of accredited evidence and guidance, which can be found on the Institute's website: https://www.nice.org.uk/. This document should not replace independent clinical decision making and should not replace local hospital policy and guidelines. This document will not cover every clinical situation and does not replace the need for individual patient assessment and subsequent clinical decision making.

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