ORAL HEALTH STATUS AND TREATMENT NEEDS OF THE INSTITUTIONALIZED CHRONIC PSYCHIATRIC PATIENTS IN TWO ONTARIO PSYCHIATRIC CARE CENTRES

by

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Abstract

Purpose: To examine the oral health status of psychiatric in-patients at two long-term psychiatric health centres, with one operating a full-time dental care facility.

Methods: Data were gathered from clinical examinations, a structured interview and hospital records from 120 participants. Periodontal (CPI) and dental (DMFT) indices, subjectively reported oral health status, and oral health behaviour were subsequently analyzed.

Results: Referrals for dental problems were made for 62.9% of participants. Bivariate analyses revealed positive correlations between DMFT scores, age and length of stay. Multiple regression analyses demonstrated correlations between DMFT scores and infrequent dental visits, frequent snacking and age. Patients at the psychiatric hospital without a full-time dental care facility were more likely to have had higher DMFT scores, and infrequent dental visits.

Conclusions: Psychiatric patients have poor oral health and significant oral health treatment needs. This study underlines the need for on-site dental care facilities at long-term psychiatric care centres.

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This thesis is dedicated to the patients at the Whitby Mental Health Centre and the Providence Continuing Care Centre – Mental Health Services Site

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Table of Contents

List of Tables

List of Figures and Flowcharts

List of Appendices

1. Introduction: Oral Health and Institutionalized Psychiatric Patients

Oral health is an important and integral part of general health and essential for the overall well being of a human being. The accumulating scientific evidence during the past two decades has significantly contributed to our understanding of the importance of not only the oral cavity but also the craniofacial complex. Oral health can affect the overall health in a number of ways. Directly, strong evidence links poor oral health (severe periodontitis) to chronic lung disorders and diabetes.(1, 2) Indirectly, serious oral diseases impede vital functioning such as breathing, eating, swallowing, and speaking. Such diseases also undermine self-image and self-esteem, discourage normal social interaction and lead to chronic stress, depression as well as incur great financial costs. The burden of disease restricts activities in school, work, and home, and often significantly diminishes the quality of life.(3)

Canada is one of the few countries in the world that does not have current data on the oral health status of its adult population. The current Canadian data is limited to the child population, the province of Quebec(4) and a few, cross-sectional investigations involving older home-bound adults.(5-7) From the available studies a few are highlighted here:

- In the 2000 Quebec study of a representative sample of 35 - 44 year-olds, 14% had 73% of the untreated carious lesions.(4)
- More than 40% of Canadians over 65 years of age are edentulous.
- During a reference week in Ontario, 11.5% of the 6134 individuals who visited their dentist had one more teeth extracted. 36% had teeth extracted due to periodontal disease and 29% had extraction(s) due to advanced carious lesions.(8)

- A sample of 907 community-dwelling edentulous elderly in Ontario, subjects reported: problems chewing (14%) problems talking (6%) and problems with appearance/socialising (22%).(6)

These data provide a snap-shot of the severity of oral health problems of selected groups of Canadians. However, while the world recognizes that the worse oral health problems pertained to the disadvantaged and the compromised, little or no data exits indicating the severity among these special groups in Canada.

> "*The greatest burden of oral diseases is on the disadvantaged and socially marginalized populations"* The World Oral Health Report, 2003.(9)

Higher oral disease rates are concentrated mostly in specific segments of the population: low-income Canadians, aboriginal citizens, recent immigrants, seniors and the disabled. To date the focus of most Canadian oral health studies have been on the elderly, aboriginal citizens, and children.(10) Chronic psychiatric patients have been documented in other countries for having poorer oral health than most other segments of the population. Factors such as the nature of psychiatric disorders, length of stay, side-effects of psychotropic drugs, access to dental care, and poor oral health behaviour have been noted as contributors to poor oral health among institutionalized chronic psychiatric patients. The focus of this dissertation is to examine the oral health status and treatment needs for chronic psychiatric patients at two Canadian psychiatric care centres.

1.1. Oral Health

Oral health is more than just healthy teeth. Indeed, it also implies being free of chronic oral-facial pain conditions, oral and pharyngeal cancers, oral soft tissue lesions, birth defects (such as cleft lip and palate) and other disease and disorders that affect the oral, dental, and craniofacial tissues.(3) The above statement, although, an accepted definition that will be utilized for the purpose of the research presented here, is limited to anatomical structures and the presence or absence of diseases. A much broader definition has been given by Yewe-Dwyer (1993) that includes functional and social aspect of health.(11)

> *"Oral health is a state of the mouth and associated structures, where disease is contained, future disease is inhibited, the occlusion is sufficient to masticate food and the teeth are of a socially acceptable appearance."* (12)

Further broadening this definition, it is also justified to imply that oral health is an integral part of overall health. Traditionally the mouth has been an autonomous anatomical structure, isolating it from both the body and the person.(11) As there is more and more evidences that nurture and nature are linked, and mind and body are both expressions of the human biology, it must also be recognized that oral health and general health are inseparable.(3) This new recognition comes in the light of increased evidence that oral health is related to a number of serious systemic disorders such as, diabetes and chronic lung disorders in addition to its affects on social interactions, speech, eating, self-esteem and emotional well-being.(9)

1.2. Chronic Psychiatric Disorders

Psychiatric disorders are among the most prevalent health problems of a modern society.(13) They are characterized by alterations in thinking, mood or behaviour (or some combination thereof) and are associated with significant distress and impaired functioning over an extended period of time.(13, 14) In the course of a lifetime, every individual experiences symptoms which may also occur in a diagnosable psychiatric disorder. These symptoms are not related to any serious psychiatric illnesses and for example may occur in understandable or stressful situations.(14)

A *chronic* psychiatric condition is defined by duration of the illness, with recurrence or a slow progression. The definition of chronic can be focussed by applying the concept of disability, particularly in terms of vocational and social functioning.(15) Moreover, it could identify only those institutionalized at a psychiatric hospital.

Some psychiatric disorders, such as dementia, schizophrenia and, less frequently, bipolar affective disorders are most commonly seen at long-term care psychiatric care centers.(16) Other significant special groups who require chronic or long-term care include the frail elderly, the developmentally delayed, emotionally disturbed children and substance users, particularly those with organic brain damage. For the purpose of this thesis, "chronic psychiatric patients" refer to members of society who suffer from a chronic psychiatric illness and demonstrate significant impairment of task and/or social performance with a history of prolonged or frequent hospitalizations for treatment.(16)

1.3. Institutionalization

Institutionalization maybe defined as the process of caring for individuals in an institutions and their adaptation to routine characteristics of the institutional environment, and/or their loss of adaptation to life outside the institution. Institutionalization has also been used to both imply treatment or damage, mostly experienced by a vulnerable population due to an inflexible application of social, medical, or legal controls. This term has widely been used within the disciplines of medicine, sociology, and economics without properly defining its intended meaning.(17, 18)

The traditional definition of institutionalization does not apply to all studies reviewed for the purpose of this dissertation. In Canada, more effective medications and treatment methods are enabling patients to be cared for outside of chronic care facilities. Both psychiatric care centres in this study have designed their programs to facilitate the return of patients into the community. The Whitby Mental Health Centre states: “Programs are designed to provide successful treatment, rehabilitation and earliest possible reintegration into the community.” Similarly, the Providence Continuing Care Centre states that: “Emphasis is placed on reintegrating clients into the community at the earliest possible opportunity”. For the purpose of this study terms such as “chronic care facility / centre / hospital” are used instead of institution in order to better represent the ‘organizations’ studied here, distinguishing them from the traditional definition of institutionalization and the ones described in the literature.

2. Background and Literature Review

2.1. Oral Health and Quality of Life

During the past fifteen years various definitions have been developed to describe health, oral health, and quality of life, each with varying emphasis on different social, cultural and medical and personal aspects. An example is the conceptual framework for measuring oral health status developed by Locker (Figure 2.1).(19) This framework is based on the WHO classification of impairment, disability and handicap, and attempts to capture all possible functional and psycho-social outcomes of oral disorders. By this definition, people who lose teeth are considered to become impaired (i.e. have lost a body part).(20) Other less frequently documented consequences of tooth loss include disability and handicap.(21)

Figure 2.1 – Conceptual model for measuring oral health (19)

Oral health problems, such as tooth loss, affect speech, eating, self-esteem, social interaction, education, career development, and emotional state. Self-perceived oral health has been demonstrated to have a significant independent effect on psychological well-being and life satisfaction.(11) Ignoring oral health problems can lead to needless pain and suffering that can impair well-being and result in financial and social costs that

significantly diminish quality of life.(3) It is imperative to consider the presence of poor oral health as a significant contributor to the already diminished quality of life of individuals diagnosed with a chronic psychiatric disorder.

2.2. Oral Health and Institutionalization

Poor oral health has long been documented among institutionalized individuals.(22-25) Often increased numbers of tooth loss and decay are reported, as compared to those not institutionalized. Some researchers have suggested institutional factors such as decreased accessibility to dental care as the cause for elevated incidence of oral diseases.(26) Others believe that predisposing characteristics of the institutionalized person accounts for differences in oral health. These factors include greater psychiatric disability, age, increased use of medication, as well as past oral health, socio-demographic, and other health factors.(27) In a more recent study, McMillan et. al. used similar standard oral health measures, Decayed, Missing, and Filled teeth scores (DMFT), Community Periodontal Index of Treatment Needs (CPITN), and the Oral Health Impact Profile (OHIP) to further investigate the effect on institutionalization. Their findings showed that previous oral disease experience was a factor affecting poor oral health of institutionalized patients.(25) This study further associated a period of institutionalization, with an overall negative impact on oral health, socio-economic status, and poorer treatment seeking behaviour.

Conversely, institutionalization can provide a setting for improvement or maintenance of oral health. Comparing the oral health status of institutionalized and non-institutionalized

adults with developmental disabilities, Tiller, reported better oral health for the institutionalized.(28) In this study, institutionalized adults with developmental disabilities had better oral health status which was attributed to increased access to dental care services through established links between the institution and organizations offering oral care services.(28) The 'deinstitutionalization' in industrialized countries may indeed decrease access to oral health care for those now receiving care in the community. As a result, it has been suggested that domiciliary dental care services need to be improved to address the increasing oral health needs of those who are not institutionalized.(29)

The majority of studies to date investigating the effect of institutionalization have been cross-sectional and involve older adult populations. As a result, the findings of these studies cannot be firmly applied to a study of psychiatric centres with a younger population. Furthermore, the traditional definitions of institutionalization, as used in the literature do not apply to current Canadian psychiatric care centres. Inaccessibility to oral health care, and past history of oral diseases history can be assumed as possible variables affecting the oral health of the chronic psychiatric patients at a continuing care centre.

2.3. Oral Health and Psychiatric Disorders

The most common psychiatric diagnoses in Canada are affective disorders, depression, and anxiety disorders.(14) However, the most common disorders found among those long-term resident of psychiatric hospitals in Canada are dementia, schizophrenia, bipolar disorder and major depressive disorders.(30) This section examines the prevalence of these diseases, their oral health implications, treatment options, and side affects.

2.3.1. Dementia

The Disorder

Dementias have been classified as both medical and psychiatric disorders. Dementia is associated with loss of brain function. It is not a single disease. Dementia involves progressive problems with memory, behaviour, learning, and communicating to the extent that it interferes with daily functioning and quality of life.(31) There are two types of dementias: reversible cognitive impairment and the irreversible dementia. Reversible cognitive impairment is frequently associated with drugs, prescribed or other, endocrine conditions, nutritional deficiencies, tumours, and infections. Alzheimer and vascular dementia are the two most common forms of irreversible dementias. Alzheimer has risk factors that include age, genetics, brain damage, Down's syndrome, which generally progresses to Alzheimer type dementia.(32) Vascular dementia involves permanent cognitive impairment resulting from a cerebrovascular disease (usually cardiovascular accident). The severity and duration of the disorder depends on the underlying cerebrovascular disease and individual response to treatment.(32)

Patients with dementia, regardless of pathophysiology, are noted for progressively poor short term memory resulting in agitation, disorientation and inappropriate behaviour. In more advanced cases of the disease, there is an increase in the loss of ability to perform self care, limb contracture and eventually a vegetative state.(31) Patients will become progressively incapable of making proper use of objects previously used for daily living, including toothbrushes and other oral health care aids.(32) Dementias, the irreversible

types in particular, are often associated with disability and subsequent institutionalization.(33)

In Canada

In Canada, as in most other countries, Alzheimer is the most prevalent form of the two major types of dementia. The 1991 Canadian Study of Health and Aging estimated that just over a quarter of a million (252,600) elderly Canadians were afflicted with some form of dementia.(34) Nearly two-thirds (64%) of those with dementia were diagnosed as having Alzheimer, the remainder being almost equally divided between vascular (19%) and other forms of dementia (17%).(30) The same study also estimated that about half of Canadians with dementia (51%) were living in institutions. In Canada, whether an individual with dementia lives in the community or in an institution is influenced, in part, by the availability of a care-giver. Furthermore, older women with dementia spend a greater proportion of their years with dementia living in institutions (58%) than do men (50%).(30)

Treatment

At the present there are no cures for irreversible dementias and the management is aimed at maintaining quality of life.(32) Drugs are used mainly to slow down the rate of mental decline, particularly of memory and to address depression, agitation and challenging behaviour. An affected person's need for support increases as the disease progresses leading to close supervision and ultimately, nursing care.

Oral Implications and Treatment Options

The impact of dementia, especially in the latter stages, leads to poor oral hygiene and an increase in periodontal disease (gum disease), increased incidence of tooth decay (both coronal and cervical) and a greater incidence of other dental problems, such as Candidiasis and maxillofacial injuries due to falls.(20) These problems also include difficulty wearing dentures, the inability to comply with oral care and the inability to carry out oral hygiene procedures.(20, 35) As the number of older adults increases during the next decade, more individuals are likely to suffer from dementia. Since a greater percentage of older adults also retain their natural teeth, therefore, there is an increased potential for carious lesions and periodontal diseases.(35) Poor oral care and an increase in oral disease can lead to changes in eating habits that may be because of a non-functional dentition, pain and discomfort or ill fitting dentures. Compromised aesthetics can also affect the individual's self-esteem.(36, 37)

2.3.2. Schizophrenia

The Disorder

Schizophrenia is a psychotic disorder characterized by varying degrees of personality disorganization which lessens an individual's ability effectively to work and to communicate with others.(33) The exact cause of schizophrenia is not yet known; however, genetics, structural brain abnormalities have been investigated as possible contributing factor.(38) The clinical symptoms of schizophrenia can be divided into "positive" and "negative". The negative symptoms are less dramatic yet they do contribute to the chronicity of the disease and prolong rehabilitation. Individuals with

these symptoms are often confused, depressed, withdrawn, or anxious. This has the consequence of diminishing the desire and the ability to exercise preventative hygiene. The majority of patients requiring long-term psychiatric care around the world have schizophrenia diagnosed as their primary disorder. Although, 1.5 percent of Americans have or will develop schizophrenia at some point, however, people with the disorder occupy nine percent of all hospital beds, 11% of nursing home beds and 40% of mental health facility beds in the United States.(38)

In Canada

It is estimated that schizophrenia affects one percent of the Canadian population.(14) Fifty-two percent of hospital admissions for schizophrenia in general hospitals are among adults between the ages of 25 and 44, and the rate of hospitalization in general hospitals is increasing among the men of this age group.(14) In 2001-2002 more than 31,000 Canadians were hospitalized for treatment of Schizophrenia, with 6600 receiving care at psychiatric hospital.(30) The total inpatient days spent by all patients diagnosed with schizophrenia in Canada was more than 2 million days in 2001-2002, or nearly half the total length of hospitalization days by all psychiatric patients. In addition, 21.2 individuals out of 100,000 Canadians were hospitalized at a psychiatric hospital due to symptoms of schizophrenia, the highest among all psychiatric disorders.(30)

Treatment

Individuals with chronic schizophrenia require a management protocol that includes a variety of psychotropic medications, periodic hospital admissions and, on discharge from

hospital, an environment within the community that will foster positive social interactions. Neuroleptic agents are often used to control symptoms such as hallucinations, delusions and thought disturbances. Non-institutionalized patients are often managed with long-acting injections of neuropletic agents.(39)

Oral Implications

Individuals who manage to control the symptoms of schizophrenia may not have any special oral health problems.(40) For patients with less controlled symptoms, poor oral self-care, in conjunction with the xerostomia (dry mouth) caused by the antipsychotic medications, which usually have anti-cholinergic side-effects, lead to increased incidence of caries and periodontal disease.(33) In addition, patients undergoing long-term treatment with neuroleptic agents are more at risk of developing tardive dyskinesia, which are repetitive, involuntary, purposeless movements. These are generally bucco-lingual, which affect the oral cavity.(39)

2.3.3. Bipolar Disorder

The Disorder

Bipolar disorder, previously called manic-depressive disorder, is an affective disorder in which the patient suffers episodes of elevated and depressive mood. Manic episodes are characterized by hyperactivity, which may involve excessive activities, sexual, occupational, religious or political.(41) The individual is often unaware of the demanding nature of the behaviour, which interferes with activities of daily living. The depressive

episodes are characterized by sadness, apathy, insomnia, loss of appetite and decreased energy. During this period, there is a loss of interest in almost all daily activities.(41)

In Canada

It is estimated that one percent of Canadians experience bipolar disorder.(30) Hospitalization data on individuals with bipolar disorders are limited as its data are often reported in conjunction with other affective disorders. From 2001 to 2002, 50,438 Canadians were admitted to hospital for affective disorders, including bipolar disorders, with 5,474 receiving care at a psychiatric hospital. Hospitalization rates for bipolar disorder have increased since the early 1990's in Canada, especially between 15 and 24 years of age. However the cause of this increase, be it early detection or changes in treatment methods are unknown.(30)

Treatment

Although most individuals with affective disorders are treated in the community, hospital admission is sometimes required for bipolar disorder. The illness is most commonly managed by a combination of pharmacotherapy, psychotherapy and mental health education.(41) Psychotherapy contributes to lowering of stress, is associated with identifying warning signs and is important in managing relapse. Pharmacotherapy may include:(42) neuroleptics, to control the acute stages of mania, Lithium Carbonate to prevent recurrences, and antidepressants to manage moderate to severe bipolar depression.(42)

Oral Implications

The oral manifestations of the manic stage may include abraded oral mucosa or cervical tooth abrasion due to over-vigorous use of toothbrushes and dental floss. During the depressive episodes, many patients exhibit a distinct decline in the level of oral hygiene, along with a rise in dental caries and periodontal disease. Dental prostheses, if used, may lose their previous fit and may also be discarded.(43, 44) The use of medical pharmacotherapy for this disorder can result in moderate to severe xerostomia, which further compounds the severity of dental disease.(41)

2.3.4. Major Depressive Disorder

The Disorder

Major depressive disorder is a psychiatric illness of at least two weeks' duration during which the patient experiences dysphoria (feeling down) sad, helpless, hopeless, irritable, angry, agitated, anxious, or any combination of these characteristics.(44) A person may have difficulty with memory, concentration or be easily distracted. Thoughts of death or suicide are common, delusions or hallucinations may occur, concurrent with the person's mood. Depressed individuals may also persecuted they are hearing voices detailing their shortcomings. When an individual is in the depth of depression, there maybe significant impairment in personal hygiene and interfere of oral hygiene.(33)

In Canada

It is estimated that eight percent of Canadian adults will experience major depression at some time in their lives. According to the 1994/95 National Population Health Survey

(NPHS), six percent of the Canadian population aged 12 years and over had symptoms consistent with depression at the time of the survey.(34) Since 1987, hospitalization rates for depression among older Canadians have decreased much more than rates among younger age groups. In 1999, among people under the age of 50 years with major depressive disorder who were hospitalized, the disorder was the primary cause determining their length of stay.(30) Among people with the disorder over the age of 50 years, depression secondary to other conditions contributing to the length of stay. Between 1987 and 1999, the average length of stay in hospital in Canada due to major depressive disorder decreased by 20%. This decrease is mostly due to the larger decrease in rate of hospital admission among the elderly than the young. Better clinical treatment or better outcomes for the elderly group have been suggested as possible reasons.(30)

Treatment

Major depression is usually treated with medication, psychotherapy, diet, exercises, and correction of sleep disturbances. ECT maybe used and is a current method of treatment at most Canadian psychiatric care centres. It is indicated for patients who are having no response to optimal pharmacotherapy, overwhelming suicidal preoccupation, and contraindication to antidepressant medication.(42) Mild to moderate depressive disorders are mostly managed without hospitalization with antidepressant medications. In Canada almost two dozen antidepressants are approved for treatment by physicians which include Selective Serotonin Re-update Inhibitors (SSRIs), Tricyclic Antidepressants, and monoamine oxidase inhibitors (MAOIs).(45)

Oral Implications

The oral implications of depressive disorders are as a result of mood changes and side effects of medications used to treat them. The side effects of medications included xerostomia, which leads to high risk of enamel and root caries and to problems of denture retention. Mood alterations cause decrease in of general health habits and neglect of oral care make the person susceptible to various infections and illnesses. Also, the loss of taste perception can contribute to a highly cariogenic diet with high levels of sucrose.(42, 46)

2.4. Measuring Oral Health Status and Outcomes of Oral Disorders

Dental Caries and Periodontal Disease

To determine the oral health treatment needs and to record the state of the hard and soft tissue of the oral cavity of a group of individuals, the DMFT and the CPI scores are the most commonly used measures. The Decayed, Missing and Filled Teeth (DMFT) scores are used to determined total dental caries (tooth decay) experience, past and present and the Community Periodontal Index (CPI) is capable of screening and monitoring periodontal treatment needs for an individual or a group. World Health Organization (WHO) guidelines in using these instruments are followed.(47)

Self-rated Oral Health

Self-rated oral health status summarizes an individual's perception of the outcomes of oral disease and disorders and their impact on functioning and well-being.(19) Self-rating is one of the most important predictors of future demands for health (oral) services and an important predictor of future health status demonstrated to predict tooth loss among older adults.(48)

Chewing Ability

The inability to chew certain foods due to oral disorders is a valid indicator of poor oral health. A simple index of the severity of chewing problems can be calculated and has been used to demonstrate its association with edentulism, number of missing teeth, partial denture wearing, eating behaviours and self-rated oral health.(48, 49)

Oro-facial Pain

Reporting of oro-facial pain documents the most immediate experiential outcomes of oral disease and conditions.(48) The questions that measure the presence or absence of pain and its intensity, provide important information on immediate dental treatment needs. The presence of pain is likely to compromise social and psychological functioning.(48)

Oral Health Services Utilization

The frequency of dental visits, time of last dental visit, type of treatment received, and insurance coverage are indicators of inequity, access, and the quality of dental care received. Regular preventive dental visits are considered by the dental profession to play a major role in the maintenance and promotion of oral health.(48)

Oral Hygiene Behaviour and Tobacco Use

Daily removal of dental plaque is essential for maintaining optimum oral health. Regular toothbrushing is the most effective method for preventing dental caries, gingivitis, and periodontal diseases.(48) Smoking has been documented to decrease healing and contribute to periodontitis (gum disease).

Dietary Sugars and Refined Carbohydrates

The frequency and consistency of consumption of carbohydrates in the form of refined sugars has been implicated in the development of dental decay.(3, 48) Increase in consumption of dietary sugars could be an indicator of problems with chewing, accessibility to food, adverse side effects to medication, and obesity.(42)

2.5. Oral Epidemiology Methods

2.5.1. Indices

DMFT

The Decayed, Missing, or Filled Permanent Teeth (DMFT) index was first devised and used by Klein et al. in 1938. Its main objective is to assess the prevalence of coronal caries. It is used on adults (whole permanent teeth) and has three components, the D-component for "Decayed," the M-component for "Missing," and the F-component for "Filled" teeth. Filled teeth are assumed to have been decayed prior to being restored. The DMFT score is obtained by the addition of how many teeth are "Decayed", "Missing" or extracted due to decay, and "Filled" with either a permanent or temporary restoration as a result of dental caries. The examiner uses a No.3 plain mirror and a fine-pointed pig-tail explorer under favourable lighting conditions to collect data. According to WHO criteria, for individuals 30 years and older, the M-component should include teeth missing due to caries or any other reason. Furthermore, for subjects under 30 years of age, only teeth missing due to caries should be included.(47) A weakness for this index is that it includes unerupted teeth, carious extraction, accidental loss and orthodontic extraction in the M-component of the data. The maximum score for an individual is 28 or 32 (if the last

molars are included). In this study as in previous studies, the sum of the scores of individuals divided by the number of subjects will provide an average score indicating the prevalence of coronal caries in the sample population.

As suggested by WHO guidelines, carious lesions are recorded as present when a lesion in a pit or fissure, or on a smooth tooth surface, has an unmistakable cavity, undermined enamel, or a detectably softened floor or wall.(47) The CPI probe is used to confirm visual evidence of caries on the occlusal, buccal and lingual surfaces. In case of root caries, lesions are recorded as present when they feel soft or leathery to probing with the CPI probe. For this study no distinction was made between crown or decayed roots.

CPI

The CPI was developed by WHO in 1982 to survey and evaluate periodontal treatment needs. This index uses three indicators of periodontal status: gingival bleeding, calculus and periodontal pockets.(47) It is a screening procedure for determining the actual and possible problems created by conditions associated with periodontal disease. It does not detect past and present periodontal status. The CPI is a widely used index and this study would provide comparable data to previously published results. The CPI evaluates the presence or absence of supra- and sub-gingival calculus; shallow (4-5 mm) and deep (6 mm or more) pocket depths, and gingival bleeding after probing. For epidemiological purposes, 10 specified teeth are examined in an adult subject. (47)

2.6. Oral Health of the Institutionalized Psychiatric Patients – A Global Review

This review was based on the available world-wide research on the oral health of the institutionalized psychiatric patients. The databases utilized included: Ovid MEDLINE (Medline, Corrections, and In-process and other Non-indexed Citations), Embase (Cochrane DSR), and PubMed. The search limited to local (University of Toronto Library System) electronic and printed original studies published during the last 20 years (1987 – 2007) in English. In this section publications were reviewed that paralleled the research presented here, with regards to methodologies and participant demographics. This review was limited to publications the involved hospitalized psychiatric patients over 18 years of age (not exclusive to an elderly population), that utilized at least one oral health index, and were not limited to a particular psychiatric disorder.

Methodology

Twelve publications met the search requirements. The methodology was cross-sectional in all studies in which one institution was studied except Ramon et al and Lewis at el who surveyed 18 and seven respectively.(50, 51) Dental caries was measured using the DMFT score while the periodontal needs were measured using one or a combination of the Oral Health Index – Simplified (OHI-S), Bleeding Index (BI), or the Community Periodontal Index (CPI) indices. Sjögren et.al. acknowledging the important role of nurses in improving the oral health of psychiatric patients as cited in previous studies, modified the Oral Assessment Guide (OAG) into OAG-PC (Psychiatric Care) and demonstrated its use as a crude method for medical personnel without a dental background to identify dental problems.

Results and Conclusions

All studies reviewed reported poor oral health, unmet dental treatment needs of the psychiatric patients and/or unavailability of oral health care services. Each one of the studies reviewed was conducted in a different country. Despite this difference, there were considerable similarities in the data and conclusions. Recommendations included intervention and preventive programs to improve the oral health of the psychiatric in-patients.

The studies reviewed suggested age (ref: 43, 50, 52-55) and length of hospitalization (ref: 43, 50, 53-57), as the main contributing factors to poor oral health. Studies generally reported increasing number of missing teeth, and a decreasing number of filled teeth with increase in age.(50, 53, 58, 59) These findings were contributed to poor oral health behaviour and lack of dental care utilization. On the other hand, Vigild et al who studied an elderly population of psychiatric patients reported high prevalence of filled teeth as compared to the number of decayed and missing teeth and noted regular dental treatment as the possible reason.(60) Nevertheless, despite the availability of the dental services and routine dental screening, as described by Gowda et al, low number of filled and high number of decayed teeth may be present if poor oral health behaviour persists in between treatment sessions.(58)

In a study by Kumar et al surprisingly low prevalence of decayed, missing and filled teeth were reported.(23) Indeed, not a single participant 15 to 34 years of age and above 55 years of age was recorded as having a filled tooth, while the average number of decayed

and missing tooth were reported at 0.57 and 0.80 respectively. The authors provided the presence 1.20 and 0.30 of fluoridated water as the only possible explanation for their results. However, the short duration of mental illness among patients and the young sample population were more likely to have been contributing factors to better oral health.

The Community Periodontal Index (CPI) scores from the studies reviewed revealed different treatment needs for each one of the populations investigated. Angelillo et al(54) reported pockets of 6 mm or more and bleeding in 64% of the patients examined (average age 55). Velasco et al reported the same results for 8.9% of the population with the majority of the population studied having pockets of 4-5 mm (average age 58).(43) Lewis et al reported 6 mm pockets in only 1% of the population studied, and reported the presence of hard deposits with no pockets in 42% of patients (average age 71).(51) The difference in periodontal treatment needs of the institutionalized psychiatric patients can be attributed to difference in age and the number of teeth present. As a result, both the DMFT and a periodontal index (CPI) must be used.

Limitations

Limitations in cost and resources have not made it possible for large scale sampling of the institutionalized psychiatric patient populations for most studies. Consequently, creations of an oral health policy or recommendations have relied on cross-sectional surveys making them unsuitable for establishing the risk factors which should be analyzed through longitudinal cohort studies. This was demonstrated by Smith et alas

oral health stability, or needing no treatment, was achieved for 44% of the institutionalized elders who routinely received comprehensive dental care.(61) It was further established in this study that high levels of initial unmet needs were associated with difficulty achieving oral health stability.

Areas of particular concern with the available research also includes the use of non-representative samples, and an emphasis on limited parameters and data to assume causality.(23, 43, 54, 50, 58) Furthermore, None of the studies reviewed reported or relied on standardization or examiner calibration. Inter-examiner inconsistencies were a significant source of error in a study by MacEntee et al in which the results were invalidated.(5)

Table 2.1 – Studies on the oral health of the institutionalized psychiatric patients

Source	Year	Country	*n*	Indices	Mean Age	DMFT Score	CPI Score	Contributing Factors to Poor Oral health
Gowda[58]	2007	India	103 (103M)	DMFT / CPI	34.4	4.49	(0-10.7%) (1-34.7%) (2-91.3%) (3-67.9%) (4-32.1%)	smoking, family pattern
Manish et.al.	2006	India	180 (105M-75F)	DMFT / OHI-S	36.7	0.92	N/A	age, length of illness, degree of helplessness
Tang et.al.[52]	2004	China	91 (59M-32F)	CPI	44.7	-	(0-1.2%) (1-7.1%) (2-71.8%) (3-72.9%) (4-28.2%)	age, length of illness
Ramon et al.[50]	2002	Israel	18 Institutions 431 (250M - 191F)	DMFT / DS	54	26.74 (± 7.47)	N/A	age, length of hospitalization
Lewis et al.[51]	2001	UK	7 Institutions 326 (143M - 183F)	DMFT / CPI OHI-S	71		(0-11.5%) (1-42.3%) (2-34.6%) (3-10.6%) (4-1.0%)	none - extensive treatment needs
Sjögren et al.[56]	2000	Sweden	57 (32M - 25F)	OAG-PC	43	OAGPC	N/A	length of hospitalization
Velasco et al.[43]	1999	Spain	565 (347M - 218F)	CPI	58	-	(0-8.5%) (1-14.2%) (2-43.8%) (3-24.6%) (4-8.9%)	age, length of hospitalization, gender, dementia
Velasco et al.[53]	1997	Spain	565 (347M - 218F)	DMFT	58	24.99 (± 7.71)	N/A	age, length of hospitalization, gender, dementia, antidepressants
Thomas et al.[57]	1996	Greece	249 (108M - 141F)	DMFT / OHI-S	50.36	23.35 (± 8.36)	N/A	length of hospitalization, medication
Hede et al.[62]	1995	Denmark	278 (164M - 114F)	DMFS / BI PD / DS	69.5	70.5 (± 41.1)	N/A	length of illness, psychiatric diagnosis, dental visit, toothbrushing
Angelillo et al.[54]	1995	Italy	297 (165M - 132F)	DMFT / OHI-S / DS	55.1	15.5 (± N/A)	(0-0.9%) (1-4.6%) (2-10.1%) (3-19.6%) (4-64.8%)	age, length of hospitalization
Rudolph et al.[59]	1993	South Africa	240 (240M)	DMFT		7.92 (± 6.12)	(0-0.9%) (1-3.2%) (2-42.0%) (3-37.5%) (4-17.1%)	none - extensive treatment needs
Barnes et al.[55]	1988	United States	252 (122M - 130F)	Treatment Needs	39.9	N/A	N/A	age, length of hospitalization

2.7. Psychiatric Disorders and Care in Ontario, Canada

It has been estimated that one in five Canadian adults will experience a mental illness during a 1-year period.(63) In 2002, as reported by the Canadian Institute for Health Information, over 190,000 Canadians were diagnosed with a psychiatric disorder and required hospitalization for an average period of 53 days.(30) The same reported also stated that in the province of Ontario, more than 70,000 individuals were admitted to hospitals during the same period of time of which more than 13,000 were cared for at psychiatric hospitals with an average stay of 85 days.(30) Although it is relatively easy to know how many people were treated at a psychiatric hospital, it is much more difficult to estimate how many individuals suffer from chronic psychiatric disorders.

The diagnostic categories by the World Health Organization are often used to classify the disorders of mentally ill patients, and they include: organic, substance related, schizophrenia and psychotic, affective, anxiety, personality and other disorders.(64) This classification is often followed by most studies concerning psychiatric patients.(43, 50, 51, 54)

There are currently 90 designated health care facilities in the province of Ontario that are required to provide psychiatric care.(65) With the exception of a few facilities, the majority are required to provide in-patient, out-patient, day care, emergency psychiatric services, as well as consultative and educational services to local agencies. The following psychiatric care centres are providers of complete psychiatric care services as designated by the Mental Health Act.

Providence Continuing Care Centre (PCCC – MHSC) (Appendix G)

Located in the city of Kingston, Ontario, Providence Continuing Care Centre – Mental Health Services (former Kingston Psychiatric Hospital) provides specialized services (inpatient and outpatient) to adults with serious mental illness in south-eastern Ontario. The 198-bed facility provides treatment through three clinical program areas, adult treatment and rehabilitation program, geriatric, psychiatry program, and regional forensic services. PCCC Mental Health Services also participates in the training of students in several disciplines. During the time of this study, PCCC – MHSC utilized an off-site private dental care services to provide dental care to the in-patient residence.

Whitby Mental Health Centre (WMHC) (Appendix H)

Established in 1912, the Whitby Mental Health Centre (WMHC) is located 50 km east of the city of Toronto. It provides a range of specialized, tertiary care mental health programs including acute, chronic and community mental health services. During the time of this study, the WMHC had 271 inpatients and provided dental care services to both inpatients and outpatients through an on-site, dental care facility staffed by a dentist, hygienist and a dental assistant.

2.8. Research Objectives and Questions

The overall objective of this study was to quantify and identify the oral health status and dental treatment needs of hospitalized chronic psychiatric patients. This study hypothesized the following:

The oral health status is adversely affected by:

1) the length of stay as a psychiatric care centre
2) unfavourable dental behaviour as demonstrated by:
    - dental utilization patterns
    - oral self-care behaviours
    - dietary factors as related to oral health
    - tobacco use (smoking)
3) hospitalization at an institution without an on-site dental care facility

This study also sought to:

- assess the oral health status and needs of patients as segregated by age, psychiatric disorder and the duration of hospitalization;
- assess the possible differences in two methods of providing dental care services and its impact on oral health; and to
- determine the oral health treatment needs by means of subjective reported oral health status, pain, discomfort, and chewing ability.

3. Research Methodology

3.1. Study Design

This study was designed to create a profile of the oral health status and the treatment needs of the institutionalized psychiatric patients at two hospitals with active chronic psychiatric care programs in the province of Ontario, Canada. To address the objectives of this study, retrieval of patient's information from three different sources were required. This research was a cross-sectional descriptive study and information was obtained through:

1. Extraction of data from patients charts and hospital records, (Appendix D)
2. An oral health questionnaire, as conducted by a face-to-face interview with each patient using a structured questionnaire, (Appendix C) and
3. A brief intra-oral examination of the patients that obtained clinical data for calculating the two oral health indices, the DMFT and CPI scores. (Appendix D)

3.2. Sample Population

The entire adult population (19 years of age and over) of both the Whitby Mental Health Centre, with approximately 290 inpatients, and the Providence Continuing Centre's Mental Health Services Site with approximately 190 inpatients, were the target population for this study. The entire population of the hospitals were considered as potential participants of this study for the following reasons:

1. A significant attrition in the sample size was expected as many patients may not have been able to give informed and free consent.

2. A representative sample population from each institution might have eliminated a certain age group or a particular disorder.
3. This study would have also provided an opportunity for a quick intra-oral examination. While it was within the abilities of this project to do this, all patients that met the inclusion criteria were given the opportunity to benefit from an intra-oral examination.

3.2.1. Participant Selection Criteria

In order to prevent certain medical complications as a result of the intra-oral examination and to best adhere to ethical protocol, the following exclusion criteria were observed during the participant recruitment process:

1. Individuals requiring prophylactic antibiotic coverage prior to invasive dental exams (i.e. probing), according to guidelines set by the American Health Association;(66, 67)
2. Individuals with a medical condition, including a psychiatric disorder, as determined by hospital officials, which would have increased the risk of harm to the patient and/or the examiner during or following the collection of clinical data; and
3. Individuals unable to give informed consent due to a cognitive impairment as determined by hospital officials (staff psychiatrist, dental health professional or attending nurse)

Patients were given the opportunity to give consent to any or all of the following:

- Collection of data from their medical records
- Participation in the face-to-face structured interview using the oral health questionnaire
- Participation in the intra-oral examination
- Referrals made to the hospital staff based on a general or a specific dental/oral problem detected during examination

Participants were still included in the study if they consented to having access to their medical records and the intra-oral examination or just the face-to-face interview. After obtaining specific consent to collect data from patients' medical records, the records for each patient were reviewed to check for any exclusion criteria mentioned above.

3.2.2. Ethics, Recruitment and Data Collection Methodology

As this investigation involved a vulnerable population, a number of ethical issues were addressed prior to the collection of data. The protocol for this study required obtaining free and informed consent from all participants. However determining the cognitive ability of patients to give consent was problematic. In order to ensure participants safety, interest and information security guidelines of the following organizations were considered and ethical approval obtained from the following organizations as well as the Faculty of Dentistry, University of Toronto.

- Canadian Tri-Council Policy on Ethical Conduct for Research Involving Humans
- University of Toronto Office for Research Ethics (Research protocol #17785)

- Centre for Addiction and Mental Health (Research protocol #192/2006)
- Providence Continuing Care Centre (Approved August 22, 2006)

The staff-psychiatrists, nurses, psychometrists, social workers, at both hospitals and the dental hygienist and dental assistant at the WMHC were consulted in the recruitment process. Participants who were legally able to provide consent were identified and approached. If the competency of a participant at any time during the study was in doubt, the examination or the interview was interrupted and a hospital official was consulted. The investigator, with the aid of hospital staff also relied on verbal and physical cues from participants to determine competency during the examination and the interview.

The investigator, who was responsible for extracting medical data from participant's records and conducting intra-oral examinations, was a trained dental practitioner with previous experience in providing oral care to institutionalized psychiatric patients.

Based on the requirements set out by Canadian Tri-Council Policy on Ethical Research, a similar recent Canadian study on an institutionalized population, and the information available on the ability of psychiatric patients to provide informed consent, the following protocol was established, approved and followed:(27, 68)

1. Investigator consulted a staff-psychiatrist, a staff-dental professional and/or the attending nurse to identify patients who were not able to give consent due to a cognitive impairment or any other medical condition that would have impaired patients' ability to give informed consent.

2. Potential participants were approached either by the examiner or a hospital staff, and were asked if they would like to participate in a study with regards to their teeth and gums.
3. Once initial interest to participate was observed, procedures for all three sections were explained and reviewed. (Appendix A)
4. Consents for part one and part two and/or three of the study was obtained. (Appendix B)
    a. Consent was obtained in an area that secures patient privacy.
    b. An attendant will be asked to be present for all patient interactions. A female attendant was present while interviewing female patients.
    c. The patients' ability to understand the research study and to give free and informed consent was assured by asking the patients to repeat information on the procedures and the goal of the study.
    d. Participants were informed that they can decline to participate in any one of the three parts of the study at this time or at any other time during the study.
    e. A copy of the letter of introduction and a copy of the informed consent was provided to the patients who have agreed to participate in the study. (Appendix A and B)
5. Based on the information obtained from the medical charts (Appendix D) and the predetermined exclusion criteria, those unsuitable for the study are excluded from the study. Patients who had agreed to participate in the study and did not meet the inclusion criteria following a medical chart

review, were given the reason(s) for their exclusion from the study and their names were given to hospital staff so that a dental examination could be arranged at a later date.

6. Patients who gave consent were transferred to a more private section of the ward for participating in the interview and the intra-oral examination.
7. At all times a female hospital staff was present for all examination and interactions with every patient.
8. A face-to-face interview was administered. (Appendix C) [Approximate time 10-15 minutes]
9. Denture(s), if present were removed and examined. (Appendix D)
10. Intra-oral examination was completed. (Appendix D) [Approximate time 10-15 minutes]
11. The 'medical / dental records update and referral form', were completed and given to the hospital staff. (Appendix E) Consent was obtained from patients prior to disclosing the findings to the hospital staff.

3.3. Measures and Variable Selection

3.3.1. Hospital Record Review

The following data were obtained by reviewing the hospital records for each participant:

- Age
- Sex
- Length of hospitalization
- Primary psychiatric diagnosis

Each hospital released the record for each patient, containing only the mentioned information, upon the presentation of patients' written consent. Prior to the release of the records the names were removed and the records were matched to patients' identification numbers.

3.3.2. Oral Health Questionnaire (Survey Instrument)

The 13 questions that made up the survey instrument used for this study were extracted from the 28 questions described in the 'Oral Health Indicators and Determinants for Population Health Surveys'.(48) These survey questions were tested for validity and reliability and were used by the Government of Canada (Health Canada) in national population surveys. The 13 question survey instrument used (Appendix C) included questions pertaining to the following three areas:

1. Indicators of oral health outcomes:
    - Self-rated oral health (Question 1)
    - Ability to chew (Question 2)
    - Pain
        - Specific oral symptoms (Question 3)
        - Oral pain during the past 4 weeks (Question 4)
        - Intensity of oral pain (Question 5)
2. Measures of access to and use of dental care
    - Time of last dental visit (Question 6)
    - Frequency of dental visit (Question 7)
    - Last dental procedure (Question 8)

3. Measures of oral health behaviours that prevent or increase the risk of oral disease
    - Toothbrushing frequency (Question 9)
    - Smoking (Question 10)
    - Frequency of smoking (Question 11)
    - Snacking frequency (Question 12)
    - Refined sugar consumption: type & frequency (Question 13)

In order to improve communication with participants, alternative / informal wording of each question was developed and used when needed. In addition, hand gestures to demonstrate actions such as (toothbrushing, smoking, eating), pointing to specific anatomical features (teeth, jaws, mouth), and answer cards were used to enhance communication with participants when needed. Questions and answers were repeated and the speed and tone of voice adjusted when necessary. In most cases the responses were collapsed. This was based on the most common group responses, decreased responses to certain options, and statistical analysis.

Question 1 – This question measured the self-rated oral health of the patients. The five possible answers (Excellent, Very good, Good, Fair and Poor) were grouped into two (Excellent, Very good, Good) and (Fair and Poor) categories. This re-grouping was done in order to further create a distinct dichotomous response and to appropriately measure self-rated oral health.

Question 2 – This question measured the chewing ability of participants. Participants gave a yes or no answer to their ability to chew four different types of food. An index of the severity of chewing problems was produced from the responses to this question.

Question 3 – Pain and discomfort of specific areas and conditions of the oral cavity (pain, bleeding, dryness, and halitosis) were measured assessing absence or presence of pain or condition.

Question 4 – Intensity of pain and discomfort for the past four weeks were measured with this question. Responses were collapsed into two categories (None of the time, and Some, or All of the time).

Question 5 – Intensity of pain or discomfort was measured with this question. The responses were collapsed into (Mild and Moderate or Severe). The reasoning for this collapse was to further identify the urgency of dental needs as indicated by the intensity of pain alone.

Question 6 – The responses to the question of the last dental visit was (<1, 1-2, 2-3, 3-5 and more than 5 years). The responses were collapsed into less than one year and more than one year. Not having seen a dental care professional for more than a year may indicate problems with accessibility to dental care. This is only a crude measure of accessibility to care.

Question 7 – This question measured the frequency of dental care and somewhat distinguishes between the preventive, episodic and symptomatic users of dental services. (48) The responses were collapsed into two categories (At least once / year and From time to time, Only when pain or Never). This dichotomization was done in order to segregate ideal frequency of use from less than ideal frequency of use.

Question 8 – The last procedure(s) performed at the last dental visit were identified through this question, which was designed to investigate the type of dental treatment received.

Question 9 – Toothbrushing frequency was measured with this question. The responses were collapsed into two groups (More than seven times per week or Less than seven times per week). The assumption was made that those who brushed seven times per week, did so at least once per day. Dental plaque removal of at least once per day is sufficient for the prevention of most infection and inflammation related oral disorders.(42)

Question 10 & 11 – These questions measured smoking and frequency of smoking. For statistical purposes the responses were grouped into two groups those who smoked (Less than 20 per day) and those who smoked (More than 20 per day).

Questions 12 & 13 – The frequency of snacking and the type of snacks consumed (sugar in tea/coffee, non-diet soft drinks, cookies, and candies) were measured. The responses

were dichotomized: those who snacked occasionally and those who snacked more than once per day.

3.3.3. Intra-oral Examination

The main objective of the intra-oral examination of participants was to produce information for calculating the DMFT and the CPI scores as well as to identify the need for immediate oral care and to examine the presence and the status of any oral prosthesis. All patients who provided consent were examined while sitting in front of a window or in a well illuminated room. Efforts were made to create a consistent source of lighting throughout the survey. In accordance with WHO guidelines, No.3 plain mirrors, sharp fine-pointed pig-tail explorers, and CPI (WHO) probes was used for all examinations. Each WHO probe is a lightweight probe that has a 0.5-mm ball tip, bearing a black band between 3.5 and 5.5 mm from the ball tip. The accompanying hospital staff member were trained and served as assistants, recording the observations made by the examiner throughout the study. All recordings were confirmed by the examiner following the end of the examinations.

Although teeth and the gingival tissue were the primary focus of the examination, best efforts were made to further examine the oral cavity for any swellings, bleeding, ulcers, or other pathology. Visual inspection of the extra-oral features, including the corners of the mouth and lips were made to identify potential pathology or abnormalities. Following the review of hospital records if a patient was identified as having a contraindication to

periodontal probing then only a hard tissue assessment was completed for the purpose of calculating a DMFT score (Appendix D).

Following the guidelines of the WHO, the need for immediate care and referral were recorded (Appendix D) and the participant referred to the hospital staff member. Referrals were made if the following were observed during the examination:

- Pain or infection
- Moderate to severe inflammation
- Suspected carious lesion
- Suspected oral lesion
- Any other serious oral health needs (i.e. need to fix a broken denture or prosthesis)

Upon the completion of the examination the patients were told of the result of the examination and referred to the hospital staff for further dental treatments if needed and consent was obtained to do so.

CPI – Community Periodontal Index (of Treatment Needs)

In order to decrease the time of the examination and the burden on participants, only indexed teeth were used for measuring gingival bleeding calculus and periodontal pockets to obtain a CPI score and a level of treatment. These three observations were then used to calculate a final CPI score and a treatment need score (TN0, TN1, TN2, and

TN3). The findings were recorded on the data extraction and oral health assessment form (Appendix D).

DMFT – Decayed, Missing, Filled Teeth Index

The WHO guidelines were used to examine the teeth for each participant. The coding for the status of each tooth was expanded to reflect other types of tooth restorations and conditions (Appendix D). The DMFT score was further calculated without any modifications from the WHO guidelines.

Full / Partial Denture Status

Prior to conducting the intra-oral examination, patients were asked if they wore any dental prosthesis. During the intra-oral examination the presence of fixed prosthesis were further confirmed. Participants were also asked to describe the condition of their prosthesis and their level of comfort with wearing their current appliance. (Appendix D)

3.3.4. Examiner Calibration

The collection of all data, including the intra-oral examinations, face-to-face interviews, and chart reviews were completed by one examiner, thereby eliminating inter-examiner variability. The examiner was calibrated against a 'gold standard', a clinical instructor from the Faculty of Dentistry, at the University of Toronto. A total of five patients from the Whitby Mental Health Centre participated in the calibration process. Calibration was done for both the DMFT score and the CPI score: $\kappa = 0.794$ indicating 'substantial agreement' between the examiner and the 'gold standard' was obtained for the DMFT

score; Also, weighted kappa (quadratic) value of $\kappa = 0.841$ was obtained for the CPI score, indicating 'almost perfect or very good agreement' between the examiner and the gold-standard.

3.4. Data Analysis

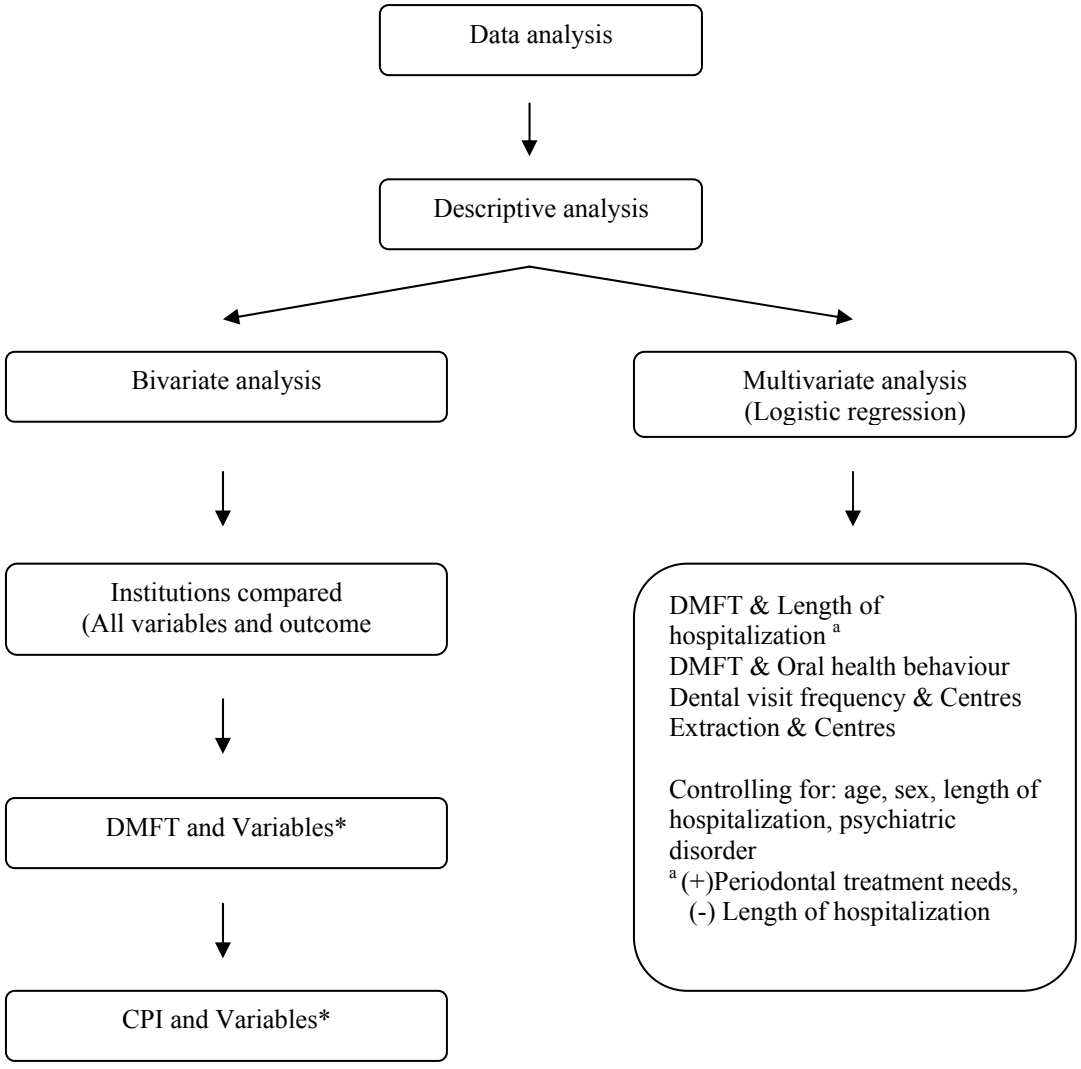
The statistical program SPSS version 15.0 (SPSS®, Chicago, Ill, USA) was used for data analysis and management. Descriptive statistics were used to summarize numeric and qualitative data. Means and accompanying standard deviations were calculated to summarize the main oral health status measure, (the DMFT index score), while proportions were used to describe the distribution of categorical response variables such as the periodontal treatment needs of the sample population.

Bivariate analyses utilized the chi-squared tests for proportions and *t*-tests to compare means. Specifically, the means associated with oral health status for patients at the two institutions were analyzed for differences in the DMFT and CPI scores using the two-independent samples t-test or its non-parametric equivalent test, the Mann-Whitney 'U' test. The impact of length of stay at a mental health centre on the oral health of the residents was assessed by multivariate analysis techniques, including logistic regression.

In addition, treatment needs were reported using frequency tables and the proportion requiring different types of treatment presented according to the health delivery methods in each institution using Chi-squared analysis.

For inter-examination reliability assessment (between the examiner and the gold standard) the Kappa statistics were performed on data from the calibration exercises before data collection. All statistical tests were two-tailed and interpreted at the 5% significant level. Flowchart 3.1 outlines the data analysis model.

Flowchart 3.1 – Data analysis model



* Variables include: age, sex, length of stay, psychiatric disorder, institution, and responses to the questionnaire

4. Results

4.1. Study Population

For this study a total of 102 patients were examined. This represented 22% of the entire 451 patient population present at the Whitby Mental Health Centre (N = 271) and the Providence Continuing Care centre (N = 180). Table 4.1 outlines the reasons for the attrition in sample size, both overall and by individual institutions. Recommendations of staff and hospital officials were considered in excluding many forensic, newly admitted (12.3%), elderly, or patients undergoing a psychiatric evaluation. These considerations often resulted in eliminating entire wards. The major reason for exclusion was the inability to provide informed consent (33.5%). This exclusion consequently eliminated the entire senior wards at both hospitals.

Out of the 105 patients approached, only three (2.8%) refused to participate in the study. Lack of interest was given as the reason for refusal in all three instances. From the remaining 102 patients that participated, eight patients were unavailable for examination due to logistical issues (Table 4.2). A further five patients were excluded from the periodontal examination due to contraindications to probing, caused by pre-determined heart conditions (Table 4.2).

Table 4.1 – Sample size attrition causes, overall, and by individual institution

	Total	PCCC*	WMHC**
Total number of participants	102	34	68
Unable to give consent as determined by hospital staff / officials	151	65	86
Other reasons	78	34	44
Unavailable at the time of hospital visit	57	27	30
Undiagnosed conditions / recent admissions	43	15	28
Exacerbation of illness on the day of examination	13	4	9
Unable to give consent as determined by dental examiner	4	0	4
Declined to participate (due to lack of interest)	3	1	2
Total	**451**	180	271

* PCCC = Providence Continuing Care Centre – Mental Health Services Site, ** WMHC = Whitby Mental Health Centre

Table 4.2 – Number and percentage of patients examined for hard and soft oral tissues in order to obtain the DMFT score and the CPI scores

		n	%
Interviewed		102	-
Hard Tissue	Examined	94	92.2
	Not available for examination	8	7.8
	Total	**102**	**100**
Soft Tissue	Examined	79	77.4
	Contraindication(s) to examination	5	4.9
	Insufficient teeth to produce a valid score	11	10.8
	Not available for examination	7*	6.9
	Total	**102**	**100**

*A patient identified as having a contraindication following the review of medical history was not available for examination.

4.2. Population Characteristics

The characteristics of the 102 participants are outlined in Table 4.3 as according to sex, primary psychiatric diagnosis, age, length of hospitalization, and psychiatric institution.

Twice as many patients were examined at the WMHC (n = 68) than at the PCCC (n = 34) which was reflective of the overall number of patients present at each hospital. Thirty two females were examined, representing 31.4% of the studied population; 68.6% of the sample population were males (Table 4.3).

Schizophrenia was the most common disorder in the sample (56%). Nearly a quarter of the sample population were diagnosed with affective disorders that included depression, mania, anxiety and panic disorders (Table 4.3). Most patients were between 45 and 54 years or of age 65 and over. The sample consisted of 10.8 – 21.6 % from each age group, however, the age group with the highest number of patients (65 years and over) had only 11% examined and the group with the lowest number (19 – 24 years) had 18% examined, a disproportionate representation largely due to excluding those unable to provide informed consent (Table 4.3). The sample captured a fair representation of the patients with varying lengths of stay in hospital, from 1 month to over 5 years of hospitalization (Table 4.3). Yet, it must be noted that 42 (41%) of the participants had an overall length of stay of less than one year.

Table 4.3 – The profile of the hospitals patient population and the study participants by sex, primary psychiatric diagnosis, age, and length of hospitalization, overall, and by institution

	PCCC*				WMHC**				Total			
			Examined				Examined				Examined	
Sex	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
Male	112	62.2	24	70.6	189	69.7	46	67.6	301	66.7	70	68.6
Female	68	37.8	10	29.4	82	30.3	22	32.4	150	33.3	32	31.4
TOTAL	**180**	**100.0**	**34**	**100.0**	**271**	**100.0**	**68**	**100.0**	**451**	**100.0**	**102**	**100.0**
Diagnosis												
Schizophrenia	65	36.1	13	38.2	156	57.6	44	64.7	221	49.0	57	55.9
Organic Psychoses	53	29.4	4	11.8	26	9.6	4	5.9	79	17.5	8	7.8
Non Psychotic Dis.	21	11.7	7	20.6	17	6.3	5	7.4	38	8.4	12	11.8
Affective Disorders	18	10.0	10	29.4	33	12.2	15	22.1	51	11.3	25	24.5
Other Psychoses	12	6.7	0	0.0	27	10.0	0	0.0	39	8.6	0	0.0
Mental Retardation	4	2.2	0	0.0	2	0.7	0	0.0	6	1.3	0	0.0
V-Code	4	2.2	0	0.0	3	1.1	0	0.0	7	1.6	0	0.0
Alcohol and Drug	3	1.7	0	0.0	2	0.7	0	0.0	5	1.1	0	0.0
Other	0	0.0	0	0.0	5	1.8	0	0.0	5	1.1	0	0.0
TOTAL	**180**	**100.0**	**34**	**100.0**	**271**	**100.0**	**68**	**100.0**	**451**	**100.0**	**102**	**100.0**
Age												
13-14 years	0	0.0	0	0.0	1	0.4	0	0.0	1	0.2	0	0.0
15-18 years	3	1.7	0	0.0	14	5.2	0	0.0	17	3.8	0	0.0
19-24 years	12	6.7	5	14.7	28	10.3	13	19.1	40	8.9	18	17.6
25-34 years	21	11.7	2	5.9	50	18.5	15	22.1	71	15.7	17	16.7
35-44 years	23	12.8	8	23.5	53	19.6	14	20.6	76	16.9	22	21.6
45-54 years	36	20.0	10	29.4	55	20.3	8	11.8	91	20.2	18	17.6
55-64 years	28	15.6	6	17.6	35	12.9	10	14.7	63	14.0	16	15.7
65 years and over	57	31.7	3	8.8	35	12.9	8	11.8	92	20.4	11	10.8
TOTAL	**180**	**100.0**	**34**	**100.0**	**271**	**100.0**	**68**	**100.0**	**451**	**100.0**	**102**	**100.0**
Length of Stay in Hospital												
1 week	7	3.9	0	0.0	13	4.8	0	0.0	20	4.4	0	0.0
1 month	11	6.1	4	11.8	23	8.5	0	0.0	34	7.5	4	3.9
3 months	20	11.1	8	23.5	32	11.8	6	8.8	52	11.5	14	13.7
6 months	16	8.9	6	17.6	35	12.9	10	14.7	51	11.3	16	15.7
9 months	12	6.7	2	5.9	34	12.5	6	8.8	46	10.2	8	7.8
1 year	12	6.7	2	5.9	15	5.5	8	11.8	27	6.0	10	9.8
2 years	28	15.6	4	11.8	42	15.5	5	7.4	70	15.5	9	8.8
3 years	19	10.6	2	5.9	14	5.2	12	17.6	33	7.3	14	13.7
4 years	23	12.8	1	2.9	14	5.2	5	7.4	37	8.2	6	5.9
5 years	5	2.8	2	5.9	12	4.4	4	5.9	17	3.8	6	5.9
over 5 years	27	15.0	3	8.8	37	13.7	12	17.6	64	14.2	15	14.7
TOTAL	**180**	**100.0**	**34**	**100.0**	**271**	**100.0**	**68**	**100.0**	**451**	**100.0**	**102**	**100.0**

* PCCC: Providence Continuing Care Centre ** WMHC: Whitby Mental Health Centre

4.3. Intra-oral Examination Results – Psychiatric Centres Compared

4.3.1. DMFT score & Caries Treatment Needs

Table 4.4 outlines the mean DMFT score and its components by age, sex, health centre and psychiatric disorder. The mean DMFT score of the sample population was 8.68 (± 6.91). The total number of decayed teeth was 133, missing 262, and filled 421, producing a total score of 816. The Missing component of the DMFT score in may not represent teeth missing due to caries alone. Patients often did not remember the cause of tooth loss and no reliable source was available to clarify the cause of tooth loss. Therefore, estimating previous caries experience through the missing teeth component may not be reliable.

Out of the 94 participants examined, 62.8% were caries free, 13.8% had at least one carious lesion, 7.4% had two lesions, 14% had between three to 13 carious lesions, and 2.1% had 14 carious lesions. The caries treatment needs and past caries experience for this population showed that 16% of the teeth needed restoration, 32% of the teeth had been lost because of caries, periodontal disease or trauma, and 51% of the teeth had been restored.

The data were highly right-skewed for the DMFT score and all its components. Non-parametric statistics were used in the statistical analysis involving the DMFT score and its components. Both the DMFT and the missing teeth scores increased with age (Kruskal-Wallis test, $P < 0.05$). The mean number of decayed or filled teeth however, remained somewhat the same across the three age groups (Table 4.4).

Similarly, the mean DMFT score and its components did not differ among the sexes (Table 4.4). There was also no significant difference between the caries experience of patients in the two institutions, as indicated by the average DMFT score of each institution.

Patients diagnosed with non-psychotic disorders had the highest mean number of decayed and missing teeth (Table 4.4). Patients with schizophrenia had the second lowest mean number of Decayed (DT) and the lowest number of Missing (MT) and Filled teeth (FT). There were significant differences in the missing, filled and the DMFT scores among the psychiatric groups (Kruskal-Wallis test, $P < 0.05$).

Table 4.4 – Mean and standard deviation of decayed, missing, and filled teeth and DMFT score according to age, sex, health centre, and psychiatric disorder

	n	DT	SD	MT	SD	FT	SD	DMFT	SD
Age									
18 - 34	33	0.64	1.19	0.48	1.50	3.97	4.04	5.09	4.40
35 - 54	36	1.78	3.75	2.81	3.69	5.44	3.90	10.03	6.33
55 - 74	25	1.92	3.49	5.80	5.52	3.76	3.87	11.48	8.52
P-value		NS		**0.001** [a]		NS		**0.001** [a]	
Sex									
Female	29	1.28	2.89	2.59	3.44	5.52	4.26	9.38	6.05
Male	65	1.48	3.13	2.88	4.59	4.02	3.78	8.37	7.29
P-value		NS		NS		NS		NS	
Health Centre									
PCCC	67	1.28	2.80	2.75	4.08	4.49	3.87	8.52	6.69
WMHC	27	1.74	3.62	2.89	4.73	4.44	4.30	9.07	7.55
P-value		NS		NS		NS		NS	
Psychiatric Disorder									
Schizophrenia	54	1.31	2.86	1.74	3.42	3.43	3.69	6.48	6.29
Affective Disorders	21	1.43	2.54	4.33	5.08	5.86	4.11	11.62	6.65
Psychotic / non-Psychotic	19	1.68	4.06	4.05	4.74	5.95	3.85	11.68	6.88
P-value		NS		**0.022** [a]		**0.022** [a]		**0.001** [a]	
Total	94	1.41	3.04	2.79	4.25	4.48	3.97	8.68	6.91

[a] Kruskal-Wallis test, $P < 0.05$, NS = Not Significant

The DMFT score and its components were also examined for correlations with the overall length of hospitalization (days) (Table 4.5). A weak, positive correlation (r_s = *0.285*, $P = 0.005$) was found between the length of hospitalization (days) and an increase in the missing number of teeth.

Table 4.5 – Length of hospitalization (days) by the DMFT score and its components

	n	DT	MT	FT	DMFT
Spearman Correlation Coefficient	94	0.040	0.285	0.054	0.148
P-value (two-tailed)		0.702	**0.005** [a]	0.602	0.154

[a] Spearman's rho correlation, significant at the 0.01 level

The DMFT score and its components were highly skewed. Therefore, in order to best identify the past caries experience and the current treatment needs of the patient population, the DMFT score was dichotomized at the 75th percentile (upper quartile) of the distribution, indicating that the cases with the worst oral health status showed DMFT scores ≥ 13 (Table 4.6). There was a significant difference between the DMFT scores of the two institutions (P = 0.032). The patients examined at PCCC were 4.43 times more likely to have had a DMFT score of ≥ 13.

Table 4.6 – The DMFT score dichotomized at the 75th percentile (upper quartile) with institutional comparison

		Total		**PCCC**		**WMHC**				
	DMFT	***n***	**%**	***n***	**%**	***n***	**%**	***P*-value**	**OR[a]**	**95% CI**
DMFT (Q75)	≤ 12	70	74.5	16	59.3	58	80.6	**0.032***	**4.43**	**1.57-12.65**
	≥ 13	24	25.5	11	40.7	9	19.4			
	Total	94	100	27	100	67	100			

* Chi-squared test, [a] OR = odds ratio; [b] 95% CI = Confidence Interval

4.3.2. CPI and Treatment Needs

Treatment needs were assessed by measuring the Community Periodontal Index. Out of the 102 participants, 79 patients were assessed for periodontal problems (Table 4.7). Five patients were excluded due to having chronic heart conditions, as indicated by the guidelines of the American Heart Association. [(66)] Eleven patients did not have a sufficient number of teeth to produce a valid CPI score as set out by the WHO oral health examination guidelines.[(47)] Seven participants were not available for periodontal examination.

Table 4.7 illustrates the percentage of participants with the highest mean CPI score by age group, sex, centre and psychiatric group. The highest percentage of patients with bleeding only was seen in the 18 – 34 years age group. Shallow pockets and calculus were mostly observed in the 18 – 34 and the 35 – 44 years age groups. The highest CPI score of 4 was seen among the oldest age groups. A significant increase in the severity of periodontal problems was seen with increasing age (Pearson Chi-squared test $P < 0.001$). The CPI scores did not differ between the sexes nor between the two hospitals providing psychiatric are.

Patients with non-psychotic disorders had the worst CPI score and patients with schizophrenia had the best relative CPI scores (Table 4.7). A low sample size again decreases the validity of the significant difference that exists between the psychiatric disorders and the severity of periodontal status.

Table 4.7 – Percentages of participants with the highest average CPI score in each age group, sex, centre and psychiatric group

	n	Bleeding 1	Calculus 2	Shallow pockets 3	Deep pockets 4
Age [a]					
18 to 34	31	22.58	25.81	48.39	3.23
35 to 54	33	3.03	18.18	60.61	18.18
55 to 74	15	0.00	13.33	40.00	46.67
Sex [b]					
Female	25	8.0	24.0	52.0	16.0
Male	54	11.1	18.5	51.9	18.5
Centres [c]					
PCCC	21	12.1	25.9	50.0	12.1
WMHC	58	4.8	4.8	57.1	33.3
Psychiatric Disorder					
Schizophrenia	45	13.3	22.2	51.1	13.3
Affective Disorders	19	5.3	31.6	52.6	10.5
Psychotic / non-Psychotic	15	6.6	0.0	53.3	40.0
Total	79	10.1	18.5	51.9	18.5

[a] Pearson Chi-squared $P < 0.001$ (sample size too small), [b] NS, [c] NS,

None of the patients examined were categorized as having a healthy periodontal status. All participants were recommended to improve oral hygiene (TN1) (Table 4.8). The general distribution of periodontal severity suggests a positive correlation with age. Deep periodontal pockets of 6 mm or more were seen in the older age group (55-74 years) and nearly absent in the younger age groups (18-34years). As a result, older adults required 'complex cleaning' and younger adults required improvements in oral hygiene and 'professional cleaning'.

Table 4.8 – CPI treatment needs by age (years), sex, health centre, and psychiatric disorder

	n	TN1	%	TN2	%	TN3	%
Age [a]							
18-34	31	7	100.0	23	74.20	1	3.23
35-54	33	1	100.0	26	78.79	6	18.18
55-75	15	0	100.0	8	53.33	7	46.67
Sex [b]							
Male	25	6	100.0	38	92.0	10	16.0
Female	54	2	100.0	19	88.9	4	18.5
Health Centers [c]							
PCCC	21	1	100.0	13	87.9	7	12.1
WMHC	58	7	100.0	44	74.1	7	33.3
Psychiatric Disorder [d]							
Schizophrenia	45	6	100.0	33	63.3	6	13.3
Affective Disorder	19	1	100.0	16	84.2	2	10.5
Psychotic / non- Psychotic	15	1	100.0	8	53.3	6	40.0
Total for each Group	79	8	100.0	57	70.4	14	18.5

TN0 = Healthy (none for this study), TN1 = Improve oral hygiene, TN2 = Improve oral hygiene and professional cleaning recommended, TN3 = Complex cleaning. None of the participants were assigned the TN0 (no periodontal treatment needs), [a, d] Pearson Chi-squared $P < 0.001$, [b] NS, [c] NS, Significance at 0.05

4.3.3. Dental Prosthetics

Two questions asked participants about their dental prosthetics identifying the type of prosthesis, and the self-described condition of the dental appliance. Of the 102 patients 14 (13.7%) used a dental prosthesis of which four (3.9%) wore both complete upper and lower dentures (Table 4.9). Of the 14 patients who wore dentures, eight (57.1%) had problems with them that included ill fit, breakage and discomfort (Table 4.10). The staff at both institutions did state that most of the seniors wore complete or partial dentures. Furthermore, the dentures were often broken, lost or provided discomfort and were not worn as the result.

Table 4.9 – Frequency of using upper and lower arch prosthetics

	Upper Prosthetics		Lower Prosthetics	
	n	**%**	***n***	**%**
No prosthesis	81	84.38	88	91.67
More than one bridge	1	1.04	0	0.00
Partial denture	7	7.29	4	4.17
Full removable denture	7	7.29	4	4.17
Total	96	100	96	100

Table 4.10 – Self-described condition of the dental prosthesis

	n	**%**
Broken	1	7.14
Ill fit, does not wear	4	28.57
Wears, comfortable	6	42.86
Wears, uncomfortable	3	21.43
Total	14	100.00

4.3.4. Referrals

A total of 69 patients (67.6%) were referred to the hospital officials (PCCC) or the dental office (WMHC) for various oral health problems (Table 4.11). Following the intra-oral examination, the patients at PCCC were 4.16 times more likely to have been referred for treatment of a chronic or an acute oral/dental pain or infection than the patients at WMHC. All 14 patients in need of 'complex cleaning' (TN3) and 51 of the 57 patients recommended for 'cleaning' (TN2) were referred. The remaining six patients were hospitalized at the WMHC and had an upcoming appointment that was confirmed by a staff at the dental services office. All eight patients that required 'oral hygiene improvement' were recommended to be seen by a dental care professional and were not formally referred. All 35 patients diagnosed with at least one carious lesion were referred in addition to four more patients who had suspected carious lesion(s). The rest of the

patients referred included those referred for possible intra-oral lesions, or broken dentures.

Table 4.11 – Number and percentage of patients with contraindications to periodontal probing and the referrals made following the intra-oral examination, compared by institution

		Total		PCCC		WMHC				
		n	%	*n*	%	*n*	%	*P*-value	OR	95% CI
Contraindication	Yes	5	4.9	2	5.9	3	4.4	1.000 [b]	2.86	0.09 - 6.66
to probing	No	97	95.1	32	94.1	65	95.6			
	Total	102								
Referrals										
total referrals	No	27	28.1	5	17.9	22	32.4	0.151 [a]	2.22	0.67 - 7.69
	Yes	69	71.9	23	82.1	46	67.6			
pain / infection	No	78	81.2	18	64.3	60	88.2	**0.006** [a]	**4.16**	**0.62 - 4.17**
	Yes	18	18.8	10	35.7	8	11.8			
periodontal	No	53	55.2	15	53.6	38	55.9	0.830 [a]	1.10	0.41 - 2.94
	Yes	43	44.8	13	46.4	30	44.1			
carious lesion(s)	No	39	40.6	12	42.9	27	39.7	0.770 [a]	0.88	5.02 - 2.38
	Yes	57	59.4	16	57.1	41	60.3			
lesions	No	93	96.8	26	92.9	67	98.5	0.203 [b]	5.26	0.34 - 100
	Yes	3	3.2	2	7.1	1	1.5			
other	No	92	95.8	26	92.9	66	97.1	0.578 [b]	2.56	17.55 - 25
	Yes	4	4.2	2	7.1	2	2.9			

[a] Pearson Chi-squared test, [b] Fisher's Exact test, significance tested at 0.05

4.4. Oral Health Questionnaire – Psychiatric Centres Compared

4.4.1. Self-reported Oral Health Status

In response to question Q1 “How do you describe the health of your teeth or mouth?” an equal percentage of the population from each institution (59.0%) rated their oral health as ‘Good’, ‘Very good’, or ‘Excellent’ (Table 4.12). The rest rated their oral health as ‘Poor’ (12.7%) and or Fair (28.4%).

Patients who reported their oral health as 'Poor' or "Fair' had significantly higher numbers of decayed (P = 0.001) and missing teeth than patients who rated their oral health as good, very good, or excellent (P = 0.001) (Table 4A – end of the results section). The same group of patients also had significantly higher average number of missing teeth than patients who reported their oral health as 'Good' or better. There was no relationship between the periodontal treatment needs and the self-described oral health status, as nine individuals who were recommended for 'complex cleaning' due to bleeding gums, presence of calculus, and deep pockets (6 mm+), described their oral health as 'Good' or better (Table 4B).

Table 4.12 – Self-reported oral health status comparison by institution as reported and as recoded

	Total		**PCCC**		**WMHC**				
	n	**%**	***n***	**%**	***n***	**%**	***P*-value**	**OR**	**95% CI**
Poor	13	12.7	4	11.8	9	13.2	0.948 [a]		
Fair	29	28.4	10	29.4	19	27.9			
Good	36	35.3	11	32.4	25	36.8			
Very Good	17	17.7	7	20.6	10	14.7			
Excellent	7	7.3	2	5.9	5	7.4			
Recoded	102								
Poor or Fair	42	41.1	14	41.2	28	41.2	1.000 [b]	1.00	0.40 - 2.50
Good, Very Good or Excellent	60	58.9	20	58.8	40	58.8			
	102								

[a] Pearson Chi-squared test, [b] Fisher's Exact test, significance tested at $P \leq 0.05$

4.4.2. Chewing Ability (Chewing Index)

Responses to the question Q2, measuring the oral functional ability of the patients are outlined in Table 4.13. From these responses a chewing index score, an oral health

outcome for this study, was obtained as outlined in the methods and materials section and presented in Table 4.14. More than 75% of the sample population obtained the highest score of 4, and only 1 person obtained the score of 0.

Bivariate analysis of DMFT scores and chewing ability (Table 4A) indicated that patients who reported not being able to chew a fresh carrot, meat or an apple had a significantly higher number of missing teeth (P = 0.005, 0.013, 0.012 respectively). Patients who reported being able to chew carrot, meat, salad, or an apple had a significantly higher mean number of filled teeth (P = 0.001, 0.002, 0.05, 0.002 respectively). Most patients were able to chew salad except two patients who had a mean decay score of 7.5 (P = 0.004, SD = 7.78). Bivariate analysis revealed that there were no significant relationship between periodontal treatment needs and chewing function (Table 4B).

Table 4.13 – Self-reported functional ability (chewing) comparison by institution

		Total		**PCCC**		**WMHC**				
		n	**%**	***n***	**%**	***n***	**%**	***P*-value**	**OR**	**95% CI**
carrots	Yes	78	76.5	25	73.5	53	77.9	0.628 [a]	1.26	0.44 -3.70
	No	24	23.5	9	26.5	15	22.1			
meat	Yes	94	92.1	30	88.2	64	94.1	0.436 [a]	2.13	0.41 - 1.01
	No	8	7.9	4	11.8	4	5.9			
salad	Yes	99	97.0	33	97.1	66	97.1	1.000 [a]	1.00	0.03 - 14.28
	No	3	3.0	1	2.9	2	2.9			
apple	Yes	77	75.5	22	64.7	55	80.9	0.090 [a]	2.32	0.45 - 6.66
	No	25	24.5	12	35.3	13	19.1			

[a] Fisher's Exact test, significance tested at $P \leq 0.05$

Table 4.14 – Distribution of chewing ability index

Most difficult food chewed	Chewing Index	*n*	PCCC	WMHC	Percent
None	0	1	1	0	0.98
Salad	1	8	3	5	7.84
Raw Carrots	2	3	0	3	2.94
Steaks or Chops	3	13	8	5	12.75
Apples	4	77	22	55	75.49
	Total	102	34	68	100.00

4.4.3. Oro-facial Pain and Discomfort

Various aspects of oral pain and discomfort were measured by question Q3. Toothache was the least common oral health problem of the six problems investigated (Table 4.15). More than 50% of the patients complained of dry mouth and bad breath. PCCC patients were nearly 3 times as likely as WMHC patients to complain of dry mouth. Sensitivity to hot or cold food or drinks was reported by 30% of the participants, and pain in or around the jaw joints was reported by 20%. A comparison of the report of 'toothache' with presence/absence of dental decay found no positive association (data not shown). However, with regards to the total DMFT score, patients who reported having toothache had a higher mean DMFT score (Table 4A). Bivariate analyses results, as shown in Table 4A, indicate that the 18% who reported having toothache had significantly higher mean number of decayed teeth (P = 2.24, SD = 4.29). Similarly, patients who reported sensitivity to hot or cold food or drinks and toothache had a significantly higher mean number of filled teeth (P = 0.011). Bivariate analyses also revealed no association between periodontal treatment needs and any measures evaluating pain, or its intensity (Table 4B).

Table 4.15 – Self-reported oral-facial pain experienced during the last 4 weeks, as compared by institution

		Total		PCCC		WMHC				
		n	**%**	***n***	**%**	***n***	**%**	***P*-value**	**OR**	**95% CI**
toothache	No	83	81.4	26	76.5	57	83.8	0.423 [a]	0.63	0.51 - 5.00
	Yes	19	18.6	8	23.5	11	16.2			
hot / cold	No	71	69.6	22	64.7	49	72.1	0.552 [a]	0.71	0.53 - 3.70
	Yes	31	30.4	12	35.3	19	27.9			
jaw	No	82	80.4	25	73.5	57	83.8	0.290 [a]	0.54	0.61 - 5.55
	Yes	20	19.6	9	26.5	11	16.2			
bleeding gums	No	62	60.8	22	64.7	40	58.8	0.669 [a]	1.28	0.30 - 2.00
	Yes	40	39.2	12	35.3	28	41.2			
dry mouth	No	50	49.0	11	32.4	39	57.4	**0.017** [b]	**2.88**	**1.10 - 7.14**
	Yes	52	51.0	23	67.6	29	42.6			
bad breath	No	52	51.0	20	58.8	32	47.1	0.263 [a]	1.61	0.25 - 7.14
	Yes	50	49.0	14	41.2	36	52.9			

[a] Fisher's Exact test, [b] Pearson Chi-squared test (not significant for all other tests), significance tested at $P \leq 0.05$

Nearly 35% of the patients interviewed complained of having pain some of the time during the past four weeks as compared to five percent reported having pain all of the time (Table 4.16). The responses for having pain were combined for statistical analysis. There was no significant difference in response to this question among the patients of the two hospitals. Of the 40 patients who reported experiencing pain, almost half expressed mild pain while the rest expressed moderate or severe pain. The patients at PCCC were 5.55 times more likely to report the intensity of pain as moderate or severe than the patients at WMHC ($P = 0.012$, OR = 5.55, 95% CI = 1.16–25.0).

Bivariate analysis revealed no association between the experience of pain over the past four weeks or its intensity and the DMFT score or periodontal treatment recommendations (Tables 4A and 4B).

Table 4.16 – Self-reported frequency and intensity of oral-facial pain experienced during the last 4 weeks, as compared by institution

Frequency	Total		PCCC		WMHC				
	n	%	*n*	%	*n*	%	*P*-value	OR	95% CI
None of the time	62	60.8	17	50.0	45	66.2	0.15		
Some of the time	35	35.3	16	47.1	19	27.9			
All of the time	5	4.9	1	2.9	4	5.9			
Frequency Recoded	102								
None of the time	62	60.8	17	50.0	45	66.2	0.115	1.96	0.78 – 5.00
Some or all of the time	40	39.2	17	50.0	23	33.8			
Intensity	102								
Mild	21	20.9	5	29.4	16	69.6	**0.012** [a]	**5.55**	**1.16 – 25.0**
Moderate or Severe*	19	79.1	12(4*)	70.6	7(1*)	30.4			

[a] Pearson Chi-squared test, significance tested at $P \leq 0.05$

4.4.4. Oral Health Care Utilization

The responses to self-reported time of the last dental visit were recoded and dichotomized into two categories, 'less than a year ago' and 'more than a year ago'. More than half (56%) of the patients interviewed had seen a dental health care professional during the past year (Table 4.17). Patients at PCCC were 3.12 times more likely to report seeing a dental professional more than 1 year ago than patients at WMHC ($P = 0.007$, OR = 3.12, 95% CI = 1.23-8.33).

Patients who reported visiting a dentist at least once per year (Table 4A) had a mean number of decayed teeth of 0.89 (SD = 2.04), which was significantly ($P = 0.001$) lower than the mean of those who infrequently visited the dentist, or only visited when in pain, or never (3.04, SD = 4.71).

Table 4.17 – Self-reported time of the last dental visit

	Total		PCCC		WMHC				
	n	**%**	***n***	**%**	***n***	**%**	***P*-value**	**OR**	**95% CI**
< 1 year	58	56.9	13	38.2	45	66.2	**0.016** [a]		
1 - 2 years	22	21.6	7	20.6	15	22.1			
2 - 3 years	8	7.8	5	14.7	3	4.4			
3 - 4 years	6	5.9	4	11.8	2	2.9			
> 5 years	8	7.8	5	14.7	3	4.4			
Recoded	102								
< 1 year	58	56.9	13	38.2	45	66.2	**0.007** [a]	**3.12**	**1.23 – 8.33**
1 < year	44	43.1	21	61.8	23	33.9			
	102								

[a] Pearson Chi-squared test, significance tested at $P \leq 0.05$

More than half or 55% of patients reported seeing a dental professional at least once per year (Table 4.18). This was the most common response from patients at both institutions. However, there was a significant difference between the institutions as patients at PCCC were 2.56 times more likely to have reported other responses, such as 'Never', 'From time to time', or 'Only when I have pain' than patients at WMHC ($P = 0.048$, OR = 2.56, 95% CI = 1.10-2.77). There was no association between the frequency of dental visits and the DMFT score (Table 4A). However, patients who utilized a dental care facility at least once per year (Table 4B) were 5.25 times less likely to have 'Complex Cleaning' recommended as their periodontal treatment ($P = 0.006$, 95% CI = 1.22-22.22)

Table 4.18 – Self-reported frequency of dental visit, compared by institution

	Total		**PCCC**		**WMHC**				
	n	%	***n***	**%**	***n***	**%**	***P*-value**	**OR**	**95% CI**
Never	7	6.9	6	17.6	1	1.5	**0.005** [a]		
At least once / year	56	55.0	13	38.2	43	63.2			
From time to time for check ups	20	19.6	6	17.6	14	20.6			
Only when I have pain	19	18.6	9	26.5	10	14.7			
Recoded	102								
At least once / year	56	54.1	13	38.2	43	63.2	**0.048**[a]	**2.56**	**1.10 – 2.77**
From time to time or Only when I have pain or Never	46	45.9	21	61.8	25	36.8			
	102								

[a] Pearson Chi-squared test, significance tested at $P \leq 0.05$

Most patients (59%) reported having received preventative measures at their last dental visit (Table 4.19). Twenty six percent of patients reported having received a restorative procedure completed during their last dental visit. A similar percentage (23%) reported having at least one tooth extracted during their last dental visit. However, patients at PCCC were 4.16 times more likely to report extraction than patients at WMHC (P = 0.047, OR = 4.16, 95% CI = 0.90-7.14).

Table 4.19 – Self-reported last procedures performed during the last dental visit, compared by institution

		Total		PCCC		WMHC				
		n	%	*n*	%	*n*	%	*P*-value	OR	95% CI
extraction	No	78	76.5	22	64.7	56	82.4	**0.047** [a]	**4.16**	**0.90 - 7.14**
	Yes	24	23.5	12	35.3	12	17.6			
restorative	No	75	73.5	24	70.6	51	75	0.634 [a]	1.25	0.45 - 3.44
	Yes	27	76.5	10	29.4	17	25			
preventative	No	52	51	21	61.8	31	45.6	0.123 [a]	1.93	0.20 - 1.30
	Yes	50	49	13	38.2	37	54.4			
dentures	No	93	91.2	30	88.2	63	92.6	0.459 [b]	1.68	0.34 - 7.69
	Yes	9	88.8	4	11.8	5	7.4			
examination	No	98	96.1	33	32.4	65	95.6	0.718 [b]	1.52	0.02 - 7.69
	Yes	4	93.9	1	1	3	4.4			
root canal	No	101	99	33	97.1	68	100	0.333 [b]	2.06	0.01 - 8.74
	Yes	1	1	1	2.9	0	0			

[a] Pearson Chi-squared test, [b] Fisher's Exact test, significance tested at $P \leq 0.05$

4.4.5. Oral Hygiene Behaviour and Tobacco Use

A majority of the patients (75%) reported brushing their teeth once or twice per day (Table 4.20). Only 12 patients (12%) reported not brushing their teeth. Bivariate analysis (Table 4A), indicated that patients who brushed their teeth less than once per day had significantly higher mean number of decayed ($P = 0.01$) and missing teeth ($P = 0.003$). Self-reported frequency of toothbrushing had no association with periodontal treatment recommendations (Table 4B).

Table 4.20 – Self-reported frequency of toothbrushing, compared by institution

	Total		**PCCC**		**WMHC**				
	n	**%**	***n***	**%**	***n***	**%**	***P*-value**	**OR**	**95% CI**
Never	12	12.1	6	18.2	6	9.1	0.448 [a]		
Once / month	3	3.0	0	0.0	3	4.5			
Once / week	3	3.0	2	6.1	1	1.5			
Few times / week	6	6.1	2	6.1	4	6.1			
Once / day	36	35.3	11	33.3	25	37.9			
Twice / day	39	39.4	12	36.4	27	40.9			
Recoded	99								
Less than 7 times / week	18	18.1	10	30.1	8	13	**0.047** [a]	**2.83**	**0.88 – 9.18**
7 - 14 times / week	75	80.9	23	69.9	52	87			
	99								

[a] Pearson Chi-squared test, significance tested at $P \leq 0.05$

A majority of patients (60%), who were interviewed, did report smoking tobacco (Table 4.21). Out of the 61 patients who smoked, 59% reported smoking between six to 20 cigarettes per day. There are no differences between the frequencies of smoking between the institutions.

Table 4.21 – Self-reported use of tobacco (smoke) and frequency of use, compared by institution

Smoking	Total		PCCC		WMHC				
	n	%	*n*	%	*n*	%	*P*-value	OR	95% CI
No	41	40.2	16	47.1	25	24.5	0.318 [a]	1.53	0.61 - 3.83
Yes	61	59.8	18	52.9	43	42.2			
Frequency	102								
<= 5 / day	13	12.7	1	5.6	12	27.9	0.213 [a]		
6 - 20 / day	36	35.3	13	72.2	23	53.5			
21 - 30 / day	6	5.9	3	16.7	3	7.0			
31 - 40 / day	4	3.9	1	5.6	3	7.0			
> 40 / day	2	1.6	0	0.0	2	4.7			
Recoded	61								
Less than 20 / day	49	48.0	14	77.8	35	81.4	0.736 [a]	1.25	0.26 – 5.55
More than 20 / day	12	11.8	4	22.2	8	18.6			
	61								

[a] Pearson Chi-squared test, significance tested at $P \leq 0.05$

4.4.6. Dietary Sugars and Refined Carbohydrates

Twenty-eight percent of participants reported having a snack about once per day and between 20 to 22 percent of respondents had a snack less than once per day and more than once per day by about one portion. The responses were recoded based on regular and irregular snacking frequencies (Table 4.22). There are no significant differences between the two institutions. Participants who reported snacking between once to three times per day had a higher significant mean DMFT score than those who snacked rarely (P = 0.049), never (P = 0.01), or occasionally not everyday, (P = 0.007) (Table 4A).

Table 4.22 – Self-reported snacking frequency, compared by institution

	Total		**PCCC**		**WMHC**				
	n	**%**	***n***	**%**	***n***	**%**	***P*-value**	**OR**	**95% CI**
Rarely / Never	16	15.7	3	8.8	13	19.1	0.281 [a]		
occasionally, not everyday	20	19.6	8	23.5	12	17.6			
About once a day	29	28.4	9	26.5	20	29.4			
About twice / day	22	21.6	6	17.6	16	23.5			
About 3 times / day	15	14.7	8	23.5	7	10.3			
Recoded	102								
Rarely / Never / Occasional, not Everyday	20	19.6	11	34.3	25	26.7	0.660 [a]	1.21	0.46 - 3.22
About once / twice / three day	29	28.4	23	65.7	43	73.3			

[a] Pearson Chi-squared test, significance tested at $P \leq 0.05$

The consumption of soft drinks, cookies, candy and sugar was measured by Q13. All were consumed on fairly regular basis as they were available for purchase from snack bars or the cafeteria at both hospitals. Soft drinks were consumed on regular basis by almost all participants. However, tea and / or coffee with sugar were consumed more frequently (Table 4.23). With the exception of one patient, patients (98.5%) at WMHC reported consuming some type of a candy at least 2-3 times per week.

Table 4.23 – Self-reported frequency of refined sugar consumption, compared by institution

		Total	PCCC		WMHC				
			n	%	*n*	%	*P*-value	OR	95%CI
Soft drinks	> 1 / week	53	15	44.1	38	55.9	0.372[a]		
	2 - 3 / week	19	6	17.6	13	19.1			
	< 3 / week	30	13	38.2	17	25.0			
Cookies	> 1 / week	63	21	61.8	42	61.8	0.968[a]		
	2 - 3 / week	28	9	26.5	19	27.9			
	< 3 / week	11	4	11.8	7	10.3			
Candy	> 1 / week	20	19	55.9	1	1.5	0.001[a]		
	2 - 3 / week	75	8	23.5	67	98.5			
	< 3 / week	7	7	20.6	0	0.0			
Tea / Coffee with sugar	> 1 / week	49	17	50.0	32	47.1	0.912[a]		
	2 - 3 / week	14	4	11.8	10	14.7			
	< 3 / week	39	13	38.2	26	38.2			

[a] Pearson Chi-squared test, significance tested at $P \leq 0.05$

4.5. Multivariate Analysis

The multivariate analysis sought to answer questions that would address the main objective of this study. Logistic regression models were developed to examine if an association existed between:

1) The length of hospitalization and oral health as indicated by a DMFT score of 13 or more (Q75), while controlling for age, sex, psychiatric disorders, length of stay, institution, and periodontal treatment needs;
2) The effects of the five oral health behaviour measures on oral health, as indicated by a DMFT score of 13 or more (Q75), while controlling for age, sex, psychiatric disorders, length of stay, and institution;

3) A) The frequency of dental visits and the hospitals in which psychiatric care is provided (PCCC or WMHC), while controlling for age, sex, psychiatric disorders, and length of hospitalization;

B) The number of extractions reported during the last dental visit and the hospital in which psychiatric care is provided, while controlling for age, sex, psychiatric disorders, and length of hospitalization.

Model 1)

Dependent Variable:

- DMFT score dichotomized at the 75th percentile (Q75). DMFT score ≤ 12 versus DMFT score ≥ 13

Independent Variables: [a] Continues variable (years), [b] Reference group

- age [a]
- sex (female [b])
- institution (WMHC [b] versus PCCC)
- psychiatric disorder (organic / none / other psychoses, schizophrenia [b], affective disorders)
- length of stay [a]
- periodontal treatment needs (improve oral hygiene (IOH [b]) and professional cleaning (PC [b]), complex cleaning (CC))

Table 4.24 – Logistic regression analysis illustrating factors that contribute to the DMFT score, dichotomized at 75th percentile (Q75)

		β	*P*-value	OR	95% CI	β	*P*-value	OR	95% CI
Length of Stay		0.00	0.25	1.00	1.00-1.00	0.00	0.25	1.00	1.00 - 1.00
Age		0.07	**0.01**	1.08	1.02-1.14	0.05	**0.01**	1.06	1.02 - 1.10
Sex	Male	-0.16	0.86	0.88	0.21-3.67	-0.08	0.90	0.93	0.30 - 2.91
	Female	-	-	1.00	-	-	-	1.00	-
Disorders	Schizophrenia	-	-	1.00	-	-	-	1.00	-
	Affective Dis.	0.99	0.24	2.69	0.52-13.92	1.39	0.04	4.03	1.08 - 5.02
	Non Psychotic	-0.05	0.95	0.95	0.17-5.16	0.62	0.35	1.87	0.50 - 6.97
Institution	WMHC	-	-	1.00	-	-	-	1.00	-
	PCCC	1.78	**0.02**	5.94	1.33-26.54	1.09	0.06	2.98	0.96 - 9.30
Treatment Need	IOH + PC	-	0.40	1.00	-	-	-	-	-
	CC	0.99	0.24	2.69	0.52-13.92	-	-	-	-

model Chi-square = 32.206, degrees of freedom = 8, *P*-value = 0.001, OR = adjusted odds ratio; 95% CI = confidence interval, IOH = Improve Oral Hygiene; PC = professional cleaning; CC = complex cleaning, WMHC = Whitby Mental Health Centre; PCCC = Providence Continuing Care Centre – Mental Health Services Site

Table 4.24 outlines the logistic regression model used to identify factors that influence past caries experience. The logistic regression analysis showed that age and institution were significant contributors to having a DMFT score of 13 or more. With every increase with age the odds of having a DMFT score of 13 or greater increased by 8%. Similarly, patients at PCCC were 5.94 times more likely to have a DMFT score of ≥ 13 compared to patients at WMHC. The inclusion of the treatment needs represents the state of oral hygiene which is related to a DMFT score. Bivariate analysis showed no association between the institutions and the periodontal treatment needs. However, a reduced model of this logistic regression, eliminating the treatment needs as an independent variable also eliminated the institutions as a factor and rendered psychiatric disorder as a significant predictor (see right side of Table 4.24).

Model 2)

Dependent Variable:

- DMFT score dichotomized at 75th percentile (Q75). DMFT score ≤ 12 versus DMFT score ≥ 13.

Independent variables: [a] Continues variable (years), [b] Reference group

- Toothbrushing frequency (less than 7 times per week [a] versus more than times per week)
- Time of last dental care (less than a year ago [a] versus more than a year ago)
- Snacking frequency (rarely / ever or occasionally, not everyday [a] versus Once, Twice, or 3 times per day)
- Dental care utilization frequency (at least once per year [a] versus not once per year)
- Smoking (yes [a] /no)
- age [a]
- sex (female [b])
- institution (WMHC [b] versus PCCC)
- psychiatric disorder (organic / none / other psychoses, schizophrenia [b], affective disorders)
- length of stay [a]

Table 4.26 – Logistic regression analysis illustrating the oral health behaviour factors influencing the DMFT score, dichotomized at 75th percentile (Q75)

		β	*P*-value	OR	95.0% CI	β	*P*-value	OR	95.0% CI
Length of Stay		0.00	0.58	1.00	1.00-1.00				
Age		0.07	**0.01**	1.07	1.02-1.12	0.04	**0.04**	1.04	1.00-1.08
Sex	Male	-0.24	0.72	0.79	0.22-2.84				
	Female	-	-	-	-				
Disorders	Schizophrenia	-	**0.05**	1.00	-	-	**0.03**	1.00	-
	Affective Dis.	1.95	**0.02**	7.04	1.38-35.96	1.70	**0.01**	5.47	1.39-21.51
	Psychotic*	1.66	**0.05**	5.28	0.97-28.67	1.52	**0.04**	4.56	1.08-19.28
Institution	WMHC	0.90	0.21	2.45	0.61-9.86				
	PCCC	-	-	1.00	-				
Toothbrushing Frequency		1.04	0.21	2.84	0.56-14.29				
Last Dental Visit		-0.92	0.19	0.40	0.10-1.57				
Snacking Frequency		1.55	**0.04**	4.71	1.05-21.19	1.58	**0.04**	4.83	1.11-21.11
Dental Care Utilization		1.71	**0.03**	5.55	1.23-25.04	1.48	**0.02**	4.41	1.29-15.13
Smoking		1.16	0.12	3.20	0.74-13.92				

OR = adjusted odds ratio; 95% CI = confidence interval, WMHC = Whitby Mental Health Centre; PCCC = Providence Continuing Care Centre – Mental Health Services Site, *Includes non-Psychotic disorders

Table 4.26 presents the results of the logistic regression model that examined the association between the self-reported oral health behaviour and oral health status as measured by having a DMFT of ≥ 13. A 'reduced model' was further developed by eliminating the least significant variables from the model in a step-by-step manner. For the purpose of analysis the 'non-reduced' model will be used.

The results indicate that those who snacked more than once per day were 4.71 times more likely to have a DMFT score of ≥ 13. Also, those who never went to dentist or did so occasionally were 5.55 times more likely to have had a DMFT score of ≥ 13. Schizophrenia, affective disorders and other types of psychiatric disorders were found to

contribute to poor oral health. Age was also a factor in increasing the DMFT score. The DMFT score increased by 1.07 fold with every year increase of age.

Model 3-A):

Dependent Variable:

- dental care utilization frequency (at least once per year versus not once / year)

Independent Variables: [a] Continues variable (years), [b] Reference group

- age [a]
- sex (female [b])
- institution (WMHC [b] versus PCCC)
- psychiatric disorder (organic / none / other psychoses, schizophrenia [b], affective disorders)
- length of stay [a]

Table 4.27 – Logistic regression analysis profiling the variables influencing the frequency of utilization of dental care services

		β	*P*-value	OR	95% CI	
Length of Stay		0.00	0.27	1.00	1.00	1.00
Age		0.02	0.16	1.02	0.99	1.06
Sex	Male	0.46	0.43	1.58	0.51	4.93
	Female	-	-	1.00	-	-
Disorders	Schizophrenia	-	0.18	-	-	-
	Affective Disorder	-0.58	0.38	0.56	0.15	2.03
	Psychotic*	-1.35	0.07	0.26	0.06	1.12
Institution	WMHC	-	-	1.00	-	-
	PCCC	1.79	0.001	5.99	1.99	18.03

OR = adjusted odds ratio; 95% CI = confidence interval; WMHC = Whitby Mental Health Centre; PCCC = Providence Continuing Care Centre – Mental Health Services Site, *Includes non-Psychotic disorders

Table 4.27 presents the result of the logistic regression model developed to demonstrate the influence of length of stay, age, sex, psychiatric disorder and institution on the pattern of dental care services utilization. The use of dental care was dichotomized to two groups; 1) those who 'have their teeth checked' once per year and 2) those who visited the dentist 'only when in pain', 'from time to time' or 'never'. The model showed that patients at PCCC were 5.99 times more likely to 'have their teeth checked' only when in pain, from time to time or never, as compared to patients at WMHC.

Model 3-B)

Dependent Variable:

- extraction at last dental visit (yes / no)

Independent Variables: [a] Continues variable (years), [b] Reference group

- age [a]
- sex (female [b])
- institution (WMHC [b] versus PCCC)
- psychiatric disorder (organic / none / other psychoses, schizophrenia [b], affective disorders)
- length of stay [a]

Table 4.28 – Logistic regression analysis outlining the demographic factors that influence tooth extraction as the last reported dental care treatment

		β	*P*-value	OR	95% CI	
Length of Stay		0.00	0.64	1.00	1.00	1.00
Age		0.02	0.13	1.02	0.99	1.06
Sex	Male	0.30	0.60	1.34	0.45	4.04
	Female	-	-	1.00	-	-
Disorders	Schizophrenia	-	0.62	1.00	-	-
	Affective Disorder	-0.54	0.40	0.58	0.16	2.08
	Psychotic*	-0.48	0.46	0.62	0.17	2.25
Institution	WMHC	-	-	1.00	-	-
	PCCC	1.03	0.05	2.80	0.99	7.88

Model Chi-square = 7.60, df = 7, *P*-value = 0.37, OR = adjusted odds ratio; 95% CI = confidence interval; WMHC = Whitby Mental Health Centre; PCCC = Providence Continuing Care Centre – Mental Health Services Site, *Includes non-Psychotic disorders

A logistic regression model was developed to investigate the factors that influence the reporting of extraction as the last dental treatment (Table 4.28). Patients were asked to report the last dental treatment and the response was designated as the dependent variable. Independent variables were age, sex, institution, psychiatric disorder, and length of stay. The logistic regression analysis showed that the institution was the only significant factor in this model. Patients at PCCC were 2.80 times more likely to have reported extraction as the last treatment received at a dental office.

Table 4A – Self-reported oral health status, chewing ability, pain experience, dental care utilization, oral self care Behaviour, and dietary sugar consumption responses as related to DMFT and its components

	n	DT	SD	MT	SD	FT	SD	DMFT	SD
Self-reported Oral Health Status									
Poor or Fair	41	2.12	3.96	3.61	5.07	4.46	4.13	10.2	7.69
Good, Very good or Excellent	53	0.87	1.95	2.15	3.41	4.49	3.89	7.51	6.06
[a]		***0.001***		***0.006***		*0.886*		*0.088*	
Chewing ability		*0.367*		*0.872*		*0.367*		*0.872*	
Carrot									
No	21	1.52	3.48	4.19	5.68	1.81	3.12	7.52	9.17
Yes	73	1.38	2.93	2.38	3.69	5.25	3.88	9.01	6.16
[a]		*0.465*		***0.005***		*0.066*		***0.011***	
[b]		*0.526*		*0.334*		***0.001***		*0.103*	
Meat									
No	11	2.36	4.20	3.91	6.15	1.64	3.75	7.91	10.99
Yes	83	1.29	2.86	2.64	3.96	4.86	3.87	8.78	6.27
[a]		*0.072*		***0.013***		*0.278*		***0.001***	
[b]		*0.694*		*0.874*		***0.002***		*0.205*	
Salad									
No	2	7.5	7.78	7.5	10.61	0	0	15	18.38
Yes	92	1.28	2.82	2.68	4.09	4.58	3.96	8.54	6.650
[a]		***0.004***		*0.114*		*0.108*		*0.193*	
[b]		*0.05*		*0.593*		***0.050***		*0.661*	
Apple									
No	22	1.5	3.27	4.14	5.15	2.55	3.88	8.18	9.10
Yes	72	1.39	2.99	2.38	4.09	5.07	3.83	8.83	6.17
[a]		*0.451*		***0.012***		*0.829*		***0.002***	
[b]		*0.473*		*0.318*		***0.002***		*0.295*	
Toothache									
Yes	17	2.24	4.29	3.47	4.27	6.59	3.82	12.29	6.66
No	77	1.23	2.69	2.64	4.26	4.01	3.88	7.88	6.66
[a]		***0.037***		*0.788*		*0.935*		*0.757*	
[b]		*0.548*		*0.065*		***0.011***		***0.013***	

[a] Independent Samples t-test $P < 0.05$, [b] Mann-Whitney "U" test

Table 4A – Continued

	n	DT	SD	MT	SD	FT	SD	DMFT	SD
Pain with hot and cold									
Yes	29	1.66	3.28	3.59	4.54	6.28	3.97	11.52	1.28
No	65	1.31	2.95	2.43	4.1	3.68	2.73	7.42	6.62
[a]		*0.645*		*0.587*		*0.632*		*0.726*	
[b]		*0.364*		*0.089*		***0.002***		***0.005***	
Jaw pain									
Yes	18	1.11	2.96	2.67	4.02	5.33	4.14	9.11	7.23
No	76	1.49	3.07	2.82	4.33	4.28	3.94	8.58	6.88
[a]		*0.650*		*0.328*		*0.902*		*0.705*	
[b]		*0.321*		*0.897*		*0.309*		*0.81*	
Bleeding gums									
Yes	37	1.46	3.12	2.68	3.99	5	3.62	9.14	6.09
No	58	1.29	3.01	2.86	4.44	4.14	4.18	8.39	7.44
[a]		*0.875*		*0.588*		*0.173*		*0.103*	
[b]		*0.883*		*0.842*		*0.154*		*0.422*	
Dry mouth									
Yes	47	1.6	3.15	3.23	4.76	4.36	4.18	9.19	7.43
No	47	1.23	2.95	2.34	3.67	4.6	3.8	8.17	6.4
[a]		*0.287*		*0.13*		*0.631*		*0.657*	
[b]		*0.865*		*0.484*		*0.626*		*0.646*	
Bad breath									
Yes	46	1.67	3.51	3.09	4.54	5.26	4.29	10.02	7.23
No	48	1.17	2.52	2.5	3.99	3.73	3.53	7.4	6.41
[a]		*0.186*		*0.907*		*0.136*		*0.995*	
[b]		*0.532*		*0.255*		*0.096*		*0.078*	
Self-reported Pain or Discomfort									
None of the time	57	1.28	2.64	2.65	4.2	4.07	4.09	8	6.61
Some or all of the time	37	1.62	3.61	3	4.38	5.11	3.75	9.73	7.33
[a]		*0.598*		*0.698*		*0.218*		*0.238*	
[b]		*0.954*		*0.464*		*0.14*		*0.286*	
Intensity of Pain Reported During Past 4 Weeks									
Mild	21	1.19	2.87	3	4.23	5.62	3.35	9.81	6.24
Moderate or Severe	16	2.19	4.43	3	4.7	4.5	4.18	9.69	8.70
[a]		*0.413*		*0.111*		*0.372*		*0.961*	
[b]		*0.954*		*0.460*		*0.140*		*0.29*	

[a] Independent Samples t-test $P < 0.05$, [b] Mann-Whitney "U" test

Table 4A – Continued

	n	DT	SD	MT	SD	FT	SD	DMFT	SD
Self-reported Time of The Last Dental Visit									
Less than 1 year go	54	1.222	2.654	3.037	4.162	4.944	4.109	9.204	6.789
More than 1 year go	40	1.476	3.14	2.333	3.838	4.048	3.248	7.857	6.271
[a]		*0.185*		*0.784*		*0.288*		*0.673*	
[b]		*0.822*		*0.089*		*0.193*		*0.283*	
Self-reported Frequency of Dental Visit									
At least once / year	71	0.89	2.04	2.49	4	4.73	4.06	8.11	6.41
Infrequently / when pain / never	23	3.04	4.71	3.7	4.95	3.7	3.66	10.43	8.20
[a]		***0.001***		*0.740*		*0.165*		*0.400*	
[b]		*0.062*		*0.403*		*0.288*		*0.229*	
Self-reported Brushing Frequency									
Less than once / day	22	2.91	4.42	4.09	5.71	2.73	3.17	9.73	8.87
At least once / day	72	1	2.38	2.49	3.7	5.23	4.01	8.36	6.24
[a]		***0.01***		***0.003***		***0.074***		*0.025*	
[b]		*0.056*		*0.455*		***0.015***		*0.799*	
Smoking									
Yes	58	1.67	3.4	2.33	3.96	4.02	4.21	8.02	
No	36	1	2.34	3.53	4.65	5.22	3.5	9.75	
[a]		***0.050***		*0.062*		*0.101*		*0.619*	
[b]		*0.631*		*0.285*		***0.05***		*0.178*	
Self-reported Smoking Frequency									
Less than 20 / day	47	1.45	3.12	2.06	3.89	3.91	4.26	7.43	
More than 20 / day	11	2.64	4.46	3.45	4.25	4.45	4.13	10.55	
[a]		*0.116*		*0.392*		*0.614*		*0.831*	
[b]		*0.425*		*0.164*		*0.421*		*0.154*	
Self-reported "Snacking" Frequency									
Rarely / Never / Occasional /not everyday	33	0.58	1.15	1.27	2.64	4.03	3.92	5.88	5.06
Once, Twice, 3 times / day	61	1.87	3.61	3.61	4.73	4.72	4.01	10.2	7.33
[a]		***0.049***		***0.01***		*0.424*			
[b]		*0.074*		*0.533*		***0.007***			

[a] Independent Samples *t*-test $P < 0.05$, [b] Mann-Whitney "U" test

Table 4A – Continued

	n	DT	SD	MT	SD	FT	SD	DMFT	SD
Self-reported Consumption of Sweets									
> 1 / week	58	0.78	2.14	2.24	3.26	4.41	3.88	7.43	5.67
2 - 3 / week	26	2.58	4.2	3.04	4.99	4.46	3.97	10.08	7.98
< 3 / week	10	2.1	3.28	5.3	6.41	4.9	4.91	12.3	9.10
[c]		***0.031***		*0.103*		*0.939*		*0.056*	
[d]		***0.018***		*0.44*		*0.997*		*0.21*	
Self-reported Consumption of Tea or Coffee with Sugar									
> 1 / week	44	0.682	1.41	2.886	3.693	5.295	3.939	8.864	5.737
2 - 3 / week	13	1.154	3.288	3.077	4.663	4.231	3.395	8.462	6.765
< 3 / week	37	2.378	4.037	2.568	4.805	3.595	4.099	8.541	8.299
[c]		***0.04***		*0.914*		*0.155*		*0.972*	
[d]		*0.078*		*0.200*		*0.085*		*0.688*	

[a] Independent Samples t-test $P < 0.05$, [b] Mann-Whitney "U" test, [c] One-way ANOVA $P < 0.05$, [d] Kruskal Wallis test

Table 4B – Self-reported oral health status, chewing ability, pain experience, dental care utilization, oral self care behaviour, and dietary sugar consumption responses as related to periodontal treatment needs

	n	IOH + PC	%	CC	%	*P*-value
Self-reported Oral Health Status						
Poor or Fair	31	27	87.1	39	81.3	*0.450* [a]
Good, Very good or Excellent	48	4	12.9	9	18.8	*0.552* [b]
Chewing ability						
Carrot						
No	11	7	10.60	4	30.80	*0.055* [a]
Yes	68	59	89.40	9	69.20	*0.076* [b]
Meat						
No	11	2	3.00	1	7.70	*0.421* [a]
Yes	68	64	97.00	12	92.30	*0.421* [b]
Salad						
No	1	1	1.50	0	0.00	*0.655* [a]
Yes	78	65	98.50	13	100	*1.000* [b]
Apple						
No	22	7	10.60	4	30.80	*0.055* [a]
Yes	72	59	89.40	9	69.20	*0.076* [b]
Toothache						
No	77	54	81.80	9	69.20	*0.302* [a]
Yes	17	12	18.20	4	30.80	*0.449* [b]
Hot / Cold Sensitivity						
No	52	44	66.70	8	61.50	*0.722* [a]
Yes	27	22	33.30	5	38.50	*0.755* [b]
Bleeding Gums						
No	44	36	66.70	8	61.50	*0.543* [a]
Yes	35	30	33.30	5	38.50	*0.764* [b]
Dry Mouth						
No	44	37	56.10	7	53.80	*0.722* [a]
Yes	35	29	43.90	6	46.20	*0.755* [b]
Bad Breath						
No	37	32	48.50	5	38.50	*0.508* [a]
Yes	42	34	51.50	8	61.50	*0.588* [b]
Self-reported Pain or Discomfort						
None of the time	48	42	87.50	6	12.50	*0.238* [a]
Some or All of the time	31	24	77.40	7	22.60	*0.352* [b]
Intensity of Pain Reported During Past 4 Weeks						
Mild	18	13	72.20	5	27.80	*0.415* [a]
Moderate or Severe	13	11	84.60	2	15.40	*0.667* [b]

[a] Pearson Chi-square test, [b] Fisher's Exact test, significance at $P \leq 0.05$, IOH = Improve Oral Hygiene; PC = professional cleaning; CC = complex cleaning

Table 4B – Continued

	n	IOH + PC	%	CC	%	*P*-value
Self-reported Time of The Last Dental Visit						
Less than 1 year ago	46	37	80.40	9	19.60	*0.379* [a]
More than 1 year ago	33	29	87.90	4	12.10	*0.541* [b]
Self-reported Frequency of Dental Visit ***						
At least once / year	60	54	90.00	6	10.00	***0.006*** [a]
Infrequently / when pain / never	19	12	63.20	7	36.80	***0.011*** [b]
Self-reported Brushing Frequency						
Less than once / day	17	14	82.40	3	17.60	*0.881* [a]
At least once / day	62	52	83.90	10	16.10	*1.000* [b]
Smoking						
Yes	29	24	82.80	5	17.20	*0.886* [a]
No	50	42	84.00	8	16.00	*1.000* [b]
Self-reported Smoking Frequency						
Less than 20 / day	40	33	82.50	7	17.50	*0.563* [a]
More than 20 / day	10	9	90.00	1	10.00	*1.000* [b]
Self-reported "Snacking" Frequency						
Rarely / Never / Occasional /not everyday	28	26	92.90	2	7.10	*0.980* [a]
Once, Twice, 3 times / day	51	40	40.00	11	11.00	*0.122* [b]

[a] Pearson Chi-square test, [b] Fisher's Exact test, significance at $P \leq 0.05$, IOH = Improve Oral Hygiene; PC = professional cleaning; CC = complex cleaning, *** Odds Ratio = 5.25, 95% Confidence Interval = (1.22-22.22)

5. Discussion

5.1. Key Findings

The information in this study was gathered from two groups of participants at two different care centres: a long-term care centre that operated an on-site full-time dental facility, and a long-term care centre that utilized an off-site private facility. The majority of patients had extensive periodontal and dental needs, as presented by a high number of untreated carious lesions, bleeding gums, dry mouth, calcified deposits, broken or ill-fitting dentures, snacking, and irregular dental utilization patterns. Furthermore, the key findings of this study showed that decreased access to dental care, frequency snacking between meals, and age were contributing factors for poor oral health. The length of institutionalization was not a factor for poor oral health among patients of long-term care at the two psychiatric care centres in this study. Patients of the psychiatric health centre without a dental care facility were: more likely to have poor oral health, less likely to have regular dental care visits, and more likely to report extraction as their last dental treatment.

5.2. Characteristics of Participants

The 102 patients who participated in this study were of a similar composition to the overall patient population of the two health centres (Table 4.3). Twice as many males than females participated in this study. Nearly half or 55.9% of the patients in the sample were diagnosed with a form of Schizophrenia. This characteristic was not only similar to the overall population of the two hospitals but also reflective of the average number of patients hospitalized for schizophrenia in the province of Ontario and Canada.(69) The

majority of previous studies on the oral health of the institutionalized psychiatric patients also reported schizophrenia as the most common psychiatric disorder among their sample populations. This observation in previous studies was only true for relatively younger sample populations, such as in one studied here.(43, 50, 54, 62) In previous studies, if sample populations involved older adults, then dementia was reported as the most common form of psychiatric disorder.(51) In this study, there were more participants from younger age groups as compared to the overall patient population of the institutions and similar past studies. This was largely due to the exclusion of patients with substitute decision makers. The hospital staff reported that the majority of the excluded patients were older adults diagnosed with dementia as also reported with similar studies involving older populations. Most of the similar studies also had significantly higher number of older adults as part of their sample population with an average age that ranged from 54 to 71 as compared to this study which was 42.4 (± 15.7).(50, 51, 53, 54, 62)

The length of stay for our sample population ranged form 1 month to 15 years with an average of 2.7 years (± 3.5). The length of hospitalization for this study was lower than expected in previous studies. In a study by Velasco et al almost 88% of the participants had a length of hospitalization of between 16 to 67 years.(53) In studies by Angeliloo et al and Hede, the length of hospitalizations for 44% and 46.5% of patients was more than 10 years.(54, 62) In this study, 14.7% of the participants had a length of hospitalization of more than 5 years. Many of the previous studies did not include the length of hospitalization as part of their analysis, thereby excluding the effect of long-term inpatient care on oral health.(51) Some researchers also reported the duration of illness

instead of length of hospitalization. It must be noted that the duration of illness and duration of hospitalization should be considered as two different yet connected variables. Many psychiatric disorders such as affective disorders and bipolar disorders have periods of high severity which would require episodic hospitalization.(13) As a result a patient could have been hospitalized for shorter amounts of time than his or her duration of psychiatric illness.

5.3. Oral Health Status

5.3.1. Oral Health, Aging and Length of Hospitalization

The oral health statuses of the 94 participants were measured using the DMFT and the CPI indices. The mean DMFT score for our population was 8.68 ± 6.91. DMFT scores as high as 26.74 (±7.47) and as low as 0.92 (±1.7) have been reported for psychiatric patients at chronic care hospitals. Bivariate analysis revealed no difference between the two institutions with regards to the DMFT score and its components. A review of the past literature along with the bivariate and multivariate results of this study indicates increase in age as one of the strongest factors influencing caries experience. Kumar et al reported a DMFT score of 0.92 (±1.7) and solely, attributed this low score to water fluoridation of the surrounding area of the hospital.(23) This is while 46.7% of their participants were less than 34 years of age with 57.8% hospitalized for less than 1 year and 96.2% hospitalized for less than 5 years. In contrast, Ramon et al, Velasco et al, and Angelillo et al reported higher DMFT scores of 26.74 (±7.47), 24.99 (±7.71), and 15.5 respectively.(50, 53, 54) The average age for these three studies 54, 58 and 55 were much higher than the study by Kumar et al.(23) In addition, the length of hospitalization for

more than 70% of patients in studies completed by Angelillo et al and Velasco et al was more than five years. Hede et al, measuring decayed, missing and filled surfaces, or the DMFS score, also found age and duration of mental illness as the only two factors that caused an increase in the DMFS score.(62) The increase in the DMFS score was measured at approximately one surface a year. In the study presented here the mean age was 42.4 (±15.7), placing this study within the general trend of previous findings as: the DMFT scores increased with mean age of the population of hospitalized psychiatric patients.

Bivariate analysis revealed significant positive correlations between the number of missing teeth and age and the length of hospitalization, while the mean number of filled and decayed was not correlated with age or the length of stay. Further multivariate analysis, controlling for length of hospitalization, sex, psychiatric disorders, psychiatric centre, and oral health treatment needs, indicated age as a contributing factor in having a higher DMFT score. As also shown in previous studies by Angelilllo et al in Italy, Ramon et al in Israel, Velasco et al in Spain, and Vigild et al in Denmark, the mean number of missing teeth was the significant part of the DMFT score.(54, 50, 53, 60) The mean number of filled and decayed teeth in these studies were also far less than the mean number of missing teeth. The exact cause of this difference has not been investigated; however, most studies have suggested that extraction is often preferred to more conservative treatment. The authors of these studies suggest that dentists are less willing to invest in complex conservative or rehabilitative treatments due to difficulties in managing psychiatric patients.(54, 60)

It has also been suggested that lack of preventative care over the length of hospitalization due to the unavailability of personnel is a contributing factor to tooth loss.(53) Vigild et al reported an unusually high Filled component of the DMFT score among the 55 years of age and older age groups, compared to previous studies, including this study. This can be in part attributed to better access to oral health care at long-term care facilities in Denmark. In the Denmark study, 'regular dental visiting habit' was reported for 61% of the population and 77% had a dental visit during the past year.(70) Furthermore, 50% of the patients received assistance in daily oral hygiene procedures, whereas in all other studies including this one, no assistance was provided. High level of dental care utilization was also reported among Danish psychiatric patients in another study by Hede, which was greatly attributed to comprehensive dental care free of charge and individually based recall examinations.(71)

5.3.2. Oral Health and Psychiatric Disorders

The DMFT score was also significantly different among patients diagnosed with different psychiatric disorders. Patients with Schizophrenia had significantly lower number of missing teeth and filled teeth and as a result a lower DMFT score. The effect of different psychiatric disorders on oral health has not been investigated. Given the complexity and variability of psychiatric disorders, it may not be possible. However, further analysis of our results indicated that 83.3% of patients under the age of 24 and 70% under the age of 34 were diagnosed with Schizophrenia. Hence, age could have been a contributing factor for this significance. Velasco et al and Ramon et al also analysed the oral health status relative to different psychiatric disorders with no significance detected in the DMFT

scores.(50, 53) Thompson et al, looking only at patients diagnosed with chronic Schizophrenia, attributed the severity of positive and negative symptoms in schizophrenia to poor oral health. Still, no particular psychiatric disorder seems to contribute to poor oral health more than another.

5.3.3. Oral Health and Self-rated Oral Health Status

Few studies have administered a questionnaire to a hospitalized psychiatric population. Bivariate analysis of the self-reported oral health status question indicated that the 41.2% of the patients who reported their oral health as poor or fair had a significantly higher average number of decayed and missing teeth. The strong association between missing teeth and self-reported oral health status was indicated by Locker et al among a group of older Canadians.(72) The significance in our study could indicate that among patients who are deemed cognitively capable of giving informed consent, a self-rated oral health question could be an important predictor of current and future oral health status. It could also be an important predictor for future oral health care needs as demonstrated by Locker et al for an older Canadian population,(72)

5.3.4. Oral Health, Pain and Physical Ability

This study also measured participants chewing ability by constructing a chewing index based on self-reported chewing abilities of apples, steaks or chops, raw carrots, and salad. The majority of participants indicated that they had the ability to chew a fresh apple, thus given the highest chewing index score. The 12.75%, who reported not being able to chew an apple, thus indicating the ability to chew all other foods, either had a full upper or

lower denture or both. Bivariate analysis revealed no differences among the two health centres with regards to the chewing index.

Normally, an individual with a properly fitted oral prosthesis should be able to bite into a fresh apple. This further indicates the instability of anterior and posterior teeth which are needed to bite as well as to chew a fresh apple. Researched on a dentate population suggest that presence or absence of opposing pairs of posterior natural teeth is the strongest indication for having a high or low chewing index.(49) An ill-fitting denture will not create a stable occlusion for chewing a relatively hard food like a fresh apple.(73) Similarly, in this study, eight of the 14 patients wearing a dental prosthesis complained of having problems with their appliance. The issue of diminished chewing ability is also related to xerostomia (dry mouth) and the number of missing teeth as demonstrated by Locker in a group of institutionalized older adults.(68) The majority of psychiatric patients in our population were prescribed a number of psychotropic drugs known to have xerostomic effects. Indeed, 51% of patients complained of having a ‘dry mouth’. The results, as shown in institutionalized elderly population, demonstrate that lack of proper oral prosthesis, xerostomia, and missing teeth are contributors to having a compromised functioning and to an extent a reduced oral health-related quality of life.(68)

The percentage of patient who reported having oro-facial pain or discomfort (40%) was greater than a previous study involving a group of Canadian adults.(74) Bivariate analysis indicated that patients who reported having a toothache had a significantly higher mean number of decayed teeth. Similarly patients who reported being sensitive to hot or cold

foods or drinks had a significantly higher number of filled teeth. There were no differences among the two hospitals with regards to these five specific parameters of pain and discomfort. It was noted at the time of the intra-oral examination that many patients with rampant caries or advanced carious lesions reported having no toothache. For instance a participant at PCCC reported having no oro-facial pain, while 14 advanced carious lesions were detected in his mouth. Similar cases were also noted at the WMHC. On the other hand, patients who would report pain and point to the right teeth that were later identified as having advanced carious lesions by the examiner. These results are supported by a number of clinical observations that pain processing and perception are altered in patients with anxiety, schizophrenia, depression and personality disorders.(75, 76)

Despite this, reporting of moderate to severe oro-facial pain is of significant concern, since it is likely to compromise social, psychological functioning and quality of life.(21) Patients at PCCC were more likely to have reported moderate or severe pain. Bivariate results also show that patients at PCCC were more likely to have seen a dentist more than a year ago and reported irregular dental visiting pattern. These findings may indicate that the presence of advanced carious lesions or other oro-facial discomforts, especially in patients reporting moderate or server pain at the PCCC were the result of decreased access to dental services and lack of an oral health maintenance program.

5.3.5. Oral Health and Oral Health Behaviour

Toothbrushing

The self-reported frequency of toothbrushing indicated that patients at the PCCC were less likely to have brushed at least once a day. The bivariate analysis indicated a relation between the missing and the decayed scores. However, in the multivariate analysis toothbrushing was not a significant factor. Various factors can influence both frequency of toothbrushing and how reliable a response can be obtained from a person with a psychiatric disorder. Poor oral health and significant amount of plaque and debris were observed in patients who reported toothbrushing twice or three times a day. As a result, the response to toothbrushing question may not be reliable.

Hede reported that negative symptoms in schizophrenia and personality disorders are possibly responsible for poor toothbrushing habits.(70) Despite this, It has been suggested that patients with schizophrenia could maintain a good toothbrushing habit.(38) Daily dental plaque removal by toothbrushing is the most effective way to maintain oral health.(42) As a result, oral health education programs are recommended as part of ADL training (actively of daily life-training) in psychiatric care hospitals.(38, 46, 70, 77)

Smoking

Almost 60% of patients interviewed reported smoking. This is less than the 70-80% estimated reported for psychiatric hospital population in Ontario and above the 24% reported for the Canadian population. Smoking is known to have adverse affects in the

oral cavity.(78, 79, 80) The adverse effects of smoking would not have been detected by the indices used in this study. It also decreases bleeding during the probing of the gums during examination, influencing the results of the CPI score.(42) Recent data suggested that in Canada, smokers have higher odds of reporting oral-facial pain, and that edentulism is at 15% among current smokers.(79)

New Ontario laws restrict smoking in all psychiatric hospitals at the time of this study and many patients were observed to be struggling to comply with the new rules. It has been reported that smoking reduces the side effects of the psychotropic medication, and that nicotine withdrawal is more pronounced for those who try to quit while on certain psychotropic medications.(78) Relative to the rest of the hospital staff, dental professionals are well positioned to provide smoking cessation advice to patients who regularly utilize dental services.(80)

Snacking

The effect of snacking on the oral health of psychiatric patients had not been studied previously. Increased frequency of snacking was related to poor oral health in bivariate and multivariate analysis. Patients who were grouped as those who snacked more frequently had more carious lesions and missing teeth than those who did not. Snacking as a contributor to poor oral health and among psychiatric patients is actually a representation of other factors that needs to be addressed. Some of these factors specific to this population are listed here;

- Many patients indicated that to alleviate the xerostomic affects of psychotropic medications they consumed non-diet soft drinks and tea/coffee often with sugar.

- Many psychiatric disorders cause patients to overindulge on sucrose-containing foods.(40)
- Both the PCCC and the WMHC operated a snack bar that offered cookies, soft drinks and other sugar containing products.
- WMHC planned to create more snack bars at different parts of the hospital. Creation of these snack bars was cited by one hospital official as a future source of income for the hospital. (Since March of 2006 the hospital operated as a stand alone specialty psychiatric hospital, responsible for its own finances.)
- A number of patients indicated missing meals due to the exacerbation of psychiatric symptoms, resorting to food from the snack bars.
- Snacking as a contributor to poor oral health was an indicator that most patients were not able to regularly accomplish adequate oral hygiene.

In order to address the oral health issues related to snacking, careful assessment of current eating habits, patient knowledge, and a coordinated approach by administrative personnel, dieticians, and dental care professionals has been suggested.(42)

5.4. Access to Dental Care

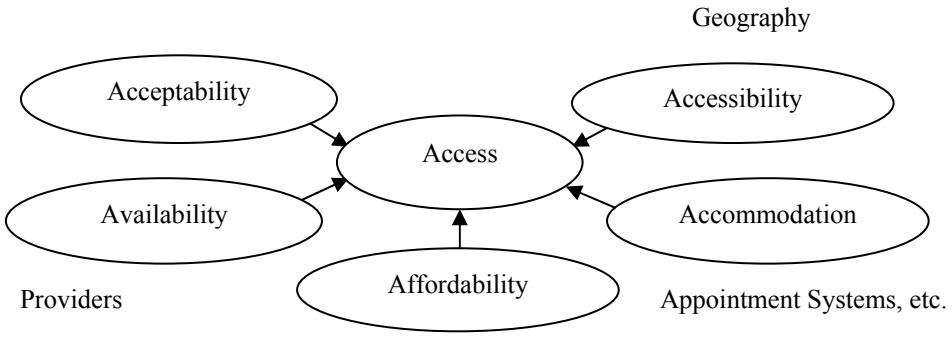
Analysis of parameters measuring access to oral health care services revealed significant differences between the two psychiatric care centres. Multivariate and bivariate analysis showed that patients at PCCC were more likely to have:

- not seen a dentist during the past year,
- been episodic, or symptomatic users of dental services, and

– had extraction reported as the last dental procedure.

These data revealed not only a decreased access to oral care but also to the type of dental care provided for the patients at PCCC. Penchansky and Thomas provided a definition of 'access' to health services on the basis of five different dimensions:(81) availability, accessibility, accommodation, affordability, and acceptability; which will be used to describe access to dental care.

Figure 5.2 – Access to care model (Penchansky and Thomas, 1991)



Availability

During the early 1980's the PCCC Mental Health Services Site (known as Kingston Psychiatric Hospital) had a population of more than 2000 patients and operated a full-time dental facility that included two full-time employed dentists and other supporting staff. Recently, the Mental Health Services Site, with 200 patients, shared an off-site dental care facility with other chronic care units that comprised the PCCC. Since the closure of this off-site dental care facility the centre utilizes a private clinic in the community.

A decrease in ‘dental client volume’ has almost eliminated all aspects of dental care for the rest of the patients. Svatun also reported the absence of dental care facilities in all ‘small’ psychiatric hospitals in Norway, and that their patients received dental treatment only occasionally.(26) The presence or absence of a dental care facility may depend on the size of the psychiatric care centre. The trend towards a more community-based psychiatric care means a small older population with more severe psychiatric illness, vulnerable to dental problems.(69)

In contrast, patients at WMHC received a full dental ‘check-up’ upon admission at the on-site dental care facility. Despite the availability of dental care, a significant number of patients showed poor oral health at the WMHC. This observation was similar to a Dutch survey by ter Horst, in which dental care services were not utilized when needed by hospitalized psychiatric patients.(82) It was observed that many patients, nurses and other staff members were unaware of the dental services offered at the WMHC. The dental clinic at the WMHC cited lack of personnel for not being able to promote its services.

WMHC had provisions for an oral health promotions program but due to lack of personnel, it was seen as ineffective. It has been demonstrated that the oral health of psychiatric patients can be improved with education, instructions and reminders.(39, 83)

Accessibility

The staff at PCCC used private transportation to transfer patients to and from the private community dental office. This meant the removal of patients from their environment,

increased cost due to travel, and time of staff spent outside of the hospital. The staff at PCCC indicated considerable decreased in efficiency and a great inconvenience for the patients to be transported to an outside care facility. The dental care site at WMHC was connected to all psychiatric wards and provided barrier free access from each patient's room to the dental chairs at the clinic.

Accommodation

Due to the nature of psychiatric disorders, appointments are often changed and patients rescheduled. The staff at WMHC noted that irregular periods of exacerbations in many of the psychotic disorders caused regular dental care appointments to be rescheduled. The dental staff also reported that at times dental procedures were interrupted and treatment needs adjusted to accommodate certain nature of some psychiatric disorders. For the PCCC patients, an off-site private dental practice would not have been able to provide the flexibility needed to accommodate them. This issue highlights the benefits of an on-site dental facility.

Acceptability

The concept of acceptability refers to the attitude of the patients towards the dental care provider, and the environment. It is also concerned with the provider's attitudes about the preferred attributes of the dental clients and their financial abilities.(81) Acceptability also refers to the willingness of the dental care provider to serve certain type of clients or to make themselves more or less available.(81)

The staff at the WMHC dental clinic demonstrated extensive knowledge of the oral health problems particular to each psychiatric patient. It was observed that patients and the members of the dental team often recognized each other and exchanged conversations indicative of a close relationship. Dental staff at the WMHC mentioned that such a close bond was needed to reduced fear and anxiety among patients. Fear and anxiety have been reported as major barriers of dental care utilization in psychiatric patients.(84, 85) It is less likely that the staff at the private dental office utilized by PCCC would be able to form the close client-patient bond needed to improve acceptability.

The costs of all dental care services provided at WMHC were paid for by the hospital. The cost of dental services for patients at PCCC was paid through government sponsored programs. The officials at PCCC noted their dissatisfaction with these programs that require increased paper work, and time to complete. Many of these programs (i.e. the Ontario Disability Support Program and /or the Ontario Health Insurance Plan) did not cover some or all of the costs of a complex dental treatment for some patients. The cost of providing dental treatment for patients at PCCC was noted as one of the most significant barriers to providing them with timely dental care treatments.

5.5. Benefits and Limitations of this Study

This study provided an opportunity for an oral examination for 94 psychiatric patients and recorded self-reported oral health problems of 102. By the end of the study 69 patients were referred to receive immediate or future dental treatments. The data from this study also provides the means to assess the demand for dental care and to formulate appropriate policies. The main limitations of this study were the adherence to the exclusion criteria, in particular the exclusion of patients with substitute decision makers. This requirement potentially excluded patients with poorer oral health. Another limitation was reliance on a self-reported survey instrument to collect data.

6. Conclusions

6.1. Oral Health Status and Treatment Needs of the Institutionalized Psychiatric Patients

Significant oral health treatment needs were present at both psychiatric care centres. Decreased access to dental care was identified as the most significant contributor to the poor oral health status of the patients at these two centres. At WMHC, the potential for optimum access to dental care was present. However, due to insufficient number of trained personnel, patients had decreased access to dental services. At PCCC, decreased access to restorative, and the lack of a preventative dental care program was the contributing factor to the poor oral health status of patients.

The result of this study also supports previous conclusions that having a psychiatric disorder predisposes an individual to poor oral health, mainly through unfavourable oral health behaviour such as poor oral self care and diet. Individuals with serious psychiatric disorders that require hospital admission need comprehensive dental treatment in order to improve and maintain their oral health.

6.2. Dental Care Delivery Systems for Psychiatric Institutions

Establishment of a full-time dental care program at PCCC will provide significant improvements for access to dental care. In this section various models were explored and the best dental care delivery model was selected for this centre. These methods were adapted from documents available by the Association of State and Territorial Dental Directors and as further reported by Durham L.R.

Fixed on-site dental care facility

A fixed on-site dental care facility is often indicated for hospitals, schools and long-term care facilities such as psychiatric care centres. It provides maximum accessibility for residents, out-patient services for the immediate catchment area and continuity of care for all patients. Possible drawbacks are cost and patient transportation issues.

Mobile: self-contained motorized van

A dental care unit inside a self-contained van or similar vehicle can move and be shared with multiple communities or organizations. It is often indicated for schools, a group of long-term care centres, and temporary care for rural areas. It could serve multiple sites with most dental care services possible. The difficulties with this model are, initial operating costs, continuity of care issues, increased coordination required, maintenance, weather and acceptability.

Mobile: non-motorized trailer

A mobile dental care unit on a non-motorized trailer is indicated for large community centres, rural hospitals, schools and selected long-term care facilities. They are less expensive, more spacious, and require less maintenance. At the same time, there are increased logistical issues and decreased in flexibility.

Portable equipment

Portable dental equipment can provide most dental care needs including restorative and/or primary and secondary prophylactic treatments. In the case of prophylactic

treatments they are portable enough to be transported and operated by one person. They are mostly indicated for homebound individuals, and long-term care facilities. They can serve multiple locations, have low maintenance costs and create easy access for patients.

6.3. Recommendations

An oral health care system must have three concurrent approaches to care: treatment of oral diseases, oral diseases prevention, and oral health promotions. (86) The recommendations suggested by this study are intended to increase access to these three areas for patients at both institutions. They are based on the current oral health status of the patients at the two psychiatric care centres, previously implemented measures for similar groups of patients, and previous recommendations from past research.

6.3.1. PCCC

The ideal model for the PCCC – Mental Health Services Site is to create an on-site dental services site that would have a dentist, a dental hygienist and a dental assistant as part of its operating staff, providing both restorative and preventative dental services, utilizing off-site services for providing complex dental treatments.

The reality model for the PCCC – Mental Health Services Site is to operate a ‘dental hygiene’ unit staffed by two dental hygienists, providing non-surgical periodontal treatment, and oral health promotions programs for the staff and patients. Other dental care delivery models discussed in this section would not provide better access.

With either model the implementation of the following recommendations are recommended to improve the oral health status of the patients**.**

1. Creation of an oral health promotion and education program geared towards:

   Patients:

   - Special oral health care needs of the psychiatric patients (e.g. side effects of psychotropic medication)
   - The need for and techniques for oral hygiene care
   - Nutrition and dietary issues related to oral health
   - Tobacco consumption and effects on oral health
   - Maintenance of dental appliances
   - Importance of optimum oral health care and its effect on the general health

   Health Care Professionals:

   - Scientific evidence on the importance of oral health and quality of life of psychiatric patients
   - Identification of oral health risk factors
   - Instructions on how to aid patients in daily oral-self care

2. Establishment of a dental care facility that provides at minimum, the following:

   - Primary and secondary prophylactic oral treatment provided by a Registered Dental Hygienist that includes:
     - Non-surgical periodontal therapy
     - Fluoride treatment as required
     - Individualized oral self-care instructions

    - Maintains a regular recall program for each patient

- Conducts initial oro-facial screening of each patient upon admission that would accomplish the following:
    - Identify each patients specific risk-factor(s) for having dental problems
    - Develop a personal oral care plan and identify the assistance needed to accomplish acceptable oral health conditions
    - Recommend and supply the necessary oral hygiene products to the patient
    - Identify future specific restorative, and prophylactic needs
    - Inform hospital staff of the findings and their specific role in the future oral health care needs of the patient
- Establish an inter-disciplinary network that assess oral health of the patients, that includes protocols for emergency dental care, oral hygiene advice and care

6.3.2. WMHC

To increase access of the patients at WMHC to the dental services offered by the centre, the addition of a dental hygienist and an administrative assistant is recommended. This increase would allow the implementation of needed oral health promotions program and the following guidelines:

1. Establishment of hospital wide oral health promotion program geared towards: Patients:
    - Methods on daily proper plaque control
    - Diet, sugar consumption and dental caries
    - The dental services are offered and how to access them

    Health Care Professionals:
    - Scientific evidence on the importance of oral health and quality of life of psychiatric patients
    - Identification of oral health risk factors
    - Instructions on how to aid patients in daily oral-self care
    - The dental services offered at the centre and how to refer patients to the dental facility
2. Establish a program that enables the nursing staff to conduct quick, systematic, and regular screening of the oral health of the patients and to report it to the dental staff.

6.4. Study Implications and Future Research

This study provided the opportunity for evaluating the oral health status of a group of hospitalized psychiatric patients and for referrals to be made for further dental treatments for those in need. It also underlined the need for establishing, and maintaining on-site dental care facilities at continuing care psychiatric centres to address the oral health needs of this population. Future research should focus on continually monitoring the oral health status of psychiatric patients and seeking ways to adjust the resources available to best meet the needs of these patients. Future studies should also examine methods to best incorporate oral hygiene knowledge and practices into the education curriculum and practices of nurses at psychiatric care centres. An oral health promotion and education program for health care professionals, especially nurses, should be regarded as important as the ones geared towards patients.

Faculty of Dentistry
University of Toronto
Community Dental Health Services Research Unit
Department of Biological & Diagnostic Sciences

Oral Health Survey Information Sheet

Title of research project: Oral health status and treatment needs of institutionalized individuals with chronic psychiatric illnesses.

Investigator: Neyaz Farrahi, Masters Student, University of Toronto, 416.979.4900 ext. 4597
Supervisor: Dr. David Locker, Professor, University of Toronto, 416.979.4900 ext. 4490
Sponsor: Community Dental Health Services Research Unit, University of Toronto
Background & purpose of research: The investigator will complete this study as part of his requirement for completing the Master of Science degree in Dentistry at the Faculty of Dentistry, University of Toronto.

Healthy teeth and gums are important, and an essential part of the overall health of an individual. An unhealthy oral cavity can cause tooth lose, bleeding gums, bad breath, and pain. These problems could reduce a person's ability to speak, eat and function properly. They could also have an unhealthy effect on the overall health and psychiatric health of an individual. It has been shown that proper brushing and cleaning of the mouth, along with regular dental check-ups can significantly reduce the chances of having cavities and gum diseases. However, circumstances such as a long-term physical or a psychiatric illness could decrease a person's ability to take care of their teeth and gums. Individuals diagnosed with a long-term psychiatric illness, seeking treatment at a long-term care centre are more vulnerable to dental related problems. In order to be able to better plan and provide dental care services to individuals with psychiatric illnesses at health care facilities we need to know the oral health condition of the patients first. The purpose of this study is to examine the oral health and treatment needs of hospitalized persons with psychiatric illnesses at your hospital. In order to do this, we would need to ask you a few questions and to take a brief look at your teeth and gums.

Eligibility:
To participate in this study you must be at least 18 years old. You must also have been given a diagnosis of a long-term psychiatric illness and receiving care on a full-time basis at an Ontario psychiatric health centre. At times we may not be able to include a participant in our survey due to the limited resources available to us at this time. This includes patients who may require special care. If this is the case for you, with your permission, the hospital staff will be advised to arrange for an examination of your teeth and gums at a later time.

Procedures:
This study will collect information in three parts. First, with your permission, we would collect some medical information from your medical chart. Second, we would ask you a number of questions about your daily activities as they relate to your teeth and gums [approximately 10 – 15 minutes]. And third, we would make a brief examination of your teeth and gums [approximately 10-15 minutes]. It is important for you to know that the examination does not include any treatment for your teeth and gums. If you would like to have any treatment or if we see the need for immediate or future dental treatment, with your permission, we would advise the hospital staff to arrange for care. A trained dental professional (a dentist and / or a registered dental hygienist) will conduct all examinations and the interviews.

Voluntary Participation & Early Withdrawal:
During this study we would ask a few questions about your oral health. You are under no obligation to answer any or all of these questions or to allow us to take information from your medical file. During the dental examination the examiner will do his or her best to make it brief and comfortable for you. You are also under no obligation to complete the examination and you are free to withdraw from this study at any time. **Participants Initials:** _____

Early Termination:
Before we begin to examine your teeth and gums, with your permission, we would review your medical file at the hospital to ensure that we can safely proceed with our examination. Due to the nature of our study, we may not be able to safely complete a dental examination on everyone. If this is the case for you, with your permission, we would inform the hospital staff to ensure that an examination of your teeth and gums are arranged at a later date.

Risks:
There are minimal risks associated with this study. During the dental examination you may feel a slight pressure from the tip of the instruments used to examine your teeth and gums. This is not expected to cause any harm or discomfort to you. However, if you feel discomfort in any way, please inform the examiner as soon as possible. The examination of your teeth and gums will take a few minutes and during this time, try not to make any sudden movements as it maybe possible for the pointed tip of an instrument to irritate your gums. The examiner will do his best to make sure that this does not happen. The findings from this study will in no way affect any medical treatment you might be receiving at the hospital.

Benefits:
This study will provide an opportunity for a quick examination of your teeth and gums. If we see any problems with your teeth and / or gums, with your permission, we would inform the hospital staff with the necessary information so appropriate treatment can be provided.

Privacy & Confidentiality:
We guarantee confidentiality to the extent permitted by law. All the data collected will remain strictly confidential. Documents with your private information will not include your name. Only people associated with the study will see your responses and the information we gather. The information is coded and will be kept in a secure location. Only with your permission our findings will be shared with the hospital staff so appropriate dental care provided for you if needed.

Compensation:
If you become ill or physically injured as a result of participation in this study, medical treatment will be provided. In no way does signing the consent form waive your legal rights nor does it relieve the investigators, sponsors, or involved institutions from their legal and professional responsibilities.

New Findings:
If anything comes to light during course of this research, which may influence your decision to continue, you will be notified.

Report of the Results:
The result of this study will be published as a report and presented to a scientific committee following the completion of the study. The results will not contain any of your private or personal information. The report will be available to all participants by contacting their hospital.

Questions:
If you have questions about the study that are not answered in these Information Sheets, please ask them. In addition, if you have questions in the future you may contact the study investigators at the telephone numbers given on the first page Dr. Padraig Darby, Chair, Research Ethics board, Centre for Addiction and Mental health, may be contacted by research subjects to discuss their rights. **Dr. Darby may be reached by telephone at (416) 535 - 8501 ext. 6876.**

Participants Initials: _____

Faculty of Dentistry
Community Dental Health Services Research Unit
University of Toronto
Department of Biological & Diagnostic Sciences

Informed Consent form for Oral Health Survey Study

I, _____have read (or had read to me) the Information Sheet for the study investigating the oral health condition of hospitalized person with psychiatric illness. The following points have been explained to me: I understand that my participation is entirely voluntary and that I can withdraw at any time. My participation or refusal to participate will have no effect on any treatment I am receiving at this time. I will be given a copy of this informed consent form to keep for my records. To increase safety during the examination of my teeth and gums, I understand that I should do my best to remain still and try to make any sudden movements.

Dr. Padraig Darby, Chair, Research Ethics board, Centre for Addiction and Mental health, may be contacted by research subjects to discuss their rights. **Dr. Darby may be reached by telephone at (416) 535 - 8501 ext. 6876.**

Please place initial next to each part to which you would like to give consent.

Part 1

☐ I give my permission for the investigator to review my medical records kept at this hospital.

Part 2

☐ If my medical records show no complications or medical risks, I agree to participate in a questionnaire with regards to my daily activities and oral health.

Part 3

☐ If my medical records show no complications or medical risks, I agree to an examination of my teeth and gums to be made by the trained dental professional: Name:……

☐ I give permission for the examiner to notify the medical / dental staff at the hospital of any dental related needs I may have.

_____ _____ _____
Participants Printed Name Participants Signature Date

_____
Investigator: Neyaz Farrahi

Interviewer Administered Questionnaire

Name and location of institution: _____

Year / Month / Day: ____/____/____ Patient ID Number: _____

Examiner: _____ Consent obtained ☐Yes ☐No

Instructions:

- *Make sure the specific section of the consent form as it relates to administering this questionnaire is signed by the participant*
- *Repeat questions and/or answers as needed*
- *Use answer cards provided for each question if necessary*
- *Assess the ability of each participants to hear and understand each question, change tone of voice and speed if necessary*
- *Use alternative questions if necessary*

---

1. How do you describe the health of your teeth or mouth? (*Show answer card if necessary*)

☐ Excellent ☐ Very good ☐ Good ☐ Fair ☐ Poor

2. Are you ordinarily able to: (*Alt: can you:*)

chew a piece of fresh carrot?	☐ Yes	☐ No
chew firm meat (steaks, chops)?	☐ Yes	☐ No
chew salad?	☐ Yes	☐ No
bite off and chew a piece from a whole fresh apple?	☐ Yes	☐ No

3. In the last four weeks have you had: (*Alt: since last month have you had:*)
(*point to the particular anatomy as you read the question, if necessary*)

toothache	☐ Yes	☐ No
pain in the teeth with hot or cold foods or drinks	☐ Yes	☐ No
pain in or around the jaw joints	☐ Yes	☐ No
bleeding gums	☐ Yes	☐ No
dry mouth	☐ Yes	☐ No
bad breath	☐ Yes	☐ No

4. In the last four weeks have you had pain or discomfort in the teeth or mouth? (Alt: *during the past month have you had any pain in the teeth or mouth? – point and show card if necessary*)

☐ None of the time	☐ Some of the time	☐ All of the time
(*Alt: Never*)	(*Alt: Sometimes*)	
GO TO Q6	*GO TO Q5*	*GO TO Q5*

5. How would you describe the intensity of the pain or discomfort? (Alt: How much did it hurt? *show answer card if necessary*)

☐ Mild	☐ Moderate	☐ Severe
(just a little)		(very much)

Interviewer Administered Questionnaire

6. When was the last time that you saw a dentist, hygienist or denturist?

(*Alt: When was the last time someone looked at your teeth? And who was the person who looked at your teeth? Show answer card)*

☐ <1 year ☐ 1-2 years ☐ 2-3 years ☐ 3-5 years ☐ >5 years

7. How often do you have your teeth checked?

☐ At least once / year
☐ From time to time for check ups
☐ Only when I have pain
☐ Never

8. What procedure(s) was/were done during your last visit? *(Alt: What did they do when you went to the dentist?)*

☐ **Extraction** ☐ **Restorative** ☐ **Preventative**

☐ **Other**_____ ☐ **Don't Remember**

9. How often do you brush your teeth?

☐ Never
☐ Once / month
☐ A few times / month
☐ Once / week
☐ Few times / week
☐ Once / day
☐ Twice / day

10. Do you smoke? ☐Yes *GO TO Q11* ☐No

11. How many cigarettes on average do you smoke a day? *(Alt: How many cigarettes do you smoke in one day? Show answer card.)*

☐≤ 5 ☐6 – 20 ☐21 – 30 ☐31 – 40 ☐> 40

12. How often do you eat something between your main meals? *(Alt: How often to you snack between your breakfast, lunch, or dinner? Show answer card)*

☐ About 3 times / day
☐ About twice / day
☐ About once a day
☐ Occasionally, not everyday
☐ Rarely / Never

13. How often to eat or drink the following: (per week) *(show answer cards)*

Pop / Soft drink (not diet)	☐ >1	☐ 2-3 times	☐ < 3 times
Cookies, doughnuts	☐ >1	☐ 2-3 times	☐ < 3 times
Candy	☐ >1	☐ 2-3 times	☐ < 3 times
Tea or Coffee with sugar	☐ >1	☐ 2-3 times	☐ < 3 time

Community Periodontal Index (CPI)

0. Healthy
1. Bleeding
2. Calculus
3. Pocket 4-5 mm (black band of probe partially visible)
4. Pocket 6 mm or more (black band of probe not visible)

X. Excluded sextant

5. Not recorded

Prosthetic Status

0. No prosthesis
1. Bridge
2. More than one bridge
3. Partial denture
4. Both bridge(s) and partial denture(s)
5. Full removable denture
9. Not recorded

Decayed / Missing / Filled Teeth (DMFT)

0. Sound
1. Decayed
2. Filled & decayed
3. Filled, no decay
4. Missing due to caries
5. Missing, any other reason
6. Implant
7. Bridge abutment or special crown
8. Complete crown
9. Trauma, fracture
10. Root fragment(s)
11. Not Recorded / Excluded

Year / Month / Day: ____/____/____ Patient ID Number: _____
Examiner: _____ Consent Obtained: ☐ Yes ☐ No
Name and location of institution: _____

Age in Years: _____
Sex: ☐ Male ☐ Female
Primary Diagnosis: _____
Other Diagnosis: _____
_____
Date of Diagnosis: _____
Length of stay: _____
Overall Length of stay: _____
Medications:

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

Contraindications for intra-oral examination: ☐ Yes ☐ No

Periodontal Status (CPI)

17/16	11	26/27
47/46	31	36/37

Prosthetic Status

☐ Upper
☐ Lower

Dentition Status (DMFT)

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Need for Immediate care and Referral

Consent Given for Referrals: ☐ No ☐ Yes
Pain or Infection: ☐ Absent ☐ Present ☐ Not Recorded
☐ Moderate to severe inflammation / bleeding of the gums
☐ Possible carious lesions on the following tooth surfaces:_____
☐ Possible intra-oral lesion(s) in the following are(s):_____
☐ Other Condition(s): (specify) _____ ☐ Not Recorded
_____
Referral: ☐ No ☐ Yes ☐ Not Recorded

Notes

Faculty of Dentistry Community Dental Health Services Research Unit
University of TorontoDepartment of Biological & Diagnostic Sciences

Patient Medical / Dental Records Update and Referral Form

To Whom It May Concern:

Today, _____ Mr. / Mrs. _____ (Participant ID number:_____) participated in an oral epidemiology study investigating the oral health status of the chronic institutionalized psychiatric patients. This study was conducted by the Community Dental Health Services Research Unit, Faculty of Dentistry, University of Toronto. Consent was obtained and participation was in the following areas of the study:

- ☐ Review of medical / dental records
- ☐ Face-to-face interview with regards to oral health behaviour, diet, and smoking
- ☐ Intra-oral examination to obtain DMFT and CPI scores (a count of decayed, missing, filled teeth, and examination of the gums)

During the intra-oral examination the following were noted by the examiner:

- ☐ Consent was not given to disclose findings
- ☐ Moderate to severe inflammation / bleeding of the gums
- ☐ Possible carious lesions on the following tooth surfaces:
  _____
- ☐ Possible intra-oral lesion(s) of concern in the following area(s):
  _____
- ☐ Other (specify):
  _____

For further information about this study please contact:
Principal Investigator: Dr. David Locker or Co-investigator: Neyaz Farrahi
Community Dental Health Services Research Unit
Faculty of Dentistry, University of Toronto
124 Edward Street
Toronto, Ontario M5G 1G6
Tel: 416.979.4900 ext.4697

_____
Investigator:
Neyaz Farrahi

Faculty of Dentistry Community Dental Health Services Research Unit

University of TorontoDepartment of Biological & Diagnostic Sciences

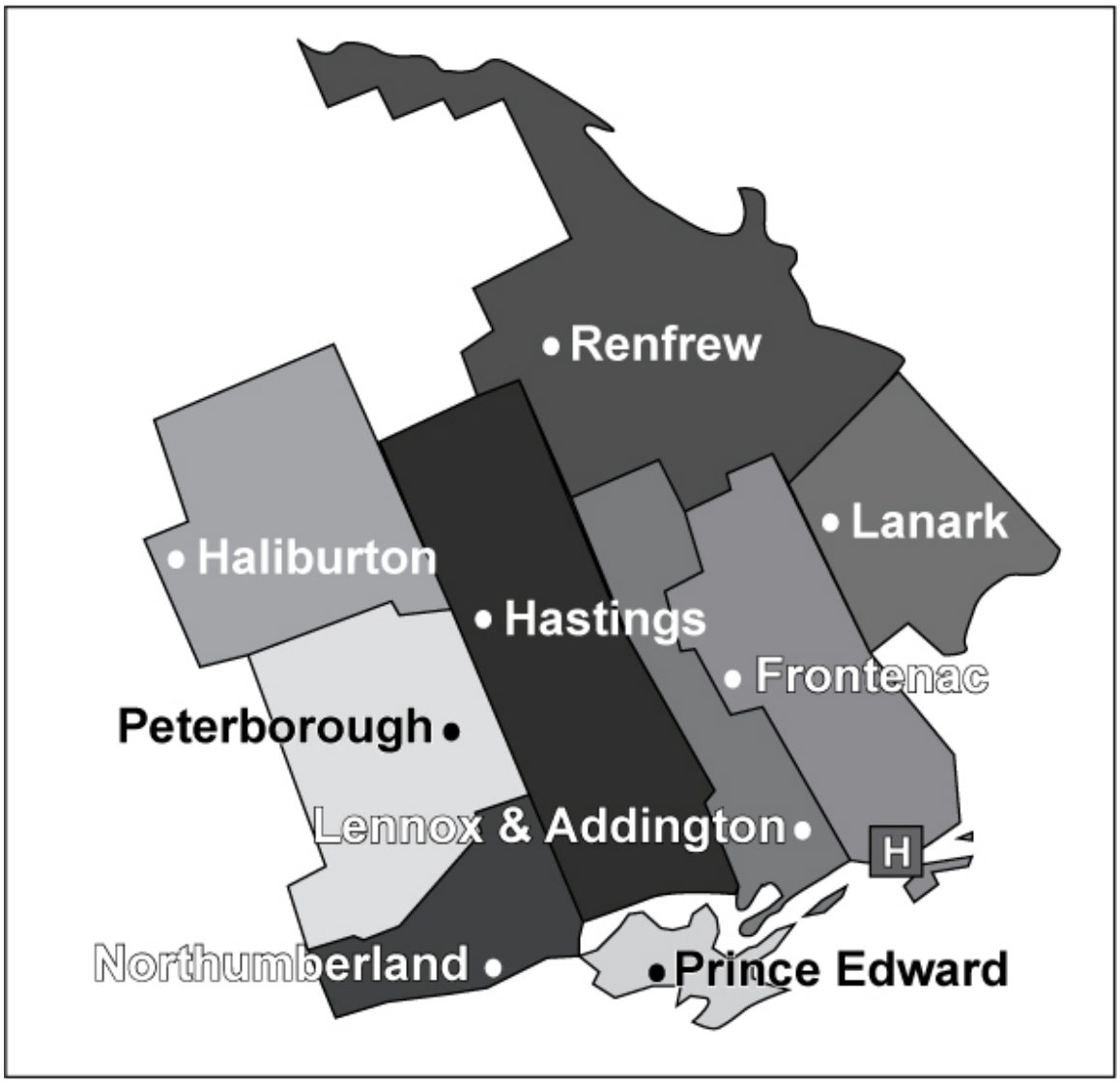
Institution _____

Examiner _____

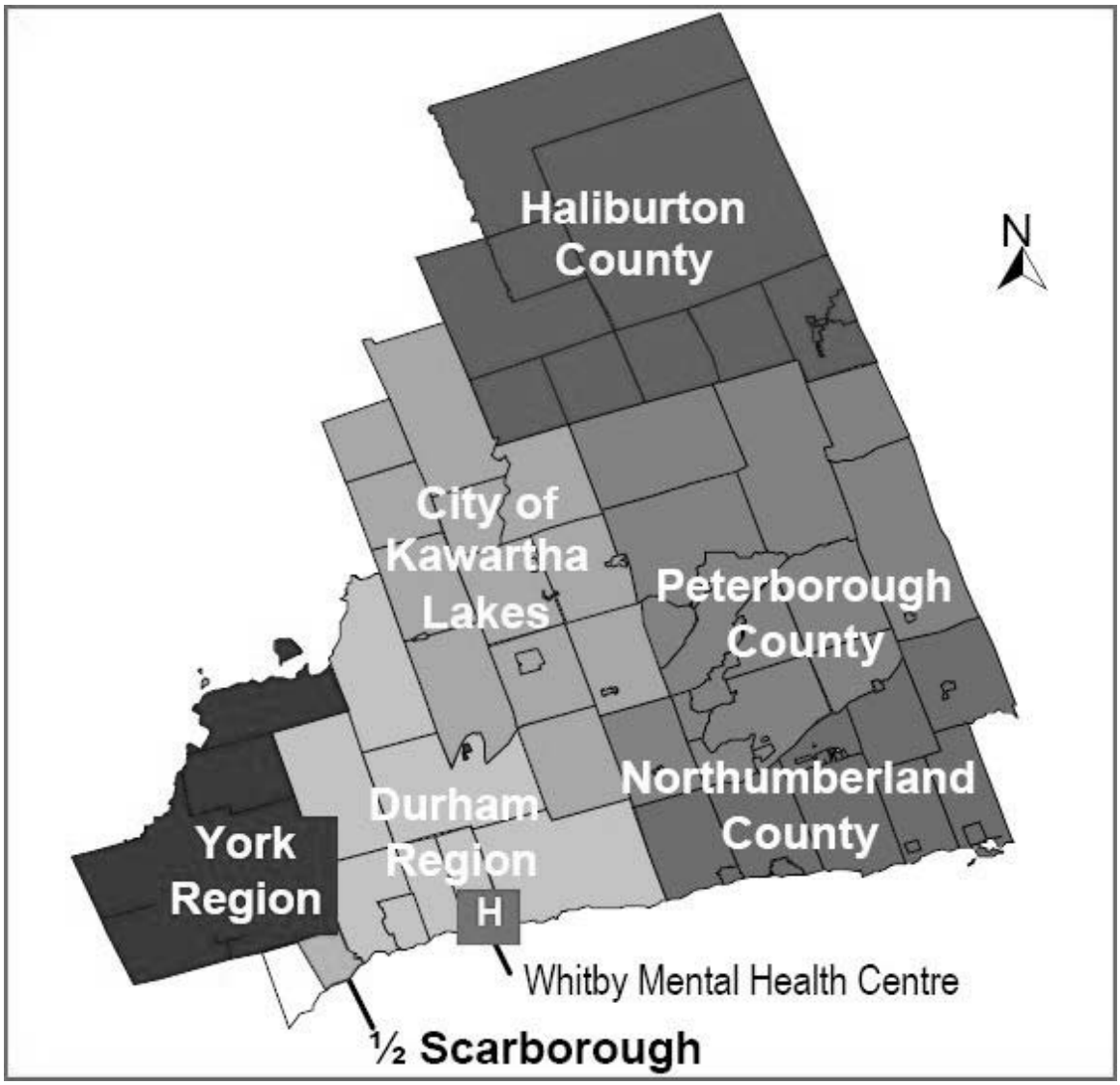
This list will be kept confidential and only the investigators will have access to this list.

Date	Last Name	First Name	Participant ID Number

Map of the catchment area for the Providence Continuing Care Centre – Mental Health Services Site



Map of the catchment area for the Whitby Mental Health Centre



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