

# Oral health and pneumonia: a case study analysis

As aspiration of bacteria in oropharyngeal secretions is an important risk factor for pneumonia in the young and elderly, poor oral health may also contribute to the development of pneumonia. This article provides a case study analysis of the links between oral health and pneumonia

**P**neumonia is a significant cause of morbidity and mortality and can affect all age groups, although it is the very young and the very old who are most at risk. Pneumonia can be caused by many different organisms and can present as a primary condition or as a complication of other diseases or acute health problems.

Thanks to intervention studies and research, it is now recognised across the academic disciplines that regular oral care by a professional can prevent aspiration pneumonia and reduce the onset of fever.

This article discusses the evidence-based links between nosocomial and community pneumonia to oral health, demonstrates the methods, tools and products available to maintain a healthy oral cavity and argues that the main issues seem to be the lack of provisions and importance placed on effective oral health both in hospitals and the community setting.

## Aetiology of pneumonia

The simple definition of pneumonia is 'an acute infection of the alveoli' (*Figure 1*) and this can be caused by a variety of pathogens (World Health Organisation, 2013). Pneumonia may be the principal

consequence of an infection or it may be a sequela to another disease such as measles or influenza. Pneumonia may also occur as a complication in hospital settings secondary to a procedure such as surgery or artificial ventilation. Consequently, the condition is generally classified into two distinct groups: community acquired pneumonia (CAP) or nosocomial (hospital-acquired).

## Community acquired pneumonia (CAP)

CAP can be defined as 'an infection of the lung parenchyma that is not acquired in a hospital, long-term care facility, or other recent contact with the healthcare system'. CAP may be caused by bacteria, viruses or fungi and occurs in all age groups. The very young (under 6) and older (over 75) age groups generally experience the most significant morbidity and mortality. However, in industrialised countries, incidence increases dramatically in those over 50 years of age pneumonia. CAP is acquired infectiously from normal social contact, as opposed to nosocomial pneumonia which develops 48 hours after hospital admission.

## Nosocomial pneumonia

Nosocomial pneumonia is an infection of the lungs that occurs during a hospital stay. This type of pneumonia can be very severe. Nosocomial pneumonia is the second most common nosocomial infection and is usually bacterial in origin (MedLinePlus, 2013).

## Aspiration pneumonia

Aspiration pneumonia occurs when food, saliva, liquids, or vomit is breathed into the lungs or airways leading to the lungs. Aspiration of bacteria from the oral and pharyngeal areas causes bacterial pneumonia (MedLinePlus, 2013).

## Nursing-home-acquired pneumonia (NHAP)

NHAP is defined as pneumonia occurring in a resident of a long-term care facility or nursing home. NHAP is one of the most common infectious diseases in long-term care facilities and is a significant cause of mortality and morbidity among residents of such facilities. NHAP primarily affects elderly people and shows no sex or race predilection. NHAP more closely resembles CAP than nosocomial pneumonia and is considered diagnostically and therapeutically synonymous with CAP.

Pneumonia is the leading cause of infective cause of death in nursing home residents, with a mortality rate of 12–21% (World Health Organisation, 2013). There has been some suggestion that improving oral hygiene in this group of patients may reduce the rates of pneumonia as NHAP pathogens appear to be micro-aspiration of infected oral secretions (Scannapieco et al, 1996).

## Symptoms of pneumonia

In previously healthy individuals, pneumonia may present with a 1–2 day history of cough, fever, dyspnoea, fatigue, rigors and pleuritic pain. Cough can be dry

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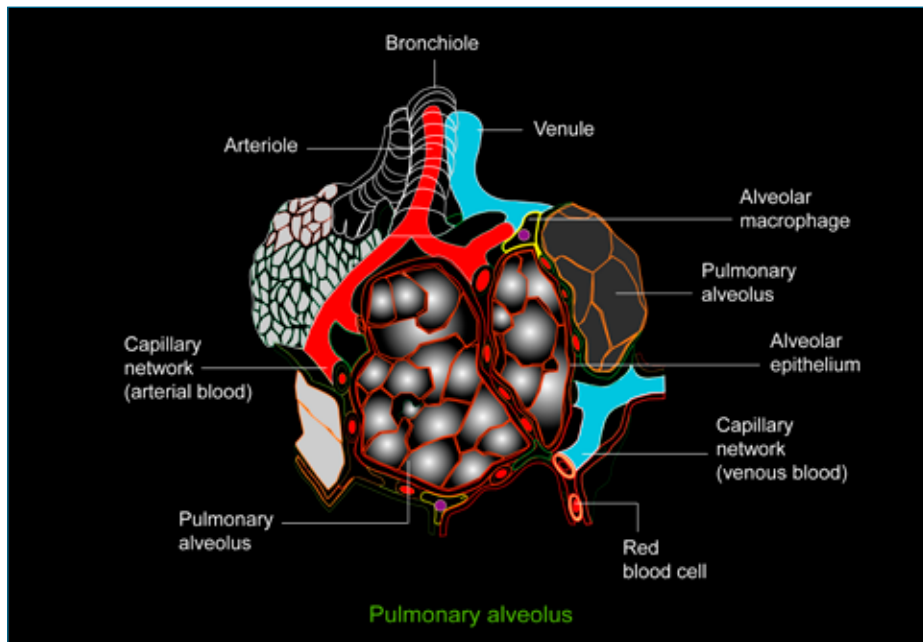


Figure 1. Alveolus

and persistent, or it may be productive. In elderly patients, coughing and chest pain may not be present at the early stage of disease, and fever and confusion may be the only presenting symptoms. Worsening of chronic illnesses may also be apparent; individuals with other chronic diseases and the elderly are likely to be very lethargic, have poor appetite and may frequently fall, owing to weakness and disorientation (Nair and Niederman, 2011).

On examination, respiratory rate is likely to be rapid, crackles may be audible on inspiration and there may be evidence of pleural effusion (dullness on auscultation or obvious lack of expansion of ribcage on inspiration). In the community, CAP is diagnosed on clinical signs and symptoms and no specific investigations are routinely recommended.

## Risk factors

Patients at risk of developing nosocomial pneumonia while in hospital include those who:

- Are alcoholic
- Have had chest surgery or other major surgery
- Have a weak immune system from cancer treatment, certain medicines, or severe wounds

- Have long-term (chronic) lung disease
- Breathe saliva or food into their lungs as a result of not being fully alert or having swallowing problems
- Are older
- Are intubated/ventilated
- Have suffered a stroke
- Are being fed via percutaneous endoscopic gastrostomy/nasogastric tube.

Risk factors that increase your chances of getting CAP include:

- Chronic lung disease (COPD, bronchiectasis, cystic fibrosis)
- Cigarette smoking
- Dementia, stroke, brain injury, cerebral palsy, or other brain disorders
- Immune system problem (during cancer treatment, or due to HIV/AIDS, organ transplant or other diseases)
- Other serious illnesses, such as heart disease, liver cirrhosis, or diabetes mellitus
- Recent surgery or trauma
- Surgery to treat cancer of the mouth, throat, or neck.

## Oral health and nosocomial pneumonia

The oral cavity is a complex micro-environment consisting of multiple

bacterial and fungal species, their associated biofilms, and a cytokine milieu influenced by constant inflammatory stimulation. The mouth is the 'gateway' to the rest of the body.

Aspiration of oral and pharyngeal secretions containing infectious agents has been proven to be a common route of pulmonary infections. Aspiration of bacteria colonising the teeth and other oral tissues is a likely key factor in pneumonia (Scannapieco et al, 1992).

Scannapieco et al (2003) undertook a review of all the available literature up to April 2002, evaluating the link between pulmonary disease and periodontal disease. The results were accepted by the review board of the American Academy of Periodontology, stating that the evidence supports the existence of a link between nosocomial pneumonia and poor oral health in high-risk patients.

## Oral health maintenance

Three factors are needed to maintain oral health: hydration of the tissues; the cleansing, microbial properties of saliva; and debridement of the teeth and tongue (Sweeney, 2005). The oral cavity needs to be kept moist and hydrated. Saliva is central to maintaining a healthy mouth. Human saliva is 99.5% water. The other 0.5% contains numerous antibacterial components, such as histatins, defensins, cathelicidin, lysozyme, lactoferrin, and lactoperoxidase, which maintain a balance of oral microbial populations (Scannapieco et al, 2003). Lack of saliva due to, for example, medication, head and neck radiation or nil-by-mouth patients, may promote an overgrowth of bacteria. As bacteria has a cleansing effect, there may well be an increased build up of plaque. This build up of plaque is not exclusive to patients with teeth. Dentures, both fixed and removable, can also foster plaque and bacterial formation. Saliva substitutes have been found to be useful. BioXtra® gel (RIS Products Ltd), which contains lysozyme, lactoferrin and lactoperoxidase, has been recommended for lubricating mucous membranes (Dirix et al, 2008). However,

## Case study 1



The figure above shows a patient who has recently suffered a stroke and is recovering on a rehabilitation ward. From the stroke point of view, the lady is receiving excellent care – all care plans are in place and up to date and the medical staff seem happy with her recovery. There is, however, no care plan in place for oral care and it is obvious that her oral condition needs some attention. The patient is PEG fed (percutaneous endoscopic gastrostomy – a tube which is passed into the patient's stomach as a means of feeding) and the patient has three lower anterior teeth, the oral cavity is red and dry, and there is some evidence of oral thrush. This patient is at a high risk of developing a nosocomial pneumonia.

the author feels that whichever saliva substitute is used, be it a gel or a spray, they are often not applied or delivered correctly; caution, for example, needs to be taken with artificial sprays in patients with swallowing issues. Attention must also be placed on using a spray that is pH neutral and ideally one that contains fluoride.

### Twice-daily brushing

The single most important oral hygiene activity has been shown to be twice-daily brushing to reduce oral debris and dental plaque (Sweeney, 2005). However, it seems that the favourite tool of choice for nursing staff is still foam swabs. This comes after the plethora of issues surrounding the

On questioning the staff about the lack of oral care, it was evident that they were aware of the issues with the patient's oral care but did not feel armed with the tools and knowledge on how to deal with the problems. The Macmillan oral health practitioner assessed the mouth using an oral assessment tool and put a oral care nursing plan into place. This involved cleaning the mouth twice a day with a suction toothbrush and non-foaming toothpaste, and lubricating the mouth two hourly with a lubricating gel. The mouth was also swabbed and treated for a fungal infection. It must also be mentioned at this point that this particular patient was compliant and cooperated fully with the staff, which is not always the case. The oral condition improved and the patient was transferred.

The author can not prove that effective oral care improved the patient's condition but no patient should have a mouth that is dry, bloodied and sore. Each patient is entitled to a clean and pain-free mouth no matter what medical condition they are suffering from.

safety of pink swabs (MDA/2012/020) (Medicines and Healthcare products Regulatory Agency, 2012). These swabs are designed to be single use but in many cases are left by the bed soaking in a mouthwash. The same swab is sometimes used on many occasions during the day.

### Electric toothbrushes

Electric toothbrushes have been shown to be more effective in plaque removal and cleaning in gingival crevices compared with manual toothbrushes (Prendergast, 2012). However, in the author's opinion, nursing staff should be trained on the use of an electric toothbrush on a patient as trauma to the mucous membranes is

possible. A fluoride toothpaste should be used at all times and a non-foaming toothpaste may be considered as this is useful in patients who are unconscious or are at risk of aspiration.

### Flossing

Flossing is also encouraged and has been shown to reduce plaque formation and gingivitis, but has not been introduced for hospitalised patients (Prendergast, 2012). Care needs to be taken with flossing in the mouths of patients who have low platelet levels, as they may have a tendency to bleed (Macmillan Cancer Support, 2013).

### Chlorhexidine mouthwash

There has been much research around the use of chlorhexidine to reduce nosocomial pneumonia. Twice-daily oral hygiene care with 0.12% chlorhexidine gluconate may hold promise as a nosocomial pneumonia reduction strategy within hospital critical care units; however, its application requires further testing (Bopp et al, 2006). Effective plaque removal with a toothbrush or a suction/powered toothbrush must always be the first step in effective oral care of this patient group.

### Oral assessment

The gold standard is for each patient to have an oral assessment on admission to hospital. This can establish the patient's baseline oral health status and then ongoing assessments can highlight any changes during the course of care and interventions can be initiated (Prendergast, 2012). It must be stressed that any assessment tool is only as good as the individual who is undertaking the assessment. This is where training and education comes to the forefront of care.

### Conclusion

The author would also like to stress that although this article has, as many other papers written on this topic, highlighted the need for effective oral health for all individuals, the actual deliverance of this care can at times be a challenge. Having worked in both hospital and community

## Case study 2



A 62-year-old man who has been treated with surgery and head and neck radiotherapy for a tongue cancer. He is edentulous and has had the whole of his tongue removed. As he has been treated with radiotherapy, his salivary glands have been compromised and, as such, he has a dry mouth. This is also exacerbated as he is now fed totally via a PEG.

The patient's wife is discharged home with a portable suction machine and district nurses will visit regarding the PEG. Review appointments are organised with the maxillofacial consultant from the oral cancer perspective. Over the next few weeks the mouth becomes dryer and crusty plugs form around the oral cavity. The patient's wife is trying to remove these plugs with eyebrow tweezers and hence these areas start to bleed. Within a period of time the patient is admitted back into hospital with a pneumonia. It is suggested that this is due to aspiration from the oral cavity.

As an in-patient the mouth is regularly cleaned and kept lubricated with an oral lubricating gel. This is performed under instruction from the Macmillan oral health practitioner based at the hospital. Once discharged home the patient and wife are asked to attend a nurse-led clinic monthly to review the mouth and instruct the pair on the best way to maintain the cavity. The picture below shows the mouth clean, moist and infection free months after discharge, and no further chest infections have been reported.



There is a cost implication here as the patient had recovered from his oral cancer and then subsequently contracted a pneumonia, which meant further hospital stays and treatment. It also had an impact on the patient's quality of life, which is often overlooked. This case highlights the need for education and training to not only the patient and carers but also the ward staff, district nurses and community staff.

settings, the author has seen first-hand the barriers that staff encounter on a daily basis. Oral assessment tools are often seen as another form to fill in and very rarely has any training on how to assess the oral cavity been provided. This is without taking into account the non-compliant patient with dementia, the intubated patient with equipment making oral care

deliverance difficult, the patient with aspiration issues, and many more barriers. It has been suggested in the past that lack of oral care has been down to the lack of importance placed on it; the author would argue that although this is often the case, staff need to be armed with the correct tools to perform the task and always backing this up with training. DN

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## KEY POINTS

- **A clean and lubricated oral cavity is a basic need and can impact on a patient's systemic health.**
- **Raised education and awareness of oral health and its links to pneumonia are imperative in its prevention and treatment.**
- **Better use of dental professionals in the assessment and subsequent treatment of patients with pneumonia may improve patients outcomes.**