



# **Oral hygiene**

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# ICU nurses attitudes regarding oral care

- **Comfort measure**
- **Low priority in ICU**

*Ross & Crumpler. ICCN. 2007; 132*

- **99% of ICU nurses brush their own teeth at least once a day**
  - Why don't they do the same for their patients?

*McNeill. ICCN. 2000. 16 367-372.*

- **Two recent studies:**

- Survey of oral care practices in US ICUs

*Binkley et al. AJIC. 2004. 32; 161-169*

- Oral care practices in ICU: a survey of 59 European units

*Rello et al. 2007. Intensive care medicine.2007. 33; 1066-1070*

- ICU nurses regarded oral care as important
  - But mainly using mouthwash – a comfort measure

# Barriers in Oral Care in ICU

- **Education in oral care:**
  - Remained unchanged last 120 years
  - Not a focus in post graduate training
- **Availability of equipment**
  - Tooth brushes
- **Time allocation**
  - Oral care not seen as a priority In ICU
- **Difficult to clean an intubated patient's mouth**

*Furr et al. Journal of Advanced Nursing. 2004. 48 454-462*

# Why is oral care so important in ICU

- **Evidence that oral care influence mortality and morbidity from VAP is limited**
  - Study designs questioned
- **Extensive evidence**
  - Organisms that are associated with VAP colonise the oropharynx before the VAP diagnosis.
- **Preventing VAP in adults: sowing seeds**
  - Craven. Chest. 2006. 130; 251-260.
  - Oral care has intuitive benefits and limited cost
  - Further studies needed

# Ecology of the ICU patients mouth

- **Most oral bacteria considered normal flora**
  - Mouth sterile at birth, within hours acquire normal oral flora
  - Up to 350 different species bacteria in the mouth
- **In ICU patients:**
  - Increased levels of **proteases** in oral secretions
  - Proteases removes **fibronectin** from the epithelial cell surface
  - Fibronectin acts as a reticuloendothelial mediated host defence mechanism
  - Depletion of fibrinectin exposes receptors to the increase bacterial adherence to the epithelial cells in the oropharynx
  - Result increased colonisation and proliferation of organisms

*Berry & Davidson. ICCN. 2006 22; 318-328*

*McNeill. ICCN. 2000. 16 367-372*

# Ecology of the ICU patients mouth

- **Organisms change from predominantly gram positive normal flora to gram negative organisms**
- **ICU patients are viewed as immunocompromised:**
  - Transient invasions of pathogens from the gums into the bloodstream may result in septicemia and infective endocarditis

*Berry & Davidson. ICCN. 2006 22; 318-328*

*McNeill. ICCN. 2000. 16 367-372*

# Dental plaque in the ICU patients mouth

- **Dental plaque is the accumulation of mainly micro-organisms and their by-products**
- **Some bacteria can only invade compromised periodontal pockets**
  - causing systemic disease
- **Some bacteria**
  - Pseudomonas gingivalis
  - Acenitabacter actinomycetemcomitans
  - have ability to directly invade undamaged tissue and causing systemic disease



Salivary proteins and glycoproteins



Coat oral structures  
Coating = acquired pellicle



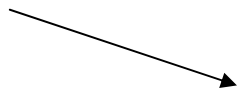
Act as principle mediator of bacterial adhesions



Initial adhesions are streptococci



Lay foundations for adherence of other bacteria



Slime, bacteria and by-products  
**= PLAQUE**  
**Not water soluble**



3 days undisturbed plaque  
Contains hundreds of species of organisms  
Relative proportion of organisms change and gram negative organisms become more prevalent

# Saliva and the ICU patients mouth

- **Saliva has important functions:**
  - Washing food debris and unattached microorganisms from the mouth
  - Neutralizes acids produced by bacteria on tooth surfaces
  - Contains calcium and phosphorus and therefore works with fluoride re-mineralise tooth surfaces
  - Contains immune substances:
    - Immunoglobulin A – obstruct microbial adherence in oral cavity
    - Lactoferrin which inhibits bacterial infection

*Berry & Davidson. ICCN. 2006 22; 318-328.*

*McNeill. ICCN. 2000. 16; 367-372*

*Dennesen et al. Crit Care Med. 2003. 31; 781-786*

# Saliva and the ICU patients mouth

- **Healthy individual:**
  - Unstimulated salivary flow – 0.25-0.35ml/min
  - Stimulated salivary flow – 4-6ml/min
- **ICU patients have a severe reduction in salivary flow:**
  - Fever, diarrhoea
  - Burns, reduced fluid intake
  - Unable to close their mouths
  - Intermittent oral suction
  - Medications: diuretics, antihypertensives, anticholinergics opiates, etc.

# Saliva and the ICU patients mouth

- **Reduction in salivary flow results in Xerostomia (dry mouth) and Mucositis**
- **Xerostomia and Mucositis result in:**
  - Oropharyngeal colonisation with respiratory pathogens

*Berry & Davidson. ICCN. 2006 22; 318-328.*

*McNeill. ICCN. 2000. 16; 367-372*

*Dennesen et al. Crit Care Med. 2003. 31; 781-786*

# Equipment used in oral care: Foam swabs/gauze and forceps

- **Commonly used internationally**
- **Effective for mucosal stimulation**
  - Efficacy depends on user technique
  - Does not reduce risk of VAP
- **Ineffective for plaque removal**
- **Foam swabs most useful for moistening mouth in between brushing**
- **Techniques used are “swabbing or scrubbing”**

*Grap et al. American Journal of Critical Care. 2003. 12: 113-118.*

*McNeill. ICCN. 2000. 16 367-372.*

*Pearson. Journal of advanced Nursing. 1996. 23: 62-69*

# Equipment used in oral care:

## Toothbrush

- **Preferred tool for cleaning the teeth**
  - Electric toothbrush most effective, not always available
  - Soft bristled “baby-toothbrush” recommended
  - Use right technique of brushing for a sufficient duration and with adequate frequency.
  - Remember to brush the gums, palate and tongue gently
  - Can be used in edentulous patients
  - After use must be washed and be left to air dry.

*Berry & Davidson. ICCN. 2006. 22; 318-328*

*McNeill. ICCN 2000. 16; 367-372*

*Pearson. Journal of Advanced Nursing. 1996. 23; 62-69*

*Kite & Pearson. ICCN. 1995. 11; 71-76*





# Equipment used in oral care: Toothbrush

- **But please take note:**
  - Tooth brushing has been linked to transient bacteraemia in healthy populations
  - ICU patients may have increased vulnerability
  - We need more evidence of the significance on clinical outcome in ICU patients

*Jones & Munro. ICCN. 2008. 24; 152-161*

# Products used in oral care: Toothpaste

- **Not crucial for plaque elimination**
- **Fluoride in the toothpaste important for re-mineralise effect on teeth**
- **Prevents halitosis and ensure patient oral comfort**
- **Non-foaming toothpaste is recommended**
  - Elmex, Colgate Gel, gel toothpastes
  - Use as little as possible of other toothpaste
  - Clinical important: toothpaste residue may have a drying effect on the mucosa



*Berry & Davidson. ICCN. 2006 22; 318-328*

# Products used in oral care:

## Chlorhexidine 0.1 – 0.2%

- **Most effective antiplaque mouth rinse**
- **How:**
  - Chlorhexidine is a positive charged molecule
  - Binds to the negatively charged sites on the tooth enamel and mucosal cells
  - Reduction of microbial adherence to the tooth and mucosal surfaces
  - Also binds bacterial cell-wall structures, altering the cell equilibrium
  - This allows leakage of potassium and phosphorus
  - The result is that the cell content is damaged

# Products used in oral care: Chlorhexidine 0.1 – 0.2%

- **Has a inhibitory effect against**
  - Gram positive organisms
    - Including MRSA and VRE
  - Gram negative organisms (less active)
  - Fungi
- Resistance rates of nosocomial pathogens have remained exceptionally low despite long-term use of chlorhexidine
- Has slow release properties
  - Maintains antimicrobial activity up to 12 hours

*Berry & Davidson. ICCN. 2006 22; 318-328.*

*Koeman et al. Am J respir Crit Care Med. 2006 173; 1348-1355*

# Products used in oral care: Chlorhexidine 0.1 – 0.2%

- **Topical chlorhexidine for prevention of ventilator-associated pneumonia: A meta-analysis**

*Chlebicki & Safdar. Crit Care Med. 2007. 35; 595-60*

- **Identified 14 studies of which 7 met the inclusion criteria**
- **Conclusion:**
  - Topical chlorhexidine is beneficial in preventing VAP
  - Benefit was most marked in cardiac surgery patients
  - Need a large randomised trial to evaluate the impact on mortality

# Products used in oral care: Chlorhexidine 0.1 – 0.2%

- **Effectiveness of 0.12% Chlorhexidine Gluconate oral rinse in reducing prevalence of Nosocomial pneumonia in patients undergoing heart surgery**

*Houston et al. American Journal of Critical Care. 2002. 11: 567-570*

- Lower rates (52%) of pneumonia in the chlorhexidine group than the control group
- Significant difference (71%) in patients intubated for more than 24 hours and who had highest degree of bacterial colonisation.

# Products used in oral care: Chlorhexidine 0.1 – 0.2%

- Side effects:
  - Discoloration of teeth
  - Burning sensation on tongue
  - Irritation of mucosa
  - Can have allergic reaction – very rare
  - Gets diluted and washed away by saliva

*Klarin et al. Critical Care. 2008 12; R136.*

# Products used in oral care: Chlorhexidine 0.1 – 0.2%

- **NB NB:**

- Must mechanically clean teeth (tooth brush) prior to use of chlorhexidine for maximum benefit
- If toothpaste is used prior to chlorhexidine it must be thoroughly removed to prevent formation of inactive low-solubility salts

*Wise et al. Crit Care. 2008 12: 419*

- **Canadian Critical Care Trials Group**

- Clinical practice guidelines for VAP prevention
- Recommend use of chlorhexidine in oral care

*Muscedere et al. Journal of Critical Care. 2008 23: 126-137*

# Products used in oral care: Povidone-iodine

- Has been used for many years general wound care including post-op wounds of the oral cavity
- Has an disinfectant quality
- No anti-plaque effect
- Long term use may result in significant amount being absorbed

*Berry & Davidson. ICCN. 2006. 22; 318-32818*  
*Kite & Pearson. ICCN. 1995. 11; 71-76*

- Considered as oral care in patients with severe head injury
  - *Muscedre et al. Journal of Critical Care. 2008. 23; 126-137*
  - *Seguin et al. Crit Care Med. 2006. 34; 1514-1519*

# Products used in oral care:

## Hydrogen peroxide

- **Been used for more than 70 years**
- **Clear, odour-free solution**
- **When diluted in water it forms an acidic solution:**
  - 1% solution – pH range of 5-6
- **Removes debris in the mouth**
- **Cause superficial burns if not diluted carefully**
- **No longer recommended for use**

*Berry & Davidson. ICCN. 2006 22; 318-328*  
*Grap. American Journal of Critical Care. 2003. 12; 113-118*  
*Kite & Pearson. ICCN. 1995. 11; 71-76*

# Products used in oral care: Sodium Bicarbonate

- **Commonly used for many years**
- **Correctly prepared reduces the viscosity of oral mucous**
- **Incorrectly diluted:**
  - Burning of mucosa
  - Altering pH with the potential to upset the normal oral flora
- **Not recommended for routine use in ICU**

*Berry & Davidson. ICCN. 2006 22; 318-328*  
*Grap. American Journal of Critical Care. 2003. 12; 113-118*  
*Kite & Pearson. ICCN. 1995. 11; 71-76*

# Products used in oral care: Lemon and glycerine

- Also commonly used for many years
- 1969 deemed not to be effective for oral care
- Initially when used it stimulate salivary flow but may exhaust this mechanism and result in xerostomia
- **Lemon:**
  - Reduces oral pH to 2-4 (normal 6-7)
  - Acidic conditions decalcify the teeth
  - Reduces salivary amylase

*Berry & Davidson. ICCN. 2006 22; 318-328  
Grap. American Journal of Critical Care. 2003. 12; 113-118  
Kite & Pearson. ICCN. 1995. 11; 71-76*

# Products used in oral care: Glycothymol

- **Familiar pink solution**
- **Short lived refreshing sensation**
- **No cleaning or disinfecting properties**

*Grap et al. American Journal of Critical Care. 2003. 12: 113-118*

*McNeill. ICCN. 2000. 16 367-372*

# Products used in oral care:

## Normal saline

- **Can promote healing of oral mucosal lesions**
- **Tendency to cause drying of the mouth**
- **Not recommended for routine use in ICU**
- **Do you like to rinse your mouth with salt water?**

*Grap et al. American Journal of Critical Care. 2003. 12: 113-118*

# Products used in oral care:

## Water

- **Value underestimated**
  - Moistening
  - Removing debris
  - With a toothbrush
  - Cost effective

# DO NOT USE HOSPITAL TAP WATER

- **Serious source of waterborne nosocomial infections**
- **Notably those attributed to pseudomonas**
- **Use a small bottle of sterile water**
  - Date and time first opened
  - Sealed between use

*Grap et al. American Journal of Critical Care. 2003. 12: 113-118.*



# Products used in oral care: Commercial mouth rinses

- **Only benefit: patient oral comfort.**

# Products used in oral care: Colistin

- Polimycin with high activity against:
  - Gram positive and
  - Gram negative organism
- Resistant rates low despite long term use
- Chlorhexidine combined with colistin significant reduction in oro-pharyngeal colonisation with gram positive and negative organisms
  - Recommended chlorhexidine
  - Colistin increasingly used in treatment of resistant gram negative organism, may develop resistance therefore not recommended for oral care

# Products used in oral care:

## Probiotics

- *Lactobacacillus plantarum 299*
  - Colonise oral cavity soon after birth – normal oral flora
  - Genetically stable- does not develop antibiotic resistant strains
- **Pilot study of 44 patients**
  - No difference between this probiotics and chlorhexidine
  - Might be as effective as chlorexadine in prevention of colonisation of oro-pharynx

*Klarin et al. Critical Care. 2008. 12; R136*

# Products used in oral care: Lip moisturisers

- **Vaseline and lanolin effective**
- **These products have an occlusive effect that reduces trans-epidermal water loss**

*Berry & Davidson. ICCN. 2006 22; 318-328.*

# Products used in oral care: Salivary substitutes

- **Some products lack the antibacterial and immunological attributes of natural saliva**
- **Select products that contain:**
  - Lactoferrin
  - Lyscozyme

*Berry & Davidson. ICCN. 2006 22; 318-328.*

# Equipment used in oral care: Yankuer Suction catheters

- **Used in ICU to withdraw oral fluids**
- **High prevalence of contamination of these catheters with highly pathogenic bacteria and fungi**
- **Should be handled and stored with appropriate care**
  - Gloves and hand washing
  - Cleaned and left to air-dry
  - Kept in designated holder, not the packaging sleeve

*Brown & Williams. Am J Infect Control. 2005. 33483-485.*

# Assessment of the mouth

- On admission to ICU
- There after daily
- Assessment must be **RECORDED**

# Assessment of the mouth

<b>B</b>	Bleeding	Gums, mucosa, coagulation status?
<b>R</b>	Redness	Gum margins, tongue, antibiotic stomatitis?
<b>U</b>	Ulceration	Size, shape, herpetic, infected?
<b>S</b>	Saliva	Xerostoma, hypersalivation, characteristics?
<b>H</b>	Halitosis	Character, acidotic, infected?
<b>E</b>	External factors	Angular cheilitis, endotracheal tubes?
<b>D</b>	Debris	Visible plaque, foreign particles

# Suggested procedure for oral care

- **Position patient:**
  - If possible turn head side ways
  - Semi-fowlers
- **Get equipment ready**
- **Clean procedure, not sterile**
  - Wear gloves for your own protection
  - Other personal protective equipment as needed

# Suggested procedure for oral care

- **Brush teeth**
  - Baby tooth brush, electric toothbrush
  - Non-foaming toothpaste, or very little standard toothpaste
  - Gentle short horizontal and circular movements
  - At least 2 minutes
  - 12 hourly
- **Brush tongue and hard palate**
- **Also recommended for edentulous patients to brush their gums, tongue and hard palate**

# **Suggested procedure for oral care**

- **Rinse mouth thoroughly with sterile water**
- **Rinse mouth with Chlorhexidine 0.1 – 0.2%**
- **Suction oropharynx**
- **Clean suction equipment**
- **Record procedure**

# Conclusion

- **‘it is aspects of basic nursing that needs most scrutiny because they have become routine and taken for granted as being satisfactory’**  
*Kite & Pearson. ICCN. 1995. 11;71-76*
- **To improve quality of oral care, do not see mouth care in isolation, focus on the patient outcome (prevention of VAP)**

