Assessing knowledge, attitude and behaviour of home carers in relation to mouth care of the older housebound population in Caithness

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Summary

Objective: To assess the baseline and post-oral health training knowledge, attitude and behaviour of local authority-employed care givers in relation to the provision of mouth care for their client group, i.e. dependent older people living in their own home and to assess the oral health status of this latter population group.

Design: Interventional study in relation to the local authority-employed care givers and a descriptive study of the oral health of dependent older people.

Setting: Caithness, Highlands, Scotland.

Participants: 131 local authority-employed care givers and 60 dependent older people.

Results: In total, 63 of a possible 131(48%) home carers attended two training sessions on oral health and completed pre- and post-training questionnaires. The findings showed little difference post-training in knowledge, attitude or behaviour of the home carers regarding oral health care. The descriptive study of 60 older people showed high levels of edentulism, xerostomia, fungal growth and poor denture hygiene. There were high levels of plaque and caries among the dentate individuals. Despite these findings, only a very small proportion of the older people indicated they wished to receive assistance with their oral care. An association was, however, found between the care category of the service user and oral care provision from the home carer with those in the 'critical' category more likely to be receiving this care.

Conclusions: Despite high levels of dental disease and poor denture care, many older people are not receiving help with their oral health care and many reported they did not want assistance. This suggests that before attempting to develop care programmes for this population group, further work is required with both the service users and providers to raise awareness of oral health issues and to gain a deeper understanding of attitudes and

the type of programmes which will meet the needs of the parties involved. Training programmes can then be developed to meet the needs of the programme.

Chapter 1
Introduction

In recent years there have been various public health initiatives highlighting the importance of oral health for the older person. *An Action Plan for Improving Oral Health and Modernising NHS Dental Services in Scotland* was published by the Scottish Executive in 2005. A key point raised was the need for the provision of suitable preventive, assessment and treatment services for older people.

Subsequent to the Action Plan, in 2006 *A Review of Primary Care Salaried Dental Services* was published, recommending changes which it was hoped would lead to an efficient and effective service for an integrated public dental service in Scotland. Part of this report highlighted interest in healthcare provision for older people.

Ageing is emerging as a major global theme affecting both developed and developing countries, and one of the reasons why health care for older people is gaining prominence relates to changing population demographics.

Throughout the world, the proportion of older people (65 and over) is growing faster than any other age group. The trends at present are such that it is projected that eventually one in every three people on Earth will be aged 60 years or over. People over 60 currently constitute a fifth of the British population, but it is estimated they will represent a third by 2030 (Greengross et al., 1997). This trend is also evident in Scotland, with the current number of people aged 75 and over predicted to rise to 650,000 over the next 25 years (Scottish Government, 2009).

In addition to the changing demographics, another reason why oral care for older people is considered a priority area for service development in the UK relates to the fact that people are now retaining their teeth for longer, with the proportion of older people edentate (with no teeth) decreasing over recent decades. For the first time since records

have been kept, half the British population aged 65 years and over are dentate (Steele et al., 1998). This has major implications in relation to the types of preventive and treatment services required for this population group. Additionally, as people age, there is an increase in the likelihood of the presence of morbidity which may influence oral health directly or the practice of daily oral hygiene.

Many elderly choose to remain in their own homes with the assistance of home-based services as a low cost alternative to nursing home care (Strayer, 1995). Various health plans, such as the National Service Framework for Older People, are committed to supporting older people in their own homes. Statistics from England in 2001 showed that just under three quarters of those aged 90 and over were living in private households. This has led to a significant increase in the volume of home help which has been provided over the past two decades (Soule et al., 2005).

It is recognised that for the promotion of oral health, the adoption of a multi-disciplinary team approach is highly recommended, and the use of non-oral health care workers can contribute substantially to improving oral health (Walid et al., 2004).

Over the last two decades, there has been a substantial volume of research in the UK relating to the oral health and oral care needs of older people in care homes and the attitudes and training needs of care home staff in relation to the provision of oral care for residents (Simons et al., 2001; Frenkel et al., 2002; Sweeney et al., 2007). This includes work in the Caithness region of Highland which investigated the effect of training care home staff in oral care (Nicol et al., 2005). However, investigation of the oral care needs of dependent elderly living at home and the role that local authority care assistants could play in supporting the provision of oral care for these individuals is very limited.

Chapter 2
Literature Review

2.1 Literature search strategy

An advanced literature search was undertaken using the Ovid database in Embase 1980 onwards, Ovid Medline in process, EBM, CINAHL, AARP and HMIC. Searches were also undertaken in the grey literature such as Google™, Scottish Executive website and Highland Council website.

2.2 Ageing population

2.2.1 Global perspective

The phenomenon "global greying" is emerging as a major theme. Throughout the world the proportion of older people (65 and over) is growing faster than any other age group at a rate of 2.5 per cent per annum compared to the annual rate of 1.7 per cent for the global population (World Health Organisation, 2002). Approximately 600 million people worldwide are aged 60 years and over and this number is expected to double by 2025 (United Nations, 2003; Peterson & Yamamoto, 2004). This demographic movement also affects developing countries and by 2050, 80% of the expected 2 billion older population will be living in developing countries (WHO, 2002; UN, 2003; Peterson & Yamamoto, 2004). At the same time, the ageing population is itself ageing. This is reflected in the real increase of the "old/old", or those aged 80 years and over. In 1990 there were 15 million octogenarians in the world, in 1999 there were 66 million and by 2059 it is estimated their number will exceed 370 million (Andrews, 2001).

2.2.2 UK perspective

The demographic pattern of ageing is also evident in Britain. Only one in six Britons born 150 years ago reached 75, whereas two thirds of those born today will attain this age (Greengross et al., 1997). Over the last 35 years, the population aged 65 years and over has grown from 7.4 million to 9.4 million (Scottish Government, 2008). People over 60 currently constitute a fifth of the British population but will increase to a third by 2030. Those aged over 80 are the fastest growing section of the population. In 1951, Britain had

300 people aged over 100; by 2031, it is estimated it will have 34 000 (Greengross et al., 1997).

2.2.3 Scottish perspective

This trend is replicated in Scotland. By 2031, the number of people aged 65 years and over is projected to rise from 16% to 26% of the total population. During the same period, the number of people aged 85 years and over is projected to rise from 1.7% to 4.1% of the population, more than doubling (Scottish Government, 2008).

2.3 Reasons for the ageing population

2.3.1 Global perspective

Advancement in medicine and public health measures has led to a shift in the world's population demographics in both developed and developing countries (Berkey et al., 2001). It can be broadly explained as resulting from the combined effects of increasing life expectancy and a reduction in fertility (Andrews, 2001). In Asia, Latin America and Africa there has been a decrease in mortality rates as a result of sanitation and public health improvements (Berkey et al., 2001). The AIDS epidemic has had an impact on the population distribution, particularly in sub-Saharan Africa. The 20 to 30-year age group has begun to shrink rapidly and many young women become infected during their childbearing years and die or become infertile. Those who do have children often pass on the disease, therefore affecting birth rates and infant mortality rates (Berkey et al., 2001; UN, 2008).

2.3.2 UK and Scottish perspective

After World War II and in the 1960s, there was an increase in the number of babies born. As they now age and move into retirement, they will be replaced in the working age population by fewer numbers of people born since the 1960s. Despite medical advances causing recent rises in fertility rates, the number being born at present is still less than in 1960 (Office of National Statistics, 2008).

2.4 Ageing associated with rural populations

2.4.1 Global perspective

There are also some specific demographic changes emerging in rural populations. Around 66% of the population in developing countries and about 25% in developed countries live in rural settings. This is approximately 56% of the world population (Andrews et al., 2001). The rapid population ageing in developing countries and the phenomenon of a "double burden" of both infectious disease and emerging chronic disease represent a major challenge (Andrew et al., 2001).

2.4.2 UK and Scottish perspective

In some developed countries a migration to rural areas is associated with retirement (Andrews et al., 2001), leading to higher proportions of older people living in rural areas. In the Highlands, the percentage of individuals 65 years and over exceeds the Scottish national average for both male and females; 17.2% compared to 14.5% (Hally et al., 2003).

2.5 Impact of ageing on general health

Ageing has a broad impact globally. Its effects are very wide ranging, including impacts on cells, physiological systems, clinical medicine, society, economics and ethics (Greengross et al., 1997).

2.5.1 Cells

The process of ageing is a complex phenomenon and difficult to define by one theory. It probably results from an accumulation of unrepaired damage to DNA (mutations) mitochondria, and other structures and is a function of both genetic inheritance and environmental factors, including lifestyle (Greengross et al., 1997). Abnormal proliferation of cells may result in neoplasms and as this occurs over a long period of time it can give rise to more older people developing cancer.

2.5.2 Physiological systems

In general, there is a decline in general health associated with ageing. A homeostatic mechanism which regulates the body temperature and fluid balance becomes less accurate as a person ages and affects the internal environment of the human body and its physiological systems (Watson, 2008).

2.5.2.1 Cardiovascular system

As a person ages, the heart, which is responsible for pumping blood to all the organs of the body, becomes less effective. Cardiovascular disorders, especially coronary heart disease and stroke, are the commonest cause of death in developed countries (Wray et al., 1999). Coronary heart disease is the result of progressive myocardial ischemia due to progressively limited coronary blood flow. This is usually caused by occlusion of the coronary arteries (usually by atherosclerosis). Coronary heart disease affects at least 20% of adult males under 60 years but increases thereafter up to 64% (Scully & Cawson, 2005).

Stroke is a common neurological condition, mostly affecting people over 65 years (Dougal & Fiske, 2008). It is the generic term to describe a cerebrovascular accident and is defined as a sudden focal neurological deficit caused by an interruption of oxygenated blood to the brain (Lamster & Northridge, 2008). The majority of cases are caused by ischemia (80-85%) and the remainder haemorrhage (15-20%) (Lamster & Northridge, 2008) and may result in loss of consciousness, hemiplegia, aphasia (loss of speech), impaired vision and/or difficulty swallowing (Scully & Cawson, 2005). Stroke has a high mortality and morbidity rate. Approximately 45% die in the first month and of those that survive, 40% require special care, 40% have a mild disability, 10% require hospitalization and 10% recover completely (Scully & Cawson, 2005).

2.5.2.2 Neurological system

Neurological disorders such as dementia are becoming more prevalent with age (Lamster & Northridge, 2008). Dementia is a progressive, neurodegenerative disease leading to a decline in intellectual and social skills. It can also cause a gradual loss of the ability to

carry out basic activities of daily living (ADLs) such as bathing, toileting and eating. Measures such as ADLs and IADLs (instrumental activities of daily living such as managing medication, maintaining the household) can determine how well older adults can maintain performance of everyday events given declining functionality (Rogers et al., 1998). Current estimates suggest 24 million people have dementia worldwide and this number is predicted to rise to 80 million by 2040 (Lamster & Northridge, 2008). It is estimated that there are 683,597 people with dementia in the UK and this is predicted to rise to 940,110 by 2021 and 1,735,087 by 2051, a rise of 145% over the next 45 years (Dementia UK, 2007). The estimate of the number of people in Scotland who have dementia is 56,106 (Dementia UK, 2007).

Alzheimer's disease, which is the most common type of dementia, is estimated to be responsible for 416,967 cases in the UK. The risk of developing Alzheimer's disease increases from one in 1000 below the age of 65, to five to 10 in 100 over the age of 65, and one in five by the age of 80 years (Dementia UK, 2007). The next most common subtypes are vascular dementia and mixed dementia, accounting for nearly one third of all cases (Dementia UK, 2007).

Parkinson's disease is a common brain disorder whose prevalence increases with age. Symptoms include trembling, muscle rigidity, difficulty walking, and problems with balance and coordination (Scully & Cawson, 2005). Parkinson's disease is becoming increasingly common with advancing age. The incidence increases to 2% over the age of 80 years. The prevalence is 200 per 100,000 population (Shukla & Brooks, 1995).

2.5.2.3 Musculoskeletal system

Musculoskeletal disorders are common causes of disability among the elderly affecting their daily living. Osteoarthritis is the most common form of arthritis and is most common in adults over 45 years (Scully & Cawson, 2005). It may affect any joint but is especially painful in weight bearing or traumatized joints.

Osteoporosis is usually seen in older people and nearly one third of the UK population over 60 years have osteoporosis. It is sometimes referred to as brittle bone disease as there is reduced bone density and bone mass leading to fragile bones.
Pagets disease is characterized by progressive deformity and enlargement of bones related to overactivity of osteoclasts and osteoblasts. It can be seen in 5% of those aged 55 years and over in the UK.

2.5.2.4 Endocrinal system

Diabetes is the most common endocrine disorder and affects at least 2% of the population. It is especially common in the elderly and in persons of Indian or Pakistani origin, where it affects up to one third of the elderly (Scully & Cawson, 2005). It is defined as a disorder of carbohydrate metabolism, secondary to defects in insulin secretion or resistance to the action of insulin or both, resulting in elevated plasma glucose levels (American Diabetes Association, 2004). There are three types of diabetes. Type 1 accounts for 5-10% of all diabetes and is a result of autoimmune destruction of the β-cells of the pancreas, resulting in little or no production of insulin. Type II diabetes is caused by inadequate secretion of insulin as well as poor tissue response to insulin. It accounts for 90-95% of adult diabetes and more commonly affects older people (Lamster & Northridge, 2008). The third type is the least common and develops during pregnancy and will usually disappear after delivery. There are also additional complications associated with diabetes. These include renal failure, amputations, periodontal disease and blindness related to diabetic retinopathy (Lamster & Northridge, 2008).

2.5.3 Society

As society ages, there has been not only a transformation in health care but in the social needs of older people. In many developing countries at present, although care remains largely in the hands of family rather than society and professionals, these family support systems are seen to be eroding (Peterson & Yamamato, 2004). In developed countries during the past 20 years, there has been a dramatic growth in the availability of community-based personal health services and housing options for older adults such as assisted living facilities and sheltered housing (Lamster & Northridge, 2008). The

expectations of older people are now greater and in the UK pressures on social services, housing and health authorities have prompted changes in the way services are offered (Shukla & Brooks, 1995). Many elderly choose to remain in their own homes with the assistance of home-based services as a low cost alternative to nursing home care (Strayer, 1995). Various health plans, such as the National Service Framework for Older People, are committed to supporting older people in their own homes. Statistics from England in 2001 showed that just less than three quarters of those aged 90 and over were living in private households. This has led to a significant increase in the volume of home help which has been provided over the past two decades (Soule et al., 2005). In Scotland, in July 2002, free personal care was introduced to support older people living at home and within their community. Those eligible for this service receive an assessment from Social Work Services and a care package is developed specific to the needs of the older person (Highland Council, 2008). Figures released from the Scottish Government estimated that in 2008, there were 68,759 home care clients across Scotland who received support, practical help and personal care from a local authority, 29 per cent of these clients received part of their home care service by a private or voluntary provider. Although the number of home care clients has fallen slightly over the last three years, the number of hours provided has increased to 651,014. In the last ten years, those receiving intensive home care (more than 10 hours per week) has increased from 9.0 clients per 1,000 population aged 65 or over in 1998 to 18.1 in 2008 (Scottish Government, 2008).

2.5.4 Economics

The cost of providing care is posing a challenge for the government. This is also a global problem affecting both developed and developing countries. The average public health expenditure on the elderly population in the developing world is $18.80 per person compared to $614.0 in Britain (Shukla & Brooks, 1995). In the UK, it has been estimated it will cost £14.7 billion for long term formal care costs by the NHS and social services in 2010. This excludes GP services, housing and leisure services relevant to community or unpaid care (Royal Commission, 1999). During the year 1998/99 the NHS spent £10 billion, around 40% of the total budget, on older people. In the same year, social services spent around £5.2 billion, nearly 50% of their total budget on older people. The bulk of

health and social care resources are directed towards the needs of older people as they tend to have a much greater need for health and social services than the younger population (National Service Framework, 2001).

2.5.5 Ethics

It is clear that ageing is a major global issue yet it has been stated that every country in the world is ill-prepared for its effects (Greengross et al., 1997). It has been recommended that a substantial body of research is required to assist the governments and public regarding ageing, yet elderly people are regularly excluded from trials (Greengross et al., 1997) and work in this area does not receive the same levels of funding enjoyed by other areas of research (Watson, 2005).

2.6 Effect of ageing on oral health

Ageing also has a major impact on an older person's oral health with a number of age-related changes occurring. These changes may affect the tooth structure, with wear on enamel and dentine and a reduction of size in the pulp chamber. Surrounding tissues are also affected and older people have a high prevalence of periodontal disease (Peterson & Yamamoto, 2004). Resorption of the mandibular and maxillary alveolar bone may occur following loss of natural teeth and can affect the stability of dentures. Changes in diet and medication may contribute to xerostomia which can affect the caries rate and incidence of oral lesions. The incidence of soft tissue lesions, including oral cancer, is also higher amongst older people.

2.6.1 Tooth loss

2.6.1.1 Global perspective

Globally, edentulism is present among older people but is no longer inevitable. With the use of preventive measures such as fluoride, retention of teeth is becoming widespread, especially among industrialised countries. Epidemiological studies have shown that persons of a high social class and high level of income and education are less likely to be edentulous (Schou, 1995; Peterson & Yamamoto, 2004). In developing countries, due to limited access to oral health services, teeth are often extracted because of pain or

discomfort. There are relatively few epidemiological studies in these countries regarding edentulism (Peterson & Yamamoto, 2004).

2.6.1.2 UK and Scottish perspective

In some working class communities, edentulism was once considered socially acceptable, and offered to young people on their 21st birthdays as a mark of maturity or provided as part of a woman's dowry (Walls & Steele, 2001). This situation is now changing and the rate of edentulism in the UK is declining as the population is increasing. The latest of the decennial surveys of adults was undertaken in 1998 by the Office of National Statistics and estimated that the proportion of people without teeth should fall over the next three decades, from 13% to only 4% of the UK population (Nunn et al., 2000). For the first time since records began, the 1998 report showed that more than half the British population was dentate (Steele et al., 1998). In Scotland, the rate of edentulism was slightly higher at 18% among adults and 56% among older adults (Kelly et al., 2000). The reductions in edentulism rates have been brought about by changing attitudes in dentistry, from one previously heavily orientated towards extractions to that of restoration and maintenance of teeth, together with prevention and restoration of function and aesthetics (Ettinger, 1993). This has led to more complex treatment, including crown and bridgework and dental implants. Some commentators see this as a double-edged sword as people age and may have problems with oral self-care, salivary function and access to care. This may lead to major issues in the future concerning the maintenance of this work.

2.7 Factors associated with ageing which may influence oral health

2.7.1 Medication

Advances in medicine have been a major factor in the increased life expectancy of the population, but the side effects of these medicines may have detrimental consequences in the oral cavity and may predispose to conditions such as xerostomia and ulceration (Simons et al., 2000; Migliorati & Madrid, 2007). Medicines are used to both prevent and cure diseases in addition to controlling many of the symptoms caused by disease (Fastbom et al., 2008). Many older people are receiving long term prescription medicines for chronic conditions (eg. antihypertensives, anticoagulants, immunosuppresants,

antidepressants) and a number of these drugs have side effects affecting the oral cavity. For example, the calcium channel blocker nifedipine, prescribed for cardiovascular disease, can provoke gingival overgrowth in the susceptible individual (Barnes & Walls, 1994).

Recently, bisphosphonate-associated osteonecrosis (BON) of the maxilla and mandible has been increasingly reported. BON is defined as the unexpected development of necrotic bone in the oral cavity lasting greater than 6-8 weeks in patients who are being treated with bisphosphonates. Bisphosphonates are osteoclast inhibitors used in the treatment of patients with osteopenia, osteoporosis, Paget's disease and in cancer patients with bone metastasis. Risk factors implicated in this condition include a recent dental extraction or oral surgery where bone exposure may occur (Migliorati & Madrid, 2007). Information about this condition and treatment for it is still being researched, but collaboration between medical and dental teams and the maintenance of an effective oral hygiene programme are necessary.

Cancer treatment may predispose older people to oral complications. Dry mouth, gingival bleeding, mucositis and ulceration all contribute to the discomfort of patients and interfere with daily activities such as eating and talking (Migliorati & Madrid, 2007).

2.7.2 Systemic diseases

Neurological diseases such as dementia or Parkinson's disease reduce the ability to self-care and carry out sufficient plaque control (Dementia UK, 2007). Swallowing problems may affect up to 80% of people with Parkinson's disease leading to decreased oral clearance and increased food stagnation resulting in an increase of caries (Dougall & Fiske, 2008). Additionally, manual dexterity problems associated with diseases such as rheumatoid arthritis may contribute to difficulty in maintaining adequate oral hygiene.

2.7.3 Xerostomia

Globally, dry mouth is reported to affect 20-30% of older people (Sreebny & Schwartz, 1997; Peterson & Yamamoto, 2004; Dougall & Fiske, 2008). It is an uncomfortable and

potentially harmful oral symptom which is usually caused by a decrease in the secretion rate of saliva and an increased use of particular medications (Sreebny & Schwartz, 1997). It has many symptoms including oral discomfort, difficulty in swallowing, eating and speaking. It can lead to an increase in dental caries and the non-retention of dentures. Xerostomia increases *Candida* spp. carriage and the prevalence of candidiasis (Epstein et al., 1992). Therefore, appropriate oral care and the development of effective treatment regimens for xerostomia will assist in decreasing the potential for problems related to oral fungal infections.

2.8 Oral diseases and the older population

2.8.1 Dental caries

The inability to practice appropriate oral hygiene and the presence of risk factors such as dry mouth (xerostomia) and a high sugar diet can predispose the older population to carious lesions. Worldwide, there is a high prevalence of coronal dental caries and root surface caries among old-age populations. There are scarce data available in developing countries, but surveys indicate that in developed countries the mean numbers of decayed and filled coronal surfaces range from 22 to 35 among the older population (Peterson & Yamamoto, 2004). One study of 949 older people attending senior activity centres in Florida showed that untreated caries was most commonly found on the crowns of teeth (25%), although a substantial proportion (18%) also had root caries (Heft & Gilbert, 1991). Although the five examiners involved in the study were standardized to a procedure of the National Institute of Dental Research, they were not calibrated against each other. In Denmark, Holm-Pederson et al. (2005) found that active root caries was related to cardiac arrhythmia and that it may be a marker of general physical decline and mortality.

In the 1998 UK adult dental health survey, decay of root surfaces was found to be uncommon in younger adults, but amongst adults aged 65 years and over an average of 10.6 teeth were vulnerable, and a third had root caries lesions. A significant proportion of people in the older age groups had caries on exposed roots and the majority of decay was

active decay (9% of vulnerable surfaces) as opposed to arrested (2%) recurrent (1%) or unrestorable (3%) decay (Nunn et al., 2000).

2.8.2 Periodontal disease

Cross-sectional studies have shown that the prevalence and severity of periodontal disease increase with age (Barnes & Walls, 1994). Older people have an increased number of risk factors associated with periodontal disease. For example, diabetes mellitus is more common in the elderly (Scully & Cawson, 2005). Additionally, manual dexterity problems associated with diseases such as rheumatoid arthritis may contribute to difficulty in maintaining adequate oral hygiene. Also with neurological problems, such as dementia and Parkinson's disease, there is a loss of cognitive and motor skills, reducing the ability to self-care and carry out sufficient plaque control (Dementia UK, 2007). Globally, the percentage of the subjects with a Community Periodontal Index score of '4' (deep pockets), ranges from approximately 5% to 70% among older people (WHO, 2002; Peterson & Yamamoto, 2004). In the UK, the proportion of dentate adults with periodontal loss of attachment greater than 3.5 mm increases from 14% among those aged 16-24 to 85% of those aged 65 and over (Adult Dental Health Survey, 1998).

2.8.3 Oral mucosal lesions

Oral mucosal lesions are a relatively common finding in older people (Sweeney et al., 2007). These may be related to denture hygiene, medication, xerostomia or other systemic conditions.

2.8.3.1 Candidosis

This is an infection with *Candida* species, usually *Candida albicans.* However, infections are emerging caused by non-*Candida albicans* species. It is one of the most common infections involving oral mucosal tissues, affecting elderly patients and can be found in 75% of the denture wearing population (Ikebe et al., 2006). Sweeney et al. (2007) carried out a cross-sectional clinical study of care home residents in Greater Glasgow and found 60 out of 288 older people showed a clinical appearance of oral candidosis and 54 of these 60 were positive for the presence of candidal species. Poor denture hygiene,

continuous wear of dentures, and tobacco smoking are all thought to be contributory factors to candidal growth (Sweeney & Bagg, 2000).

2.8.3.2 Denture stomatitis

Denture stomatitis is the commonest form of erythematous candidosis caused by the colonization of yeast on the fitting surface of dentures (Sweeney & Bagg, 2000). Globally, its prevalence is reported to be within the range of 11-67% in complete denture wearers (Peterson & Yamamoto, 2004). In the UK, it affects up to 50% of denture wearers (Scully & Cawson, 2005). The most important factor in its management is oral hygiene and, even with antifungal therapy, if the underlying predisposing factors are not corrected, the condition will return after treatment (Scully & Cawson, 2005).

2.8.3.3 Angular cheilitis

Angular cheilitis is a condition, often associated with edentulous patients, and usually involving both angles of the mouth. It is usually caused by *Candida* spp but *Streptococcus* spp may also be involved. Characteristics of the condition are weeping, crusting lesions which usually cause localised discomfort. It may occur in isolation or in combination with denture stomatitis (Davies & Finlay, 2005). Nutritional deficiencies, especially of iron, folate and vitamin B12 are recognised predisposing factors (Sweeney & Bagg, 2000). A study by Nicol et al. (2005) identified angular cheilitis in 32% of older people resident in nursing homes in the Highland region of Scotland.

2.8.4 Soft tissue lesions

Denture hyperplasia and traumatic ulcers are prevalent in old-age denture wearers and range from 4 to 26% (Peterson & Yamamoto, 2004). Denture hyperplasia is an example of a benign soft tissue lesion caused by poorly fitting dentures (Wray et al., 1999). The combination of poorly fitting dentures and poor oral hygiene are predisposing factors for oral candidal infections (Fitzpatrick, 2000).

2.8.4.1 Oral cancer

Globally, it has been estimated that oral cancer is the fourth most common malignancy among men and the sixth most common among women (Wray et al., 1999). Most cases of oral cancer occur in the groups aged 60 and over. In Scotland, approximately 85% of new cases occur in those aged 50 and over. The incidence of oral cancer in Scotland is almost twice that of England and Wales (13 per 100,000 compared to 7 per 100, 000) (University of Glasgow, 2009). Tobacco usage is the most important determinant of oral cancer and heavy consumption of alcohol is also a significant risk factor in oral cancer.

2.9 Effect of oral health on general health

There is a strong association between general health and oral health. Good oral health is essential to optimise an individual's speech, nutritional intake and systemic health. Gift (1988) stated that a healthy mouth is a premise for overall health.

2.9.1 Quality of life

Oral health has been described as "a standard of health of the oral and related tissues which enables an individual to speak and socialize without active disease, discomfort or embarrassment and which contributes to general well being" (Kay and Locker, 1997). The terms "oral health related quality of life" and "quality of life" are now in common use to describe the outcomes of oral health conditions and therapy for those conditions. These are usually referred to as measures of oral health-related quality of life (OHRQoL) based on the assumption that the functional and psychosocial impacts they document must affect the quality of life (Locker & Finbarr, 2007). An '80/20 movement' was set as a goal in Japan, referring to the retention of ≥20 teeth at 80 years. As part of this initiative, Takata and co-workers (2006) carried out a cross sectional survey and found a relationship between poor chewing ability and poor quality of life in 80-year-old subjects. They found it was the chewing ability and not the number of teeth that was associated with QoL in 80-year-old subjects. However, it is important to note that the number of pairs of occluding teeth were not recorded. Tsakos et al. (2006) did record the number of occluding pairs of natural teeth in older British people and found that OHRQoL is significantly related to occluding pairs of natural teeth among the dentate and the

presence of denture adaptation and retention problems among the edentate older people. Older dentate people with at least nine pairs of occluding teeth overall, or with at least three pairs of occluding teeth in the anterior region of their mouths, are unlikely to experience severe levels of oral health related impacts (Tsakos et al., 2006).

2.9.2 Aspiration pneumonia

Oral health can have an impact on a person's general health and, as outlined above, can affect their quality of life (Brady et al., 2006). There is evidence to suggest that poor oral health status may lead to the aspiration of pathogens from the oropharynx and that oral health may therefore be a risk factor for diseases such as aspiration pneumonia (Yoneyama et al., 2001). Sjögren and co-workers (2008) have suggested that providing mechanical oral hygiene may prevent up to 1 in 10 cases of death from pneumonia. The systematic review from which this theory is proposed is largely based on two studies only. However, it highlights the importance of oral health intervention among dependent older people (Arpin, 2009).

2.9.3 Nutritional status

Normal oral functions such as chewing, speaking, laughing and appearance can be impaired by loss of natural teeth (Sheiham et al., 2001). A softer diet may be adopted by older people requiring minimal chewing and thereby reducing stimulation of muscle tone and the condition of the oral tissues (Fitzpatrick, 2000). A survey carried out in Great Britain involving 753 free living and 202 institutionalized older people found that their oral status affected the ability to eat several common types of food, such as apples and cheese, which in turn may affect their intake of necessary vitamins and minerals (Sheiham et al., 2001). This may result in dietary changes and the use of frequent, high calorie, small meals and energy rich food supplements, which tend to have a high sugar content (Griffiths & Boyle, 2005; Dougall & Fiske, 2008).

2.10 Oral health of institutionalised older people

There is a substantial amount of research evidence documenting the state of oral health among institutionalised older people. It is recognized globally that oral health is generally

very poor among residents in long term care facilities (MacEntee et al., 2007). The majority of studies have originated from the USA, Australia, Japan and Scandinavian countries. Data regarding developing countries such as Africa and India are scarce (Peterson & Yamamoto, 2005). In the UK, high levels of tooth decay, denture stomatitis, periodontitis and oral lesions have been recorded among institutionalised older people (Steele & Walls 1998; Simons et al., 1999 and 2000; Frenkel et al., 2001; Nicol et al., 2005; Sweeney et al., 2007). In Scotland, older people have worse oral health than in the rest of the UK (Steele & Walls, 1998; Sweeney et al., 2007). A study carried out in Greater Glasgow among care home residents revealed high levels of untreated dental caries and soft tissue disease, with 47% of those assessed requiring treatment and 6% being classed as urgent (Sweeney et al., 2007).

2.11 Oral health of non-institutionalised older people

There are few studies concerning the oral health of non-institutionalised dependent older people, but the general message is similar to that of the institutionalised. The retention of more natural teeth in recent decades has resulted in increased caries rates and increased periodontal disease among this cohort (Strayer, 1995; De Visschere & Vanobbergen, 2006). Globally, a number of small studies have been carried out in Japan, USA and Sweden. In Japan, Tamura and co-workers (2001) carried out a small descriptive study of 301 older housebound patients. The mean DMFT was 25.4 and a third wore complete upper and lower dentures. In Heft and Gilbert's study (1991) in Florida, involving 949 older people aged 65-97 years, only 18% of those aged 65-69 were edentate, with the proportion increasing to 35% in those aged 80 years and over. It is important to note that those included in the study were people who attended senior activity centres only and were not representative of older adults overall (Heft & Gilbert, 1991).

Over the past decade, both Sweden and Japan have undergone new health and welfare schemes (Paulsson et al., 1998; Tamura et al., 2001). In Sweden, a new dental care ordinance was passed into law in 1999, guaranteeing preventive oral care, while in Japan, the 80/20 movement described earlier has been introduced. As part of these schemes, several oral health education programmes have been provided to health care professionals

on the assumption that better training would lead to better oral hygiene (Paulsson et al., 1999).

In the UK, knowledge regarding the oral status of older people still living in the community is extremely limited but the information available paints a similar picture to that of the institutionalised. As part of the National Diet and Nutrition Survey (NDNS), older people's oral health was assessed to enable study of the association between their oral health and their dietary intake and nutritional status. The NDNS involved a sample of 1687 people aged 65 years and over of whom 412 were living in residential care and the remainder free-living. The sample for the oral health survey was a sub-sample of that used for the dietary survey. All those who completed a four-day diary were invited to take part in the oral health survey. In total, 41% of the free-living sample and 67.1% of the institutionalised took part in the oral health survey. It comprised an oral examination and a questionnaire-led oral health interview. In general, the oral health in the institutionalised group was poorer but there was still high levels of poor oral health and untreated dental disease amongst the free-living population (Steele et al., 1998). The report found that in general those with good oral health were more likely to have better diets and nutritional status. Although the sample was considered to be broadly representative of the older population as a whole, Steele and co-workers (1998) found minor discrepancies. Both samples were under-represented with respect to women and in people from manual backgrounds. The free-living sample was over-represented with respect to dentate subjects and the institutionalised were under-represented with respect to dentate subjects (Steele et al., 1998).

2.12 Oral health support for older people

Trained nurses and care staff can play an important role in promoting both general hygiene and oral hygiene (Peterson & Yamamoto, 2004). Today's nursing home residents are older and more impaired than in the past and generally require 24-hour supervision (Lamster & Northridge, 2008). Dependent older people who still live in the community prefer non-institutionalised approaches to care which utilize home-based services (Strayer, 1995). As a result, many older people both in residential care and community

dwelling rely on nursing staff and care staff for help with routine activities including dental care (Wardh et al., 1997). It has been stated that it is essential to increase the involvement of health professionals and caregivers in oral health education and promotion programmes (Peterson & Yamamoto, 2004).

2.13 Oral health promotion for older people

2.13.1 Global perspective

Oral health policies and programmes should be an integral part of national and community health programmes. However, it is recognised that few countries have clearly stated policies or goals (Peterson & Yamamoto, 2004). These authors have indicated that developed and developing countries require policies for designing public oral health programmes for the homebound, those in residential care and the physically and economically vulnerable (Peterson & Yamamoto, 2004).

Globally, the WHO, jointly with Fédération Dentaire Internationale (FDI) and the International Association for Dental Research (IADR), have encouraged goals for the oral health of the elderly for the year 2020. These include reducing the number of teeth lost due to caries and periodontal disease, increasing the number of natural teeth present and increasing the number of individuals with functional dentitions (20 or more natural teeth) (Peterson & Yamamoto, 2004). They have recognised the benefits of a multi-disciplinary approach to improve both general health and well-being and stressed the importance of health services, local authorities and individuals all having key roles to play (Peterson & Yamamoto, 2004).

2.13.2 UK perspective

The British Society for Disability and Oral Health released a series of guidelines and recommendations in 2000 for the oral health care of specific groups of people including dependent patients, long-stay patients and people with a physical disability. They included protocols related to oral care procedures for each type of group, oral health assessment tools and recommendations for oral health training specific to the needs of the patients and those providing the training (Arnold et al., 2000; Fiske et al., 2000).

2.13.3 Scottish perspective

In Scotland, the Scottish Executive has been committed to improving the health of older people (Scottish Executive, 2005). *An Action Plan for Improving Oral Health and Modernising NHS Dental Services in Scotland* was published in 2005. A key point raised was the need for the provision of suitable preventive, assessment and treatment services for older people. A number of targets relating to older people were to be reached by 2008. These included: NHS adult patients aged 60 years and over should be offered a free oral health examination from 2005 onwards; NHS Boards should have in place appropriate oral health care and support programmes for all elderly care homes and should introduce performance indicators to measure their compliance; NHS dental registration levels for 65-74 year olds should increase from the 2005 level of 40% to 60%, and for people aged 75 years and over from 28% to 40% ; and older people with special needs should have individual care programmes. A number of targets were also set for 2010. These included increasing the number of adults with natural teeth to 90%, and for those aged 55-74 years, at least 65% should have some natural teeth (Scottish Executive, 2005).

Subsequent to the Action Plan, in 2006 *A Review of Primary Care Salaried Dental Services* was published, recommending changes which it was hoped would lead to an efficient and effective service for an integrated public dental service in Scotland. Part of this report highlighted interest in healthcare provision for older people.

Also in 2005, NHS Quality Improvement Scotland published a Best Practice Statement "Working with dependent older people to achieve good oral health" (NHS QIS, 2005). This was part of a series of nursing Best Practice Statements describing the best and achievable practice collected from available evidence, expert opinion, existing guidance and views of service users (White, 2007). There are four sections to the Best Practice Statement, with recommendations in each section and suggestions of how they can be implemented. In the document relating to oral health, the first section describes the role staff can play in the promotion of oral health and how oral health can influence general health. The second section recommends that an oral assessment should be carried out by a

registered nurse when a resident first arrives at a care facility and includes a protocol for a referral for dental care if necessary. The third section details the role staff should play in assisting the maintenance of good oral health. The final section details the education and training the staff should receive in relation to oral care of their residents (NHS QIS 2005; White, 2007). This statement provides guidance to nursing and care staff so that an adequate standard of oral care can be achieved. Although, it is an excellent step forward in the provision of guidance on oral healthcare it is, however, based on the assumption that a registered nurse is employed at the nursing home and also that they have received adequate training to conduct an oral health assessment (White, 2007).

2.14 Oral health education programmes for care workers in care homes

A number of papers have presented the outcomes of programmes designed to provide training for care workers in oral health. While many have shown no effect on the oral health of residents (Simons et al., 2000), some of the programmes have resulted in an improvement in oral health (Nicol et al., 2005), levels of knowledge (Paulsson et al., 1998) and changes in attitude (Paulsson et al., 1998).

In the UK, Frenkel et al. (2001) conducted a randomised controlled trial evaluating an oral health education programme delivered to nursing care home assistants. The training included demonstrations of cleaning techniques for dentures and natural teeth, including practical sessions and the role of plaque in dental disease. The control group did not receive any training until after the trial was complete. This study showed that up to six months after care staff training, there were significant improvements in clients' oral health. Of the 337 nursing home residents who completed the trial, there was significantly less plaque on the dentures of those in the homes who received training, but no statistical difference in dental plaque or gingivitis levels between the groups.

This finding was similar to a controlled interventional study conducted in Scotland by Nicol et al. (2005). Seventy eight residents of five long term care institutions received a baseline assessment and then further assessments at three and nine month intervals. Three of the five long term care institutions received intensive staff training. At the end of the

18 months, 62 of the original 78 residents remained. There was a statistically significant improvement in oral care procedures and health gains after training. This included significant reductions in both the prevalence and severity of denture stomatitis. There was little change in dental plaque and gingivitis scores, but given the low numbers (nine dentate), no statistical comparisons were made.

2.15 Oral health care programmes involving oral health professionals

In Finland, Peltola et al. (2007) carried out a randomised controlled trial on oral cleanliness among 130 long term hospitilised elderly over 11 months. The residents were divided into three groups (A, B and C). In group A, a dental hygienist provided oral hygiene measures every 3 weeks, in group B, the nursing staff first received hands-on instruction and thereafter assumed responsibility for the subjects' daily oral hygiene. Group C served as a control. The best outcome for both denture and dental hygiene occurred in group B. The proportion of those with good denture hygiene increased from 11% to 56%.

Simple measures such as the application of fluoride varnishes and the use of medicated chewing gum can decrease active caries lesions and improve stomatological health (Ship, 2002; Ekstrand et al., 2007). In the latter study, however, the authors failed to mention the periodontal health and diet of the subjects which are both factors in the progression of carious lesions.

2.16 Oral health education programmes for carers of dependent older people in the community

There are few studies involving preventive programmes for older people living in the community. A small number of studies have been conducted in Japan involving home carers (Atsushi et al., 2003; Shimoyama et al., 2007). In both studies, over 90% of home carers recognised that oral care needed to be provided for dependent older people. However, Atsushi and co-workers (2002) reported that only 11% put oral care into practice. The carers indicated they wished to know more about denture management, the routine of oral care and infection control. Tomuro (2004) conducted a very small pilot

study in Tokyo involving four home dwelling older males. The aim of the study was to develop and evaluate a telecare programme for home dwelling elderly. The results were promising and there were changes in knowledge of oral care, general health and diet amongst the males. However, limitations must be recognized due to the very small numbers in this study.

2.17 Barriers to providing oral care to older people

Often oral care is neglected and treated as a low priority. It can be seen as distasteful and is often delegated to untrained staff. Many barriers have been highlighted such as understaffing, lack of time, older people's refusal of help and older people's perceived ability to manage the oral care themselves (Eadie & Schou, 1992; Wardh et al., 1997). In a recent investigation, White (2009) carried out a cross-sectional descriptive study among care home managers and concluded that oral healthcare and support falls below that of current guidance in a large proportion of care homes in Scotland. Barriers such as lack of staff training and lack of oral health materials had an effect on reaching a good oral health standard (White, 2009).

Various studies have emphasised the need to tailor educational programmes differently for personnel with high and low levels of health care education, the former favouring theoretical and the latter practical training (Wardh et al., 1997; Paulsson et al., 1998 and 2001). However, Frenkel and co-workers (2002) found the least favourable part of the training amongst this group was the simulated brushing on a manikin head. This may be explained by a reluctance of these care-workers to provide intra-oral care (Nicol et al., 2005).

Promoting effective oral hygiene practices is a complex issue and deep rooted barriers relating to the provision of oral care need to be addressed (Eadie & Schou, 1992).
It is felt that working with care worker's own attitudes to oral health care probably gives more successful results than if these are denied. Once the desired behaviour change has occurred, then the lack of knowledge about oral health care can be addressed (Wardh et al., 1997).

High levels of staff turnover have been indicated as a barrier to providing training for nursing home staff (Simons et al., 2000). However, this is not such a significant factor in remote locations due to limited job opportunities (Nicol et al., 2005). This latter study, one of the few to find that mouth care training had an impact on practice, with a measurable improvement in oral health, was set in Caithness, a remote location in the Highlands of Scotland (Nicol et al., 2005).

2.18 Barriers to providing oral care to older people in non-institutionalised care

Barriers to the provision of oral health care for the non-institutionalised have been less well documented. In Sweden, Wardh and co-workers (1997) undertook a descriptive study using questionnaires to investigate staff attitudes to the provision of oral health care among registered nurses (N=70), nursing assistants (N= 148) and home care aides (N=146). The home care aides had a less positive view of oral care in comparison to registered nurses and assumed their clients were capable of carrying out their own oral care. In the USA, Strayer (1995) undertook a study, involving a questionnaire and an oral examination, among 50 service users of a social service agency to identify barriers to accessing dental care. This study identified the cost of delivery of oral care, access and transportation difficulties as significant factors and noted that due to more people viewing home care as a lower cost alternative to nursing home care, such care may place increasing demands on the health service in the future.

2.19 Local authority home care provision in Caithness, Scotland

The Highland region of Scotland covers almost 10,000 square miles and has a widely distributed population group, with almost half of its 220,000 inhabitants living in the more remote and rural areas of the region (Hally et al., 2003). There are nine people per km^2 in the Highlands, compared to 3,329 per km^2 in Glasgow (GRO, 2008). Caithness is a region within Highland, in the north east of Scotland, and has a population of 25,101 spread over 1806 km^2. The two main towns in Caithness are Thurso, with a population of 7,740 and Wick, with a population of 7,924 (Scottish Government, 2008).

The role of care givers is of particular importance in the Highlands due to its remote and rural location. Local authority home carers assist in a range of personal care procedures including hygiene, food and diet and assistance with simple medication. In the Highlands, in 2008, 2,105 clients received a service from the local authority (Scottish Government, 2008). Following assessment by the home care management team, each service user is categorised into one of three care need groups - moderate, substantial or critical, and their care package is created from this assessment. At present, in Highland, oral care is not included in the initial assessment of the older person or as part of the care package, unless specifically asked for by the older person.

2.20 Dental services in Caithness, Scotland

Currently, in Highland there is a shortage of NHS dental services and this is reflected in Caithness also where there are three private dental practices, four practices within the salaried service and no independent NHS practices. Due to the shortage of NHS dental services in the Highlands, a waiting list has been created for people to register. At present, approximately 7,410 people are on the waiting list in Caithness (NHS Highland, 2009). Figures indicate that in Highland 36.3% of those aged 65-74 years and 32.8% of those aged 75 years and over are registered with NHS dental services. These are lower than the figures for Scotland of 51.2% and 42.5% of those aged 65-74 years and 75 years and over, respectively (ISD Scotland, 2009).

2.21 Summary of literature review

Current government policy in Scotland is to encourage older people to remain in their own homes for longer (Scottish Executive, 2007a). More people are choosing this alternative to care homes, with the assistance of family, local authority-based services or private care. While the poor oral health status of many elderly care home residents has been recognised and attempts made to improve the situation through staff training, there is a lack of information relating to the oral health status of functionally dependent older people living in their own homes. The potential role of local authority-employed care assistants in the provision of oral care also requires exploration. This issue may be

particularly relevant to the more rural areas and to locations where there are difficulties accessing dental services such as the Highlands in Scotland.

The review of the literature thus suggests there is a need to undertake research relating to the provision of oral health care for functionally dependent older people to inform the development of appropriate care programmes aimed at maintaining the oral health and quality of life for this rapidly expanding population group.

Chapter 3
Research aims and objectives

3.1 Research aims

The study, conducted within the Caithness region of Scotland, had two major aims. The first was to assess the baseline and post-oral health training knowledge, attitude and behaviour of local authority-employed care givers in relation to the provision of mouth care for their client group, i.e. dependent older people living in their own home. The second aim was to assess the oral health status of this latter population group.

It was hoped the investigation would provide useful data to inform the development of future oral health care programmes for this population group and appropriate training programmes for home carers.

3.2 Hypothesis

The provision of an oral health training programme to home carers will improve their knowledge, attitude and behaviour towards the oral health of their client group.

3.3 Study objectives

- To measure the baseline knowledge, attitude and behaviour of local authority caregivers in Caithness in relation to mouth care of their older people client group;
- To provide an oral health training programme for the caregivers and measure any change of knowledge, attitude or behaviour of the caregivers regarding the provision of oral care to their client group following receipt of the training programme;
- To assess the views of older people in the Caithness region, receiving care in their own home from local authority care givers, relating to their perceived oral health status and the potential role of care givers in assisting them with oral hygiene;
- To assess clinically the oral health status of a group of older people in the Caithness region, receiving care in their own homes from local authority care givers;
- Through the study, to provide data to inform the development of future training and oral care programmes which could be evaluated via a randomised control trial.

Chapter 4
Methods

4.1 Ethical approval

The NHS REC application version 5.5 was completed online and sent to the North of Scotland Research Ethics Committee. A protocol of the study was also sent which described the study, outlined the aims and objectives and included a literature review, method, timetable of study and appendices. Following the meeting of the Committee in Aberdeen, some amendments were made to the paperwork. It was agreed that all data would be stored anonymously, any identifiable data would not be stored on a laptop and all data would be stored for 10 years and then destroyed.

4.2 Research & Development approval

Research and Development approval from NHS Highland was also required before the study was allowed to proceed. The NHS REC application version 5.5 was sent to the Research and Development office in Inverness, together with the protocol and details of any amendments made prior to approval being granted. A service support costs form was also completed for use of materials and staff from NHS Highland. A site specific form was not required as neither the training of home carers nor the assessments of older people were taking place on NHS property.

4.3 Sponsorship

The Research Ethics Committee requires a Research Governance Sponsor for each study. A project sponsorship checklist was completed and sent to the Senior Contracts Manager of the Research and Enterprise team at the University of Glasgow. An authorised signature was provided by the Research and Enterprise team and sponsorship was provided.

4.4 Funding

A total of four thousand pounds was provided by NHS Education for Scotland to pay for the home care staff training and for the cost of materials related to the training.

4.5 Study population of home care staff

All home carers (N=121) and members of the Home Care Management Teams (N=10) employed by Highland Council and working in Caithness were invited to take part in the study.

4.6 Home Care Department

The Home Care Department in Caithness was approached to take part in the study. The Chief Investigator discussed the proposed study with the Care at Home Co-ordinator and members of the Home Care Management Team. Thereafter, the Social Work Services Department, based in Inverness, was made aware of the study and approval given by the Head of Operations in Community Care. An agreement was made that a fee of £14.95 per hour per carer (inclusive of travel expenses) would be paid to Highland Council to defer the costs of bringing the home carers together for the training. A certificate on mouth care would be awarded to home carers who completed the training.

4.7 Telephone interviews with Home Care Management Team

Initially, telephone interviews were arranged between the Chief Investigator and individual members of the Home Care Management Team. A covering letter was first sent to the members of the management team explaining the purpose of the interviews (Appendix i). A telephone interview was then arranged, which took approximately five minutes. The interview asked four questions about their views on the importance of oral health care and their opinions on oral health training for home carers (Appendix ii).

4.8 Training of home care staff

4.8.1 Consent

Informed consent was required from each home carer before the training commenced. Each home carer was given an information sheet (Appendix iii), bearing the NHS Highland logo, which explained the purpose of the study. It explained that there was no obligation to take part, the home carer was free to withdraw at any time and that all data would be recorded in an anonymous format. If the home carer was willing to take part, two copies of the consent form were signed by the home carer and a witness. One consent

form was taken by the Chief Investigator and the other consent form, together with the information sheet, was retained by the home carer.

4.8.2 Baseline training programme

A training programme took place at Pulteney House, the offices of the Home Care Management Team. The training programme was conducted by the Chief Investigator and her dental nurse, and was observed by a Clinical Senior Lecturer in Special Care Dentistry, University of Glasgow. A 90-minute training session was delivered on ten separate occasions, each session being held on an afternoon to minimise disruption to the service users. Each home carer was invited by the Home Care Management Team to attend one of the sessions, with approximately ten invitees per session.

4.8.3 Content of training

The components of the training are listed below:

- Questionnaire 1
- Video of "Down in the Mouth"
- PowerPoint presentation on Mouth Care
- Tooth brushing demonstration
- Question and answer session
- Questionnaire 2
- Evaluation questionnaire

4.8.4 Questionnaire 1 (Appendix iv)

A validated questionnaire, previously used in a study assessing the effect of an oral health care education programme on nursing home caregivers' knowledge and attitude (Frenkel et al., 2002), was adapted to be relevant to home carers. This was completed at the beginning of the training to assess the home carers' knowledge and attitudes prior to any mouth care training. The questionnaire took approximately 15 minutes to complete. Knowledge relating to the care of dentures and natural teeth was tested by true/false responses to 26 statements. Responses on a five-point Likert scale to 20 statements on oral health care (including 12 on home carers' own oral health) assessed attitudes. Data

were also collected on the home carers' pattern of attending the dentist (Frenkel et al., 2002). Home carers were invited to write comments on the mouth care of their clients, their own views and their experiences of dental health and dental treatment. They were also asked to imagine themselves in a situation where they received care in their own home and recommend any improvements in mouth care.

4.8.5 Video presentation

A video of "Down in the Mouth" was then shown. This forms part of a resource pack which was developed to train medical, nursing and untrained care staff to recognise oral disease and carry out routine oral care. The video lasts 22 minutes and was filmed on location in a specialized hospital unit for care of the elderly. The video is split into different sections. It shows common oral diseases including dental caries, periodontal disease and oral candidosis and demonstrates denture care, dentate care and management of a dry mouth (Sweeney et al., 2000).

4.8.6 PowerPoint presentation on mouth care

A PowerPoint presentation was given by the Chief Investigator. This contained information on the care of dentate and edentate mouths. All material used in the slides was sourced from the multimedia resource pack mentioned above (Sweeney et al., 2000). A healthy mouth was described and pictures of healthy dentate and edentate mouths were shown. Pictures of unhealthy mouths, due to gum disease and tooth decay were then shown. The reasons for decay and factors which make people more prone to decay, such as dry mouth and not using fluoride toothpaste, were discussed. The relationship between plaque and gum disease was explained and the importance of good oral hygiene to help prevent gum disease. A brushing technique was then described and demonstrated on tooth models. The insertion and removal of dentures was described. A cleaning technique for dentures was presented and advice regarding solutions for the storage of dentures was given. Clinical photographs of fungal infections related to denture wearers, such as angular cheilitis, were shown.

4.8.7 Tooth brushing demonstration

A selection of tooth brushing aids was passed around, including adapted toothbrush handles, denture brushes, interdens brushes and angled toothbrushes. Tooth models, partial acrylic dentures and recommended denture solutions were also available for inspection. A demonstration of toothbrushing was given by a dental nurse on the Chief Investigator and on tooth models. Home carers were invited to take part in pairs and carry out toothbrushing on each other.

4.8.8 Question and answer session

Questions and comments were invited from the home carers to allow discussion of any potential problems, fears or anxieties in providing oral health care for their clients.

4.8.9 Questionnaire 2 (Appendix v)

Following the discussion, an adaptation of a questionnaire (Bonetti, 2009) designed to investigate health care beliefs and attitudes of care workers in relation to providing oral health care for children was given to each home carer. This was to assess their beliefs and attitudes in relation to oral health care provision for their client group. It took ten minutes to complete.

Part 1

The first part identified demographic information about the home carer, the number of clients cared for and the length of time the home carer had been working as a carer and what shift the home carer usually worked.

Part 2

The second part was divided into seven different sections investigating the intention to provide oral health care and the intention to develop plans to incorporate oral health care into everyday working life. Each section was coded on a seven-point Likert scale. It also assessed theoretical variables related to providing oral health care (attitude, perceived behavioural control, and self efficacy). The last section provided space for any written comments related to providing oral health care.

4.8.10 Evaluation questionnaire (Appendix vi)

An evaluation questionnaire (Nicol et al., 2005) was given to each home carer to complete at the end of the training session. Space was provided for written comments.

4.8.11 Notebook allocation

At the end of training, a pack containing a laminated protocol (Appendix vii) relating to dentate and edentate care was given to each home carer. The pack also included a toothbrush and toothpaste for personal use and a notebook. A series of instructions was provided on the front page:

"Please enter clients name and date of birth at the top of each page (1 page per client). Then every time you prompt, advise or carry out oral care for the client please note, sign and date it in the book, thanks"

The carers were asked to use the notebook for four weeks. A return date was provided and the carers were informed that an award of a certificate for the training depended on return of the notebook.

4.8.12 Follow-up training

Six months later, follow-up training took place and all those who attended the baseline training were invited to attend. This was again arranged to take place at Pulteney House. As before, each session lasted 90 minutes and was arranged for the afternoon to minimise disruption to the service users. Each home carer was invited by the home care management team to attend, in groups of approximately 10 per session. The Chief Investigator, a dental nurse and a senior member of staff from the University of Glasgow conducted the training.

The follow-up training sessions contained the following elements:

- Questionnaires 1 (Appendix iv) and 2 (Appendix v)

- PowerPoint presentation, including results of the clinical assessments of their client group
- PowerPoint presentation of common oral conditions
- Question and Answer session
- Evaluation questionnaire

Questionnaires 1 and 2 were administered at the beginning of the follow-up training session to assess any change in the knowledge and attitude of the home carers from the baseline training session.

The first PowerPoint presentation contained a selection of results from the clinical assessment of the service users, conducted by the Chief Investigator. Thereafter, a recent case of neglected oral health care, which had received media attention, was highlighted to the home carers (BBC news "Home sued over dental care"). The oral health care of dentate and edentate patients was then reinforced, describing techniques and recommended products. Key points for providing oral health care were summarised to conclude the first presentation.

The second PowerPoint presentation contained clinical photographs of problems in the mouth related to fungal and viral infections, poor dental care and poorly fitting dentures. The home carers were encouraged to take part in a structured case discussion about each scenario.

A final discussion was held with the home carers when they had the opportunity to raise any problems they faced or difficulties they had concerning the provision of oral health care to their service users.

The collection of notebooks then took place. A mouth care certificate (Appendix viii) was given out to those who completed both training sessions and returned their notebook. The oral health care training certificate was an adaptation of one used in a previous study (Nicol et al., 2005).

4.8.13 Evaluation of training

The same evaluation questionnaire (Appendix vi) was given to each home carer at the end of the session.

4.8.14 Analysis of questionnaires before and after training

All data were entered into the SPSS 15.0 system. Analysis of the change in response to the knowledge questions (correct/incorrect) for home carers before and after training was assessed using McNemar's test. A statistically significant result indicates a significant change (positive or negative) in the percentage of home carers responding correctly to the question. Individuals responding "don't know" to any of the questions were excluded from this analysis.

The changed response to the attitudinal questions (Likert scales) for home carers before and after training was assessed using Wilcoxon's Signed Rank test. This test considers the magnitude of change in response in addition to direction of change.

4.9 Service users study

4.9.1 Study population

Approximately 400 people who live in Caithness receive home care services from Highland Council.

4.9.1.1 Selection criteria

The Home Care Department was asked to randomly select 60 older people receiving home care from their service, comprising 20 from each of the following care categories: "moderate", "substantial" and "critical". The selected service users were invited by the home care management team to take part in the study. If they agreed to this, the Chief Investigator then contacted them and a visit was arranged.

4.9.1.2 Exclusion criteria

As the service users are classed as vulnerable adults, it was important they understood what the study was about before consenting to it. Those that had a lack of capacity to understand the study were excluded. A number of those who were receiving critical care were deemed not to be suitable for the study by the Home Care Management team. This was due to the fact they did not have the capacity to understand or were too ill to receive a visit. This led to a decrease in the number of service users involved in the study who were receiving critical care and the management team was asked to make the total number of participants up to 60 through the selection of additional clients from the other two categories.

4.9.2 Design of assessment

Each service user received a structured interview and an oral health assessment. This was carried out by the Chief Investigator and a dental nurse. It took place in the service user's own home, sheltered housing or in a day care centre. The assessment and interview lasted approximately 30 minutes in total.

4.9.3 Consent

An information sheet (Appendix ix) explaining the purpose of the study was given to the service user prior to the assessment. If the service user agreed to take part, two copies of the consent form were signed by the service user and the Chief Investigator. If the service user had the capacity to understand what the study was about, but was unable to sign the consent forms, a member of their family signed on their behalf. In each case, one consent form was retained by the Chief Investigator and the other was kept by the service user, together with the information sheet.

4.9.4 Structured interview (Appendix x)

Socio-demographic details such as age, sex and postcode were recorded. The service user's dental history, including current registration and date of last appointment was collected.

A series of questions were asked regarding their home care in general and included whether any mouth care was provided. The service user was also asked whether they had any problems associated with their mouth such as pain, problems with speech, swallowing or a dry mouth. A detailed medical history was taken and smoking and alcohol histories were also recorded.

4.9.5 Oral health assessment (Appendix xi)

After the structured interview, an oral health assessment of the mouth was carried out. This was similar to a dental check-up and recorded the number and dental status of any natural teeth, the presence, type and condition of dentures and an assessment of soft tissues. Illumination was provided by a pen torch and dental mirrors were used to retract soft tissues and assess the dentition. A square piece of gauze was used to aid the examination of the tongue.

4.9.5.1 Status of natural teeth

A charting was carried out and each tooth was recorded as decayed (into dentine), missing or filled. Caries was noted as being present on the coronal surface or on the root surface or both. Calculus was recorded as being present on the lower anterior teeth only and/or also on other sites.

A debris index (Greene & Vermillion, 1964) was recorded using the criteria below:

0 - no debris or stain present

1 - soft debris covering not more than one third of the exposed tooth surface or extrinsic stain, without other debris, regardless of surface area covered

2 - soft debris covering more than one third, but not more than two thirds, of the exposed tooth surface

3 - soft debris covering more than two thirds of the exposed tooth surface

4.9.5.2 Assessment of dentures

If the service user wore dentures, these were assessed for cleanliness in two ways. The first method was by visual appearance, unaided. The level of cleanliness was recorded as

"good" if there was no presence of plaque or debris on the denture, "satisfactory" if there was a small amount present or "poor" if there was a lot of plaque or debris present. The second way was by visual appearance, with the aid of a 10µl bacteriological loop. The loop was swept across the fitting and non-fitting surfaces of the dentures (Simons et al., 2001) and the amount of debris on the denture was recorded as follows:

0 - no debris in loop

1 - presence of debris (loop less than half full)

2 - loop half full of debris

3 - loop full of debris

The retention of each denture was recorded as "good", "satisfactory" or "poor".

4.9.5.3 Xerostomia

Xerostomia was recorded as present if the mucosa appeared dry and a dental mirror adhered to the buccal mucosa when pressed against it.

4.9.5.4 Microbiological assessment

A microbiological swab (Transport swabs Amies w/o charcoal®, Copan Italian spa) was taken from the dorsal surface of the tongue, the hard palate and the upper denture if present, and stored in a transport medium. If angular cheilitis was present, a swab was also taken from both angles of the mouth. All swabs were collected and posted first class delivery to the Microbiology Laboratory at Glasgow Dental Hospital and School. On arrival they were inoculated onto blood agar, mannitol salt, Pagano Levin and Sabaroud's agar plates (all made and poured in-house) and incubated at 37°C for 48 hours. A semi-quantitative assessment of growth was made, in which confluent growth was defined as "heavy", semi-confluent growth as "moderate" and scattered colonies as "light" growth (Bagg et al., 2003). To identify the yeast species, germ tube tests were performed and, in addition, API 20E and API 32C (bio-Mérieux S A, Marcy-l'Etoile, France) profiles were determined for all species (Bagg et al., 2003).

Catalase and coagulase tests were carried out to identify bacterial species.

Susceptibility to fluconazole and itraconazole was determined by gradient MIC (minimum inhibitory concentration on agar plates) (ABbiodisk® Solna Sweden).

4.9.5.5 Soft tissue assessment

An assessment of the soft tissues was then conducted and the findings recorded using a standardised form. The twenty mucosal sites listed on the form were each recorded as "normal", "ulcerated", "white", "red", "swollen", "pigmented" or "other" (Sweeney et al., 2007).

4.9.5.6 Assessment of treatment need

Any treatment required was noted and assessed as urgent or routine. If any treatment was required, this was offered through the NHS salaried services.

4.9.6 Statistical analysis

All data management and analyses were carried out in SPSS for Windows (version 15.0). Clinical and biological significance were considered in parallel with statistical significance. Descriptive statistics were presented as follows: For continuous data, means and standard deviations were reported for normally distributed data and medians, interquartile ranges were reported for data that were skewed. For categorical data, percentages and totals were reported.

The relationships between categorical variables based on service users responses were described using cross-tabulations, and analysed using Pearson's Chi-Squared tests, and in cases where the expected cell frequency<5, Fisher's Exact Tests.

4.9.6.1 Sensitivity and specificity

The sensitivity and specificity of assessing the cleanliness of dentures using unaided visual assessment (screening tool) versus aided visual assessment (loop), and microbiological analyses (gold standard) were calculated. Dentures were visually assessed as clean if there was no presence of plaque or debris visible (unaided) or if there

was a plaque score of 0 (aided). Dentures were assessed as visually unclean if there was a presence of plaque or debris (unaided) or if the plaque score was greater than 0 (aided). Sensitivity (detection rate) is defined as the percentage of *affected* individuals who are *screen-positive*. Specificity (100% - false positive rate) is defined as the percentage of *unaffected* individuals who are *screen-negative*.

Chapter 5
Results

5.1 Telephone interviews with Home Care Management Team

Interviews were conducted with six local Home Care managers. All interviewees considered mouth care to be part of the home carer's remit and were in favour of mouth care training. The majority (five) felt that mouth care was part of personal care and ranked personal care highest in priority. One manager did not include mouth care as part of personal care and ranked it fourth on a list of five aspects of care including domestic care, social duties, emotional support, personal care and mouth care. They all felt that mouth care training programmes should be available and thought they would benefit both the service users and the home care staff. The managers wanted the training to cover cleaning teeth and dentures and for it to increase awareness among staff about oral diseases and mouth problems which may occur.

5.2 Training

5.2.1 Participants

In total, 77 of the 131 invited home carers (59%) attended the baseline training session and 63 (82% of baseline; 48% of those invited) of these returned for the second training event. All 77 of the attendees were female. The age profile of the 131 home carers invited to attend the training is shown in Table 1.

Table 1: Age profile of home carers in Caithness

Age of home carers (years)	Number (%)
20-29	5 (3.8%)
30-39	21 (16%)
40-49	40 (30.5%)
50-59	42 (32%)
60+	23 (17.6%)

The carer's work profile was collected using data from the second questionnaire from the initial training session. More than half of the 77 (53%) carers stated they worked the early morning shift and 22.1% stated they worked all day. The carer's work profile is shown in Table 2.

Table 2: Carer's work profile

	Response Number	Median	1st Quartile	3rd Quartile	Minimum	Maximum
No. of service users per carer	**68**	**5**	**2.75**	**8.25**	**1**	**17**
No. of years worked	**74**	**6.8**	**3**	**15.3**	**0**	**29.5**
No. of sessions worked per week	**62**	**6**	**4.8**	**12**	**1**	**15**

5.2.2 Questionnaire 1

The results of the questionnaire, adapted from Frenkel and co-workers (2002) are based on those who attended both training sessions (N=63).

Tables 3 and 4 show the answers to the 26 questions from the questionnaire before and six months after the initial training. The "total number" is defined as the number of home carers who attended both training sessions and answered both questions (i.e. "before" and "after").The "valid number" represents those who answered either "true" or "false" on both questionnaires and excludes the home carers who answered "don't know".

5.2.3 Knowledge of denture care

Statements 1 – 11, related to denture care, are shown in Table 3. Although there were no significant differences, with regard to any of the statements, in the proportion of respondents answering correctly before and after the training, a high percentage of carers answered most statements correctly at both times. At baseline over 90% knew that unclean dentures cause mouth infection (Statement 5), dentures should be rinsed after meals and that cleaning solutions alone do not remove debris. Knowledge was low for

statement 8, that denture stomatitis could be symptomless, however, there was some improvement after the training (13.1% to 21.3%), although not statistically significant. Overall, there was little change in the mean percentage of correct answers related to denture care before and after the training (70.5% to 73.3%).

Table 3: Participant response in relation to knowledge of denture care

Question related to denture care (Correct response)	Don't know		Correct		Incorrect		Total Number	*p* value	Valid Number
	Before %	After %	Before %	After %	Before %	After %			
1. Ideally, dentures should be taken out at night (True)	5.1	5.1	89.8	88.1	5.1	6.8	59	1.000	55
2. Denture cleaning solutions remove the dirt without needing to brush them as well (False)	0	3.3	93.4	95.1	6.6	1.6	61	.250	59
3. Soft food often sticks to dentures, but it does not make them uncomfortable to wear (False)	16.9	6.8	59.4	69.5	23.7	23.7	59	1.000	46
4. Bacteria tend not to stick to the surfaces of dentures (False)	3.3	3.3	85.2	82	11.5	14.7	61	.754	57
5. Unclean dentures can cause mouth infections (True)	0	0	98.4	98.4	1.6	1.6	61	1.000	61
6. For clients' comfort, dentures should be rinsed after every meal (True)	13.1	6.6	83.6	90.1	3.3	3.3	61	1.000	51
7. Clients without any natural teeth only need a dental check-up when they have a problem (False)	14.8	6.6	63.9	77	21.3	16.4	61	.125	49
8. Clients usually notice discomfort if they have a gum infection underneath their dentures (False)	9.8	11.5	13.2	21.3	77	67.2	61	.424	52
9. A dirty denture may be an unsightly one but it will not cause any disease in the mouth (False)	5	11.7	85	83.3	10	5	60	.375	51
10. Thorough brushing cleans dentures more effectively than soaking in a denture cleaner (True)	18.6	18.6	62.7	59.4	18.7	22	59	.754	41

Question related to denture care (Correct response)	Don't know		Correct		Incorrect		Total Number	*p* value	Valid Number
	Before %	After %	Before %	After %	Before %	After %			
11. Wearing a denture increases the number of bacteria in the mouth (True)	39.2	36.1	41	42.6	19.7	21.3	61	1.000	26

p-value based on McNemar's Test of before versus after in those with true/false response

5.2.4 Knowledge in relation to care of the dentate mouth

Statements 12-26 related to knowledge of care of the dentate mouth. As shown in Table 4, after the initial training, knowledge improved significantly with regard to statement 12, i.e. that a softer toothbrush was better for cleaning natural teeth from 39% before to 64% after ($p= 0.001$). There was also a significant improvement after training in the number of carers who knew that it was possible to halt gum disease (Statement 25) from 72.6% to 79% ($p= 0.031$). However, the number of carers incorrectly indicating that a mouth swab was a good alternative to a toothbrush increased after training ($p= 0.013$) (Statement 18) from 16.4% to 41%.

A high percentage of carers (over 90%) correctly knew at baseline that brushing improved the gingival condition (statement 16), sugary diet increased the risk of decay (statement 17) and gloves should be worn when cleaning teeth (statement 23). Knowledge was low at baseline and remained low at follow-up for statement 14, that a lack of calcium was not a risk factor for tooth decay (1.6% to 4.8%), and only a small percentage of carers knew that gingivitis could be symptomless (25% to 23.3%)(Statement 22).

Overall, there was little change in the mean proportion of correct answers relating to knowledge of dentate care (52.5% to 55.8%) following the training.

5.2.5 Attitude to oral care

The second part of the questionnaire explored the carers' attitudes to oral health care. Table 5 shows 20 statements and their answers before and after the training.

With regard to statement 1, on comparing post- with pre-training responses, a significantly ($p<0.001$) higher proportion of carers disagreed with the statement they felt more uncomfortable brushing clients' teeth compared with other types of personal care. Carers felt significantly less confident about cleaning clients' natural teeth ($p= 0.007$) (Statement 4) following training, however, over 70% remained confident about carrying out this task.

A high percentage believed they could play a useful part in preventing their clients from getting gum disease (82% to 83.6%) (Statement 5) and decay (85.5% to 83.3%) (Statement 2).

Table 4: Participant responses in relation to knowledge of care of the dentate mouth

Questions related to dentate care (correct response)	Don't know		Correct		Incorrect		Total number	P value	Valid number
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)			
12. A softer toothbrush is better than a hard one for cleaning clients' teeth (True)	23.7	16.9	39	64.3	37.3	18.6	59	.001	37
13. A large-headed toothbrush is less efficient at cleaning teeth than a small-headed toothbrush (True)	21.7	15	38.3	43.3	40	41.7	60	.648	41
14. Lack of calcium can put clients at risk from tooth decay (False)	8.1	14.6	1.6	4.8	90.3	80.6	62	.250	50
15. Old people's teeth are less prone to decay than younger people's teeth (False)	6.6	11.5	77	80.3	16.4	8.2	61	.289	52
16. Brushing clients' teeth will also improve the condition of their gums (True)	6.5	4.9	93.5	91.9	0	3.2	62	.500	56
17. If clients' have a lot of sugary food and drink, their teeth are more likely to decay (True)	4.9	3.3	90.2	90.2	4.9	6.5	61	.625	57
18. A mouth-swab is a good alternative to a toothbrush for cleaning clients' teeth (False)	19.7	18	63.9	41	16.4	41	61	.013	42
19. It is possible to catch certain infections from contact with a clients' saliva (True)	21	24.2	66.1	58.1	12.9	17.7	62	.63	41
20. Bacteria in clients' mouths are one of the causes of dental decay (True)	14.5	11.3	79	87.1	6.5	1.6	62	.250	49

Questions related to dentate care	Don't know		Correct		Incorrect		Total number	P value	Valid Number
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)			
21. Clients with dry mouths will tend to get less decay (False)	48.4	25.8	48.4	69.4	3.2	4.8	62	1.000	28
22. Even if the gums around the teeth are inflamed or bleeding, they do not usually cause any pain (True)	5	18.3	25	23.3	70	58.3	60	1.000	47
23. For health and safety reasons, you should wear protective gloves when cleaning clients' teeth (True)	0	0	100	98.4	0	1.6	62	1.000	62
24. Most clients with bad teeth will have inherited a tendency to get decay (False)	17.7	17.7	51.6	61.3	30.6	21	62	.388	45
25. Once gum disease has started it is almost impossible to halt (False)	12.9	17.7	72.6	79	14.5	3.2	62	.031	46
26. Older people can often get more decay than younger people (True)	33.9	19.4	27.4	27.4	38.7	53.2	62	1.000	39

p-value based on Mc Nemar's test of before versus after in those with true/false response

Table 5: Attitudinal statements before and after training related to providing oral care

Statements related to providing oral health care	Neutral		Agree		Disagree		N	P value
	Before	After	Before	After	Before	After		
1. I would feel more uncomfortable brushing inside a client's mouth than I do with most other kinds of personal care	30.6	4.8	27.4	30.7	41.9	64.5	62	<0.001
2. I believe I can help in preventing my clients' teeth from becoming decayed	9.7	4.8	85.5	83.3	4.8	11.3	62	0.588
3. I think that only the dentist can prevent clients' teeth from decaying	8.2	0	9.8	16.4	82	83.6	61	0.067
4. Cleaning clients' natural teeth is a task I feel confident to carry out	13.6	3.4	79.7	74.6	6.8	22.1	59	0.007
5. I believe I can play a useful part in preventing my clients from getting gum disease	9.8	3.3	82	83.6	8.2	13.1	61	0.717
6. I think that the dentist is the only person who can help clients who have gum disease	4.9	6.6	29.4	24.5	55.8	59	61	0.131
7. Brushing teeth is a very personal thing that you should not be expected to do for somebody else	4.9	11.5	18	18.1	77	70.4	61	0.266
8. In my opinion, it is better to wait until clients have a problem before asking the dentist to see them	0	1.6	22.6	11.3	77.4	86.5	62	0.135

p-value based on Wilcoxon's Signed Rank test

5.2.6 Opinion related to carers own oral health

A high percentage of respondents at baseline and follow-up (90.1% and 88.5%) disagreed with statement 10 that there was little they could do to prevent getting dental problems and a similarly high percentage of carers (93.2% and 91.2%) hoped that someone would be able to clean their teeth if they were too ill or disabled to do so themselves (Statement 15) (see Table 6).

Although over 80% of carers believed it was important to keep all of their teeth (statement 17), approximately 50% thought it was inevitable that they would lose some teeth as they got older (statement 14).

Post-training, a higher proportion of carers disagreed with the statement that they relied on the dentist to prevent dental problems (50.9% to 63.2%) (Statement 18) and a high percentage (86.9% to 95.1%) believed it was the carer's own responsibility to look after the health of their mouth (Statement 20).

Table 6: Opinions related to carers own oral health

Statements related to opinion about how carer feels about their own oral health	Neutral		Agree		Disagree		Number	p value
	Before	After	Before	After	Before	After		
9. I believe my own teeth should last me throughout my life	0	5.2	69	74.2	22.4	20.7	58	0.988
10. I find there is very little I can do to prevent myself getting dental problems	4.9	1.6	4.9	9.8	90.1	88.5	61	0.184
11. I feel that dentures are less trouble than looking after your own teeth	8.5	8.5	22	15.3	69.5	76.2	59	0.177
12. If my gums bleed when I brush, I suppose it means I have been brushing them too hard	4.9	4.9	16.1	16.1	78.6	78.9	61	0.292
13. Up to now, I feel I have looked after my own teeth well	11.3	8.1	67.8	67.8	20.9	24.2	62	0.632
14. As you get older, I think you are bound to lose some of your teeth	8.6	6.9	58.6	46.6	32.8	47.1	58	0.130
15. If I was too ill or disabled to clean my own teeth, I hope somebody would do it for me	1.7	3.4	93.2	91.2	5.1	3.4	59	0.159
16. I worry that I haven't been able to look after my own teeth as well as I would have liked	7.3	7.3	60	47.3	32.7	45.5	55	0.526
17. It is important to me to keep all of my own teeth	10.3	6.9	79.3	84.5	10.3	8.6	58	0.816
18. I rely on the dentist to prevent me from getting dental problems	12.3	3.5	36.9	33.3	50.9	63.2	57	0.046
19. If my gums bleed when I brush my teeth, I worry that I am not looking after them well enough	5.1	6.8	44.1	47.5	50.9	45.8	59	0.594
20. It is my own responsibility to look after the health of my mouth	3.3	0	86.9	95.1	9.9	4.9	61	0.671

p-value based on Wilcoxon's Signed Rank test

5.2.7 Qualitative responses to additional questions

The proportion of carers reporting they attended a dentist once a year increased after the initial training session from 55.4% to 66.1% (p=0.388).

Responses to open ended questions at the end of the questionnaire revealed a common concern regarding the cost of dental treatment and the lack of NHS dentists in the area.

"I would like to see the dentist being more available to the people. I feel over the last decade dental practices have failed the public"

"I have not been at the dentist for a few years, as I could not get registered anywhere. I have now got registered with a dental plan in Thurso this week. Most dental surgeries locally have their full quota of patients and have long waiting lists"

"I tend to find that the cost of dental care up here in the Highlands is very expensive"

Prior to the training there was also a reluctance to provide oral health care to their clients unless they were asked to do so.

In relation to cleaning natural teeth - "rather not do it and thankfully I don't have to"

"Oral hygiene is very important – but personal. If asked to clean dentures or whatever I would, but would not do it unless asked"

After the initial training, carers showed an increased awareness but still some reluctance to providing oral health care.

"I would feel very uncomfortable cleaning someone else's teeth! Although since doing the first phase of this course it has given me a big insight into looking after my children's teeth and my own teeth"

"Although I feel comfortable in providing oral care, if the client felt uncomfortable or gave strong indication they did not want this service provided, I would not force the issue"

All home carers who commented on imagining they were a client mentioned daily cleaning of teeth, regular encouragement and reinforcement of daily oral care as activities they felt home carers could undertake.

"Giving client more information regarding mouth care. Carer to check mouth and gums on a regular basis. Keeping check of any dental appointments for me and give reminders, when necessary. Giving advice on diet/food intake relative to healthy teeth"

5.2.8 Questionnaire 2

The results are again based on the responses of those carers who attended both the initial and the follow-up training sessions (N=63).

Table 7 shows the results of the first two sections of the questionnaire which explored the carers' attitude, from an indirect perspective, to providing oral health care to their clients. After training, there was a significant increase in the proportion of home carers agreeing that the provision of oral health care to clients would be supported by their line manager (from 58.5% to 77.4%; p=0.042) and would allow the carer to make a contribution to the overall health of the service users (from 68.5% to 86%; p=0.031). After training, over 80% of home care staff thought it was important that this service would increase their job satisfaction; be supported by their line manager; and contribute to the overall health of their clients.

The results in Table 8 indicate the carers' perceived behavioural control, from an indirect perspective, in relation to providing oral health care. The question with the highest number of carers indicating a potential difficulty related to coping with the paperwork and this perception increased following training (22.4% to 31%; p=0.02).

Table 7: Carers' attitudes, from indirect perspective, to provision of oral health care

In general, (I expect) providing oral health care to my clients (will)	Agree %		Disagree %		Neutral %		Valid N	p-value
	Before	After	Before	After	Before	After		
Allow opportunity for my professional development	64.6	70.9	22.9	14.6	12.5	14.6	48	.472
Have a positive impact on my relationship with my clients and their family	53.8	64.9	29.7	22.3	16.7	13	54	.139
Severely disadvantage me in terms of time	17	30.2	52.8	47.2	30.2	22.6	53	.589
Severely disadvantage me in terms of workload	25.5	32.7	56.4	49	18.2	18.2	55	.572
Increase my job satisfaction	60	72.8	21.8	20	18.2	7.3	55	.212
Be supported by my line manager	58.5	77.4	26.4	15.1	15.1	7.5	53	.042
Be a financial burden on me	13.7	9.8	86.2	88.3	2	0	51	.713
Increase my anxiety	18.6	22.3	66.7	70.3	14.8	7.4	54	.87
Allow me to contribute to the overall health of my clients	68.5	86	24.6	12.3	7	1.8	57	.031
When providing ohc to my clients it is important to:								
Have opportunity for my professional development	84.9	75.4	5.3	17.6	10.5	7	57	.108
Safeguard my relationship with client and family	81	77.7	8.5	10.4	10.3	12.1	58	.562
Not be disadvantaged in terms of time	56.8	58.8	27.5	25.5	15.7	15.7	51	.664
Not be disadvantaged in terms of workload	58.5	54.7	24.5	20.7	17	24.5	53	.935
Increase my job satisfaction	87.9	82.7	5.1	10.3	6.9	6.9	58	.267
Be supported by my line manager	87.7	83.9	5.3	6.2	7	6.2	57	.835
Minimise my anxiety	78	70	14	10	8	20	50	.945
Contribute to the overall health of my client	93	92.9	1.8	7.1	5.3	0	57	.348

p-value based on Wilcoxon's Signed Rank test

Table 8: Expected difficulty in providing oral health care (ohc) for clients

How difficult do you expect it to be for you to:	Difficult %		Not difficult %		Neutral %		Valid N	p-value
	Before	After	Before	After	Before	After		
Provide ohc to your clients	23.4	23.4	69.9	70	6.7	6.7	60	.597
Find the time needed to provide ohc	22.1	18.7	73	74.6	5.1	6.8	59	.774
Gain support needed to provide ohc	17.9	16.1	69.7	75	12.5	8.9	56	.647
Cope with paperwork associated with providing ohc	22.4	31	63.8	51.7	13.8	17.2	58	.02
Cope with additional time demands caused by providing ohc	21.4	25	62.5	57.2	16.1	17.9	56	.077

p-value based on Wilcoxon's Signed Rank test

The results relating to the carers' perceived behavioural control, from a direct perspective, are shown in Table 9. There was a decrease over time in the proportion of home care staff who thought they could fit oral health care into their everyday practice if they really wanted to (74.9% versus 61.7%; p=0.07).

Table 9: Carers perceived behavioural control, from a direct perspective

How much do you agree with these statements	Agree %		Disagree %		Neutral %		Valid N	p-value
	Before	After	Before	After	Before	After		
I want to provide ohc but I don't really think I can	23.3	15.1	65	75	11.7	10	60	.408
I could fit ohc in with my everyday practice if I really wanted to	74.9	61. 7	18.3	28.4	6.7	10	60	.068
I am unable to do what is necessary to allow me to provide ohc	24.1	24.1	66.6	68.5	9.3	7.4	54	.819
I expect to have plans in place to help me incorporate ohc into my everyday working life	41.9	53.5	34.9	30.3	23.3	16.3	43	.357

p-value based on Wilcoxon's Signed Rank test

Results relating to self-efficacy are presented in Table 10. After training, more home carers felt less confident about providing oral health care (7.2% to 21.5%) (p=0.025) and about finding the time to provide such care (5.7% to18.9%) (p=0.036). However, overall, the majority of home carers were confident about all statements, both before and after the training.

Table 10: Carers' perceived confidence in providing oral health care (ohc)

How confident are you that you can:	**Not confident %**		**Confident %**		**Neutral %**		**Valid N**	**p-value**
	Before	**After**	**Before**	**After**	**Before**	**After**		
Provide ohc to your clients	7.2	21.5	78.9	69.7	14.3	8.9	56	.025
Find the time required to provide ohc	5.7	18.9	79.3	71.7	15.1	9.4	53	.036
Gain the support needed to provide ohc	7.4	13	76	79.6	16.7	7.4	54	.537
Cope with paperwork assoc with ohc	13	16.7	72.2	62.9	14.8	20.4	54	.580
Cope with additional time commitments	14.5	16.4	70.9	67.3	14.5	16.4	55	.556

p-value based on Wilcoxon's Signed Rank test

Table 11 shows the results in relation to the carers' attitudes, from a direct perspective, to the provision of oral health care for their clients. There were no significant differences before and after the training. Over 70% of home carers felt providing oral health care was useful, not stressful and something they wanted to do both at baseline and at follow-up.

Table 11: Attitudes, from direct perspective, to the provision of oral health care

For me providing ohc is :	**Agree %**		**Disagree %**		**Neutral %**		**Valid N**	**p-value**
	Before	**After**	**Before**	**After**	**Before**	**After**		
Useful	91.1	87.5	1.8	5.4	7.1	7.1	56	.324
Stressful	13.6	13.6	74.9	77.3	11.4	9.1	44	.764
Something I want to do	74.5	74.4	8.5	12.8	17	12.8	47	.26

p-value based on Wicoxon's Signed rank test

From the open ended questions, most carers seemed happy and confident in providing oral health care, but they often found the service user or their family carried out this function.

"Sometimes clients wish help, other times don't want you to do teeth or mouth care"

"Most of my clients have family who care for oral hygiene"

"Oral Health care is very important and is something I have carried out daily with various clients, though 9 times out of 10 they prefer to carry out this task themselves"

"Several clients will not allow carers to assist with oral health care"

5.2.9 Evaluation questionnaire

Generally, both training sessions were well received. All the evaluation questionnaires were completed with positive responses and most found the training interesting and enjoyable. From the first training programme, the home carers found the video and PowerPoint presentation the most successful. The majority of carers also found the demonstrations of brushing teeth and dentures very useful, however, they all stressed they did not want to brush each others teeth.

"Essential - most successful explaining how to brush teeth properly but "getting carers to brush each others teeth" should be deleted"

The home carers found the slides of oral problems with case discussion of scenarios most useful in the second training session but felt that using these slides in the initial training session would not have been as effective. They were all in favour of having two training sessions and felt the training was delivered at the correct level.

5.2.10 Return of notebooks

Thirty six of the 77 notebooks (47%) were returned and certificates given. Some of the home carers who completed the notebooks showed an increased awareness in oral care and made notes in relation to giving advice to their clients on cleaning teeth and dentures.

"Using dilute Miltons for cleaning dentures"

"Uses Tepe brushes and corsodyl mouthwash for gum problems"

One home carer's notebook described using the brushing technique she had been shown at the training session on her client with very positive results:

"smiling broadly, teeth looking shinier, less signs of residue on surface of teeth….she mentioned that she had found very little bleeding from her gums now which pleased her".

A number of home carers stated that *"most clients have their own routine, solutions or tablets and not interested in change"* and their "*clients wished to carry out their own oral care"* or members of their family carried out their mouth care.

Some home carers stated that due to the shift they work, such as a night warden, it was not possible to carry out oral care as they were only allocated a short time for each client.

One home carer stated *"they had enough to do"* and her clients did their own teeth.

In general, home carers mostly prompted or reminded their clients to clean their teeth and dentures and gave assistance as and when required.

5.3 Service users' results

The names and addresses of 60 service users were given to the Chief Investigator by the Home Care Department to enable clinical oral assessments to be carried out. All service users were able to consent and agreed to take part in the study.

5.3.1 Demographics

All service users lived in their own homes in Caithness. The majority (N=39; 65%) lived in the Wick area (KW1 postcode). At the time of their assessments, the median age of service users was 82, ranging from 67 to 95 years. The majority of service users were female (N=46; 76.7%).

5.3.2 Care need of service users

The care need category of each service user was given to the Chief Investigator by the Home Care Department. The results are shown in Table 12, with 28 (46.7%) receiving moderate care, 36.7% receiving substantial care and 17% receiving critical care.

Table 12: Demographics of service users

Sex	Male Female	14 (23.3%) 46 (76.7%)
Age (years)	65-70 71-75 76-80 81-85 86-90 91-95	7 (11.7%) 8 (13.3%) 13 (21.7%) 11 (18.3%) 11 (18.3%) 10 (16.7%)
Place of residence	KW1- Wick area KW14- Thurso area KW3- Lybster area	39 (65%) 19 (31.7%) 2 (3.3%)
Care need	Moderate Substantial Critical	28 (46.7%) 22 (36.7%) 10 (16.6%)
Reported Dental Registration Status	Yes No	13 (21.7%) 47 (78.3%)

5.3.3 Dental registration status

Only 13 (21.7%) indicated they were registered with a dentist and 10 of those 13 (16.7%) were seen within the last six months. Of those not registered, 44 (73.3%) stated they had not seen a dentist in over three years.

5.3.4 Home care provisions

All service users were identified as having home care provided to them by local authority care givers. The majority of service users (53.3%), had been receiving care for over three years.

Two thirds of service users were visited at least once daily by home carers and 17 (28.3%) were visited 2-3 times per week. Table 13 shows how long the home carer stayed with each service user. Only one service user stated they had a home carer who stayed longer than one and a half hours.

Table 13: The provision of home care to service users

		Number (%)
Length of time service user had been receiving care	<6 months	7 (11.7%)
	6 months - 1 year	7 (11.7%)
	1-2 years	6 (10.0%)
	2-3 years	8 (13.3%)
	>3 years	32 (53.3%)
How often the home carer visited the service user	once a week	3 (5.0%)
	2-3 times a week	17 (28.3%)
	once a day	20 (33.3%)
	twice a day	13 (21.7%)
	three times a day	7 (11.7%)
How long the home carer stayed with the service user	<30 mins	25 (41.7%)
	30 mins- 1 hour	28 (46.7%)
	1-1 ½ hrs	6 (10.0%)
	>1 ½ hrs	1 (1.6%)

Each service user was asked what type of care they received. The results are displayed in Table 14. Those that received domestic care were included in the "Other" category.

Table 14: Type of care the service user received

Type of care received	Number who received assistance (%)
Dressing	31 (51.7%)
Bathing	39 (65.0%)
Preparing meals	16 (26.7%)
Eating	1 (1.7%)
Personal care	27 (45.0%)
Other i.e. domestic	29 (48.3%)

Service users were asked if they received mouth care from the home carers and if they wanted to change the mouth care they received. The results are shown in Table 15. Only 10 (16.7%) indicated they received mouth care from the home carers and most were happy with the care they received. Only one (1.7%) of these individuals wished to change their mouth care. Of those that did not receive mouth care from the home carers, two service users (3.3%) wished a change and 48 (80%) were happy with their mouth care situation.

The service users were also asked if they received mouth care assistance from their family. Five (8.3%) answered yes, four (6.7%) were happy with their care and one (1.7%) of these also received help from the home carers.

Table 15: Provision of mouth care from home carers and the families of service users

		Provision of mouth care from families		Total
Provision of mouth care from home carers	Perceived requirement of service users	No	Yes	
No (N=50)	No change required	44 (73.3%)	4 (6.7%)	48 (80.0%)
	Change required	2 (3.3%)	0 (0%)	2 (3.3%)
Yes (N=10)	No change required	8 (13.3%)	1 (1.7%)	9 (15.0%)
	Change required	1 (1.7%)	0 (.0%)	1 (1.7%)
Total		55 (91.7%)	5 (8.3%)	60 (100.0%)

Table 16 shows that four of the 10 service users in the critical care need category received mouth care from the home carers and one individual in this category, not presently receiving mouth care, indicated that such help was required.

Table 16: Provision of mouth care from home carers and category of client care need

		Category of care			
Provision of mouth care from home carers	Perceived requirement of service users	Moderate	Substantial	Critical	Total No (%)
No	No change required	25 (41.7%)	18 (30%)	5 (8.3%)	48 (80.0%)
	Change required	0 (0%)	1 (1.7%)	1 (1.7%)	2 (3.3%)
Yes	No change required	2 (3.3%)	3 (5%)	4 (6.7%)	9 (15.0%)
	Change required	1 (1.7%)	0 (0%)	0 (0%)	1 (1.7%)
Total		28 (46.7%)	22 (36.7%)	10 (16.7%)	60 (100%)

5.3.5 Medical history

A series of medical questions was asked. Only two (3.3%) service users stated they did not take any medication. The majority of service users said they had heart problems and arthritis. The warning cards carried were for taking warfarin tablets and for a penicillin allergy. Results are shown in Table 17.

Table 17: Medical history of service users

Medical History question	Number answered yes (%)
Receiving treatment from doctor or clinic	31 (51.7%)
Taking medication/tablets/ointments /injections/inhalers	58 (96.7%)
Carries a warning card	2 (3.3%)
Any allergies to medicines, materials or foods	16 (26.7%)
Chest problems ie asthma, bronchitis	15 (25%)
Fainting attacks, giddiness or epilepsy	13 (21.7%)
Heart problems, angina, high blood pressure or stroke	48 (80%)
Diabetes	10 (16.7%)
Arthritis	38 (63.3%)

5.3.6 Social history

Service users were asked about their alcohol and smoking history and 18 (30%) said they drank alcohol regularly. Only eight (13.3%) smoked at present, however, a further 21 (35%) stated they smoked in the past. In total, 29 (48.3%) service users indicated they were a smoker or an ex-smoker.

5.3.7 Perceived problems with the mouth

Each service user was asked if they had any problems with any aspects of their mouth. Many (N = 24: 40%) suffered from a dry mouth, 16 (27%) had denture-related problems and nine (15%) suffered from pain.

5.4 Clinical assessment

5.4.1 Xerostomia

All of those who indicated they had a dry mouth (24/24) were assessed clinically to have xerostomia (100%), compared to only 19% (7/36) who indicated no dry mouth, yet were assessed clinically to have xerostomia (see Table 18). There was a significant association between those that complained of a dry mouth and xerostomia being present ($p<0.001$).

Table 18: Relationship between evidence of xerostomia and complaints of a dry mouth

	Xerostomia		**Total**
Self-report status	**Absent**	**Present**	
No dry mouth	29(81%)	7 (19%)	36 (60%)
Dry mouth	0 (0.0%)	24 (100%)	24 (40%)
Total	29 (48.3%)	31 (51.7%)	60 (100%)
		Fisher's Exact $p<0.001$	

5.4.2 Dental status

5.4.2.1 Dentate individuals

There were 15 (25%) individuals who were dentate and seven of these service users had a functional dentition without any dentures. The results are shown in Table 19.

Table 19: Denture Status of dentate individuals

Type of denture	Number (% Total)
Full upper, dentate lower	2 (13.3%)
Full upper, partial lower	2 (13.3%)
Partial upper	1 (6.7%)
Partial upper and lower	3 (20%)
Not applicable (no denture)	7 (46.7%)
Total	15 (100%)

The median number of teeth a dentate service user had was 19 (Q1:6, Q3:21).

Table 20 indicates that of the 15 individuals that were dentate, seven (46.7%) had caries present; two (13.3%) had caries on the root surface only; and five (33.3%) had both root and coronal caries.

Only one (6.7%) service user did not have any calculus, nine (60%) had calculus present on the lower anterior site only, and five (33.3%) had calculus present on other sites also.

Table 20: Presence of caries and calculus on dentate individuals

		Number (%)
Caries present	No	8 (53.3%)
	Root caries only	2 (13.3%)
	Root and coronal caries	5 (33.3%)
Calculus present	No	1 (6.7%)
	Lower anterior site only	9 (60.0%)
	Other sites including lower anterior	5 (33.3%)
Total		15 (100%)

A debris index, using Greene and Vermillion scores (Greene & Vermillion, 1964) was recorded for dentate individuals and the results are shown in Table 21. Many of the dentate individuals (66.7%) had *at least* two thirds of their teeth covered in plaque and debris.

Table 21: Greene and Vermillion debris index score on dentate individuals

Debris index	Number (Total % dentate)
0	1 (6.7%)
1	4 (26.7%)
2	7 (46.7%)
3	3 (20.0%)
Total	15 (100.0%)

5.4.3 Denture status

There were 39 (65%) edentate service users who wore full upper and lower dentures, three (5%) wore only a full upper and three (5%) edentate service users did not wear any dentures. As indicated in Table 19, of the dentate service users, eight wore upper dentures including partials and four wore lower partial dentures. In total, there were 50 upper dentures and 44 lower dentures.

5.4.4 Denture retention

The fit of the upper and lower dentures was assessed by the chief investigator as being good, satisfactory or poor. The majority of the upper dentures (58%) were assessed as being a good fit with only six out of 50 dentures (12%) being assessed as a poor fit. Regarding the lower dentures, only 10 out of 44 (23%) were assessed as being a good fit, 41% were considered to be satisfactory and 36% were assessed as being a poor fit.

5.4.5 Denture cleanliness

The cleanliness of dentures was assessed in two ways by the same investigator blinded to the process: (i) visual appearance (unaided) and (ii) visual appearance via the use of a microbiological loop. The results are shown in Table 22.

Based on unaided visual assessment, the cleanliness of 40% of the upper dentures was classified as good; 26% were rated as satisfactory and 34% as poor. For visual appearance based on the use of the microbiological loop, 52% of the upper dentures were classified as having no debris, while in 14% of cases a full loop of debris was removed from the denture.

Table 22: Upper denture cleanliness visually assessed unaided and by the use of a microbiological loop (aided)

	Visual appearance via use of microbiological loop				
Visual appearance (unaided)	0-no debris	1-presence	2- half full	3- full	total
Good	20(40%)	0 (0%)	0 (0%)	0(0%)	20 (40%)
Satisfactory	6 (12%)	7 (14%)	0(0%)	0(0%)	13(26%)
Poor	0 (0%)	2 (4%)	8 (16%)	7(14%)	17(34%)
Total	26 (52%)	9 (18%)	8 (16%)	7(14%)	50(100%)

5.4.5.1 Sensitivity and specificity of unaided visual assessment of denture cleanliness

Considering the visual assessment of the upper dentures using the microbiological loop as the gold standard, the performance of the unaided visual assessment for cleanliness was investigated by calculating sensitivity (detection rate) and specificity (100% - false positive rate). For this analysis, the categories for both assessment techniques were collapsed into two groups: Unaided: visually clean and visually unclean; Aided: plaque score = 0 and plaque score > 0. The results are shown in Table 23.

Table 23: Upper denture cleanliness visually assessed unaided (clean and unclean) and aided (plaque scores)

	Upper denture assessed visually unaided	
Upper denture assessed visually aided	Visually not clean	Visually clean
Plaque score >0	24 (100%)	0 (0%)
Plaque score =0	6 (23%)	20 (77%)

Twenty four upper dentures were identified as having a plaque score > 0 using the aided visual assessment, and all of these were classified as visually unclean in the unaided visual assessment (sensitivity =100%). Of the 26 upper dentures having a plaque score= 0 using the aided visual assessment, six were identified as visually not clean under the unaided visual assessment, resulting in a false positive rate of 23% (or specificity of 77%).

The results relating to the cleanliness of the lower denture are shown in Tables 24 and 25.

Table 24: Lower denture cleanliness visually assessed unaided and by the use of a microbiological loop (aided)

	Visual appearance aided with use of microbiological loop				
Visual assessment (unaided)	0-no debris	1-presence	2- half full	3- full	Total
Good	15 (34.1%)	0 (0%)	0 (0%)	0(0%)	15 (34.1%)
Satisfactory	5 (11.4%)	7 (15.9%)	0(0%)	0(0%)	12 (27.2%)
Poor	0 (0%)	3 (6.8%)	10 (22.7%)	4 (9.1%)	17(38.6%)
Total	20 (45.5%)	10 (22.7%)	10 (22.7%)	4 (9.1%)	44(100%)

Table 25: Lower denture cleanliness visually assessed unaided (clean and unclean) and aided (plaque scores)

	Lower denture assessed visually unaided	
Lower denture assessed visually aided	Visually not clean	Visually clean
Plaque score >0	24 (100%)	0 (0%)
Plaque score =0	5 (25%)	15 (75%)

Of the 24 lower dentures with a plaque score > 0 using the aided visual assessment, 100% were correctly classified as visually unclean in the unaided visual assessment (sensitivity = 100%). Twenty lower dentures were given a plaque score =0 in the aided visual assessment and of these 25% were identified as visually not clean in the unaided visual assessment (false positive rate = 25%; specificity = 75%)

5.4.6 Use of oral hygiene aids

The oral hygiene aids used by the service users are shown in Table 26. Only one service user reported using interdental cleaning aids and four out of 60 did not use a toothbrush. One of the dentate service users stated that they did not use any toothpaste.

Table 26: Use of oral hygiene aids by service users

Oral hygiene aids	**Dentate number using aids** (% of dentate) N=15	**Edentate number using aids** (% of edentate) N=45	**Total number using aids (%)**
Toothbrush	15 (100%)	41 (91.1%)	56 (93.3%)
Toothpaste	14 (93.3%)	26 (57.8%)	40 (66.7%)
Interdental cleaning aids	1 (6.7%)	0 (0%)	1 (1.7%)
Mouthwash	4 (26.7%)	7 (15.6%)	11 (18.3%)
Other ie.steradent®	2 (13.3%)	27 (60%)	29 (48.3%)

5.4.7 Soft tissues lesions

A soft tissue examination was carried out for all service users and the results presented in Table 27. No lesions were identified requiring an urgent referral. None of the service users had an intra-oral swelling and therefore this category is not included in Table 27.

Table 27: Service user soft tissue examination results

Soft tissue	None(%)	Red (%)	Ulcer (%)	Pigmented (%)	White (%)	Other (%)
Upper lip	59(97.3%)	1 (1.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Lower lip	60 (100%)	0 (0%)	0 (0%)		0 (0%)	0 (0%)
R commisure	60 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
L commisure	60 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Upper labial mucosa	60 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Upper sulci	57 (95%)	2 (3.3%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)
Upper gingivae	55 (91.7%)	4 (6.7%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)
Hard palate	49 (81.7%)	10 (16.7%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)
Soft palate	55 (91.7%)	4 (6.7%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)
Tonsillar area	56 (93.3%)	3 (5.0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)
Tongue dorsum	39 (65%)	6 (10.0%)	0 (0%)	0 (0%)	6 (10.0%)	9 (15.0%)
Tongue R lateral border	58 (96.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (3.3%)
Tongue L lateral border	59 (98.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)
Tongue ventral	59 (98.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)
Floor of mouth	59 (98.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)
R buccal mucosa	58 (96.7%)	0 (0%)	1 (1.7%)	1 (1.7%)	0 (0%)	0 (0%)
L buccal mucosa	57 (95.0%)	1 (1.7%)	1 (1.7%)	1 (1.7%)	0 (0%)	0 (0%)
Lower gingivae	52 (86.7%)	4 (6.7%)	2 (3.3%)	0 (0%)	0 (0%)	2 (3.3%)
Lower sulci	51 (85.0%)	3 (5.0%)	2 (3.3%)	0 (0%)	3 (5.0%)	1 (1.7%)
Lower labial mucosa	58 (96.7%)	1 (1.7%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)

5.5 Microbiological assessments

Swabs were taken of the hard palate, tongue and upper denture (if applicable) for microbiological assessment. The swabs were processed at the microbiology laboratory of Glasgow Dental Hospital and School and the results recorded. The growth of fungal species was identified as light, moderate or heavy.

There was a significant association (p = 0.007) between growth of fungal species on the hard palate and presence of a red lesion at this intra-oral site (Table 28). Of those with no lesion on the hard palate, 43% had heavy fungal growth, this compared with 60% with a red lesion.

Table 28: Association between a heavy fungal growth and a lesion on the hard palate

	Growth of fungal species on hard palate				Total (%)
Lesion on hard palate	None (%)	Light (%)	Moderate (%)	Heavy (%)	
none	22 (44.9%)	2 (4.1%)	4 (8.2%)	21 (43%)	49 (100%)
red	0 (0%)	0 (0%)	4 (40%)	6 (60%)	10 (100%)
other	1 (100%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Total	23 (38.3%)	2 (3.3%)	8 (13.3%)	27 (45%)	60 (100%)
				(Fisher's Exact) p= 0.007	

Forty five percent of service users had heavy fungal growth on the hard palate, compared to 61.7% on the tongue and 70% on the upper denture. The results are shown in Table 29. Valid percentage include those who wore upper dentures.

Table 29: Growth of fungal species by intra-oral site

Species growth	Hard palate (%)	Tongue (%)	Upper denture (%) (valid %)
No fungal species	23 (38.3%)	15 (25%)	13(21.7%) (26%)
Light	2 (3.3%)	4 (6.7%)	0 (0%)
Moderate	8 (13.3%)	4 (6.7%)	2 (3.3%) (4 %)
Heavy	27 (45%)	37 (61.7%)	35 (58.3%) (70%)
Not applicable	0 (0%)	0 (0%)	10(16.7%)
Total	60 (100%)	60 (100%)	60 (100%)

5.5.1 Sensitivity and specificity of aided and unaided visual assessment of denture cleanliness and fungal growth

Fungal growth on the upper denture was categorised into 'no growth' and 'some growth' and then compared to the aided visual assessment of denture cleanliness using the microbiological loop (plaque score = 0, > 0). For this comparison, the microbiological laboratory assessment of the swabs was considered the gold standard, and the visual assessment using the microbiological loop, the comparator.

Table 30: Comparison of fungal species growth and upper denture cleanliness scores (visually aided)

Upper denture fungal species	**Upper denture assessed visually aided**	
	Plaque >0	Plaque =0
Growth	20 (54%)	17 (46%)
No growth	4 (31%)	9 (69%)

Of the 37 samples positive for growth from the laboratory, 20 (54%) were identified positive from the aided visual assessment (sensitivity = 54%). The false positive rate (% negative from laboratory identified as positive from plaque score > 0) was 31% (4/13), therefore specificity was 69%.

This procedure was then repeated using the unaided visual assessment and the growth of fungal species and the results are presented in Table 31.

Table 31: Comparison of fungal species growth and assessment of upper dentures (visual unaided)

Upper denture fungal species growth	**Upper denture assessed visually unaided**	
	Visually not clean	Visually clean
Growth of fungal species	24 (65%)	13 (35%)
No growth of fungal species	6 (46%)	7 (54%)

Thirty-seven samples were positive using the laboratory technique. Of these 65% were classified as visually not clean using the unaided visual assessment (sensitivity = 65%). The false positive rate (percentage of growth negative identified as visually not clean) is 46% giving a specificity of 54%. Hence the unaided visual assessment has higher sensitivity than the aided visual assessment, but lower specificity.

When candidal species were identified, six different species were found either singly or in combination with other candidal species. The results are shown in Table 32.

Table 32: Candida species present on hard palate, tongue and denture

***Candida* species**	**Hard palate (%)**	**Tongue (%)**	**Denture (%)**
C. albicans	20 (54.1%)	24 (53.3%)	18 (48.6%)
C. glabrata	9 (24.3%)	10 (22.2%)	6 (16.2%)
C. krusei	1 (2.7%)	1 (1.7%)	1 (2.7%)
C. lusitaniae	0 (0%)	1 (2.2%)	1 (2.7%)
C. albicans and C. glabrata	7 (18.9%)	7 (15.6%)	9 (24.3%)
C. parapsilosis and C. glabrata	0 (0%)	1 (2.2%)	1 (2.7%)
C. parapsilosis and C. albicans	0 (0%)	0 (0%)	1 (2.7%)
C.lipolytica and C. albicans	0 (0%)	1 (2.2%)	0 (0%)
Total	37 (100%)	45 (100%)	37 (100%)
Not applicable	23	15	23

Each species was then tested for sensitivity to five different antifungals. No service users had species that were resistant to nystatin or miconazole. Only one service user had species resistant to Amphotericin B. There were 14 out of 46 (30.4%) service users who had species resistant to both fluconazole and itraconazole and a further nine service users had species resistant only to itraconazole (23 out of 46) (50%). These results are shown in Table 33.

Table 33: Sensitivity to antifungals

	Sensitivity			
Antifungal	Yes (%)	No (%)	Not applicable	Total
Nystatin	46 (100%)	0 (0%)	14	60
Miconazole	46 (100%)	0 (0%)	14	60
Amphotericin B	45 (97.8%)	1 (2.2%)	14	60
Fluconazole	32 (69.6%)	14 (30.4%)	14	60
Itraconazole	23 (50%)	23 (50%)	14	60
Fluconazole and Itracoazole	32 (69.6%)	14 (30.4%	14	60

The swabs were also processed for the presence of *Staphylococcus aureus*. This species was found on swabs from 13 (21.7%) service users and assessed as light, moderate or heavy growth. There were six service users with *S. aureus* resistant to methicillin. These results are presented in Table 34.

Table 34: Presence of Staphylococcus aureus and resistance to Methicillin

Growth of Staphyloccus aureus	**Resistant to Methicillin**		Total
	No	Yes	
Light growth	5 (38.5%)	2 (15.4%)	7 (53.8%)
Moderate growth	1 (7.7%)	1 (7.7%)	2 (15.4%)
Heavy growth	1 (7.7%)	3 (23.1%)	4 (30.8%)
Total	7 (53.8%)	6 (46.2%)	13 (100.0%)

5.5.2 Association between provision of mouth care and fungal growth

5.5.2.1 Tongue

There was no significant association between fungal growth on the tongue and the provision of mouth care received or desired by service users. However, 29 (60.4%) of the

48 service users who perceived they did not need help with their mouth care had a heavy fungal growth on their tongue. The results are shown in Table 35.

Table 35: Association between mouth care provision and fungal growth on the tongue

		Growth of fungal species on tongue				
Provision of mouth care from carers	Perceived requirement of service users	None No.	Light No.	Moderate No.	Heavy No.	Total (%)
No	No change required	14	3	2	29	48 (80%)
	Help required	0	0	0	2	2 (3.3%)
Yes	No change required	1	1	2	5	9 (15%)
	Change required	0	0	0	1	1 (1.7%)
Total		15 (25%)	4 (6.7%)	4 (6.7%)	37 (61.7%)	60 (100%)
		(Fisher's Exact) *p*=0.494				

5.5.2.2 Hard palate

The association between fungal growth on the hard palate and the provision of mouth care received or desired by service users is shown in Table 36. Twenty two (45.8%) of the 48 service users who perceived they did not need help with their mouth care had a heavy fungal growth on their hard palate.

Table 36: Association between mouth care provision and fungal growth on the hard palate

		Growth of fungal species on hard palate				
Provision of mouth care from carers	Perceived requirement of service users	None No.	Light No.	Moderate No.	Heavy No.	Total (%)
No	No change required	21	0	5	22	48 (80%)
	Change required	1	0	0	1	2 (3.3%)
Yes	No change required	1	2	3	3	9 (15%)
	Change required	0	0	0	1	1 (1.7%)
Total		23 (38.3%)	2 (3.3%)	8 (13.3%)	27 (45%)	60 (100%)
		(Fisher's Exact) p=0.022				

5.5.2.3 Upper denture

Ten service users did not wear an upper denture. There were no recordings of light fungal growth associated with the upper denture, therefore this category is not included in Table 37. Twenty five (64.1%) of the 39 individuals who perceived they required no help with their mouth care had a heavy growth of fungal species on their upper denture.

Table 37: Association between mouth care provision and fungal growth on upper denture

		Growth of fungal species on upper denture			
Provision of mouth care from carers	Perceived requirement of service users	None No.	Moderate No.	Heavy No.	Total (%)
No	No change required	12	2	25	39 (78%)
	Help required	0	0	2	2 (4%)
Yes	No change required	1	0	7	8 (16%)
	Change required	0	0	1	1(2%)
Total		13 (26%)	2 (4%)	35 (70%)	50 (100%)
		(Fisher's Exact) p=0.803			

5.6 Mouth care provision and debris index of dentate service users

There was no significant relationship between the debris index of dentate individuals and the mouth care received or desired by the service users. However, 13 (92.8%) of the 14 dentate service users who felt able to look after their own mouth had a debris index of one or more.

Table 38: Association between mouth care provision and debris index of dentate service users

		Debris index				
Provision of mouth care from carers	Perceived requirement of service users	0	1	2	3	Total (%)
No	No change required	1 (6.7%)	4 (26.7%)	7 (46.7%)	2 (13.3%)	14 (93.3%)
Yes	No change required	0 (0%)	0 (0%)	0 (0%)	1 (6.7%)	1 (6.7%)
Total		1 (6.7%)	4 (26.7%)	7 (46.7%)	3 (20 %)	15 (100%)
		(Fisher's Exact) p=0.267				

5.7 Treatment need

At the end of the clinical assessment, a treatment need was determined. In total, 30 (50%) service users were indentified as requiring treatment and the treatment required is shown in Table 39.

Table 39: Treatment need identified from clinical examination

Treatment need	Number requiring treatment (%)
Oral hygiene	16 (26.7%)
Conservation/extraction	9 (15.0%)
Dentures	27 (45.0%)
Soft tissues treatment	4 (6.7%)
Urgent	12 (20.0%)

Oral hygiene treatment need included those with dentures. An urgent treatment need related to service users suffering from pain, lost dentures or loose dentures causing discomfort.

After the assessment was completed, the Chief Investigator determined if the service user required any assistance with their mouth care. This was based on findings from the assessment including medical problems, cleanliness of the denture, presence of plaque and calculus. It was assessed that 40 (66.7%) service users should be getting help with their mouth care.

As shown in Table 40, there was a significant relationship (p = 0.002) between the need for assistance with mouth care and the level of general care required. All (100%) of service users in the 'critical' care category were assessed as requiring assistance with mouth care, compared with 77% of service users requiring substantial care and 46% of those requiring moderate levels of care.

Table 40: Association between care category of service user and mouth care assistance required

	Assessment relating to requirement for mouth care		**Total**
Care category	**Yes**	**No**	
Moderate	13 (21.7%)	15 (25%)	28 (46.7%)
Substantial	17 (28.3%)	5 (8.3%)	22 (36.7%)
Critical	10 (16.7%)	0 (0%)	10 (16.7%)
Total	40 (66.7%)	20 (33.3%)	60 (100%)
	Fisher's Exact (p=0.002)		

Chapter 6
Discussion

6.1 Background

Many older people are choosing to remain at home with the assistance of home-based services but little is known about the dental status of these people at either the UK level or within Scotland.

This study was undertaken in one rural area in Scotland to assess the knowledge, attitude and behaviour of local authority-employed home carers in relation to their involvement in the provision of mouth care for dependent older people living in their own home. Additionally, it was deemed important to carry out oral health assessments on a sample of dependent older people, the service users of the home carers.
It was anticipated that this study would provide some useful information regarding oral health care for dependent older people still living in the community which could be used to inform further, larger studies and the development of appropriate care for this population group.

6.2 Study design

The purpose of the study was to achieve the aims outlined in Chapter 3. There were two main aspects to this study, i.e. investigations involving both service users and their home carers. In relation to the home carers, the study was designed as an interventional study using validated questionnaires (Frenkel et al., 2002; Bonnetti, 2009). For the service users, a descriptive study was undertaken to assess their oral health status and their views in relation to their own oral health.

6.3 Questionnaire design and study forms

6.3.1 Home carers

In relation to the home carers, the main objectives were to assess attitude, knowledge and behaviour in relation to the provision of oral care for their clients, before and after training. Following a literature review of similar studies, two validated questionnaires

were selected for use in this study. Both questionnaires were adapted to be relevant to home carers.

Frenkel and co-workers (2002) carried out a randomised controlled trial among care givers in nursing homes and used a questionnaire which assessed attitude and knowledge. The second questionnaire (Bonnetti, 2009) was used to assess the beliefs and attitudes of care workers in relation to providing advice on mouth care. This was a modification of a tool previously used to investigate health care beliefs and attitudes related to Childsmile (an oral health improvement programme for under fives) among health care professionals.

Although it would have been desirable to keep the questionnaires as short as possible, as part of the pilot-type study, it was considered necessary to assess all aspects of knowledge, attitude and behaviour, the latter from both a direct and indirect perspective. While most of the questions were in closed format, requiring less time to complete, several home carers commented about the length of the questionnaires and felt they were too long.

6.3.2 Service users assessment

As stated previously, little is known about the oral health status of dependent older people still living in their own homes in the UK. A structured interview was included to obtain socio-demographic details and also to ascertain their views on their own oral health and on whether or not they received or would like to receive assistance with their mouth care. The questions were developed by the chief investigator as there was no known questionnaire relating to the mouth care of older people still living in their own homes. The oral health assessment was similar to a dental examination and included aspects from other studies. A soft tissue assessment was carried out using a standardised form recording any abnormalities (Sweeney et al., 2007). Debris on the natural dentition was recorded using a debris index (Greene &Vermillion, 1964). Debris on dentures was recorded visually unaided and visually aided using a microbiological loop (Simons et al., 2000).

6.4 Home carers

6.4.1 Home care management team's attitude to oral health care of clients

Oral health care has been described previously as being of low priority among both trained and untrained care staff (Wardh et al., 1997). A recent study of care home managers in Scotland also found that oral care was considered of lower priority than other areas of care included in NHS QIS Best Practice Statements (White et al., 2009). In the present study, the majority of local Caithness managers considered oral care to be part of personal care, which they ranked as having the highest priority. However, it is acknowledged there may be bias associated with this finding as the managers were aware the telephone interview related to oral health care training for their staff. Additionally, while personal care as a whole received the highest priority rating, it is unclear how important the managers perceived oral care to be within this category. Nevertheless, it is encouraging that the local managers appeared to be supportive. This seemed to be borne out by the fact that the managers agreed to the training of their staff and that a large proportion of home carers indicated in their questionnaire responses that they believed that their involvement in oral health care would be supported by their line managers. However, less than half the staff members attended both training sessions, despite many training sessions being made available to accommodate work patterns. Therefore, the level of commitment of the managers to the programme has to be questioned as they did not make participation in this activity mandatory.

6.4.2 Demographics of home carers

A barrier frequently cited in relation to the oral health care training of care workers has been high staff turnover. However, the duration of employment of home carers in this study suggests that this issue was of less importance. This is perhaps related to the remote location, with consequent limited job opportunities (Nicol et al., 2005). Lower levels of staff turnover could also account for the average age of the home carers, with the majority aged 40-59. In previous studies, caregivers have been found to be younger and this has also been thought to be due, in part, to the physically demanding nature of their job (Frenkel et al., 2002).

6.4.3 Training of home carers

Training was arranged at the Home Care Department office to encourage a higher attendance. However, only 63 out of the possible 131 staff members came to both training sessions, even when additional sessions were arranged. This may be due to the difficulty in bringing home carers together at a given time, the level of commitment given to the training programme by the managers (as mentioned above) or the perceived importance of the topic by the care workers. The level of participation was disappointing, particularly as costs were covered by the project. Previous oral health training programmes involving care staff have usually been on-site in nursing homes, residential homes and hospitals (Simons et al., 2000; Frenkel et al., 2002; Nicol et al., 2005). This has also proved problematic due to the difficulty of removing carers from their daily workload (Simons et al., 2000) and the greater likelihood of interruptions taking place (Frenkel et al., 2002). The multiple site locations of home carers in this study posed additional problems which must be recognised when considering the development of appropriate training programmes in the future. One solution would be to incorporate oral health training into the generic staff training. However, it is likely that the priority and perceived importance of oral health care would need to be raised nationally and regionally among senior members of home care departments and social services in order for this to be achieved.

The outcome of the training sessions, as described in subsequent sections, suggests that further consideration should be given to the content and format of future programmes and that these considerations should include the views and needs of the client group and the support given to the home carers with respect to their involvement in oral health care.

6.4.4 Knowledge of home carers

It has been documented that both trained and untrained care staff lack knowledge in relation to oral health care (Adams, 1996; Paulsson et al., 1998; Frenkel et al., 2001; Young et al., 2008). In this study, although the home carers had received no formal oral health care training prior to the present programme, the baseline knowledge, especially concerning denture care, was, for some questions, higher than anticipated. Frenkel et al.

(2002) also found this and thought it may lead to a possible ceiling effect in some cases. In the present study, some aspects of knowledge related to the dentate mouth improved significantly after training, with more carers recognising that a softer toothbrush was better for cleaning natural teeth and that it was possible to halt gum disease. However, it was disappointing to see that, post-training, more carers incorrectly thought that a mouth swab was a good alternative to a toothbrush for cleaning teeth. This misunderstanding may have arisen as a result of the training programme. A swab or piece of dampened gauze had been discussed as a good alternative to cleaning the soft tissues of the mouth in older people and this may have led to the confusion. There was also a lack of understanding post-training concerning the perceived association between dietary calcium and dental decay and to the fact that gingivitis could be symptomless.

Overall, the results from the first questionnaire regarding post-training improvements in knowledge of oral care were marginal and smaller than had been hoped. For some questions, this was probably due to the ceiling effect mentioned previously. The length of time between the initial training and the administration of the post-training questionnaire may also have been a factor. The interval between training sessions was meant to be six months but due to home care staffing issues, extra sessions had to be added, and for some, eight months elapsed between sessions. Although previous studies involving care staff have shown that oral health education programmes improve knowledge of oral health, assessments have usually taken place over shorter time intervals. Simons and co-workers found a knowledge gain one week after an oral health training programme. Frenkel and co-workers (2002) found a marginal knowledge gain over a longer time interval of one month and six months but the questionnaires were distributed immediately after the oral health training. It is obviously more meaningful with regard to long-term benefit if one is able to show improved knowledge over a prolonged period, rather than immediately following training. In Sweden, Paulsson and co-workers (2003) achieved an increase in knowledge following an oral health education programme three years before. This may be attributed to the Swedish Dental Care Ordinance which came into effect in 2000 and which may have increased both the awareness and the importance of the subject of oral health (Paulsson et al., 2003).

In relation to the present study and the lack of improved knowledge demonstrated post-training for many of the questions, consideration has to be given to the relative importance of the various items of information for this particular group of workers. In developing this programme further, the training content and the questions included in the assessment of knowledge should be carefully considered to ensure relevance as stated above. For some areas where it is perceived that a good level of knowledge is very important, but the present study showed a lack of increased knowledge post-training, alternative ways of communicating these points should be developed for use in future training programmes.

6.4.5 Attitude of home carers

6.4.5.1 Attitudes to involvement in oral health care of clients

Oral health care has been reported to be more disagreeable and distasteful than other nursing activities and this has been documented as one of the barriers towards the delivery of effective oral health care to older people (Eadie & Schou, 1992; Strayer, 1995; Wardh et al., 1997). This was demonstrated in the first training session where some home carers were repulsed even at the thought of having to handle tooth models. Even if knowledge of oral health care is improved, it may not be implemented without attitudinal changes taking place (Wardh et al., 1997; Simons et al., 2000).

In this study, the questionnaire responses suggest, in general, that attitudes among the home carers to the provision of oral health care were positive, although some conflicting statements were apparent. Additionally, as indicated above, such an attitude was not always demonstrated during the practical aspects of the training sessions and the relatively low participation rate would also suggest a more negative attitude among some of the workforce.

While it was encouraging to see that, post-training, a higher proportion of carers indicated on their questionnaire that they would not feel more uncomfortable brushing inside a client's mouth than performing other types of personal care, approximately a third of the respondents were still of the opposite view after training. Some of the

workers reported either in their notebook or on the free-text sections of the questionnaire that they would rather not carry out this work and/or that they felt most clients wished to look after their own oral care. This to some extent was in line with the findings of the study involving the clients themselves, where most indicated that they did not wish assistance with oral care from their home carer. Additionally, during training, the component of the programme involving the carers cleaning each other's teeth had to be deleted as they refused to carry this out. This may have been due to a number of factors, including embarrassment or a reluctance to carry out toothbrushing on another individual. A number of previous studies have shown a reluctance among care workers to help with intra-oral cleaning (Eadie & Schou, 1992; Wardh et al., 1997; Frenkel et al., 2002; Nicol et al., 2005). It has been reported that caregivers may feel such an action is an invasion of personal space, even though they carry out other aspects of care that some people may find unpleasant, such as work relating to incontinence (Frenkel et al., 2002). In previous studies, carers felt more comfortable cleaning dentures outside the mouth. Nicol and co-workers (2005) found a significant improvement in denture hygiene, but little improvement in plaque scores related to natural teeth. This was similar to the findings of Frenkel and co-workers (2001) where, although there was an improvement in dental plaque scores following training, it was still below an acceptable standard.

In the present study there was a decrease following training in confidence among the carers with regard to cleaning client's natural teeth. Although a high percentage (>70%) remained confident about carrying out this task, a significant number of carers indicated a decrease in confidence. Explanations for this could be that the training showed the procedure to be more involved than they had initially thought or that some of the carers had begun to carry out oral health care following the training and realised it was more difficult than anticipated. If these possible explanations were true, it could be argued that the results showed an increase in awareness of oral health care procedures.

The results indicate that more work is required to explore in depth the attitudes and beliefs of both the home carers and the dependent older people with regard to the home carer's involvement in the oral health care of this client group. A high proportion of the

care workers believed they could help improve the oral health status of their clients and prevent disease but how this would be achieved and how this relates to some of the other attitudinal findings requires further study. Qualitative work in this area could help tease out some of these issues and perhaps provide information which would help determine the appropriateness and potential effectiveness of various types of intervention ranging from the provision of oral health advice to the more hands-on intra-oral oral hygiene approach.

6.4.5.2 Attitudes to own oral health

The literature suggests that a carer's attitude to their own oral health can influence their attitude to their involvement in mouth care for their clients (Wardh et al., 1997). In this study, the questionnaire results suggest that most home carers did not feel they should be relying on their dentist to prevent dental problems and that they had a relatively positive attitude to their own dental health, although almost 50% felt that as you get older 'you are bound to lose some of your teeth'. However, as mentioned previously, one of the reasons why the carers refused to brush each other's teeth during the training session could have been due to embarrassed at the prospect of others looking in their mouths.

Components of the training attempted to provide information relevant to the carers themselves and this was acknowledged in a few post-training free-text comments where it was stated that useful information had been provided which had been passed on to family members.

A very high percentage of home carers, both pre- and post-training indicated that they would wish someone to clean their own teeth if they became too ill or disabled to do it themselves, and when asked to put themselves in the situation of a client, most of the responses received mentioned they would like help with the cleaning of their teeth and advice about mouth care. One of the potential reasons for the differences found between these responses and the current practice of the home carers, i.e. limited involvement in the oral care of their clients, could relate to the care category of the older people they visited. Many home carers reported that their clients did not feel they required assistance

with mouth care and it may be that the carers felt it was appropriate to offer such care only to those in the 'critical' care category, i.e. corresponding to the question about being "too ill or disabled to carry out mouth care". This is what appeared to be happening in practice, with a much larger proportion of clients in the 'critical' category receiving or wishing assistance with oral care, compared with those in the other care categories.

6.4.5.3 Barriers to the provision of oral health care

Lack of time has been cited as a barrier to providing oral health care by nursing and care staff (Wardh et al., 1997). The home carers have an increasingly busy workload, which is usually fitted into short, time-limited periods per service user. If care workers view oral care as a low priority and their clients do not wish oral care assistance then, it has been argued, providing such care would offer little in the way of job satisfaction (Wardh et al., 1997).

One of the purposes of the second questionnaire (Bonnetti, 2009) in this study was to help determine potential barriers and facilitators to the involvement of home carers in the oral health care of their clients. A sizeable proportion of home carers felt that the additional paperwork and time demands related to oral care work would create difficulties, with only 50-60% indicating these factors would not be a problem.
The paperwork, in the form of the notebook distributed to the home carers, was an additional burden which would not be present under normal circumstances. It was used during the study as a way of recording the behaviour of the home carers, with regard to involvement in the oral care of their clients, between the two training sessions. In retrospect, it is acknowledged this may have acted as a barrier to the sought-after behaviour and other methods of assessing behaviour change may have been more appropriate.

Although a number of free-text comments made it clear that some home carers felt uncomfortable putting their hands in someone's mouth, this barrier, which is often referred to in the literature, could not be discerned to any major extent from the questionnaire responses. This could be a limitation associated with the method of data

collection, with some individuals perhaps 'ticking' what they felt was the correct or appropriate response. This is an area which therefore requires further investigation, perhaps using qualitative methodologies to explore the in-depth views of the care workers in relation to this issue.

From an indirect perspective, the attitude of the clients was perceived by some home carers to be a barrier to them becoming involved in oral care. Thus, when exploring possible ways of overcoming barriers, consideration has to be given to both the home carers' and the clients' perspectives.

6.4.6 Behaviour of home carers

It is recognised that encouraging individuals to change their behaviour with respect to health or the provision of health care is a considerable challenge (Humphris & Ling, 2000). Traditional health education has focused upon professionals who provide relevant information that increases knowledge which in turn changes attitudes and leads to improvement in behaviour, known as the K-A-B model. This model has been used in previous studies involving training programmes for carers in the oral health care of older people, but with mixed success. Some studies have shown an improvement in denture care, while care of the natural dentition showed little change (Frenkel et al., 2001; Nicol et al., 2005). Other studies have found that even when oral health care training programmes are well received, no measurable improvement in the oral health of older people occurs (Simons et al., 2000). Knowledge and attitudes are prerequisites for behaviour change (Frenkel et al., 2002) but, even if behaviour does change, it is often short-lived (MacEntee et al., 2007). In this study, an attempt was made to assess the behaviour of the home carers after the initial training through the distribution of notebooks. The home carers were asked to record the oral care they delivered to their clients over a one-month period.

Only 36 out of a potential total of 77 (47%) notebooks were returned. This was despite the fact that it was made clear to the home carers that they would only receive their certificate for completion of oral health care training if they attended both training

sessions and returned a completed notebook. The fact that less than half the home carers returned their notebooks could be due to a number of reasons including: they did not see oral health care as a high priority, they did not think their clients wished assistance with oral care, they did not feel comfortable providing mouth care, or they did not like the paperwork and time commitment required to make entries in the notebook.

Ideally, it would have been better to have a record of oral care delivered prior to training but as there were no documents available which collected this information, this was not possible. Another way of doing this would be to clinically assess the service users both before and after the training. However, time constraints of the chief investigator made this impossible. In addition, it was not known if the service users assessed had carers who participated in the oral health training, therefore some bias would have been introduced. The most appropriate way to assess behaviour change associated with the training programme would be to conduct a randomized controlled trial, with a major outcome being the oral health of the clients associated with the home cares in the intervention and control groups.

From those that did return notebooks, there were mixed comments with some indicating they were now providing some mouth care or giving oral health advice, some saying the client or family members undertook mouth care, and some stating that the time of day they visited their clients precluded oral health care activity.

The complexity of trying to understand human behaviour gives the field its great attraction for many practitioners, health personnel and researchers (Humphris & Ling, 2000). In health promotion, a belief in the ability of self to achieve certain outcomes, known as self-efficacy belief, is an essential component of individuals acquiring a sense of empowerment (Humphris & Ling, 2000). Although the majority of home carers indicated they were confident regarding their ability to provide oral health care for their clients, for most topics covered in the self-efficacy section of the questionnaire, e.g. finding time to provide the care and having the support to undertake this activity, the proportion of carers feeling confident actually fell after training. It may well be that the

understanding of carers concerning the practicalities of providing oral care prior to training may have been limited and that although a single training session and asking them to participate in this activity for a short period may have raised awareness to some extent, a one-off training programme is not enough to change deep rooted attitudes leading to changes in behaviour. The solution to behaviour change needs to come from giving oral care a higher priority, understanding the type of behaviour that is required to meet the needs of the client group and giving the carers the on-going support to practice the behaviour. It has been stated that legislation at a local or national level, incentives and social support often need to be introduced to assist in behaviour change (Humphris & Ling, 2000).

6.5 Service user study

This aspect of the study involved 60 older people who were receiving home care services from the local authority. As stated earlier in the literature review, little is known about the oral health status of the homebound elderly in the UK. Steele and co-workers (1998) found that older people living in the community had better oral health than those who are institutionalised. Despite this, these individuals still had high rates of dental decay and poor oral health, and the oral health status of dependent older people living in their own homes is unknown.

From an ethical point of view, only older adults who could give informed consent were included in the study. This meant that older adults who lacked the capacity to understand were excluded from the study. This also meant that the proposed allocation of service users into groups of care need had to be revised as those who were unable to consent were more likely to be in the critical care category. This led to a reduction of critical care numbers included in the study (N=10) and an increase in moderate (N=28) and substantial (N=22) care group numbers. This is likely to have led to an underestimation of the care needs of the service users as in many ways those who lacked capacity to consent were more likely to struggle with oral health self-care. The was borne out by the fact that, in general, those included in the study in the critical care category who were

able to give consent were found to have greater oral health care needs than the participants in the other care groups.

6.5.1 Home care provision

Figures published by the Scottish Government in 2008 show that even although the number of home care service users has fallen slightly in recent years, the proportion receiving intensive home care (more than 10 hours per week) has increased from 11% in 1998 to 30% in 2008 (Scottish Government, 2008). As more people are choosing home-based services rather than institutionalised care, this may lead over time to more dependent older people residing in the community, with a consequent increased need for more intensive support. One third of service users stated they received at least two visits from the home carer per day and so could potentially fall into the intensive care category. This figure is similar to the national statistics (30%) of those who receive intensive care. It was interesting to note that some of the service users still used coal fires and so, even if they did not require daily care, they were still visited daily to replenish the coal. This is perhaps a more likely occurrence in the rural areas and may lead to skewed data with respect to the Scottish population as a whole.

6.5.2 Demographics

The high percentage of female older people (76.7%) participating in this study is similar to the figures released from the Scottish Government, showing that 71.7% of older people receiving home care services are female. This reflects the greater female to male ratio among this age group (Scottish Government, 2007).

As there have been no previous published studies in Scotland investigating the oral health of dependent older people living in their own home, there are no data available to allow comparison of demographic characteristics. The best proxy available is to compare the present findings with those of investigations researching the dental status of older people residing in nursing and care homes. One such study by Nicol and co-workers (2005) took place in the same rural area, hence some comparisons can be made. Age ranges were similar, with a median of 82 years-old in the current study compared to 84 years-old in

the care home investigation (Nicol et al., 2005). There was a greater number of present and ex-smokers in the present study (48.3%) compared to the percentage of ex-smokers (26%) in the study by Nicol and co-workers (2005).

6.5.3 Dental status

Despite a greater number of older people in the UK remaining dentate, the oral health of this population group remains below adequate levels (Steele et al., 1998; Frenkel et al., 2001). In Scotland, older people have among the worst levels of oral health in the UK (Steele et al., 1998). In this study, dentate levels (25%) were lower than that found in the most recent UK dental survey of those aged 65 years and over (46%) (ONS, 1998) and also lower than that of the free living sample, aged 65 years and over, from the National Diet and Nutrition survey (50%)(Steele et al., 1998). In reality, as may be expected given their dependent status, the dentate level found in the present study was more similar to the level found amongst the institutionalised elderly (21%) in the above UK survey (Steele et al., 1998) and in a study by Frenkel and co-workers (2001)(28.6%). Additionally, the findings were similar to those of studies of older people residing in care homes in Greater Glasgow (26%) (Sweeney et al., 2007) and Caithness (27%) (Nicol et al., 2005).

The presence of 21 or more teeth has been used as an indicator of a functional dentition (ONS, 1998). In this study, the median number of teeth (19) among the relatively small number of dentate individuals indicates that few older adults had a functional dentition. A high prevalence of caries (76.6%) and calculus (93.3%) was found among the dentate. This may be associated with an increased prevalence of risk factors associated with oral disease and also with low dental registration levels (21.7%), as those who reportedly attend for regular check-ups are half as likely to have decay or unsound teeth (ONS, 1998). There was a high level of treatment need, with half the service users assessed as requiring treatment. With low registration levels, this further reflects the importance of prevention and appropriate daily oral care for these older people.

6.5.4 Denture cleanliness

For the purpose of this study, denture cleanliness was visually assessed in two ways. The visually aided method, previously used by Simons and co-workers (2000), was included as an objective method of assessing denture hygiene and a visually unaided method was used as a more subjective way of assessing denture cleanliness. There was a 100% sensitivity for assessing the upper and lower dentures, i.e. all dentures which were scored visually unclean also had a plaque score of > 0. Specificity was slightly lower, being 77% (upper denture) and 75% (lower denture), so there were more false positives. Some dentures were found to have hardened denture calculus present which was not picked up by the microbiological loop and, conversely, some food debris could be collected in the loop which was not denture plaque. Thus, the subjective unaided method, although more difficult to calibrate, would appear to permit a relatively accurate method of assessing denture cleanliness. This study found high levels of poor denture cleanliness using both methods. Almost half the upper dentures (48%) and half the lower dentures (55%) were assessed as having a plaque score > 0 and being visually unclean. This finding has implications regarding the requirement for the provision of appropriate denture care for this population group.

6.5.5 Xerostomia

Only two service users stated they did not taken any medication and polypharmacy was prevalent in this study. A large number of medications and salivary gland hypofunction are capable of inducing xerostomia (Sreenby & Schwartz, 1997). There was clinical evidence of xerostomia in just over half the older people examined, but only 40% complained about this problem. In the study by Nicol and co-workers (2005), 49% of older people were prescribed xerogenic medication but the authors found that many residents were uncomplaining and only voiced their symptoms if they were severe. Xerostomia can compromise oral health, resulting in an increased risk of dental caries, food stagnation, discomfort and poor denture retention (Fitzpatrick, 2000). Therefore, without regular care, the oral health of older people may suffer.

6.5.6 Microbiology

Xerostomia can increase *Candida* spp. carriage. There was a significant association between those that had a red lesion on the hard palate and those that had a heavy growth of yeast species. Clinically, 16.7% had evidence of a red lesion and a heavy fungal growth on their hard palate. This was a similar percentage to that reported in the study by Sweeney and co-workers (2007) in Greater Glasgow (18.8%), where the results were also confirmed by culture.

A relatively high proportion of service users were found to have a heavy growth of fungal species on the hard palate, the tongue and on the upper denture, if worn. There was a relatively high sensitivity (54%) and specificity (69%) in relation to fungal growth on the denture and the visual assessment (aided) of an unclean denture. The high carriage of yeasts is likely to reflect poor denture and dental hygiene. Such problems could be reduced by regular and effective oral hygiene care.

It was interesting to note the presence of non-albicans species and of azole resistance, both of which have been noted in people with advanced cancer (Bagg et al., 2003). Of the fungal species cultured, 50% were resistant to itraconazole and 30% were resistant to fluconazole and itraconazole. The microflora of older people are thus worthy of further study, particularly with regard to some of the non-albicans species such as *C. glabrata* (White et al., 1998; Sweeney et al., 2007). Additionally, MRSA was isolated in 10% of service users. This is also of concern as it can be difficult to eliminate this micro-organism.

6.5.7 Mouth care provision

The paper by Eadie and Schou (1992) reports on one of the few studies which has investigated barriers related to the provision of oral care by home carers. Although this study mainly investigated nurse and health visitor views (N=36), community carers were also involved (N=12). The common view was that if there was no reported problem, it was taken for granted that the client was capable of undertaking their oral health care themselves. These findings are reflected in the present study, with many home carers

expressing this view and a large number of the service users (80%) stating they did not need any assistance with mouth care, despite evidence of poor oral hygiene. There was a significant association between those that perceived they did not require any assistance with their oral health and a heavy growth of fungal species on their hard palate. There was also evidence of heavy fungal growth on the upper denture (50%) and presence of debris in dentate individuals (93%) among this group of service users. Eadie & Schou (1992) found that both carers and nursing staff felt that the standards of oral hygiene care could be better, but there was a reluctance to admit it. Several other studies which have included home carers have stated that these workers felt that many of those still living in their own homes were capable of carrying out their own oral health care. This was a common finding in this study. Even amongst the ten individuals in the critical care category, only four of these dependent older people reported they were currently receiving oral care from a home carer. The Chief Investigator assessed that, overall, 66.7% of the 60 service users examined should be receiving assistance with their oral health care. However, even when it was stated that assistance with mouth care was being received, a relatively high proportion of these individuals still had poor oral hygiene and the presence of a heavy fungal growth. The results would therefore seem to indicate that the type and quality of care provided was not meeting the needs of the clients and that further work relating to the development of appropriate training of home carers is required.

6.6 Study limitations

It is acknowledged that there were a number of limitations to this work, and the findings should be viewed as providing some useful pilot data to aid the development of future work.

The number of home carers attending both training sessions was lower than had been expected and therefore the results have to be viewed with caution as the potential for bias is recognised, with those less interested or with a less positive attitude to the provision of oral health care for their clients perhaps being less likely to participate.

Ideally, as previously mentioned, a randomised controlled trial design would have been used to assess post-training changes in attitude, knowledge and behaviour among the home carers. However, there were insufficient numbers of home carers in this region to enable this type of study to be undertaken. Additionally, the logistics of bringing together a control group to administer the questionnaires on two separate occasions, without providing any training, was not considered viable in this small-knit community. As stated above, this study was therefore designed as a preliminary investigation to provide useful information to help inform the development of future training programmes and of a future RCT and also to increase knowledge regarding the oral health status of dependent older people living in their own homes.

Although both questionnaires had been used in previous studies, they had not been used together prior to the study and some amendments were required to ensure they were applicable to the population group of interest. This investigation therefore served a useful purpose in piloting the adapted questionnaires and the results suggest that refinement of the tools is required prior to further work of this type. There was some apprehension among the home carers when presented with the numerous pages of questionnaires and the style and length of the questionnaires may have influenced the ability of the home carers to complete the forms appropriately and also their cooperation in relation to returning for the follow-up training session. Few home carers were used to completing these types of questionnaires and they caused some confusion, especially the Likert scale.

The six to eight month time frame between the completion of pre- and post-training questionnaires was longer than that used in many studies of this type. While it could be argued that the time period was appropriate with regard to measuring any long-term change in knowledge or attitude, it is recognised that the administration of the post-training questionnaire closer to the training event is likely to have produced more positive results. Regular refresher courses in oral health care have been advocated to sustain the level of knowledge and awareness of the topic among nursing home carers (Nicol et al., 2005). It would have been interesting to determine whether the second training session resulted in any further change in knowledge or behaviour of the participants.

The behaviour of the home carers in relation to oral health care was difficult to assess. Prior to the study, there was no documentation to say if the service user received oral health care and, if so, who provided this. The use of the notebooks was one way of attempting to assess the oral health care provision from home carers, but as they were not used to recording such information, compliance with regard to completing the notebooks was limited. This led to difficulties in assessing behaviour and a different method would have been preferable. Ideally the service users should have received an assessment both before and after the training but this was not possible due to time constraints and the clinical service commitments of the chief investigator. The home carers attending the second training session received information relating to the actual oral health status of their own client group. It would have been interesting to know if this had an impact on their future behaviour.

It is acknowledged that qualitative work would have been very beneficial in complementing the information obtained from the questionnaires and notebooks. The use of interviews and/or focus groups, involving both service providers and users, would have allowed a more in-depth exploration of the factors influencing attitudes and behaviours and thereby would have provided rich data to assist with the future development of this work. The advantages of this approach were recognised during the investigation, but it was not possible to fit this work into the timeframe of the MSc study. However, it is hoped that some of this work can be conducted in the future.

It is accepted that only small numbers of dependent older people living in their own homes were involved in the present study and that the investigation was conducted in a rural area in the north of Scotland. It is therefore recognised that the results cannot be generalised to this population group as a whole at either the UK or Scottish level, but the findings of a relatively high level of need, suggest that further studies of this type should be conducted across the UK.

Chapter 7
Conclusions and recommendations

7.1 Conclusions

Worldwide, the proportion of older adults is increasing and those aged 80 years and over are the fastest growing population segment (Berkey et al., 2001). This will lead to increases in health and social expenditures, with associated challenges to governments across the world. Dentistry and the provision of oral health care is also affected by these demographic shifts. The oral health status of this population group is also changing, with decreasing rates of edentulism. As a greater percentage of older people remain dentate, this may lead to more complex problems associated with the delivery of oral health care. Work is therefore required to identify need and to develop appropriate care programmes for dependent older adults. Adoption of a multi-disciplinary approach is recommended (Walid et al., 2004). The potential use of non-oral health care workers, such as local authority home carers, in the provision of oral health care requires exploration.

This study had two main aims. The first was to assess the baseline and post-oral health training knowledge, attitude and behaviour of local authority home carers in relation to the provision of oral health care of their client group. The second aim was to assess the oral health status of this client group. The following conclusions can be made.

There was a relatively poor training participation rate despite care managers indicating support for the training of their staff, multiple training sessions being provided and the cost of training, in terms of staff time and travel, being met by the researchers.

There appeared to be a relatively high percentage of home carers with baseline knowledge in relation to some aspects of oral health care (particularly associated with denture-related care), but in other areas where knowledge was less prevalent, very little or no improvement was seen post-training.

Although home carers indicated on both pre- and post-training questionnaires a relatively positive attitude to involvement in the provision of oral care for their clients and stated that they felt they could contribute to their client's general health through oral health care provision, a less positive attitude was demonstrated during practical training and there was very limited evidence from notebook entries of this attitude being translated into actual behaviour. Additionally, although most home carers indicated post-training that they did not consider intra-oral brushing more unpleasant than other aspects of personal care provision, a number of free-text responses indicated that for some, this was a problem.

One of the main reasons given by the home carers for lack of involvement in the oral health care of their clients was that those visited did not feel they required help from the carers in relation to this activity. This perception was confirmed by the client group in the service user part of the study.

Other barriers identified by a sizeable proportion of home carers in relation to participation in oral health care were time constraints and paper work associated with noting the care provided.

As mentioned previously, behaviour was difficult to assess. However, the low return rate of notebooks and the lack of evidence of provision of oral health care in many of the notebooks that were returned suggest that the training programme had a very limited effect on increasing the involvement of home carers in the oral health care of their clients.

The hypothesis that knowledge, attitude and behaviour of home carers in relation to mouth care improved following training was not proven. As outlined earlier in Chapter 6, the lack of change in attitudes and behaviour is not an unexpected finding, given the nature of the short training programme and the fact that oral health care plans were not available for the home carers to implement on an individual client basis. Although these findings may appear negative, they provide useful information with regard to identifying areas where increased knowledge is required and they have shown that further work is

required to understand more fully the true attitudes of the home carers concerning the provision of oral health care to their clients.

The findings have identified learning needs and the fact that little if any increase in knowledge occurred post-training indicates that further work is required to determine the appropriate format and content of training programmes for home carers. Additionally, the tools for assessing knowledge and attitude need refining – both in terms of the questionnaires used and expanding the research methods to include qualitative work, particularly in relation to the attitudinal issues.

The other main aim of the study was to assess the dental status of older people receiving care from the home carers. The results of the clinical examinations identified a much higher level of care need and treatment need than had been perceived by the service users. There were high rates of edentulism, a high prevalence of plaque on dentures and the natural dentition and heavy growths of candida species cultured from many individuals. All in the 'critical' care group were assessed as requiring oral health care assistance.

Those who reported receiving oral health care assistance from home carers still showed high levels of dental disease, suggesting that the provision of care was not as effective as it could be.

A number of service users were assessed as requiring assistance with mouth care but did not want any help. This suggests that before attempting to develop care programmes for this population group, further work is required with both the service users and providers to raise awareness of oral health issues and to gain a deeper understanding of attitudes and the type of programmes which will meet the needs of the parties involved. Training programmes can then be developed to meet the needs of the programme.

The results of the clinical assessments can help to inform priorities with regard to the involvement of carers in oral care and could be fed into the discussions outlined above.

Areas identified where home carers could be involved include: the provision of advice or actual intra-oral assistance with oral hygiene; asking clients about their oral condition and if any pain or other problems are identified, helping the individual to access dental care; or facilitating regular attendance at the dentist. Some of these activities require less direct involvement in oral health care and consideration could be given to developing care programmes in an incremental fashion, with some types of work being easier and quicker to implement than others.

7.2 Recommendations

This study has identified a number of issues and the following recommendations are made.

Qualitative research should be conducted with stakeholders including home carers, their clients and managers and the dental professionals to explore attitudes to the provision of oral health care by home carers and identify facilitators and barriers to this activity.

Attempts should be made to raise awareness of oral health among the service users. If older people become more aware of their oral health and level of oral hygiene, they may be more ready to allow home carers to assist with their oral health care.

Further surveys of the oral health of dependent older people living in their own homes should be conducted in Scotland to add to the knowledge base generated in this study.

The above investigations should provide information to help identify ways of facilitating involvement of home carers in oral health care provision for their clients and identify the activities that home carers could assist with. This, in turn, would help inform the development of appropriate oral health programmes for the client group. Appropriate training programmes could then be developed to meet the needs of the service users and providers.

Once these programmes had been developed, a randomised control trial should be conducted to test the efficacy and effectiveness of the proposed training and oral health programmes.

Concurrent work is required to raise awareness of the poor oral health of this population group with government and social services at the national and local level. This could include discussion of the potential to develop appropriate care programmes, care plans and the training of care workers.

Consideration should be given to oral health care training in the future being included in the generic training of home carers to encourage a greater attendance and ensure all home carers receive the appropriate training.

Consideration should be given to the inclusion of oral health in the initial care plan assessment, and oral health care plans for service users should be developed. This would allow home carers to know what oral health care should be provided and could introduce a standardised way of recording oral care provision. NHS dental services would need to work with social services to develop these assessments and provide training for those conducting the assessments and developing the individual care plans.

References

Adams R. (1996) Qualified nurses lack adequate knowledge related to oral health, resulting in inadequate oral care of patients on medical wards. *Journal of Advanced Nursing,* **24**(3): 552-560.

American Diabetes Association (2004)
Available URL: http://www.diabetes.org/uedocuments/AnnualFINAL.pdf Accessed April 2008

Andrews G. (2001) Demographic and Health Issues in Rural Aging: A Global Perspective. *Journal of Rural Health,* **17**(4): 323-327.

Arnold C., Brookes V., Griffiths J., Maddock S. & Theophilou S. (2000) *Guidelines for Oral Health Care for People with a Physical Disability*. *Report of British Society for Disability and Oral Health.* Available URL: http://www.bsdh.org.uk/guidelines/physical.pdf Accessed May 2007.

Arpin S. (2009) Oral hygiene in elderly people in hospitals and nursing homes. *Evidence-Based Dentistry,* **10**: 46.

Atsushi O., Yoshinori T., Yoshiyuki S. Koyama I., Shimizu C., Kurosaki N. & Mataki S. (2003) Home care workers' oral health awareness. *Journal of the Stomatological Society,* **70**(1): 32-39.

Bagg J., Sweeney M.P., Lewis M.A.O., Jackson M.S., Coleman D., Al Mosaid A., Baxter W., McEndrick S. & McHugh S. (2003) High prevalence of non-albicans yeasts and detection of ant-fungal resistance in the oral flora of patients with advanced cancer. *Palliative Medicine,* **17:** 477-481.

Barnes IE & Walls A. (1994) *Gerodontology*. Glasgow. George Warman Publications

Berkey D., Meckstroth R. & Berg R. (2001) An ageing world: Facing the challenges for dentistry. *International Dental Journal,* **51**: 177-180.

Bonnetti D. (2009) Personal communication.

Brady M., Furlanetto D., Hunter R.V., Lewis S. & Milne V. (2006) Staff-led interventions for improving oral hygiene in patients following stroke. *The Cochrane Database of Systematic Reviews,* **4**: 1-23.

Davies A. & Finlay I. (2005) *Oral care in advanced disease.* London. Oxford University Press

Dementia (2007) Available URL:
http://www.alzheimers.org.uk/downloads/DementiaUK_Full_Report.pdf
Accessed April 2008.

De Visschere L.M. & Vanobbergen J.N. (2006) Oral health care for frail elderly people: actual state and opinions of dentists towards a well-organised community approach. *Gerodontology,* **23**: 170-176.

Dougall A. & Fiske J. (2008) Access to special care dentistry, part 9. Special care dentistry services for older people. *British Dental Journal*, **205**(8): 421-434.

Eadie D.R. & Schou L. (1992) An exploratory study of barriers to promoting oral hygiene through carers of elderly people. *Community Dental Health,* **9**: 343-348.

Ekstrand K., Martignon S., Holm-Pederson P. (2008) Development and evaluation of two root caries controlling programmes for homebased frail people older than 75 years. *Gerodontology,* **25**(2): 67-75.

Ettinger R. (2005) Oral Health in aging societies: a global view. *Special Care in Dentistry,* **25**(5): 225-6.

Ettinger R. (1993) Cohort differences among aging populations: a challenge for the dental profession. *Special care in Dentistry,* **13**(1): 19-26.

Epstein J.B., Stevenson-Moore P. & Scully C. (1992) Management of xerostomia. *Journal of the Canadian Dental Association,* **58**(2): 140-143.

Fastbom J., Aguero-Torres H. & Hilleras P. (2008) How do older people experience their management of medicines? *Journal of Clinical Nursing*, **17**(5): 106-115.

Fiske J., Griffiths J., Jamieson R. & Manger D. (2000) *Guidelines for Oral Health Care for Long-stay Patients and Residents*. *British Society for Disability and Oral Health* Available URL http://www.bsdh.org.uk/guidelines/longstay.pdf Accessed May 2007.

Fitzpatrick J. (2000) Oral health care needs of dependent older people: responsibilities of nurses and care staff. *Journal of Advanced Nursing,* **32**(6): 1325-1332.

Frenkel H., Harvey I. & Newcombe R.G. (2001) Improving oral health in institutionalized elderly people by educating caregivers:a randomised controlled trial. *Community dentistry and oral epidemiology,* **29**(4): 289-97.

Frenkel H., Harvey I. & Needs K. (2002) Oral Health Care education and its effect on caregivers' knowledge and attitudes: a randomised controlled trial. *Community dentistry and oral epidemiology,* **30**(2): 91-100.

Gift H. (1988) Issues of aging and oral health promotion. *Gerodontics,* **4**: 194-206.

Greengross S., Murphy E., Quam L., Rochon P. & Smith R. (1997) Ageing: a subject that must be the top of world agendas. *British Medical Journal,* **315**: 1029-1030.

Greene J.C. & Vermillion J.R. (1964) The simplified oral hygiene index. *Journal of the American Dental Association,* **68**: 7-13.

Griffiths J. & Boyle S. (2005) *Holisitic Oral Care- a guide for health professionals.* London. Stephen Hancocks Limited.

General Register Office for Scotland (2009) Available URL: http://www.gro-scotland.gov.uk/statistics/publications-and-data/population-estimates/index.html Accessed June 2009.

Hally J., Clarkson J.E. & Newton J.P. (2003) Continuing dental care for Highlands elderly: current practice and attitudes of dental practitioners and home supervisors. *Gerodontology,* **20**(2): 88-94.

Heft M.W. & Gilbert G.H. (1991) Tooth loss and caries prevalence in older Floridians attending senior activity centers. *Community Dental Oral Epidemiology,* **19**: 228-232.

Highland Council (2008) Available URL: http://highland.gov.uk/socialwork/olderpeopleservices Accessed April 09.

Holm-Pederson P., Avlun K., Morse D.E., Stoltze K., Katz R.V., Viitanen M., & Winblad B. (2005) Dental caries, periodontal disease, and cardiac arrhythmias in community dwelling older persons aged 80 and older: is there a link? *Journal of the American Geriatrics Society,* **53**(3): 430-437.

Humphris G. & Ling M.S. (2000) *Behavioural Sciences for Dentistry* London. Churchill Livingstone

Ikebe K., Morii K., Matsuda K., Hata K. & Nokubi T. (2006) Association of candidal activity with denture use and salivary flow in symptom-free adults over 60 years. *Journal of Oral Rehabilitation,* **33**(1): 36-42.

ISD Scotland Available URL: http://www.isdscotland.org/isd/4680.html
Accessed June 2009

Kay E. & Locker D. (1997) *Effectiveness of Oral Health Promotion: A Review* London. HEA

Kelly M., Stelle J., Nuttal N. Bradnock G., Morris J. & Nunn J. (2000) *Adult Dental Health Survey-oral health in the United Kingdom*. London. The Stationary Office

Lamster I.B. & Northridge M.E. (2008) *Improving Oral Health for the Elderly; An Interdisciplinary Approach*. New York. Springer

Locker D. & Finbarr A. (2007) What do measures of "oral health-related quality of life" measure? *Community Dentistry and Oral Epidemiology,* **35**(6): 401-411.

MacEntee M.I., Wyatt C.C.L., Beattie B.L., Paterson B., Levy-Milne R., McCandless L. & Kazanjian A. (2007) Provision of mouth-care in long term care facilities: an educational trial. *Community Dentistry and Oral Epidemiology,* **35**(1): 25-34.

Migliorati C.A. & Madrid C. (2007) The interface between oral and systemic health: the need for more collaboration. *Clinical Microbiology and Infection,* **13**(4): 11-16.

National Service Framework for Older People (2001) Department of Health Available URL:http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@endocuments/digitalasset/dh_4071283.pdf Accessed March 2008

NHS Quality Improvement Scotland. Best Practice Statement: Working with dependent older people to achieve good oral health (2005) Available URL: http://www.nhshealthquality.org/nhsqis/files/NHS%20QIS%20Annual%20rep%2005.pdf Accessed May 2009

Nicol R., Sweeney M.P., McHugh S. & Bagg J. (2005) Effectiveness of health care worker training on the oral health of elderly residents of nursing homes. *Community Dentistry and Oral Epidemiology,* **33**(2):115-124.

Nunn J., Morris J., Pine C., Pitts N.B., Bradnock G. & Steele J. (2000) The condition of teeth in the UK in1998 and implications for the future. *British Dental Journal,* **189**(12) 639-644.

Ohyama A., Toriyama Y., Sasaki Y., Koyama I., Shimizu C., Kurosaki N. & Mataki S., (2003) Home care workers' oral health awareness and practice for disabled elderly. *Journal of the Stomatological Society,* **70**(1): 32-39.

Office of National Statistics (2008) Available URL: http://www.statistics.gov.uk/cci/nugget.asp?ID=949 Accessed May 2009

Paulsson G., Fridlund B., Holmen A., Hyg O. & Nederfors T. (1998) Evaluation of an oral health education programme for nursing personnel in special housing facilities for the elderly. *Special Care in Dentistry,* **18**(6): 234-242.

Paulsson G. Soderfeldt B., Fridlund B & Nederfors T. (2001) Recall of an oral health education progamme by nursing personnel in special housing facilities for the elderly. *Gerodontology,* **18**(1): 7-14.

Paulsson G., Soderfeldt B., Nederfors T. & Fridlund B. (2003) The effect of an oral health education programme after three years. *Special Care Dentist,* **23**(2): 63-69.

Peltola P., Wehkalahti M.M. & Simoila R. (2007) Effects of 11-month interventions on oral cleanliness among the long-term hospitalised elderly. *Gerodontology,* **24**: 14-21.

Penner A. & Timmons V. (2004) Seniors' attitudes: oral health and quality of life. *International Journal of Dental Hygiene,* **2**(1): 2-7.

Peterson P.E. & Yamamoto T. (2005) Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. *Community Dentistry and Oral Epidemiology,* **33**(2): 81-92.

Preston A.J. & Barber M.W. (2007) The ageing UK population-considerations for the restorative dentist. *International Dental Journal,* **57**: 423-428.

Rogers W.A., Meyer B., Walker N. & Fisk A.D. (1998) Functional limitations to daily living tasks in the aged: A focus group analysis. *Human Factors and Ergonomics Society,* **40**(1): 111-126.

Royal Commission (1999) London. London Stationary Office

Schou E. (1995) *Disease prevention and oral health promotion*. Copenhagen. Munksgaard

Scottish Executive (2005) *An action plan for improving oral health and modernising NHS dental services*. Edinburgh

Scottish Executive (2006) *Review of Primary Care Salaried Dental Services in Scotland.* Edinburgh.

Scottish Executive (2007a) *All our futures: Planning for a Scotland with an ageing population: 1: Summary and action plan* Available URL: http://www.scotland.gov.uk/Resource/Doc/169472/0047205.pdf Accessed May 2009

Scottish Government (2008) Available URL: http://www.scotland.gov.uk/News/Releases/2008/1124/62033 Accessed May 2009

Scottish Government (2008) Available URL: http://www.scotland.gov.uk/topics/statistics/browse/population/ Accessed April 2008

Scottish Government (2009) Available URL: http://www.scotland.gov.uk/Publications/2009/08/12134857/2 Accessed June 2009

Scully C. & Cawson R.A. (2005) *Medical Problems in Dentistry.* Fifth Edition. London. Elsevier Churchill Livingstone

Sheiham A., Steele J.G., Marcenes W., Tsakos G., Finch S. & Walls A.W.G. (2001) Prevalence of impacts of dental and oral disorders and their effects on eating among older people; a national survey in Great Britain. *Community Dentistry and Oral Epidemiology,* **29**(3): 195-203.

Shimoyoma K., Chiba Y. 7 Suzuki Y. (2007) The effect of awareness on the outcome of oral health performed by home care service providers. *Gerodontology,* **24**: 204-210.

Ship J. (2002) Improving Oral Health in Older People. *Journal of the American Geriatrics Society,* **50**(8): 1454-1455.

Shukla R.B. & Brooks D. (1996) *A Guide to Care of the Elderly.* London. HMSO

Simons D. (2003) Who will provide dental care for housebound people with oral problems? *British Dental Journal,* **194**(3): 137-138.

Simons D., Baker P., Jones B. & Kidd E.A.M. (2000) Evaluation of an oral health training programme for carers of the elderly in residential homes. *British Dental Journal,* **188**(4): 206-210.

Simons D., Brailsford S., Kidd E.A.M. & Beighton D. (2001) Relationship between oral hygiene and oral status in dentate elderly. *Community Dentistry and Oral Epidemiology,* **29**(6): 464-470.

Sjörgren P., Nilsson E., Forsell M., Johansson O., Hoogstraate J. (2008) A systematic review of the preventive effect of oral hygiene on pneumonia and respiratory tract infection in elderly people in hospitals and nursing homes: effect estimates and methodological quality of randomised controlled trials. *Journal of American Geriatric Society,* **56**: 2124-2130.

Soule A., Babb P., Evandrou M., Balchin S. & Zealey L. (2005) *Focus on Older People.* London. HMSO

Sreenby L.M. & Schwartz S.S. (1997) A reference guide to drugs and dry mouth- 2nd edition. *Gerodontology,* **14**(1): 33-47.

Steele J. G., Sheiham A., Marcenes W. & Walls A.W.G. (1998) *National diet and nutrition survey: people aged 65 years and over. Report of the Oral Health Survey. Volume 2*. London. The Stationary Office

Steele J.G., Treasure E., Pitts N.B., Morris J. & Bradnock G. (2000) Total tooth loss in the United Kingdom in 1998 and implications for the future. *British Dental Journal,* **189**(11): 598-603.

Steele J.G. & Walls A.W.G. (2000) Using partial recording to assess tooth wear in older adults. *Community Dentistry and Oral Epidemiology,* **28**: 18-25.

Strayer M.S. (1995) Perceived barriers to oral health care among the housebound. *Special Care in Dentistry,* **15**(3): 113-118.

Sweeney M.P. & Bagg J. (2000) The mouth and palliative care. *American Journal of Hospice and Palliative Medicine,* **17**(2): 118-124.

Sweeney M.P., Bagg J., Kirkland G. & Farmer T.A. (2000) Development and evaluation of a multimedia resource pack for oral health training of medical and nursing staff. *Special Care in Dentistry,* **20**(5): 182-186.

Sweeney M.P., Bagg J., Mc Cann P.J. & Gibson J. (2005) Training in oral disease, diagnosis and treatment for medical students and doctors in the UK. *British Journal of Oral and Maxillofacial Surgery,* **43**(1): 61-4.

Sweeney M.P., Manton S., Kennedy C., Macpherson L.M.D. & Turner S. (2007) Provision of domiciliary dental care by Scottish dentists: a national survey. *British Dental Journal,* published online: 2 February 2007/doi:10.1038/bdj.2007.79
Accessed June 2008.

Sweeney M.P., Williams C., Kennedy C., Macpherson L.M., Turner S. & Bagg J. (2007) Oral health care and status of elderly care home residents in Glasgow. *Community Dental Health,* **24**(1): 37-42.

Takata Y., Ansai T., Awano S., Fukuhara M., Sonoki K., Wakisaka M., Fujisawa K., Akifusa S. & Takehara T. (2006) Chewing ability and quality of life in an 80-year-old population. *Journal of Oral Rehabilitation,* **33**(5): 330-334.

Talbot A., Brady M., Furlanetto D.L.C., Frenkel H. & Williams B.O. (2005) The challenge of providing oral care in stroke settings across Scotland. *Gerodontology,* **22**(2): 77-83.

Tamura M., Sato T., Shinada K., Miura H. & Kawaguchi Y. (2001) Statistical analysis of a dental care programme for homebound elderly patients in Shinjuku-ku. *Journal of the Stomatological Society,* **68**(4): 307-312.

Tomuro K. (2004) Development of oral home telecare programme for the home-dwelling elderly: a pilot study. *Gerodontology,* **21**: 177-180.

Tsakos G., Steele J.G., Marcenes W., Walls A.W.G. & Shieham A. (2006) Clinical correlates of oral health-related quality of life: evidence from a national sample of British older people. *European Journal of Oral Sciences,* **114**(5): 391-395.

United Nations (2003) Available URL: http://www.un.org/esa/population/publications/2003monitoring/worldpopmonitoring_2003.pdf Accessed May 2008

United Nations (2008) Available URL: www.unaids.org/en/knowledgecentre/HIVdata/GlobalReport/2008/2008_Global_Report.asp Accessed April 2009

University of Glasgow (2009) Available URL: http://www.gla.ac.uk/schools/dental/oralcancer/howcommoniscancer/ Accessed May 2009

Walid E.I., Nasir F. & Naidoo S. (2004) Oral health knowledge, attitudes and behaviour among nursing staff in Lesotho. *Journal of the South African Dental Association,* **59**: 288-292.

Walls A.W.G. & Steele J.G. (2001) Geriatric oral health issues in the United Kingdom *International Dental Journal,* **51**: 183-187.

Wardh I., Andersson L. & Sorensen S. (1997) Staff Attitudes to oral health care. A comparative study of registered nurses, nursing assistants and home care aides *Gerodontology,* **14**(1): 28-32

Watson R. (2006) Care of older people. *Nursing Practice: Hospital and Home: the Adult,* 1131-1146.

Watson R. (2008) Research into ageing and older people. *Journal of Nursing Management,* **16**(2): 99-104.

Weaver D. (2006) Wider perspectives on ageing. *Nursing &Residential Care,* **8**, No. 8.

Weeks J.C. & Fiske J. (1994) Oral care of people with disability: a qualitative exploration of the views of nursing staff. *Gerodontology,* **11**(1):13-7.

White T.C., Marr K.A. & Bowden R.A. (1998) Clinical, Cellular and Molecular Factors that contribute to Antifungal Resistance. *Clinical Microbiology Reviews,* **11**(2): 382-402.

White V.A.A. (2007) *Provision of Oral Health Care and Support for Older People in Care Homes in Scotland*. Thesis MPH. Glasgow University

White V.V.A., Edwards M., Sweeney M.P. & Macpherson L.M.D. (2009). Provision of oral healthcare and support in care homes in Scotland. *Journal of Disability and Oral Health,* **10**: 99-106.

WHO (2002) Available URL: http://www.who.int/whr/en/ Accessed May 2008

Wray D., Lowe G.D.O., Dagg J.H., Felix D.H. & Scully C. (1999) *Textbook of General and Oral Medicine.* London. Churchill Livingstone

Yoneyama T., Yoshida M. & Akgawa Y. (2001) Oral care reduces pneumonia of elderly patients in nursing homes, irrespective of dentate or edentate status. *Japanese Journal of geriatrics,* **38**(4):481-483.

Young B.C., Murray C.B. & Thomson J. (2008) Care home staff knowledge of oral care compared to best practice: a West of Scotland pilot study. *Britsh Dental Journal*, published online :10 October 2008/doi:10.1038/s.j.bdj.2008.894

Appendices

Appendix i

Letter to Home Care Managers

Lochshell Dental Clinic
Wick Business Park
Wick
KW1 4QR
Telephone **01955 609940**

Dear Sir/Madam,

Assessing attitude, knowledge and behaviour of home carers in relation to mouth care of the older housebound population in Caithness

Further to our telephone discussion, I would be grateful if you would consider taking part in a short semi-structured telephone interview to determine your views concerning mouth care training programmes for home carers.

It is important to stress there are no right or wrong answers and that this interview is carried out to give you an opportunity to express your views regarding the provision of mouth care by home carers and the training programme.

The interview will take five minutes and will consist of four short questions related to mouth care. All answers will be anonymised so that no one will be identifiable.

I will contact you in the next two weeks to confirm your acceptance and arrange a suitable time for the telephone interview to take place.

If you have any questions please do not hesitate to contact me.

Thank you.
Yours sincerely

Myra O'Boyle BDS

Appendix ii
Structured Interview for
Home Care Managers

Structured Interview for Home Care Managers

Do you think mouth care for older people is part of the home carers remit?
Why?

- Rank order of care
- Domestic duties eg cooking, cleaning,
- Personal care eg washing feeding
- Social duties eg shopping
- Emotional support eg listening, empathizing
- Mouth care

How important would provision of mouth care training programmes be to the home carers in your organization?

What would you like to see being achieved if mouth care training was provided?

Appendix iii
Information Sheet and Consent
for Home Carers

Information sheet - Home Carers

Assessing the attitude, knowledge and behaviour of home carers in relation to the mouth care of the older housebound population in Caithness

We would like you to consider taking time to participate in this study. Before you decide to take part it is important you understand what the study is about and why it is being done. Please take time to read the following information and if there is anything that is unclear or you would like more information about please ask.

Please take time to consider this request. If you decide to take part in the study you are free to withdraw at any time.

What is the purpose of the study?

It is important to keep the mouth healthy and clean. Diseases of the mouth may cause problems to a person's health and affect how they lead their life. Often mouth care is treated as a low priority and is sometimes neglected as a result.

This study wishes to determine what effect a mouth care training programme for home carers providing care to older people still living in their own homes can have on the carers' attitude, knowledge and behaviour in relation to mouth care of older people.

Why have I been chosen?

As a home carer employed by the Highland Council you have been invited to take part in this study.

Do I have to take part?

No. It is up to you to decide whether to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If

No. It is up to you to decide whether to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part, you are still free to withdraw at any time.

What will it involve?

It will involve answering a series of questions about your knowledge, attitude and behaviour in relation to mouth care for your older clients. You will then receive training in mouth care. The questionnaire will then be repeated in 6 months and will assess whether the mouth care training programme has made a difference.

The training programme will be delivered in groups of 10. It will consist of a series of photographs of older peoples' mouths, information about cleaning dentures and teeth and a hands-on session practising cleaning dentures and teeth. You will be provided with a certificate in mouth care at the end of the training and asked to fill in an evaluation questionnaire of the training.

Will my taking part in this study be kept confidential?

All information which is collected will be kept strictly confidential. Your name will be removed prior to the analysis of the information so you cannot be recognised from the results.

What will happen to the results of the research study?

The study is part of an MSc in Dental Public Health with the University of Glasgow. The results will be written up in an anonymised way and the report will be made available to local care managers and may help inform the future development of services.

Who is funding the research?

A national organisation, responsible for the training of many groups of health care workers (NHS Education for Scotland) is funding the research.

Who has reviewed the study?

North of Scotland Ethics Committee has reviewed the study.

Please take time to consider this request. If you decide to take part you are still free to withdraw at any time. All information collected will be kept confidential.

If you have any concerns or questions please contact:

Myra O'Boyle BDS
Lochshell Dental Unit
Wick Business Park
Wick
Caithness
KW1 4QR
01955 609940

Consent Form for Home carers

Assessing attitude, knowledge and behaviour of home carers in relation to the mouth care of the older housebound population in Caithness

I have read and understood the information sheet for the above study ☐

I am aware that the study is voluntary and I am free to withdraw at any time ☐

All information that is collected will be treated confidentially ☐

I agree to take part in this study ☐

Name of Home Carer _____ Signature _____ Date_____

Name of person
taking consent _____ Signature _____ Date _____

Name of witness_____ Signature_____ Date _____

When completed one copy to be kept in research file and one copy to be given to the home carer

Appendix iv

Questionnaire 1

CARING FOR CLIENTS WITH DENTURES

Please indicate whether you think the following statements are true or false.

Please tick one box ☑ in each row

1. Ideally, clients' dentures should be taken out at night	True ❑	False ❑	Don't know ❒
2. Denture cleaning solutions remove the dirt from dentures without you needing to brush as well	True ❑	False ❑	Don't know ❒
3. Soft food often sticks to dentures, but it does not make them uncomfortable to wear	True ❑	False ❑	Don't know ❒
4. Bacteria tend not to stick to the surfaces of dentures	True ❑	False ❑	Don't know ❒
5. Unclean dentures can cause mouth infections	True ❑	False ❑	Don't know ❒
6. For clients' comfort, dentures should be rinsed after every meal	True ❑	False ❑	Don't know ❒
7. Clients without any natural teeth only need a dental check-up when they have a problem	True ❑	False ❑	Don't know ❑
8. Clients usually notice discomfort if they have a gum infection underneath their dentures	True ❑	False ❑	Don't know ❒
9. A dirty denture may be unsightly, but it will not cause any disease in the mouth	True ❑	False ❑	Don't know ❒
10. Thorough brushing cleans dentures more effectively than soaking in a denture cleaner	True ❑	False ❑	Don't know ❒
11. Wearing a denture increases the number of bacteria in the mouth	True ❑	False ❑	Don't know ❒

CARING FOR CLIENTS WITH THEIR OWN TEETH

Please indicate whether you think the following statements are true or false.

Please tick one box ☑ in each row

12. A softer toothbrush is better than a hard one for cleaning clients' teeth	True ❑	False ❑	Don't know ❑
13. A large-headed toothbrush is less efficient at cleaning teeth than a small-headed toothbrush	True ❑	False ❑	Don't know ❑
14. Lack of calcium can put clients at risk from tooth decay	True ❑	False ❑	Don't know ❑
15. Old people's teeth are less prone to decay than younger people's teeth	True ❑	False ❑	Don't know ❑
16. Brushing clients' teeth will also improve the condition of their gums	True ❑	False ❑	Don't know ❑
17. If clients' have a lot of sugary food and drink, their teeth are more likely to decay	True ❑	False ❑	Don't know ❑
18. A mouth-swab is a good alternative to a toothbrush for cleaning clients' teeth	True ❑	False ❑	Don't know ❑
19. It is possible to catch certain infections from contact with a client's saliva	True ❑	False ❑	Don't know ❑
20. Bacteria in clients' mouths are one of the causes of dental decay	True ❑	False ❑	Don't know ❑
21. Clients with dry mouths will tend to get less decay	True ❑	False ❑	Don't know ❑
22. Even if the gums around the teeth are inflamed or bleeding, they do not usually cause any pain	True ❑	False ❑	Don't know ❑
23. For health and safety reasons, you should wear protective gloves when cleaning clients' teeth	True ❑	False ❑	Don't know ❑
24. Most clients with bad teeth will have inherited a tendency to get decay	True ❑	False ❑	Don't know ❑
25. Once gum disease has started it is almost impossible to halt	True ❑	False ❑	Don't know ❑
26. Older people can often get more decay than younger people	True ❑	False ❑	Don't know ❑

We are interested in your comments and opinions on these statements. Space is provided at the end of the question for you to write your own views

First, please indicate how strongly you agree or disagree with the statements by ticking the box that most closely reflects your own feelings.

Please tick one box ☑ in each row

	Strongly agree	Tend to agree	Tend to disagree	Strongly disagree	No opinion
1. I would feel more uncomfortable brushing inside a client's mouth than I do with most other kinds of personal care	❑	❑	❑	❑	❑
2. I believe I can help in preventing my clients' teeth from becoming decayed	❑	❑	❑	❑	❑
3. I think that only the dentist can prevent clients' teeth from decaying	❑	❑	❑	❑	❑
4. Cleaning clients' natural teeth is a task I feel confident to carry out	❑	❑	❑	❑	❑
5. I believe I can play a useful part in preventing my clients from getting gum disease	❑	❑	❑	❑	❑
6. I think that the dentist is the only person who can help clients who have gum disease	❑	❑	❑	❑	❑
7. Brushing teeth is a very personal thing that you should not be expected to do for somebody else	❑	❑	❑	❑	❑
8. In my opinion, it is better to wait until clients have a problem before asking the dentist to see them	❑	❑	❑	❑	❑

Please use the space below to write down your own comments and views about the statements you have just considered.

HOW YOU FEEL ABOUT YOUR OWN ORAL HEALTH

Please indicate how strongly you agree or disagree with the following statements.

Please tick one box ☑ in each row

	Strongly agree	Tend to agree	Tend to disagree	Strongly disagree	No opinion
9. I believe my own teeth should last me throughout my life	❑	❑	❑	❑	❑
10. I find there is very little I can do to prevent myself getting dental problems	❑	❑	❑	❑	❑

	Strongly agree	Tend to agree	Tend to disagree	Strongly disagree	No opinion
11. I feel that dentures are less trouble than looking after your own teeth	❑	❑	❑	❑	❑

12. If my gums bleed when I brush, I suppose it means I have been brushing too hard	❑	❑	❑	❑	❑
13. Up to now, I feel I have looked after my teeth well	❑	❑	❑	❑	❑
14. As you get older, I think you are bound to lose some of your teeth	❑	❑	❑	❑	❑
15. If I was too ill or disabled to clean my own teeth, I hope somebody would to do it for me	❑	❑	❑	❑	❑
16. I worry that I haven't been able to look after my teeth as well as I would have liked	❑	❑	❑	❑	❑
17. It is important to me to keep all of my own teeth	❑	❑	❑	❑	❑
18. I rely on the dentist to prevent me from getting dental problems	❑	❑	❑	❑	❑
19. If my gums bleed when I brush my teeth, I worry that I am not looking after them well enough	❑	❑	❑	❑	❑
20. It is my own responsibility to look after the health of my mouth	❑	❑	❑	❑	❑

If you have any other comments to add about your own experiences with dental health and dental treatment, we would be very interested to hear them. Please write in the space below.

We would be grateful if you could provide the following personal details so that we can compare answers from all the people taking part in this survey:

Please indicate the statement that best describes your usual pattern of visiting the dentist. *Please tick one box only* ☑

Regular check-ups once a year or more	❑
Only when I think something needs doing, although I am not getting any pain	❑
Only when I am getting some discomfort	❑
Only when I am having severe pain	❑
Other (please specify)	_____
	_____
	_____

Imagine you are a client living in their own home receiving care. Can you suggest any improvements in mouth care that would you like to see? If possible, explain the reasons for your answer. (Use the space below for your reply)

Thank you very much for completing the questionnaire

Appendix v

Questionnaire 2

PROVIDING ORAL HEALTH CARE TO HOME CARE CLIENTS

The aim of this questionnaire is to further our understanding of how to provide oral health care to home care clients. As this is a new development in home care, we need to know how best to support those providing such care. Your answers will help us to do this. All information will be treated confidentially, so feel free to say what you think. Thanks for your help.

.

PART ONE – BACKGROUND INFORMATION

1. Are you: Male ☐ Female ☐

2. What is your number of clients? ☐☐☐

3. How long have you been working as a home carer? ☐☐ years ☐☐ months

4. How many sessions (0.5 days) do you work per week? ☐☐

5. Which shift do you usually work? Please tick one box ☑

All day	☐
Early day-shift	☐
Late day-shift	☐
Night shift	☐
Other	☐

(please specify)

_____

_____

PART TWO – YOUR VIEWS AND EXPECTATIONS

5. In general, (I expect) providing oral health care to my clients (will)	**Please indicate how much you agree or disagree with these statements by circling a number**						
	Strongly disagree						strongly agree
allow opportunity for my professional development (e.g. learn new skills, gain knowledge)	1	2	3	4	5	6	7
have a positive impact on my relationship with my clients and their family	1	2	3	4	5	6	7
severely disadvantage me in terms of time	1	2	3	4	5	6	7
severely disadvantage me in terms of workload	1	2	3	4	5	6	7
increases my job satisfaction	1	2	3	4	5	6	7
be supported by my line manager	1	2	3	4	5	6	7
be a financial burden on me	1	2	3	4	5	6	7
increase my anxiety	1	2	3	4	5	6	7
allow me to contribute to the overall health of my clients	1	2	3	4	5	6	7
6. When providing oral healthcare to my clients it is important to:	Please indicate how important each statement is by circling a number.						
	Very important						Not at all important
have opportunity for my professional development	1	2	3	4	5	6	7
safeguard my relationship with client and their family	1	2	3	4	5	6	7
not be disadvantaged in terms of my time	1	2	3	4	5	6	7
not be disadvantaged in terms of my workload	1	2	3	4	5	6	7
increase my job satisfaction	1	2	3	4	5	6	7
be supported by my line manager	1	2	3	4	5	6	7
minimise my anxiety	1	2	3	4	5	6	7
contribute to the overall health of my client	1	2	3	4	5	6	7
7. How difficult (do you expect it to be) for you to:	very difficult						not at all difficult
Provide oral health care for your clients	1	2	3	4	5	6	7
Find the time needed to provide oral health care	1	2	3	4	5	6	7
Gain support needed to provide oral health care	1	2	3	4	5	6	7

Cope with paperwork associated with providing oral health care	1	2	3	4	5	6	7
Cope with additional time demands caused by providing oral health care	1	2	3	4	5	6	7
8. How much do you agree or disagree with these statements:	strongly disagree						strongly agree
I want to provide oral health care but I don't really think I can	7	6	5	4	3	2	1
I could fit oral health care in with my everyday practice if I really wanted to	7	6	5	4	3	2	1
I am unable to do what is necessary to allow me to provide oral health care	7	6	5	4	3	2	1
I expect to have plans in place to help me incorporate oral health care into my everyday working life	7	6	5	4	3	2	1
9. How confident are you that you can:	not at all confident						very confident
provide oral health care to your clients	1	2	3	4	5	6	7
find the time required to provide oral health care	1	2	3	4	5	6	7
gain the support needed to provide oral health care	1	2	3	4	5	6	7
cope with paperwork associated with oral health care	1	2	3	4	5	6	7
cope with the additional time commitments	1	2	3	4	5	6	7
For me, providing oral health care is:	very useful 1	2	3	4	5	6	not at all useful 7
	very stressful 1	2	3	4	5	6	not at all stressful 7
	something I want to do 1	2	3	4	5	6	not at all what I want to do 7

10. Please use the box below for any comments on providing oral health care to your clients

THANK YOU VERY MUCH FOR YOUR CONTRIBUTION

Appendix vi

Evaluation questionnaire

COURSE TITLE:
COURSE NO:
DATE:

IMMEDIATE POST-COURSE QUESTIONNAIRE
to be completed by course members

Please complete this short questionnaire before you leave and hand it to the lecturer or course organiser. Your responses will be used to help us plan and improve our courses.

1. Which category best describes you? *Please tick one box*

☐ GDP ☐ Community Dental Service ☐ Hygienist

☐ Dental Nurse ☐ Other *Please describe* .....

2. Please consider each pair of statements and decide which most clearly reflects your view and tick one box. The box closest to the statement indicates stronger agreement.

A	The course content was very relevant to my needs	☐	☐	☐	☐	The course content was not at all relevant to my needs
B	The course has greatly improved my knowledge and understanding	☐	☐	☐	☐	There has been no improvement to my knowledge and understanding
C	As a result of this course, it is very likely that I'll change my practice	☐	☐	☐	☐	As a result of this course, it is very unlikely that I'll change my practice
D	The course objectives were met	☐	☐	☐	☐	The course objectives were not met
E	The content was too advanced	☐	☐	☐	☐	The content was too simple
F	There should be more courses on this theme	☐	☐	☐	☐	There have been sufficient courses on this theme

3. Please score each course speaker:-

Speaker	Very Good	Good	Fair	Poor

4. How would you describe your feelings about the course? Please ring relevant items in the list:

interesting: essential: boring: new: patronising: more of this please: confusing: dull

5. In your view, what was the most successful and/or useful aspect of the course? .....

.....

.....

6. What, if anything, would you recommend the presenter(s) revise, delete or add? .....

.....

Any other comments?

THANK YOU for completing this form. Please hand it to the lecturer or course organiser.

section63\assess\immedq;

Appendix vii
Protocols for dentate and edentate service users

Dentate Clients (with natural teeth)

• Clean teeth with fluoridated toothpaste at least twice a day
• Partial dentures should be taken out and cleaned
• Consider use of chlorhexidine gluconate 0.2% mouthwash for additional plaque control
• A dental hygienist or dentist should provide instruction and advice on those with complex dental work

Edentulous Clients (with no natural teeth)

• Dentures should be left out of the mouth at night and soaked in a suitable cleaning solution
Eg dilute sodium hypochlorite solution (1 part Milton Sterilising Fluid to 80 parts water) for plastic dentures
Or chorhexidine gluconate 0.2% for metal dentures. Rinse thoroughly before placing in the mouth
• Check the lining of the mouth is clean. If necessary clean the mouth with gauze or foam sticks moistened with water
• Dentures should be rinsed thoroughly after meals
• Dentures should be removed from the mouth and brushed at least once daily over a sink of water

(Sweeney 1998)

Appendix viii

Certificate for completion of training

NHS Highland

Scottish Dental Postgraduate Rural Fellowship

NHS Education for Scotland

This is to certify that

_____

Has attended and successfully completed a course in

Oral Health and Mouth Care

On

_____ *and* _____

Signed _____ *Date* _____

Myra O'Boyle BDS MFDS

Dentist

Appendix ix

Information Sheet & Consent for Service users

NHS Highland

Information Sheet – Home Care Clients

Assessing the attitude, knowledge and behaviour of home carers in relation to mouth care of the older housebound population in Caithness

We would like you to consider taking time to participate in this study. Before you decide to take part it is important you understand what the study is about and why it is being done. Please take time to read the following information and discuss the study with friends or family before consenting to take part. If there is anything that is unclear or you would like more information about please ask.

Please take time to consider this request. If you decide to take part in the study you are free to withdraw at any time.

What is the purpose of the study?

It is important to keep the mouth healthy and clean. Diseases of the mouth may cause problems to a person's health and affect how they lead their life. Often mouth care is treated as a low priority and is sometimes neglected as a result.

This study involves obtaining a sample of people receiving support from home carers. We will ask the people for their views about mouth care and

have a look round their mouths to assess the level of assistance which may be required.

Why have I been chosen?

As a person who receives help from home carers employed by the Highland Council you have been one of 60 older people randomly selected to take part.

Do I have to take part?

No. It is up to you to decide whether to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part, you are still free to withdraw at any time. A decision not to take part will not affect the standard of care you receive.

What will happen if I take part?

The study involves asking you a few questions about your general health and medication, the care you receive, including mouth care, and carrying out an assessment of your mouth. The assessment will include a look around the inside of your mouth and teeth, taking swabs of your tongue, the roof of your mouth and your false teeth if you wear them. The swabs are taken to check for fungal growth.

If any treatment is needed you will be invited to register with NHS Highland dental service and receive the appropriate care.

The assessment will take approximately 30 minutes.

Will my taking part in this study be kept confidential?

All information which is collected will be kept strictly confidential.

Your name and address will be removed prior to the analysis of the

information so you cannot be recognised from the results.

What will happen to the results of the research study?

The study is part of an MSc in Dental Public Health with the University of Glasgow. The results will be written up in an anonymised way and the report will be made available to local care managers to help inform the future development of services.

Who is funding the research?

A national organisation, responsible for the training of many groups of health care workers (NHS Education for Scotland) is funding the research.

Who has reviewed the study?

North of Scotland Ethics Committee has reviewed the study.

Please take time to consider this request. If you decide to take part you are still free to withdraw at any time. All information collected will be kept confidential.

If you have any concerns or questions please contact:

Myra O'Boyle BDS
Lochshell Dental Unit
Wick
Wick Business Park
Caithness
KW1 4QR
01955 609940

Consent Form - Home Care Clients

Assessing attitude, knowledge and behaviour of home carers in relation to the mouth care of the older housebound population in Caithness

I have read and understood the information sheet for the above study ☐

I am aware that the study is voluntary and I am free to withdraw at any time ☐

All information that is collected will be treated confidentially ☐

I agree to take part in this study ☐

Name of Client _____ Signature _____ Date _____

Name of person
taking consent _____ Signature _____ Date _____

Name of witness _____ Signature _____ Date _____

When completed one copy to be kept in research file and one copy to be given to client

Appendix x

Structured Interview

Name:

Date of Birth:

Gender: Male Female

Postcode:

Medical History

Screening Medical History

Are you currently	
Receiving treatment from a doctor or clinic	☐ yes ☐ no
Taking any prescribed medicines/tablets/ointments/injections/inhalers	☐ yes ☐ no
Carrying a medical warning card	☐ yes ☐ no
Do you suffer from	
Allergies to medicines, materials or foods	☐ yes ☐ no
Bronchitis, asthma or other chest condition	☐ yes ☐ no
Fainting attacks, giddiness or epilepsy	☐ yes ☐ no
Heart problems, angina, high blood pressure or stroke	☐ yes ☐ no
Diabetes	☐ yes ☐ no
Arthritis	☐ yes ☐ no
Do you smoke	☐ yes ☐ no
Did you ever smoke	☐ yes ☐ no
Do you drink alcohol	☐ yes ☐ no

Notes:	

Are you registered with a dentist? ☐ Yes
☐ No

When did you last visit a dentist?
< 6 months ☐ 6 months - 1 year ☐ 1-2 years ☐ 2-3 years ☐ > 3 years ☐

How long have you been receiving homecare from highland council?
< 6 months ☐ 6 months - 1 year ☐ 1-2 years ☐ 2-3 years ☐ > 3 years ☐

How often do homecarers attend the house?
Once a week ☐ 2-3 times a week ☐ once a day ☐ twice a day ☐ three times a day ☐

How long do they usually stay?
<30 mins ☐ 30 mins - one hour ☐ one - one 1/2 hours ☐ > one 1/2 hours

What care generally do you receive?

Assistance with dressing ☐	Assistance with bathing ☐
Assistance with preparing meals ☐	Assistance with eating ☐
Assistance with personal hygiene ☐	Other ☐

What oral hygiene aids do you use?

Toothbrush ☐	Toothpaste ☐	Interdens brushes ☐	Mouthwash ☐	Other ☐

Do you receive mouth care from the homecarers?

Yes ☐ If yes, is the mouth care adequate for you? ☐
No ☐ If no, would you like to receive some help with mouth care? ☐

Is there anything you would change concerning your mouth care?

Appendix xi

Oral Health Assessment

Assessment

Are you having problems with;

Speech ☐	Swallowing ☐	Dentures ☐	Pain ☐	Dry Mouth ☐

Soft tissues recorded using sheet proforma

Xerostomia

Present ☐	Absent ☐

Denture Plaque - bacteriological loop (Simons et al 2000)
0- no plaque or debris
1- 1=presence
2- 2=half full
3- 3=full

Dental Screening Form

Screening Form

Level of Care Needed	

Dentate	Caries	Calculus	Debris (G+V)
☐ no ☐ yes	☐ no ☐ yes ☐ coronal ☐ root	☐ no ☐ yes ☐ L ant only ☐ other sites	☐ no ☐ yes 1,2,3

Charting

Right								**Left**							

EDENTULOUS	COMPLETE U/L	PART U/L
☐ no ☐ yes	☐ FU ☐ FL ☐ no dentures	☐ PU ☐ PL

DENT FIT UPPER	DENT FIT LOWER	U DENT cleanliness	L DENT cleanliness
☐ good ☐ satisfactory ☐ poor*	☐ good ☐ satisfactory ☐ poor*	☐ good ☐ satisfactory ☐ poor* Plaque (Simons)	☐ good ☐ satisfactory ☐ poor* Plaque (Simons)

Treatment Needed	5. Urgent
☐ no ☐ yes ☐ Hygiene ☐ Cons/Extns ☐ Dentures ☐ Soft Tissue	☐ no ☐ yes

Notes

*Please give details.

Mucosal Lesions

Site	None	Ulcer	White	Red	Swelling	Pigmented	Other
Upper Lip	☐	☐	☐	☐	☐	☐	☐
Lower Lip	☐	☐	☐	☐	☐	☐	☐
R commissure	☐	☐	☐	☐	☐	☐	☐
L commissure	☐	☐	☐	☐	☐	☐	☐
Upper labial mucosa	☐	☐	☐	☐	☐	☐	☐
Upper sulci	☐	☐	☐	☐	☐	☐	☐
Upper gingivae	☐	☐	☐	☐	☐	☐	☐
Hard palate	☐	☐	☐	☐	☐	☐	☐
Soft palate	☐	☐	☐	☐	☐	☐	☐
Tonsillar area	☐	☐	☐	☐	☐	☐	☐
Tongue-dorsum	☐	☐	☐	☐	☐	☐	☐
Tongue- R lateral border	☐	☐	☐	☐	☐	☐	☐
Tongue- L lateral border	☐	☐	☐	☐	☐	☐	☐
Tongue- ventral	☐	☐	☐	☐	☐	☐	☐
Floor of mouth	☐	☐	☐	☐	☐	☐	☐
R buccal mucosa	☐	☐	☐	☐	☐	☐	☐
L buccal mucosa	☐	☐	☐	☐	☐	☐	☐
Lower gingivae	☐	☐	☐	☐	☐	☐	☐
Lower sulci	☐	☐	☐	☐	☐	☐	☐
Lower labial mucosa	☐	☐	☐	☐	☐	☐	☐

Please indicate need for specialist referral by ticking the relevant box

- ☐ Urgent
- ☐ Non Urgent
- ☐ No Referral Required

Comments