Development of an oral health assessment tool based on scientific evidence of abnormalities of the oral tissues and the dysfunctional condition of dental prostheses in seniors in Canada

Report submitted to the Office of the Chief Dental Officer of Canada

Public Health Agency of Canada

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List of Abbreviations

-	“Insufficient”, according to COSMIN evaluation criteria
?	“Indeterminate”, according to COSMIN evaluation criteria
+	“Sufficient”, according to COSMIN evaluation criteria
±	“Inconsistent”, according to COSMIN evaluation criteria
BOHSE	Brief Oral Health Status Examination
CI	Confidence interval
CINAHL	Cumulative Index to Nursing and Allied Health Literature
COSMIN	COnsensus-based Standards for the selection of health Measurement INstruments
D.D.S.	Doctor in Dental Surgery
D.M.Sc	Doctor of Medical Science
DH	Dental Hygienist
DHR	Dental Hygiene Registration
DOI	Digital Object Identifier
e.g.	Exempli gratia
GOHAI	General Oral Health Assessment Index
ICC	Intraclass correlation coefficient
InterRAI-HC	InterRAI Home Care
ISBN	International Standard Book Number
k	Cohen’s kappa coefficient
K^w	Weighted kappa coefficient
LL.B	Law degree
M.Sc	Masters in Science
MDS	Minimum Data Set
MDS/RAP	Minimum Data Set/Resident Assessment Protocols
MDS-HC	Minimum Data Set for Home Care
MPS	Mucosal-Plaque Score
MS	Mucosal score
n/a	Non applicable
No.	Number
OAG	Oral Assessment Guide

OAS	Oral Assessment Sheet
OHAT	Oral Health Assessment Tool
OHI-S	Simplified Oral Hygiene Index
OHR-InterRAI	Optimized photograph-supported Oral Health-Related section-InterRAI
OHSTNP	Oral Health Screening Tool for Nursing Personnel
p	p-value
PDF	Portable Document Format
PICO	Population, Intervention, Comparison, Outcome
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyzes
PRISMA-P	Preferred Reporting Items for Systematic Reviews and Meta-Analyzes - for systematic review protocols
PS	Plaque score
r	Pearson correlation coefficient
RAI	Resident Assessment Instrument
RAP	Resident Assessment Protocol
rho	Coefficient de corrélation de Spearman
ROAG	Revised Oral Assessment Guide
ROAG-J	Revised Oral Assessment Guide-Jönköping
THROAT	The Holistic and Reliable Oral Assessment Tool
α	Cronbach's alpha coefficient

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Summary

Vulnerable seniors are prone to developing abnormal or pathological dental conditions. This is a greater concern for seniors living in long-term care residences, where the detection and treatment of dental conditions is often delayed. Assessment of oral health and its components by general health care professionals like physicians and nurses is therefore essential. This process makes it possible to detect abnormal oral conditions in frail seniors earlier and to direct the patients to oral health professionals in a timely manner. The key goal of this systematic review is to identify existing oral health assessment tools used by non-dental professionals and intended for use with frail seniors aged 65 and over. The review was conducted based on the PRISMA production criteria, which were designed for drafting systematic reviews. The Medline (PubMed and Ovid), Embase, Cochrane Library, CINAHL (EBSCO), Ageline (EBSCO), Web of science and Google scholar databases were consulted to identify the studies to be included in this review. The key words *oral health assessments, non-dental healthcare professionals*, *older people (65+)* and their synonyms were entered into the database search engines. Two revisewers carried out the study selection process independently. The psychometric properties of the tools were examined using the assessment elements from the COSMIN checklist. In total, 4,033 studies were identified, but only 15 of them were selected for analysis purposes. The 15 selected tools primarily assessed the state of oral structures, prosthodontics, oral pain, dental and prosthodontic hygiene, oral functions and quality of life with respect to oral health. The tools contained between 2 and 12 assessment categories or parameters that were scored on a scale of two to five points. Examiner training was required to administer 12 of the tools. Ten tools suggested one-time interventions when examiners detected abnormal oral conditions following participant assessments. The methodological quality of the studies according to the psychometric properties of tools was deemed doubtful in most cases. Only the BOHSE, OHAT and ROAG seemed to be the most complete tools for

assessing the condition of oral structures and prosthodontics. DHR also appeared to be an appropriate tool for assessing dental and prosthodontic hygiene. Despite their limitations and shortcomings, these four tools appear to be valid and reliable in assessing oral health in vulnerable seniors. The results for tools assessing oral function and quality of life related to oral health were not conclusive, since the assessment parameters used by the tools were based on subjective assessments. No identified tool met all the criteria that would allow for individual screening for oral structure and health component abnormalities in the target population by non-dental healthcare professionals. We then recommended the design of an individual oral health screening tool for persons suffering loss of autonomy, for use by non-dental healthcare professionals. It should be based on assessing oral structures and other oral health components by means of images with accompanying brief written descriptions.

An individual screening oral health assessment tool (ISOHAT) for persons suffering loss of autonomy, consisting of ten items to be assessed and supported by key words, was developed for use by non-dental healthcare professionals. Items assessing the state of oral structures, components of oral health and prosthodontics are assigned one of three levels: normal condition; mild to moderate abnormal condition; and severe abnormal condition. A rigorous process involving oral health experts was implemented to select images for inclusion in the tool. An assessment sheet, intervention guide, and a description of the conditions of use were developed to accompany the tool

Introduction

In Canada, the oral health of vulnerable seniors is a concern. Many suffer from loss of autonomy, which impedes their ability to perform adequate daily oral care. This limitation, coupled with other factors stemming from loss of autonomy, leaves them prone to developing abnormal oral conditions. Late detection of these oral conditions, obstacles to accessing care in a dental office, and the scarcity of dental care provision in institutions and home care settings often mean delays in treating abnormal oral conditions. This means frail seniors more often suffer from tooth decay with root involvement, untreated dental abscesses, broken or missing fillings, and broken tooth edges causing mucosal injury. Early detection of these abnormal conditions would make it possible to ensure treatment while limiting the extent and complexity of the treatments required to restore adequate oral health.

Because the number of professionals providing oral health care in nursing homes and home care settings is limited, and because this population needs more frequent oral assessments, it makes sense to involve non-dental healthcare professionals who provide daily care to frail seniors. However, these professionals may have limited knowledge of oral health. To enable them to screen for abnormal oral conditions, they need clear, simple screening tools and training to support them in carrying out this task.

The objectives of this report, which will be submitted to the Office of the Chief Dental Officer of Canada, are to:

1. Describe the state of oral health of Canada's seniors through a careful and methodical examination of the evidence;

2. Conduct a critical review of the scientific literature to identify and classify, in order of importance, the key factors in oral health deterioration among frail seniors in Canada;
3. Identify the various existing tools for assessing oral health in seniors and examine those developed for people aged 65 and over, that are to be administered by non-dental professionals, and that could be applied or adapted to the population of vulnerable seniors in Canada;
4. Determine whether a single accurate, reliable, valid tool exists for detecting abnormal oral conditions in seniors;
5. Develop or adapt an initial version of a tool for assessing oral health in seniors that is quick and easy to use, can be administered by non-dental healthcare professionals, can be used in nursing homes or home care settings, and that will enable early treatment thanks to the interventions set out in a guide prepared in this report and allow early detection of abnormal oral conditions.

This report is divided into four sections, which will make it possible to achieve the stated objectives in a structured and orderly manner.

Section I of the report provides a snapshot of the state of knowledge of oral health in Canada's vulnerable seniors. The key factors in oral health deterioration in that population are also addressed. This section concludes with the relevance of and need for improving oral health in vulnerable seniors through early screening for abnormal oral conditions and quicker treatment of these conditions.

Section II includes a systematic review of the tools for assessing seniors' oral health that are administered by non-dental healthcare professionals. The review identified and analyzed the various

tools in existence worldwide and made it possible to determine whether any of them have the properties needed for early detection of oral abnormalities. The systematic review was also useful in analyzing the tools' strengths and weaknesses to arrive at a design for a tool that has the qualities needed to meet the stated objectives.

Section III presents the illustrated tool for assessing oral health in seniors, which was developed to be administered by non-dental healthcare professionals. This section also includes the elements and aspects associated with its design, a document on the tool's conditions of use, and an intervention guide on actions to take once abnormal oral conditions are detected.

Lastly, section IV presents the conclusions drawn from the report that will help vulnerable seniors achieve better oral health through early detection of abnormal oral conditions by non-dental healthcare professionals.

Section I: State of Knowledge

1.1. Snapshot of the senior population in Canada today

Aging can be defined as a process that, from a physiological and cognitive standpoint, progressively transforms an adult in good health into an adult in diminished health. The process is accompanied by growing vulnerability to assault, illness and, ultimately, death.[1] It is important to note that aging is not necessarily a pathological process. In fact, aging varies from person to person, as it is affected by a number of organic, psychological, behavioural and social factors. How these factors interact determines whether a person ages in good health or experiences a deterioration of their overall condition.

Population aging is accelerating worldwide, particularly in developed countries with low birth rates, like Canada. In recent years, there has been a sustained increase in the number of seniors in Canada. In 2010, Canada had 4.8 million seniors, making up 14.1% of the Canadian population.[2] In 2019, there were 6.6 million seniors in Canada, or 17.5% of the total population.[3] The soaring senior population numbers can be explained in part by dropping birth rates and longer life expectancies.[3]

Population aging has brought with it a rise in the incidence of health problems. In Canada, the most common chronic illnesses among seniors are high blood pressure, osteoarthritis, ischemic heart disease, osteoporosis, and chronic obstructive pulmonary disease. Data shows that more than a third of seniors suffer from two or more chronic diseases.[3] Living with a number of diseases can affect the senior's activities of daily living, reduce their quality of life, and increase their mortality risk. Multiple health problems in seniors can give rise to other potentially harmful effects, such as chronic use of multiple medications, which are associated with a high risk of inappropriate use and side effects.[3]

1.2. Bidirectional link between oral health and overall health

Oral health and overall health are interrelated in several ways. Systemic diseases and the side effects of their treatments can have a negative impact on the individual's oral health, which can then harm overall health.

Numerous studies have shown that poor oral health is associated with the development or aggravation of diseases like cardiovascular disease, diabetes, and respiratory infections. For example, bacteria from dental plaque, also called dental biofilm, and its toxins can migrate from the mouth to the bloodstream, causing generalized inflammatory reactions. These reactions can thus contribute to arterial blockages and heart valve damage, leaving the person vulnerable to heart disease. With respect to poor oral health and diabetes, periodontal disease can develop with poorly controlled blood sugar or glycemic imbalances in people with diabetes. Conversely, untreated periodontal disease can cause systemic inflammatory reactions that can, in turn, lead to glycemic imbalances. In the case of lung infections, orogastric secretions containing bacteria from the mouth or excess plaque that builds up on teeth and removable prosthodontics can be aspirated and cause aspiration pneumonia or worsen existing lung infections. This is particularly common among seniors aged 75 and over who are bedridden, severely frail, and suffering from multiple systemic illnesses.[4–7]

Oral diseases have both a physiological and psychosocial impact. For example, persons with poor oral health often suffer from difficulty chewing as well as pain in the temporomandibular joint, chewing muscles and deficient oral structures. These individuals also have other oral symptoms that can lead to communication and social interaction issues. Seniors who report oral problems seem more prone to withdraw from socializing.[8]

Deficient oral health can also cause difficulty eating, as it can diminish chewing capacity, alter the sense of taste, and affect swallowing. In turn, these factors can lead to nutritional deficiencies, since the person will tend to modify the type of foods they eat while also eating less. Over time, the decline in food quantity and quality can lead to acute or chronic malnutrition. This can have significant morbid effects and raise the risk of infection and associated mortality.[9–11]

1.3. Key factors in the deterioration of oral health in seniors

The main factor in deteriorating oral health in seniors is the loss of functional autonomy. As we will see below, functional impairments interfere with daily oral care, which leads to more accumulation of bacterial plaque. Some drugs used to treat the conditions that led to the loss of autonomy also reduce saliva production. Together, these processes foster the development of oral diseases and contribute to deteriorating oral health. Other factors also affect the maintenance of oral health; these are mainly related to barriers to accessing professional dental care and a lack of oral health knowledge on the part of caregivers looking after frail seniors.

1.3.1. Loss of autonomy

To better understand loss of autonomy, we must first define the concept of functional autonomy. A person's functional autonomy is determined by their ability to carry out activities of daily living, like preparing meals, eating, bathing, dressing and brushing one's teeth. These daily activities are necessary for survival, well-being, and social participation.

Loss of autonomy is therefore defined as a difficulty or inability to independently carry out activities of daily living. Loss of autonomy is part of an evolving process. At first, loved ones compensate for it by providing care in the home setting or adapting the living environment to the person's limitations. Over time, the person becomes entirely dependent on third parties to carry out these daily tasks. Once resources become insufficient, the person has to move to a setting that provides greater supervision and offers care tailored to the person's loss of autonomy. This type of care is provided by nursing homes.[12,13]

There are two types of loss of autonomy: cognitive and physical.

1.3.1.i.a. Loss of cognitive autonomy

Loss of cognitive autonomy is defined as an evolving, irreversible process during which the person experiences a gradual deterioration of their functional autonomy because of changing or declining cognition (neurocognitive disorder). Although loss of functional autonomy and neurocognitive disorders are considered two separate processes, they progress simultaneously over time. Loss of cognitive autonomy is caused by neurodegenerative diseases like Alzheimer's disease and frontotemporal, mixed or vascular dementia.[14]

1.3.1.i.b. Impact of loss of cognitive autonomy on oral health

Loss of cognitive autonomy has a negative impact on oral health. For example, the person suffering from a neurocognitive disorder can sometimes neglect their daily oral care by performing it

incompletely, forgetting to brush altogether or keeping their removable prosthodontics in during the night, without cleaning them. This results in severe build-up of dental plaque.[15]

During the evolving process of the loss of cognitive autonomy, the person develops significant impairments with regards to recognizing and identifying objects and their associated functions. As a result, the person will no longer recognize familiar items, like toothbrushes, denture brushes, and toothpaste. Daily oral care gets neglected because the person can no longer recognize the object itself or its use. The sufferer may also fail to recognize known faces, including those of loved ones and caregivers. As the neurocognitive disorder progresses, the person may become incapable of carrying out motor tasks, although in some cases, motor functions remain intact. This means that at a certain stage of autonomy loss, the sufferer will no longer be able to perform daily oral hygiene, even if they still have the physical ability to do so.[15–17]

All the changes related to loss of cognitive autonomy lead to heavy plaque build-up, which in turn causes cavities, abscesses, periodontal disease and, ultimately, tooth loss. In people who have had their teeth removed and wear removable prosthodontics, there is often a heavy build-up of food debris and plaque on their removable prosthodontics. Sub-prosthetic candidiasis is common in this population owing to nighttime denture wearing and poor cleaning.[18–20]

The drugs used to treat neurocognitive disorders have a significant anticholinergic effect, which decreases saliva production and raises the patient's risk of tooth decay. Some antipsychotic drugs used to control the behavioural symptoms of neurodegenerative diseases decrease saliva production and can cause side effects in the form of repetitive, involuntary muscle spasms of the face and tongue. This abnormal muscle activity is known as tardive dyskinesia.[21,22]

Because the patient's ability to record, store and retrieve information is reduced during cognitive autonomy loss, individuals may forget their dental appointments or fail to follow pre- and post-operative dental care instructions.[14,23]

Those suffering from neurocognitive disorders often have impaired judgement and reasoning ability, meaning that they may not feel the need to receive dental care. As a result, they use fewer dental services, and dental problems can develop or worsen. In some cases, the person simply does not realize that they have dental problems, when this would be obvious to anyone else.[23]

Advanced neurocognitive disorders are accompanied by behavioural disorders that take various forms, including refusal of care, impaired ability to cooperate, and aggressive reactions. When assessing oral health in an individual with loss of cognitive autonomy, the dental professional may have trouble examining the oral structures, which can make it difficult to identify tissue abnormalities, lesions and other issues.[24]

1.3.1.ii.a. Loss of physical autonomy

Loss of physical autonomy stems from functional impairments caused by musculoskeletal disorders, such as arthritis, osteoarthritis, osteoporosis, and trauma sequelae, including fall-related bone fractures. Mobility issues, which take the form of difficulty moving about and an increased risk of accidental falls, are observed during loss of physical autonomy. Neurological issues can also lead to loss of physical autonomy. These can include Parkinson's disease, peripheral neuropathy and, in rarer cases, multiple sclerosis, which generally affects young adults. People suffering from these conditions experience more fine motor issues and eventually gross motor issues.[25]

The causes of loss of physical autonomy can also be metabolic. Malnutrition, diabetes and renal failure can cause a variety of complications that lead to functional disabilities and eventual loss of autonomy. For example, diabetes can cause complications like retinopathy and neuropathy. These lead to vision, dexterity and mobility issues. Cardiovascular disease also causes conditions that lead to loss of autonomy. These diseases limit the sufferer's ability to walk, leaving them out of breath, making their heart race, and causing exercise intolerance. Strokes can also lead to a range of sequelae, including hemiplegia (paralysis of one side of the body).[26]

1.3.1.ii.b. Impact of loss of physical autonomy on oral health

When they are losing physical autonomy, the person has increasing difficulty carrying out daily tasks owing to failing manual dexterity. This means they have trouble performing daily dental care. Tooth brushing, denture cleaning, and flossing become complex or impossible tasks.[17]

Mobility issues and difficulty standing also mean limited access to the sink. The person suffering loss of physical autonomy will therefore need assistance with completing or performing daily dental care. If this care is not done, dental plaque and tartar can build up and cause a variety of oral diseases.[17,27]

As loss of physical autonomy progresses, visits to oral health professionals become less frequent because getting to the dental office is much more complicated for the sufferer.

1.3.2. Difficulty accessing professional dental care

Fair access to professional oral care for all Canadians is essential to diagnosing, preventing and treating abnormal oral conditions, as well as maintaining optimal oral health.[28] Nonetheless, a minority of people in Canada report having trouble accessing professional dental care. This minority is made up of socially and economically vulnerable populations for whom oral care in a private office is often inaccessible.[29] These vulnerable populations include frail seniors.

Frail seniors who do not have access to regular professional dental care have poor oral health. Moreover, they are often at greater risk of developing abnormal oral conditions.[28,29] In Canada, a large number of seniors encounter barriers to accessing oral care, either because they lose dental insurance coverage when they retire, their income is too limited to cover professional dental care, or they are in poor overall health.[3,30]

Another contributing factor to the senior population's limited access to professional dental care is the small number of dental professionals with the specific knowledge and skills needed to treat seniors suffering from loss of autonomy or complex medical conditions. To treat this vulnerable population, oral health professionals have to have medical, dental and pharmaceutical knowledge to plan treatments and provide care as part of a dental practice that revolves around the needs of seniors. In Canada currently, there are few dental professionals trained to treat seniors suffering from loss of autonomy or complex medical conditions.

It is interesting to note that a number of senior-specific factors limit their use of dental care. First, a segment of the senior population sees no use or need for oral health care, which limits their access to

professional dental care.[30,31] This is most obvious among seniors living in nursing homes. Cognitive issues in this population may alter their judgment, thus diverting their attention from oral care. They tend to express needs after the fact, once they begin experiencing pain, discomfort and other issues. These situations involve delayed requests for dental consultations, and once these finally take place, complex interventions are often required to treat abnormal oral conditions.[31]

Second, most frail seniors have limited tolerance for interventions, which means they have little desire to consult an oral health professional. Anxiety, concerns, fear of new situations, and prior negative experiences can also influence their willingness to obtain professional dental care.[30]

Third, in a situation involving nursing home residents with loss of cognitive or physical autonomy, imperatives around getting to a dental office are often fraught with concern. Some seniors prefer to avoid these types of situations, which limits their opportunities to see oral health professionals for curative care. For frail seniors in the home setting, getting to a dental office requires additional effort on the caregiver's part, both in terms of planning the appointment and getting there on the day of the appointment, which often means that follow-up appointments are dropped and only dental emergencies are dealt with.[31]

1.3.3. Lack of knowledge of oral health on the part of nursing home staff

Loss of physical and cognitive autonomy in seniors inevitably leads to placement in a nursing home. These establishments provide care, along with nursing, pharmaceutical, medical and other services. However, some caregiving staff in nursing homes may have limited knowledge of oral health care.[32–

[34] These shortcomings primarily involve daily oral care, particularly toothbrushing and denture cleaning techniques, brushing frequency, and levels of assistance with daily oral care. Many nursing home staffers are also unaware of the negative overall health effects of poor oral health in seniors.

Lack of knowledge of oral health is one factor impeding the early detection of abnormal oral conditions in nursing home residents. These conditions are usually only detected once they are advanced, and there are often delays in reporting them to oral health professionals. This means that managing the conditions can be complex and time-consuming.

Interestingly, a number of studies[32,33] have shown that nursing home care providers can sometimes share incorrect information about oral care and oral health problems. For example, the authors of one study[33] found that caregivers were advising seniors to take out their removable prosthodontics at night to prevent choking. In this case, the advice was correct, but the reason for it was not.

1.4. Common abnormal oral conditions among seniors

In the previous sections, we explained how loss of autonomy affects the ability to maintain good oral health. In this section, we will be looking at the most common abnormal oral conditions among seniors.

1.4.1. Inadequate oral hygiene

Inadequate oral hygiene leads to significant plaque build-up, i.e., dental biofilm. This build-up poses a risk of developing oral diseases, including cavities, dental abscesses, periodontal disease and even fungal infections.[35] The latter are often caused by continuous wearing of removable prosthodontics,

along with deficient oral and prosthetic hygiene, which causes the formation and hardening of prosthetic biofilm and eventually sub-prosthetic candidiasis.[36,37]

Epidemiological studies[36,38] show that 19% of seniors have oral hygiene that is deemed "adequate." The percentage of seniors with "acceptable" oral hygiene is 31.9%, and the percentage of seniors with oral hygiene deemed "poor" is 48.9%.[39–41]

With respect to removable prosthodontic hygiene, 15.7% of seniors appear to have "adequate" prosthodontic hygiene, 35.7% have "acceptable" hygiene, and 48% have "poor" prosthodontic hygiene.[38,42] Approximately 85.5% of seniors have "mild to moderate" accumulation of dental plaque and tartar, with gum bleeding on at least one tooth. The percentage of seniors with "severe" dental plaque and tartar is 13.3%.[36,38]

In nursing homes, between 43.2% and 77.6% of seniors have "poor" oral hygiene.[43,44] In addition, 82% of seniors in nursing homes have at least one tooth with dental plaque and tartar, and between 38.1% and 50.6% of seniors have at least one tooth with gum bleeding.[45–48] With respect to removable prosthodontic hygiene, approximately 95% of removable prosthodontics are considered "unhygienic."[45] Moreover, 78.3% of nursing home residents had "mild to moderate" amounts of dental tartar with gum bleeding on at least one tooth. The percentage of nursing home residents with "high" amounts of dental plaque and tartar was 26.2%.[49] With respect to brushing frequency, between 23.8% and 34.2% of nursing home residents brushed their teeth twice a day or more; 31% to 57.1% did so only once a day; and 7.9% to 13.1% brushed only a few times per week.[50]

1.4.2. Tooth decay

Many low-income nursing home residents requiring dental care adapted to their medical or physical condition are vulnerable to oral diseases.[51] One such condition is tooth decay, which is defined as a multifactorial, infectious process that develops slowly and gradually breaks down the hard tissues of the tooth.[52]

Tooth decay can be divided into coronal and root caries. The first develops on the enamel of the dental crown and occurs mainly in children and adults. The second, which is primarily found in seniors, affects the root surfaces, which become exposed in the mouth as gums recede. Root caries are the result of a breakdown of the minerals in the cementum and dentine. This decay occurs when bacteria produce acids and enzymes that eat away at the organic components of the dentine. Because the dentine has a lower mineral content than the enamel, along with a higher proportion of organic components, root caries tend to progress quickly.[53,54]

In Canada, approximately 10% of people aged 65 and over suffer from tooth decay.[55] In other countries, the percentage ranges from 20% to 60%.

The prevalence of tooth decay in nursing home residents is nonetheless very high. Between 60% and 80% of this population has at least one tooth affected by decay. Factors associated with developing tooth decay include difficulty performing adequate daily oral hygiene owing to loss of autonomy, refusal of care or lack of staff training; the co-occurrence of several diseases in an individual; use of any of several medications that reduce saliva production; and sugar intake in the form of sugary drinks and snacks.

It has also been shown that seniors suffering from neurocognitive disorders have more tooth decay than do their cognitively intact peers. For example, a 2017 systematic review found that seniors without cognitive impairments suffered 0.0 to 1.0 coronal caries and 0.3 to 1.7 root caries. The rate for seniors with neurocognitive impairments was 0.1 to 2.9 coronal caries and 0.6 to 4.9 root caries.

1.4.3. Periodontal disease

The periodontium is the set of tissues that support the teeth. These include the gums, alveolar bone, periodontal ligament, and cementum. When mixed bacterial infections cause damage to the periodontium, that is periodontal disease. It takes two classic forms: gingivitis and periodontitis. Gingivitis is a localized inflammation limited to the free gum, with no damage to the underlying supportive tissues. This inflammation, which is considered reversible, is associated with a quantitative change in the local bacterial flora. Periodontitis refers to damage to the periodontium as a result of a mixed infection caused by a specific group of bacteria along with the host's immunodestructive response.

The prevalence of gingivitis in seniors ranges from 10% to 40%, with the estimated periodontitis rate varying from 26% to 60% according to various studies. In nursing homes, the prevalence of "moderate to severe" periodontitis is 35.6% to 75%. It was also found that between 35% and 78.9% of nursing home residents had at least one tooth with a periodontal pocket larger than four millimetres. The gap in these percentages stems from differences in methodology, particularly the criteria used to define periodontal disease (which vary from study to study), the periodontal parameters assessed, examination conditions, and participant inclusion and exclusion criteria.

Research has shown that individuals with neurocognitive disorders are more likely to suffer periodontal disease than are those with intact cognitive functions. Epidemiological studies have shown that among neurocognitive disorder sufferers, 13.6% to 38.9% suffered from gingivitis, 6.9% to 36.0% suffered from moderate periodontitis and 11.9% to 24.5% had severe periodontitis.

1.4.4. Tooth loss

Teeth are indispensable for chewing, swallowing, speaking and esthetics. As a result, they perform important functions in human physiology. When oral diseases like tooth decay and periodontitis are not treated promptly, they damage the dental structures and their supporting tissues, leading to irreversible total or partial tooth loss.

The loss of teeth and occlusal contacts causes a cascade of other complications, such as tooth migration and extrusion and difficulty chewing. Tooth loss also leads to alveolar bone loss, which can impede denture creation and implant insertion. This bone loss, which is irreversible, chronic and cumulative, is a lifelong condition.

Age is not considered a predictive factor in tooth loss. However, the prevalence of tooth loss increases with age. For example, in the United States, from 2015 to 2018, the prevalence of complete tooth loss in persons aged 65 and over was 12.9%, and prevalence increased with age: 8.9% for those aged 65 to 69; 10.6% for ages 70 to 74; and 17.8% for persons aged 75 and over.

Compared to non-institutionalized seniors, nursing home residents suffer more tooth loss. According to a systematic review of oral health in nursing home residents, between 20.4% and 62% of residents were edentulous. A number of factors contribute to tooth loss in the nursing home setting. On the one hand, severe loss of autonomy means that sufferers are unable to perform proper daily oral hygiene themselves, so tooth decay and periodontal issues develop quickly. Left untreated, these oral conditions worsen quickly and lead to tooth loss. On the other hand, owing to worsening loss of autonomy, the sufferer may be unable to cooperate with oral care. A person with advanced loss of autonomy who cannot cooperate with care would likely have a low tolerance for complex dental treatments aimed at keeping the tooth in their mouth as long as possible. This places them at significant risk of irreversible tooth decay requiring extraction under sedation or general anesthesia. To simplify treatment in this poorly cooperative population, dental professionals may opt for procedures that are relatively simple to perform but do not preserve the tooth, such as tooth extraction. This means that the number of teeth in this population is significantly lower.

1.4.5. Xerostomia

Saliva is a remarkably complex fluid with many properties and functions that are indispensable for oral and general health. Saliva helps to initiate the digestive process, lubricates and protects the mucosa against abrasion, helps to control oral infections thanks to its antimicrobial components, and limits the tooth decay process by keeping the mouth's pH neutral. Saliva is secreted at rest or in response to a stimulus. A healthy adult produces between 0.5 and 1.5 litres of saliva per day.

A variety of factors can limit or significantly reduce saliva production, leading to dry mouth. Decreased saliva production, combined with changes in its chemical makeup, can cause dry mouth, also known as xerostomia. It has been abundantly demonstrated that xerostomia fosters the development of oral diseases, such as tooth decay, oral candidiasis and prosthetic ulcers. Xerostomia sufferers also report discomfort, difficulty chewing, swallowing and speaking, halitosis, a burning sensation, and altered sense of taste.

Xerostomia is multifactorial in origin. It is primarily caused by medications, particularly anticholinergics. Other causes include chronic dehydration, tobacco use, uncontrolled diabetes, and destruction of salivary tissue caused by radiation therapy or autoimmune diseases. The exact relationship between xerostomia and medication is influenced to varying degrees by a range of factors, including the type and number of drugs the patient is taking, drug dosage and presentation, when and for how long drugs are taken, drug interactions, and adherence to drug treatment.

Xerostomia prevalence in seniors ranges from 12% to 39%, with a weighted average of 21%. Recently, the authors of a meta analysis found the global prevalence of xerostomia in seniors to be 33.37%. These data show that xerostomia is a common condition in that population. It should be pointed out, however, that the prevalence of xerostomia in young adults is estimated to be about half of what it is in seniors. In nursing homes, the percentage ranges from 34.8% to 60%, depending on the studies. In Canada, the figure is approximately 36%. The gaps in study results can be explained in part by the way xerostomia was measured, and in part by factors inherent to seniors, such as the number of medications taken, tobacco use, and metabolic or systemic differences.

1.4.6. Oral candidiasis

Oral candidiasis is an opportunistic infection caused by Candida yeast, of which the most common pathogenic agent is Candida Albicans. Candidiasis is recognized as an opportunistic infection because, under the influence of various local and systemic factors, Candida yeast transforms from a saprophytic yeast (one that lives in the organism without causing disease) into a pathogenic yeast. Local predisposing factors for oral candidiasis include extended prosthodontic wearing or poor prosthodontic hygiene, xerostomia, and inhaled corticosteroids. Systemic factors include immunosuppression, drug side effects, malnutrition, radiation therapy, and endocrine dysfunction.

Oral candidiasis primarily presents in three clinical forms: pseudomembranous, erythematous and hyperplastic. Pseudomembranous candidiasis typically presents on the dorsal aspect of the tongue or on the oral mucosa. With an asymptomatic clinical picture, this type of candidiasis causes the formation of easily detachable whitish patches on erythematous surfaces.

Erythematous candidiasis is characterized be reddish lesions on the mucosa. It can be called different things depending on its location. Two forms of erythematous candidiasis are particularly common among seniors: prosthetic stomatitis and angular cheilitis. Prosthetic stomatitis takes the form of a usually asymptomatic erythema on the oral mucosa that are in direct contact with a removable prosthetic. Its preferred location is the hard palate, but it can also occur on the alveolar mandibular crests. Nighttime denture wearing, inadequate cleaning, and infected dental prosthetics help this type of candidiasis develop. Angular cheilitis occurs exclusively at the corners of the lips, mainly in edentulous patients, those who do not wear a lower denture, and those who wear full removable prosthodontics with decreased occlusal vertical dimension. Saliva infiltrates the lip commissure,

causing persistent moisture that allows microorganisms to colonize the area. Oral examination shows a unilateral or bilateral fissure of the lip commissures with associated redness or scaling of the irritated tissue. These lesions are generally painful.

Hyperplastic candidiasis is often observed in edentulous seniors. This type of candidiasis generally occurs on the upper edentulous ridge. From a clinical standpoint, the lesions are whitish, hypertrophic, non-detachable and raised. One predisposing factor for this type of candidiasis is inadequate cleaning of removable prosthetics.

The prevalence of oral candidiasis in the senior population varies depending on the sample studied (which can be made up of functionally autonomous seniors, those with loss of autonomy, or both) and also the predisposing factor for candidiasis (systemic versus local factors). This diversity results in differing prevalence figures depending on the context in which the studies were carried out. However, generally speaking, the prevalence of pseudomembranous candidiasis in seniors ranges from 15% to 43%, with the figure for prosthetic stomatitis varying from 12.2% to 71%. These differences in percentages can be explained by the differing diagnostic criteria selected in the studies and differences within the groups, such as age, whether or not they were nursing home residents, and the impact of drugs and diseases. Lastly, the prevalence of angular cheilitis in the senior population ranges from 1.3% to 5.1%.

1.4.7. Mouth sores

Mouth sores are defined as a loss of substance from the oral epithelium that can gradually spread to the underlying tissues. Mouth sores take the form of circumscribed lesions covered with a yellowish grey membrane, surrounded by a red halo with slightly raised reddish edges. These lesions are generally painful and isolated. Predisposing factors include trauma, immune or infectious processes, and, rarely, neoplastic factors.

Traumatic ulcers, as well as small and large canker sores, are ulcerated lesions of the mouth that are most common in the senior population. Traumatic ulcers generally occur following an accidental bite to the soft tissues of the mouth, injury from sharp-edged teeth, extended wear of poorly adjusted prosthodontics, or broken prosthodontic hooks. The cause of canker sores remains a mystery in most cases. However, a set of factors is frequently associated with them: the use of certain medications, eating certain foods, hormonal variations, stress, nutritional deficiencies, and systemic diseases.
The diameter of traumatic ulcers depends on the severity of the damage to the oral mucosa. The lesions take 10 to 14 days to heal once the triggering factor is eliminated. Small and large canker sores are differentiated by their diameter; hence their names. Small canker sores measure less than a centimetre and generally heal within ten days; large canker sores exceed one centimetre in diameter and take more than ten days to heal over, as they involve deeper layers of the oral epithelium.

In the senior population, the main cause of traumatic ulcers is wearing removable prosthodontics that are in poor condition, which accounts for 22.6% of cases. Traumatic ulcers from other causes vary from 1% to 15.6% of the senior population. Canker sores occur in an estimated 1.2% of seniors; the figure is approximately 0.2% in nursing homes.

Sores that develop on the lateral edges of the tongue require particular attention, as they can be either traumatic or neoplastic in nature. As indicated in the preceding paragraphs, traumatic ulcers heal within 10 to 14 days of the irritating factor being eliminated. If the ulcer has not healed after that time, a biopsy of the affected area becomes necessary. The goal is to rule out a neoplastic lesion.

1.4.8. Prosthetic dysfunction

Prosthodontics serve to replace one or more of the individual's missing teeth. Restoring missing teeth through appropriate prosthetic treatment is essential to re-establishing oral function, chewing ability, appearance, and the person's oral health.

Dysfunctional prosthodontics can cause a range of problems, including irritation of the soft tissues of the mouth and early, significant bone resorption. Dysfunctional prosthodontics can also make it difficult to pronounce certain words and chew food properly.

Various epidemiological studies of nursing home residents show that many of them have dysfunctional prosthodontics. Approximately 40% of them report issues associated with wearing dentures. The most commonly observed issues were poor retention of removable dentures (40%); dentures that were unstable or required relining (30%); and prosthodontics in need of repair (10%). A Canadian study of nursing home residents showed that between 14.3% and 29.4% of residents wore unstable removable prosthodontics; 9.5% to 33.5% wore removable prosthodontics with poor retention; and 1.4% to 2% wore prosthodontics in need of refurbishing. Between 10.5% and 54.6% of nursing home residents

developed lesions of the oral mucosa, which were related to poor functioning of removable prosthodontics.

1.4.9. Peri-implant mucositis and peri-implantitis

Peri-implant mucositis occurs in the mucosa surrounding a dental implant. Clinical examination reveals mucosal inflammation around the implant, as well as bleeding or suppuration on probing. No radiological indications of bone loss are observed. Peri-implant mucositis is chiefly caused by biofilm accumulation around the dental implant. Peri-implantitis is the logical outcome of untreated peri-implant mucositis. Peri-implantitis is characterized by progressive bone loss around the implant. It results primarily from a bacterial infection. Clinically, suppuration or exudate will be observed flowing out of the peri-implant space, and there will be bleeding on probing. Advanced cases can lead to implant mobility and ultimately its loss. The prevalence of peri-implant mucositis in seniors is approximately 30%, while the frequency of peri-implantitis ranges from 11.1% to 43.8%.

1.4.10. Oral pain

Oral pain often stems from untreated oral issues. It normally involves pulpitis, dental abscesses, ulcerous lesions, trauma such as broken teeth, defective restorations, poorly fitted prosthodontics, etc. It affects the person's quality of life by directly impacting overall health. For example, oral pain can cause difficulty chewing and lead to a deterioration in the person's nutritional status. Among those with neurocognitive disorders, oral pain can cause behavioural issues, such as agitation and confusion.

Generally speaking, the prevalence of oral pain among seniors is 6.7% to 18.5%. The prevalence appears to be higher among seniors with neurocognitive disorders. The prevalence of oral pain in this population ranges from 7.4% to 21.7%; only one study found a prevalence of approximately 60%. The variation in prevalence rates can be explained by the influence of external and internal factors related to the individual. The external factors are related to the tool used to assess pain, the use of different nociceptive stimuli, limited or non-homogenous samples, or the living environment. Internal factors include the presence of psychological disorders and personality traits that can alter pain perception, chronic use of painkillers or other drugs that act on the central nervous system, as well as the variety of individual responses and subjective factors that influence it.

1.5. Need to develop or adapt an oral health assessment tool

Loss of autonomy leads to a progressive decline in oral health. It would be possible to slow this decline early on and quickly by detecting and intercepting the abnormal oral conditions that develop during the process. This would make it possible to manage abnormal oral conditions at earlier stages, thus limiting the complexity of the treatments needed to address them.

Currently, there are too few periodic visits to nursing and long-term care homes by oral health professionals. The number of oral health professionals practising in these establishments is limited. In most cases, there is no oral health professional who comes in regularly and frequently. They are called in only in situations that are critical, urgent, or complex to manage. The constant presence of such professionals in nursing and long-term care homes would make it possible to detect and intercept abnormal oral conditions early on, before they worsen and damage the senior's oral and overall health.

To ensure that abnormal oral conditions in seniors are intercepted quickly and managed earlier, we must rely on health professionals who are constantly with seniors and provide them with care on a regular basis. However, a large proportion of these health professionals have received no training on oral health and how to recognize abnormal oral conditions, and their knowledge of the topic may be limited. It therefore becomes necessary to either develop a tool for assessing seniors' oral health or put an existing assessment tool in place to allow health professionals to identify the most common abnormal oral conditions among seniors. If necessary, these professionals will be able to call in oral health professionals for early intervention.

In order to do this, we must begin by conducting a systematic review of existing oral health assessment tools that can be administered by non-dental healthcare professionals. The conclusion of the systematic review is that we can envisage creating an effective assessment tool for the early detection of abnormal oral conditions in seniors, for use by health professionals who work with seniors in nursing and long-term care comes.

Section II: Systematic Review of Oral Health Assessment Tools Used by Health Care Professionals Treating Vulnerable Seniors

1. Introduction

The oral health of vulnerable seniors, including those living in long-term care facilities, is a cause for concern. Many studies[43,56–61] focusing on this group have revealed deep cavities, fractured or rotted teeth, untreated abscesses, teeth fully covered with plaque or tartar, pronounced mobility in teeth, and other oral conditions.

Scientific literature finds that the main obstacles to maintaining good oral health are related to reduced physical or cognitive autonomy, low income and limited access to dental care.[28,29,62] Reduced autonomy leads to a decline in attention to daily oral hygiene which varies between individuals but is invariably significant. Most of the time, such incapacity results in increased plaque, which in turn accelerates the progression of oral disease.

In retirement homes, there are other factors that promote the development of oral diseases in the elderly, such as the lack of supplies necessary for the oral hygiene of the elderly, the lack of time for caregivers to carry out oral hygiene care for residents, refusal of daily oral hygiene care from seniors with loss of cognitive autonomy as well as snacks, high-sugar supplements and the use of sugary foods to facilitate medication administration.[63] Oral diseases, increasingly present in vulnerable seniors, are detected and treated far too late.[15,16,64,65] This late screening could be linked to the lack of availability of oral health professionals to visit retirement homes and also to the lack of knowledge of the oral health parameters by general health care professionals, among other reasons.[28,29] The development of a valid, reliable and easy-to-administer screening tool to assess the oral health status of seniors living in long-term care by general health care professionals becomes imperative in order to improve the oral health of the elderly.

An oral health assessment tool is defined as any instrument that determines oral health by evaluating oral structures and other components of oral health. It must have certain characteristics in order to be administered by general health care professionals with no specific dental education:

- reproducible, reliable and valid;
- simple, comprehensible and easy to administer using few dental instruments;
- easy to use without dental equipment;
- compatible with commonly used computer systems;
- easily incorporated into resident's records;
- affordable for intended use.[66,67]

There are numerous tools[68–73] that allow for the evaluation of various aspects of oral conditions. Most of these tools were developed specifically for dental professionals and therefore prove to be complicated for general health care professionals. Few[74–88] tools for assessing seniors' oral health can be administered by non-dental health care professionals. In addition, some of them require that the information collected be supplemented by a self-assessment by the senior. For seniors with reduced cognitive autonomy, this type of tool is inappropriate and would be difficult to modify without compromising validity.[67]

The assessment of oral health relies on the resident's ability to self-report oral symptoms, which presents a problem for many seniors living in long-term care facilities, particularly those with cognitive impairment.[67]

In 2005, Chalmers et al.[67] conducted a systematic review of the oral health assessment of seniors with dementia living in care facilities. The assessments were performed by the caregivers of the facilities selected for the study. The authors found that the caregivers did not have valid and reliable tools to assess the residents' health. Since the study was published, numerous tools[78,80,83,85,87,88] have been designed for seniors living in care facilities. In 2020, a systematic review[89] of the oral health assessment tools administered by caregivers in these facilities found that the OHAT and ROAG were the most complete tools. Recently, in another systematic review[90] on the same topic, the authors found that none of the selected tools exhaustively assessed all aspects of oral health.

Available assessment tools describe the various oral structures with short phrases or key words, which can be difficult for professionals not specialized in oral health to interpret. In addition, text descriptions of normal or abnormal tissue can create a mental image that differs from the clinical reality. This can lead to false negatives or false positives. Professionals not specialized in oral health are more likely to misread the clinical circumstances in this situation.

The objectives of this systematic review are as follows:

- identify tools that assess oral health by evaluating the condition of oral structures, the condition of dental prostheses, oral pain, hygiene of teeth and dental prostheses and oral health–related quality of life;
- out of the tools identified, determine which were developed for seniors aged 65 and over as well as which can be applied or tailored to vulnerable seniors in Canada;
- conduct a qualitative evaluation of the oral health assessment tools identified in this systematic review.

2. Materials and methods

The systematic review was structured according to the PRISMA[91] for Preferred Reporting Items for Systematic Reviews and Meta-Analyses. To develop the systematic review, a research protocol was prepared and written. The protocol provided a means of defining the objectives and research question of the review and setting out the methods to be used to identify, select and evaluate the studies. The research protocol was written in accordance with the PRISMA-P[92] criteria for systematic review protocols.

2.1. Research question

This systematic review focused on the following research question: "Is there a tool to assess the oral health of seniors that, when administered by a non-dental health care professional, allows for accurate identification of all oral health problems as well as normal and abnormal conditions of oral structures and dental prostheses?"

The research question was deconstructed by using the PICO criteria (Population, Intervention, Comparison, Outcome) to identify key concepts to apply to the search strategy. These criteria are presented in Table I.

Table I: PICO criteria based on the research question of the systematic review.

Criteria	Definition
Population	Individuals aged 65 and over with reduced autonomy living in care facilities or at home, healthy or otherwise
Intervention	Use of tools, instruments, scales, analysis grids, sheets, guides, indices or questionnaires administered by non-dental health care professionals that allow for the evaluation of oral structures, saliva, hygiene of teeth and dental prostheses, oral pain and oral health–related quality of life
Comparison	No comparison was conducted
Outcome	Accurate identification or detection of all oral health problems and all normal and abnormal conditions of oral structures, saliva, dental prostheses, teeth and dental prosthesis hygiene regardless of effect on quality of life and oral pain.

2.2. Eligibility criteria

Studies were selected for inclusion based on the following eligibility criteria:

1. The studies had to focus on the assessment of seniors' oral health using assessment tools administered by non-dental health care professionals:
    a. the seniors had to be aged 65 or older. Level of autonomy, presence of health problems, living situation (home or care facility), presence of teeth or presence of oral pathologies or conditions were not considered as eligibility criteria for seniors;
    b. the assessment had to consist of evaluating, in part or in full, the condition of oral structures, dental prostheses and saliva, the hygiene of teeth and dental prostheses, oral health–related quality of life and oral pain;
    c. the assessment tools were required to be tools, questionnaires, sheets, guides, grids, scales, indices or any other instrument allowing for the identification or detection of

normal and abnormal conditions related to oral structures, dental prostheses and oral pain regardless of effect on quality of life. The assessment tools could be used alone or in combination, with no limitations on duration or frequency of administration;

   d. none of the health professionals who used the tools were specialized in dentistry;
   e. tools that assessed oral structures using X-ray images were eligible for this review only if they were used by non-dental specialists.

2. All types of studies including a tool as defined in item 1.
3. All results obtained from a tool as defined in item 1.
4. The statistical analysis of data was not a requirement for selected studies.
5. Studies had to be available in digital format and published in scientific databases or on the Internet.
6. Studies had to be published in or translated to English, French or Spanish.

There were no restrictions regarding the studies' population size or publication date.

2.3. Information source

To begin, various bibliographical databases in the field of health sciences were consulted to identify studies for inclusion in the review. The following databases were consulted:

- MEDLINE via the PubMed interface, Ovid;
- Embase;
- Cochrane Library;

- CINAHL for Cumulative Index to Nursing and Allied Health Literature (nursing sciences database) via the EBSCO interface;
- AgeLine (database with gerontology and geriatrics articles) via the EBSCO interface;
- Web of Science (multidisciplinary health sciences database).

Second, using the Google Scholar search engine, we conducted a search of grey literature to account for studies not published in scientific journals.

The search of bibliographical databases and grey literature took place from January 11, 2021, to January 25, 2021.

2.4. Search strategy

To begin, terms associated with the search criteria of this review were targeted. To this end, the search topic was divided into three key concepts: oral health assessment tools, seniors, and non-dental health care professionals. Next, each concept and its synonyms were transformed into key words and recorded on a worksheet prepared for this purpose. This step allowed for the identification of terms and key words used in the literature search.

Once the terms and synonyms were selected, we verified if they were contained in the following thesauruses: “MeSH” on PubMed, “EMtree” on Embase and “CINAHL Headings” on CINAHL. To ensure a comprehensive search of the subject matter literature, key words appearing in study titles and summaries were combined using Boolean operators (e.g. AND, OR) and wild cards (e.g.*, $, ?). This

process generated a number of research equations. A set of equations made up a “formula”, which was analyzed by the database search engines. We repeatedly tested many different equations in order to obtain the most effective “formula” and thereby narrow and optimize the bibliographical search. The research equations are presented in Appendix I. The best search formulas for each database were inputted into the various search engines selected.

The references returned by the search engines were then exported to EndNote®, a bibliography management software application. In EndNote®, a single collection of references was created based on the queries launched in each database.

It should be noted that the search strategy for this review was prepared by Katherine Carbajal-Rosas (holder of a master’s in dental science from Laval University and a Doctorate of Dental Medicine) and approved by the Principal Investigator, Christian Caron (PhD MSc., D.D.S., LL.B.).

2.5. Selection of studies

Two examiners (KC and CC) took part in the selection of studies by separately and simultaneously carrying out each step of the process. Discussions were held during the selection process.

First, the examiners counted the study references in the collection generated by EndNote®. Next, the software was programmed to search for and delete references found in the database twice. The final number of references without duplicates was recorded.

Second, the examiners individually read the title and summary of each study in EndNote® to make an initial selection. For a study to be preselected, three terms had to appear in the title or summary: “Oral health assessment tools”, “seniors” and “non-dental health care professional”, or any synonyms for these terms. If one of the terms was absent, the study was deemed unsuitable and excluded from the review. In case of doubt, and notwithstanding the above rule, the full summary or article was read in order to decide whether to include it. Preselected studies were collated into an Excel file.

Third, the examiners exchanged information to ensure a consistent selection and to identify any discrepancies. Disagreements were addressed through consensus-based discussion. Persistent disagreements were ruled on by the Principal Investigator.

For the fourth step, the reviewers individually read the preselected studies in PDF or Word format. When a study could not be located in one of these formats, Google Scholar was consulted using the study’s DOI (Digital Object Identifier) or ISBN (International Standard Book Number). Failing that, a copy of the study was requested from the Laval University library.

Before each study was fully read, the examiners had to determine whether it met the eligibility criteria. If so, it was added to a computer database. If the criteria were not met, the study was entered in a separate computer file with a rationale for its exclusion. The examiners also thoroughly reviewed the bibliographies of selected studies to find other studies that may have been missed by search engines.

Finally, the examiners performed a second verification to compare their chosen studies and to identify any discrepancies.

The selection of studies took place from January 25, 2021, to February 28, 2021.

2.6. Data extraction

Once the studies were selected, we extracted data with potential to answer the research question.

To do so, one of the two examiners fully read through the selected studies. Next, this examiner entered data on the study characteristics, population and assessment tool in an extraction grid prepared by the work team. Before undertaking the data extraction process, the extraction grid was tested using three randomly selected studies, allowing for necessary adjustments to be made.

If one of the studies used more than one tool to assess the oral health of a single population, the results for each tool were presented separately.

In addition, if more than one version of a tool was identified, the results for each version were presented separately as if each version were a different tool. If a tool had been translated into multiple languages, we retained only the article concerning the original version.

A final, comprehensive review of the search process was carried out to identify any errors.

Data extraction began on March 1, 2021, and was finalized on March 7, 2021.

2.7. Evaluation of evidence quality

The analysis of assessment tools goes beyond a simple compilation of various measurement tools. Protocols can vary based on the context, the population under assessment and the objectives of the assessment. All possible forms of assessment are valid, as long as they are deemed relevant in context and meet the assessment objectives with the required rigour, which is based on the validity of the tool and the reliability of its results. An assessment is expected to measure what it claims to measure (validity) and to provide accurate and stable results upon completion of the assessment process (reliability).[93] This review therefore analyzed content validity, structural validity, criterion validity, cross-cultural validity, hypothesis testing validity, internal consistency, intra-examiner and inter-examiner reliability, measurement error and reactivity.

2.7.1. Validity

Content validity provides a means of determining if the constituent items of the assessment tool adequately reflect the concept of interest. This psychometric property is studied based on the information provided by the authors of the tools. To confirm the content validity of a tool, it must be established that professionals in disciplines relevant to the assessment topic helped develop the tool and that the constituent items of the tool were tested by a sufficient number of professionals or clinicians during development. Without this information, it is difficult to establish the content validity of a tool.[94,95]

Structural validity refers to the extent to which the scores of an assessment tool adequately reflect the dimensionality of the concept being measured. Statistical tests, such as a confirmatory factor analysis

or an estimate of the root-mean-square deviation, must be carried out in order to establish the structural validity of a tool.[94,95]

Criterion validity refers to the ability of a tool to provide results equivalent to those obtained by the "gold standard", in this case, an oral health professional used as a reference for comparison. For continuous variables, Pearson (r) or Spearman (rho) correlation analyses must be performed to compare the results. To ensure the criterion validity of a tool, the Pearson or Spearman correlation coefficient must be equal or superior to 0.70. Sensitivity and specificity analyses can also quantify criterion validity, but only for dichotomous variables.[94,95]

Cross-cultural validity refers to how each item performs when the tool is translated or adapted to other cultures. Translated tools should perform similarly to the original version.[89,96]

2.7.2. Reliability

Internal consistency refers to the tool's consistency from start to finish. To measure this, Cronbach's alpha (α) must be estimated. If the result is above 0.70, this indicates the stability of results for all items of the tool.[93–95]

Reliability refers to the accuracy of the tool's results. Reliability is demonstrated by the accuracy of results obtained using the tool for two simultaneous assessments by different examiners (inter-examiner reliability) or multiple assessments by the same examiner (intra-examiner reliability). Reliability also refers to the consistency of results over time and whether administration conditions

remain stable (test-retest). Statistical measures that allow for the evaluation of reliability are the Cohen's kappa coefficient (k) and the intraclass correlation coefficient (ICC). To guarantee the reliability of a tool, the weighted kappa coefficient (K^w) or ICC must be between 0.70 and 1.00.[93–95]

Measurement error is intended to identify gaps between the value obtained by a measurement and the accurate value; the score obtained by a tool reflects an approximation of the individual's real score. The statistical analyses necessary to determine measurement error are "standard error of measurement", "smallest detectable change" and "limits of agreement".[94,95]

2.7.3. Methodological quality

The COSMIN checklist was used to estimate the methodological quality of the studies and the quality of the tools' measurement properties.[94] The checklist assists research professionals in selecting the most appropriate measurement tools based on the concept being studied. This approach relies on a system of evaluation to determine the quality of evidence available for a given tool. The COSMIN system evaluates the methodological quality of selected studies as "very good", "adequate", "doubtful" or "inadequate". The quality of measurement properties was deemed sufficient (+), insufficient (-), indeterminate (?) or inconsistent (±) according to the availability of data on the tool under evaluation.

3. Results

3.1. Results of literature search

The literature search resulted in the extraction in 4,333 references, of which 624 were from PubMed, 588 from Ovid, 619 from Embase, 145 from Cochrane, 467 from CINAHL, 144 from AgeLine, 466 from Web of Science and 980 from Google Scholar.

Next, unusable references were discarded, namely duplicate references and those published in other formats (e.g. Books and reports) or in a language other than English, French or Spanish. The examiners retained 2,204 references and proceeded to read their titles and summaries. Once this was done, it was found that a further 2,003 references did not meet the eligibility criteria of this review. This left 201 studies to be read in full, of which only 15[74–88] ultimately met the criteria (Figure 1).

3.2. Selected studies

The studies[74–88] selected were extracted for thorough analysis of their content. The identified tools are presented in Appendix II.

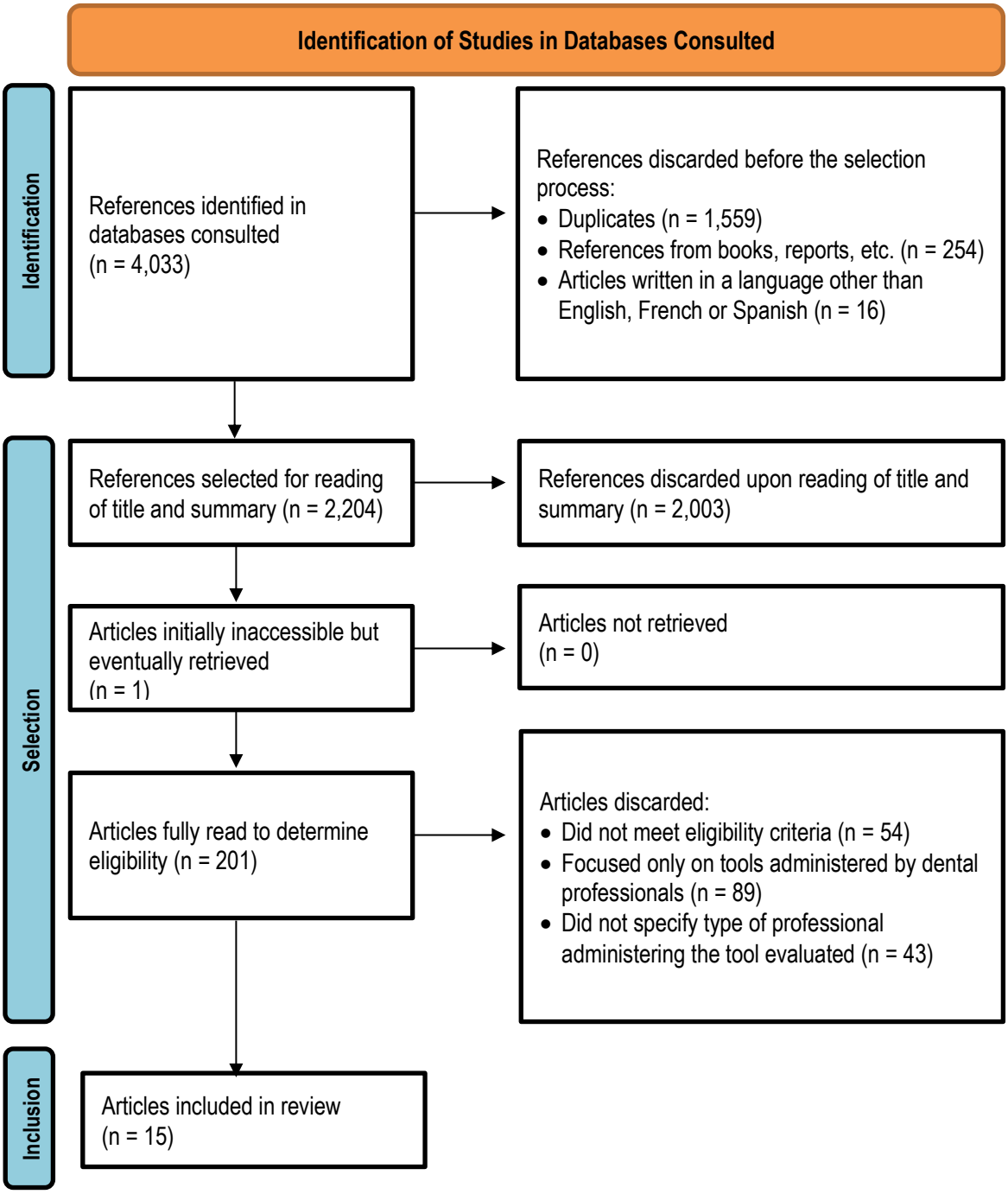


Figure 1. PRISMA 2020 flow diagram (Page and collaborators) for study selection process.

The studies retrieved focused on the following tools: Oral Health Screening Tool for Nursing Personnel (OHSTNP)[87], Oral Health Assessment Tool (OHAT)[77], Revised Oral Assessment Guide (ROAG)[75], Revised Oral Assessment Guide-Jönköping (ROAG-J)[83], Minimum Data Set (MDS)[81], Minimum Data Set / Resident Assessment Protocols (MDS/RAP)[76], Minimum Data Set for Home Care (MDS-HC)[86], InterRAI Home Care (InterRAI-HC)[78], optimized photograph-supported Oral Health-Related section-InterRAI (OHR-InterRAI)[85], Dental Hygiene Registration (DHR)[80], General Oral Health Assessment Index (GOHAI)[74], Oral Assessment Sheet (OAS)[88], The Holistic and Reliable Oral Assessment Tool (THROAT)[79], Mucosal-Plaque Score (MPS)[82] and Brief Oral Health Status Examination (BOHSE)[84]. The country of origin and year and language of publication are presented in Table II.

The oral health assessment tools were administered to people living in long-term care facilities[76,77,80-82,84,85,87,88], autonomous seniors residences[83] or at home[74,78,86]. Only two of the above tools[75,79] were administered to people in hospital rehabilitation units.

The average age of study participants ranged from 79.6 to 89.[74–79,82–87] Three[80,81,88] of the studies did not calculate the average age of participants. However, each study specified that the participants were all seniors living in long-term care facilities. Sample size varied between studies, ranging from 24 participants[82] to 25,872 participants[78].

Table II: Oral health assessment tools included in this systematic review.

Tool	Abbreviation	Country of Origin	Year Published	Language of Publication
General Oral Health Assessment Index[74]	GOHAI	United States	1990	English
Minimum Data Set[81]	MDS	United States	1995	English
Brief Oral Health Status Examination[84]	BOHSE	United States	1995	English
Minimum Data Set / Resident Assessment Protocols[76]	MDS/RAP	United States	1996	English
Minimum Data Set For Home Care[86]	MDS-HC	United States	1997	English
Mucosal-Plaque Score[82]	MPS	Norway	1999	English
The Holistic And Reliable Oral Assessment Tool[79]	THROAT	United Kingdom	2001	English
Revised Oral Assessment Guide[75]	ROAG	Sweden	2002	Anglais
Oral Health Assessment Tool[77]	OHAT	Australia	2005	English
Revised Oral Assessment Guide-Jönköping[83]	ROAG-J	Sweden	2016	English
Dental Hygiene Registration[80]	DHR	Norway	2016	English
Oral Health Screening Tool For Nursing Personnel[87]	OHSTNP	Japan	2017	English
Oral Assessment Sheet[88]	OAS	Japan	2017	English
InterRAI-Home Care[78]	InterRAI-HC	United States	2019	English
Optimized Photograph-Supported Oral Health-Related Section-InterRAI[85]	OHR-InterRAI	United States	2020	English

Thirteen assessment tools[75–86,88] were designed as measurement scales, and one was developed as a questionnaire[74]. Only one tool[87] incorporated both a scale and questionnaire into a single assessment. The number of categories or sections contained in each tool ranged from 1 to 12. Each category contained multiple items. For example, the MDS has two categories, but nine items for

assessment. The tools with the fewest categories or sections were the MDS-HC and InterRAI-HC, with one section, and the MDS and MDS/RAP with two sections. It should be noted that these tools assessed not only the oral health of seniors, but also their general health and level of autonomy. The OHSTNP and GOHAI had the most categories, with 12 oral health–related categories each. Response options took the form of groups of words[74–84,86,88] or groups of words and images.[85,87] Regarding the scoring system, 10 tools[75,77,79,80,82–85,87,88] allocated 3 to 4 points to each component measured. The scores corresponded to a gradually increasing level of severity, from normal oral health to a deteriorated condition of the evaluated parameters. One tool[74] incorporated answers based on the frequency of the problems identified on a five-point scale. Four tools[76,78,81,86] used a binary scale to assess oral health (Table III).

Regarding administration methods, only the study[84] on the BOHSE detailed the manner in which the tool was used. Ten studies[74,76,77,79,80,82,83,85,87,88] partially described the administration method, and four others[75,78,81,86] provided no information. Participant assessment duration varied between 1.9 minutes and 35 minutes. The health professionals who administered the tools to participants were mainly nurses, but also caregivers, social workers, therapists, doctors and personal support workers, as well as dental hygienists and dentists, both of whom were the “gold standard”. Most studies found that training was necessary to administer the tool [75–78,80–86,88]. That information is summarized in Table IV.

Table III: Type of assessment tool and scoring system.

Tool	Type	Number of Categories	Number of Items	Answer Method	Point Scale	Interpretation Of Score
OHSTNP	Scale	12	12	Text	3	0 = Good; 1 = Passable; 2 = Mediocre
OHAT	Scale	8	8	Text	3	0 = Normal; 1 = Change; 2 = Unhealthy
ROAG	Scale	8	8	Text	3	1 = Healthy; 2 = Moderate problem; 3 = Severe problem
ROAG-J	Scale	8	8	Text	4	0 = Not relevant to assess; 1 = Healthy or normal condition; 2 = Moderate changes; 3 = Severe changes
MDS	Scale	2	9	Text	2	Yes or no*
MDS/RAP	Scale	2	9	Text	2	Yes or no*
MDS-HC	Scale	1	3	Text	2	Yes or no*
InterRAI-HC	Scale	1	4	Text	2	Yes or no*
OHR-InterRAI	Questionnaire Scale	9	9	Text Images	3	1 = Acceptable; 2 = Not acceptable, moderate 3 = Not acceptable, marked
DHR	Scale	2	2	Text	3	0 =No teeth present plaque; 1 = Plaque visible on one or more teeth, but fewer than half present plaque; 2 = Plaque visible on more than half of teeth
GOHAI	Questionnaire	12	12	Text	5	1 = Always; 2 = Often; = Sometimes; 4 = Rarely; 5 = Never
OAS	Scale	3	9	Text Images	3	A = Poor condition requiring immediate intervention; B = Acceptable but requires intervention; C = Condition poses minimal problems
THROAT	Scale	9	9	Text	4	0 = Normal; 1 = Mild; 2 = Moderate; 3 = Severe
MPS†	Scale	2	2	Text	4	MS: 1 = Normal aspect of gums of mucosae; 2 = Mild inflammation; 3 = Moderate inflammation; 4 = Severe inflammation PS: 1 = No plaque; 2 = Small quantity of plaque; 3 = Moderate quantity of plaque; 4 = Large quantity of plaque
BOHSE	Scale	10	10	Text	3	0 = Healthy; 1 = Change; 2 = Unhealthy

Abbreviations: Oral Health Screening Tool for Nursing Personnel (OHSTNP), Oral Health Assessment Tool (OHAT), Revised Oral Assessment Guide (ROAG), Revised Oral Assessment Guide-Jönköping (ROAG-J), Minimum Data Set (MDS), Minimum Data Set / Resident Assessment Protocols (MDS/RAP), Minimum Data Set for Home Care (MDS-HC), InterRAI Home Care (InterRAI-HC), optimized photograph-supported Oral Health-Related section-InterRAI (OHR-InterRAI), Dental Hygiene Registration (DHR), General Oral Health Assessment Index (GOHAI), Oral Assessment Sheet (OAS), The Holistic and Reliable Oral Assessment Tool (THROAT), Mucosal-Plaque Score (MPS), Brief Oral Health Status Examination (BOHSE). *No information on point value of scores. †MPS includes two scores: Mucosal Score (MS) and Plaque Score (PS).

Table IV: Information related to the administration of tools reviewed. Dental hygienists and dentists were the “gold standard”.

Tool	Administration Method Indicated	Average Administration Duration in Minutes	Health Care Professional Administering the Tool	Training to Administer Tool
OHSTNP	Yes	3.08; 2.73 and 1.9‡	Nurses, caregivers and dentists	Not required
OHAT	Yes*	7.8	Nurses and dentists	Yes
ROAG	No	Unspecified	Nurses and dental hygienists	Yes
ROAG-J	Yes*	3-4	Nurses	Yes
MDS	No	Unspecified	Nurses	Yes
MDS/RAP	Yes*	3-4	Nurses and dentists	Yes
MDS-HC	No	Unspecified	Nurses	Yes
InterRAI-HC	No	Unspecified	Nurses, therapists, physiotherapists and caregivers	Yes
OHR-InterRAI	Yes*	35	Caregivers and dentists	Yes
DHR	Yes*	< 1	Nurses, dentists and dental hygienists	Yes
GOHAI	Yes*	30	Unspecified	No information
OAS	Yes*	Unspecified	Nurses, personal support workers, dentists and dental hygienists	Yes
THROAT	Yes*	Unspecified	Nurses and dental hygienists	No information
MPS	Yes	2 to 4	Nurses, dentists and dental hygienists	Yes
BOHSE	Yes†	5.6; 7.4 to 8.7	Nurses and dentists	Yes

Abbreviations: Oral Health Screening Tool for Nursing Personnel (OHSTNP), Oral Health Assessment Tool (OHAT), Revised Oral Assessment Guide (ROAG), Revised Oral Assessment Guide-Jönköping (ROAG-J), Minimum Data Set (MDS), Minimum Data Set / Resident Assessment Protocols (MDS/RAP), Minimum Data Set for Home Care (MDS-HC), InterRAI Home Care (InterRAI-HC), optimized photograph-supported Oral Health-Related section-InterRAI (OHR-InterRAI), Dental Hygiene Registration (DHR), General Oral Health Assessment Index (GOHAI), Oral Assessment Sheet (OAS), The Holistic and Reliable Oral Assessment Tool (THROAT), Mucosal-Plaque Score (MPS), Brief Oral Health Status Examination (BOHSE).

*Administration method partially described †Administration described in detail ‡Nurses assisted, caregivers assisted and dentists assisted respectively. °Dentists and nurses respectively.

The authors of 12 tools[75–78,80–86,88] provided examiners with administration training in various forms: discussion groups[77,84,88], readings on the main problems encountered in the oral cavity[75], consulting the tool user guide[76,78,81,83,86] and image- or video-based presentations[80,82,85]. The administration training for examiners was led and guided by dentists or the personnel conducting the study. Often, once training was complete, dentists or dental hygienists would administer the tool to an individual to demonstrate to examiners the proper sequence for assessing oral structures. Upon completion of training, the examiners were to administer the tool under the supervision of the dental professionals acting as trainers. Regarding the OHSTNP, the tool authors stated that professionals require no prior training to use the tool. The authors of studies[74,79] on the GOHAI and THROAT did not provide information on training.

Ten assessment tools[74–77,80,83–85,87,88] suggested ad hoc intervention when examiners detected abnormal conditions of the oral structures and other components of participants' oral health (Table V). The tools reviewed have distinguishing characteristics, namely their methods of assessing oral health. Some of them assess the condition of oral structures, including the lips, mucosae, gums, tongue, teeth, oral hygiene and dental prostheses, while others assess oral pain. Other tools focus mainly on assessing the functions of the oral complex, such as the capacity to swallow, speak or eat. This information is compiled in Table VI and Table VII.

Table V: Interventions suggested after use of assessment tools.

Intervention	OHSTNP	OHAT	ROAG	ROAG-J	MDS	MDS-RAP	MDS-HC	InterRAI-HC	OHR-InterRAI	DHR	GOHAI	OAS	THROAT	MPS	BOHSE
Refer resident to a dentist or consult a dentist	✓	✓	✓	✓		✓			✓		✓				✓
Refer resident to a doctor or consult a doctor			✓	✓		✓									
Refer resident to a dental hygienist or consult a dental hygienist			✓												
Improve oral hygiene		✓				✓				✓					
Provide assistance with oral hygiene			✓						✓						
Monitor oral hygiene on a daily basis										✓					
Improve or correct unfavourable oral conditions												✓			
Instruct nurses to provide preventive oral hygiene care				✓											
Use saliva substitute			✓												
Carry out a second examination on a specific date		✓													

Abbreviations: Oral Health Screening Tool for Nursing Personnel (OHSTNP), Oral Health Assessment Tool (OHAT), Revised Oral Assessment Guide (ROAG), Revised Oral Assessment Guide-Jönköping (ROAG-J), Minimum Data Set (MDS), Minimum Data Set / Resident Assessment Protocols (MDS/RAP), Minimum Data Set for Home Care (MDS-HC), InterRAI Home Care (InterRAI-HC), optimized photograph-supported Oral Health-Related section-InterRAI (OHR-InterRAI), Dental Hygiene Registration (DHR), General Oral Health Assessment Index (GOHAI), Oral Assessment Sheet (OAS), The Holistic and Reliable Oral Assessment Tool (THROAT), Mucosal-Plaque Score (MPS), Brief Oral Health Status Examination (BOHSE).

Table VI: Categories and items evaluated by the various oral health assessment tools.

Categories and items evaluated	OHSTNP*	OHAT*	ROAG	ROAG-J	MDS	MDS-RAP	MDS-HC	InterRAI-HC	OHR-InterRAI	DHR	GOHAI	OAS	THROAT	MPS	BOHSE†
LIPS															
Colour	✓	✓	✓	✓									✓		✓
Texture	✓	✓	✓	✓									✓		✓
Moistness	✓	✓	✓	✓									✓		✓
Swelling or inflammation	✓	✓													
Bleeding													✓		
Ulcers, wounds, reddish or whitish patches	✓	✓											✓		✓
Growth		✓													
Redness at commissures	✓	✓	✓												✓
Pain at commissures				✓											
Ulcers and bleeding at commissures	✓	✓	✓	✓											
MUCOSAL MEMBRANE (including palatal mucosa)															
Colour	✓	✓	✓	✓					✓				✓	✓	✓
Texture	✓	✓							✓				✓	✓	✓
Moistness	✓	✓	✓	✓					✓				✓	✓	✓
Swelling or inflammation	✓	✓							✓				✓	✓	✓
Bleeding	✓	✓	✓	✓									✓	✓	✓
Ulcers, wounds, reddish or whitish patches	✓	✓	✓	✓	✓	✓			✓				✓	✓	✓
Growth, hyperplasia														✓	
Pain point under dental prosthesis	✓	✓													✓
Generalized redness under dental prosthesis	✓	✓												✓	
Ulcers under dental prosthesis	✓	✓												✓	
Blisters			✓	✓											
Inflammation of salivary duct orifices														✓	

*These tools assess the mucosa and gums under a single category. †The mucosa category of BOHSE also includes the floor of the mouth.

Table VI: Categories and items evaluated by the various oral health assessment tools (cont'd).

Categories and items evaluated	OHSTNP*	OHAT*	ROAG	ROAG-J	MDS	MDS-RAP	MDS-HC	InterRAI-HC	OHR-InterRAI	DHR	GOHAI	OAS	THROAT	MPS	BOHSE
GUMS															
Colour	✓	✓	✓	✓					✓				✓		✓
Texture	✓	✓	✓	✓					✓				✓		✓
Moistness	✓	✓											✓		
Swelling or inflammation	✓	✓	✓	✓	✓	✓			✓				✓		✓
Bleeding	✓	✓	✓	✓	✓	✓			✓				✓		✓
Ulcers, wounds, reddish or whitish patches	✓	✓			✓	✓			✓				✓		
Growth, hyperplasia														✓	
Abscesses					✓	✓									
TONGUE (including floor of mouth)															
Colour	✓	✓	✓	✓					✓				✓		✓
Texture	✓	✓											✓		✓
Moistness	✓	✓	✓	✓					✓				✓		✓
Swelling or inflammation	✓	✓							✓						
Bleeding				✓									✓		
Ulcers, wounds, reddish or whitish patches	✓	✓	✓	✓					✓				✓		✓
Presence of papillae			✓	✓											
Coating	✓	✓	✓	✓								✓	✓		✓
Blisters			✓	✓									✓		
SALIVA															
Colour of flesh soaked in saliva	✓	✓													
Moistness of flesh soaked in saliva	✓	✓										✓			✓
Quantity of saliva	✓	✓		✓									✓		
Consistency of saliva	✓	✓										✓	✓		✓
Mouth mirror sticks to buccal mucosa			✓												
Experience manifested by resident		✓					✓	✓	✓						

*These tools assess the mucosae and gums under a single category.

Table VI: Categories and items evaluated by the various oral health assessment tools (cont'd).

Categories and items evaluated	OHSTNP	OHAT	ROAG*	ROAG-J†	MDS	MDS-RAP	MDS-HC	InterRAI-HC	OHR-InterRAI	DHR	GOHAI	OAS‡	THROAT°	MPS•	BOHSE
TEETH															
Not decayed or broken	✓	✓							✓						✓
Decayed, broken, residual roots			✓	✓	✓	✓		✓	✓						
Number of decayed or broken teeth	✓	✓													✓
Defective fillings									✓						
Wear		✓													
Absent or lost teeth					✓	✓									✓
DENTAL PROSTHESES															
Condition (intact, broken)	✓	✓	✓												
Wearing of dental prostheses	✓	✓		✓	✓	✓		✓							✓
Stability and retention		✓										✓			
Identification of dental prostheses		✓													
Broken artificial teeth															✓
Lost	✓	✓													
ORAL HYGIENE															
Plaque, food debris or tartar on natural teeth	✓	✓	✓	✓	✓	✓			✓	✓		✓	✓	✓	✓
Plaque, food debris or tartar on dental prostheses	✓	✓	✓	✓					✓	✓		✓	✓	✓	✓
Halitosis	✓	✓										✓	✓		
Teeth brushing, denture cleaning					✓	✓	✓								

*The teeth category of ROAG includes the assessment of natural and artificial teeth and dental hygiene. †The teeth category of ROAG-J includes the assessment of broken teeth and teeth hygiene. The prosthesis category of ROAG-J includes the wearing of prostheses and prosthesis hygiene ‡The dental hygiene category includes the presence of coating on tongue. °The teeth category of THROAT assesses only the presence of plaque. •Food debris is excluded from the MPS assessment of plaque.

Table VI: Categories and items evaluated by the various oral health assessment tools (cont'd).

Categories and items evaluated	OHSTNP	OHAT	ROAG	ROAG-J	MDS	MDS-RAP	MDS-HC	InterRAI-HC	OHR-InterRAI	DHR	GOHAI	OAS	THROAT	MPS	BOHSE
ORAL PAIN															
Behavioural signs		✓													
Verbal signs		✓													
Physical signs		✓													
Experience manifested by resident					✓	✓			✓		✓				
LYMPH NODES															
Enlargement and tenderness															✓

Abbreviations: Oral Health Screening Tool for Nursing Personnel (OHSTNP), Oral Health Assessment Tool (OHAT), Revised Oral Assessment Guide (ROAG), Revised Oral Assessment Guide-Jönköping (ROAG-J), Minimum Data Set (MDS), Minimum Data Set / Resident Assessment Protocols (MDS/RAP), Minimum Data Set for Home Care (MDS-HC), InterRAI Home Care (InterRAI-HC), optimized photograph-supported Oral Health-Related section-InterRAI (OHR-InterRAI), Dental Hygiene Registration (DHR), General Oral Health Assessment Index (GOHAI), Oral Assessment Sheet (OAS), The Holistic and Reliable Oral Assessment Tool (THROAT), Mucosal-Plaque Score (MPS), Brief Oral Health Status Examination (BOHSE).

Table VII: Oral functions evaluated by the assessment tools.

Oral function evaluated	OHSTNP	OHAT	ROAG	ROAG-J	MDS	MDS-RAP	MDS-HC	InterRAI-HC	OHR-InterRAI	DHR	GOHAI	OAS	THROAT	MPS	BOHSE
Number of occluding pairs of teeth												✓			✓
Difficulty chewing					✓	✓	✓	✓	✓		✓	✓			
Difficulty swallowing			✓		✓	✓					✓				
Difficulty eating											✓				
Difficulty opening mouth												✓			
Difficulty speaking											✓				
Voice			✓	✓											
Pronunciation of certain words	✓														
Choking during meals	✓														
Thrusting tongue forward	✓											✓			

Table VII: Oral functions evaluated by the assessment tools (cont'd).

Oral function evaluated	OHSTNP	OHAT	ROAG	ROAG-J	MDS	MDS-RAP	MDS-HC	InterRAI-HC	OHR-InterRAI	DHR	GOHAI	OAS	THROAT	MPS	BOHSE
Ability to puff out cheeks while keeping mouth closed	✓														
Others															
Aspect of teeth											✓				
Concerns about condition of teeth											✓				
Social withdrawal owing to poor oral health											✓				
Restricted nutritional intake owing to poor oral health	✓										✓				

Abbreviations: Oral Health Screening Tool for Nursing Personnel (OHSTNP), Oral Health Assessment Tool (OHAT), Revised Oral Assessment Guide (ROAG), Revised Oral Assessment Guide-Jönköping (ROAG-J), Minimum Data Set (MDS), Minimum Data Set / Resident Assessment Protocols (MDS/RAP), Minimum Data Set for Home Care (MDS-HC), InterRAI Home Care (InterRAI-HC), optimized photograph-supported Oral Health-Related section-InterRAI (OHR-InterRAI), Dental Hygiene Registration (DHR), General Oral Health Assessment Index (GOHAI), Oral Assessment Sheet (OAS), The Holistic and Reliable Oral Assessment Tool (THROAT), Mucosal-Plaque Score (MPS), Brief Oral Health Status Examination (BOHSE).

3.3. Characteristics of tools reviewed

The following pages provide a synthesis of the main characteristics of the assessment tools selected for this systematic review.

3.3.1. Oral Health Screening Tool For Nursing Personnel (OHSTNP)

Using this tool, nurses assess oral health and function in seniors in care facilities. The OHSTNP was developed by dentists, nurses and caregivers. It includes12 categories, of which 7 are found in the OHAT, with the exception of the tooth pain section, and 5 in the tool New Oral Screening Sheet at the Oral Rehabilitation Clinic[97] initially designed for dental professionals. To use this tool, the examiner requires a pen lamp, a tongue depressor and a dental mirror. Scores range from 0 (good) to 2 (bad). The OHSTNP's distinguishing feature is the fact that the examiner can use the tool without prior training and that following

the assessment, the examiner can deem it necessary to refer the resident to a dentist, without objective criteria having been defined beforehand. The tool includes spaces to enter the reason why the resident requires a professional dental examination. Based on the results obtained from the tool, procedures from a dental professional can be suggested.

3.3.2. Oral Health Assessment Tool (OHAT)

This tool assesses the oral health of seniors regardless of the presence of neurocognitive issues. The OHAT is used by nurses and other caregivers in care facilities. It was created from the BOHSE tool and following a literature review focusing on the main oral health assessment tools. Recommendations were also formulated by an expert panel of dentists specialized in geriatric dentistry, nurses, dental hygienists and caregivers. The OHAT assesses the condition of the lips, tongue, gums and mucosae, saliva, natural teeth, dental prostheses, oral hygiene and tooth pain. No dental instruments are required for use. While developing the OHAT, the experts agreed to exclude the BOHSE categories of lymph nodes and occluding pairs of teeth and to combine the categories of mucosae and gums. They also added a category, tooth pain. The possible responses for each OHAT category are 0 (healthy), 1 (changes) or 2 (unhealthy). The resident is referred to a dentist if answers of 1 or 2 are recorded for one or more categories. As needed, nurses may implement a preventive dental care plan after assessing the resident.

3.3.3. Revised Oral Assessment Guide (ROAG)

This is a revised version of the Oral Assessment Guide[98] also known as "OAG". The OAG was developed to assess the oral health of individuals having undergone a bone marrow transplant, radiation therapy or chemotherapy, as well as residents with cancer. Following a literature review on oral health assessment, the OAG was modified by an expert group to allow nurses to administer it to geriatric populations. The ROAG resulted from this process. The tool comprises 8 categories (lips, mucosae, tongue, gums, teeth and dental prostheses, saliva, voice and saliva) that are assigned a score from 1 to 3. The examiner must use an artificial light source and a dental mirror to administer the ROAG. It should be noted that oral hygiene falls under the category of teeth and prostheses. The ROAG includes a "Method" column where examiners indicate the method of examining each structure, and a "Procedures" column, where examiners suggest procedures to caregivers based on the abnormalities detected. The tool was tested on patients hospitalized in a geriatric unit following a stroke.

3.3.4. Revised Oral Assessment Guide-Jönköping (ROAG-J)

This tool was developed from the ROAG. However, ROAG-J primarily assesses the oral health of seniors living in care facilities. The ROAG and ROAG-J have nearly identical categories, with the following exceptions: the ROAG category of teeth and prostheses is two separate categories in ROAG-J and the swallowing category of the ROAG was removed from the ROAG-J. Each category is assessed on a four-point scale: "0" and "1" indicate that no intervention from nurses is required, "2" indicates that nurses should carry out preventive dental care and "3" indicates that the resident needs to be referred to a dentist or doctor. The method of performing the assessments is specified in the associated guide.

3.3.5. Minimum Data Set (MDS)

The MDS contains 18 sections that assess various aspects of resident's health, such as the senses, cognition, behaviour and functioning. Health care professionals in almost every discipline took part in developing the tool. This tool helps nurses in care facilities to detect residents' primary health problems. Two sections of the MDS are dedicated to oral health. Section L focuses on problems with chewing, swallowing and oral pain, while section M provides a summary assessment of the condition of the gums, teeth, dental prostheses and oral hygiene. The assessment consists of observing the resident or asking questions about the MDS parameters for assessment. An intra-oral examination is not required. Given that the MDS has a dichotomous scoring method (yes/no), the assessment of oral problems and the condition of structures provides no indication of severity. Dental health interventions are not expected upon administration of the MDS.

3.3.6. Minimum Data Set/Resident Assessment Protocols (MDS/RAP)

This tool combines the MDS and Resident Assessment Protocol (RAP) into a single instrument. The RAP protocol helps nurses organize care for residents in care facilities based on the observations made using the MDS. The MDS/RAP tool is part of the RAI approach (Resident Assessment Instrument), which allows for a full description of the resident's condition, guides the health care professional in implementing a care plan adapted to the resident's needs, and evaluates the quality of care in care facilities. The MDS/RAP parameters for assessment and response options are identical to those of the MDS. However, if abnormal conditions are noted in the mouth, the RAP protocol sets out measures to refer the resident to an oral health professional.

3.3.7. Minimum Data Set For Home Care (MDS-HC)

This is a version of the MDS that has been adapted to seniors receiving care at home, hence “HC” for “home care”. It can be used by nurses, social workers, therapists and even doctors. MDS-HC condenses the MDS oral health section. Indeed, the MDS-HC assesses only three parameters: chewing problems, the presence of xerostomia and difficulties related to teeth brushing. As is the case for the MDS, the scoring method is dichotomous and measures to improve individual oral health are not suggested.

3.3.8. InterRAI Home Care (InterRAI-HC)

InterRAI provides a global assessment system for seniors. Designed by a panel of health experts, this system is applied to various populations in different formats. InterRAI-HC is meant for seniors receiving care at home. This tool may be used by all health care professionals. It contains 20 sections, of which one is dedicated to oral health (section K). The wearing of dental prostheses, the teeth, xerostomia and chewing difficulties are assessed. The assessment consists of observing the resident and asking questions about the items for assessment. It is based on the presence or absence of abnormal conditions, with the two response options being “yes” and “no”. No intervention is suggested following use.

3.3.9. Optimized Photograph Supported Oral Health Related Section InterRAI (OHR-InterRAI)

This tool was designed based on the oral health section of InterRAI. However, OHR-InterRAI adds photographic materials to this section and assesses more items than its precursor. This tool is intended to identify older residents in care facilities who require assistance with dental hygiene care or need to consult a dentist. The tool can be used by nurses, caregivers, dental hygienists, dentists and other professionals. The OHR-InterRAI identifies chewing, pain and salivation-related issues through resident questions. If cognitive problems or other issues prevent the resident from answering, the questions are directed to the caregiver. The tool also assesses the teeth, tooth and dental prosthesis hygiene, the gums, the tongue and the mucosae on a three-point scale. Interventions are suggested if items receive a score above 1. An artificial source of light is the only requirement for assessment.

3.3.10. Dental Hygiene Registration (DHR)

The DHR is used by nurses to rapidly determine the quantity of plaque on teeth and dental prostheses and to assess the oral hygiene of seniors living in care facilities. It was a designed by an expert panel of dentists, dental hygienists, nurses and geriatrists. The panel conducted a review of literature on instruments to assess dental plaque and analyzed the assessment criteria of existing tools, such as the Simplified Oral Hygiene Index[99] also known as “OHI-S”, the mucosal-plaque Index[82] and the ROAG in order to develop the DHR. The DHR has two categories: maxilla and mandible. Each category is scored on a three-point scale. The scores are added together upon completion of the assessment, and recommendations are made based on

this overall score. If the total score is 1, the recommendation is to monitor hygiene and pay special attention to difficult-to-clean areas. If the total score falls between 2 and 4, the recommendation is to improve resident's dental hygiene. With this tool, the examiner only requires a pen lamp to assess the resident.

3.3.11. General Oral Health Assessment Index (GOHAI)

This is a self-assessment questionnaire developed to assess the dental health-related quality of life of seniors living at home. The GOHAI also includes a number of oral health assessment components. Dentists and nurses designed the tool in consideration of oral health indicators and by drawing from a literature review on how oral disease affects seniors and questionnaires assessing the functioning of oral structures. All health care professionals can administer the questionnaire during an individual interview with a resident. The GOHAI primarily assesses oral functions (eating, chewing, swallowing, speaking), psychosocial functions (self-image, self-criticism regarding oral health, social withdrawal), and pain. It comprises 12 questions, each of which is scored on a five-point scale ranging from "always" to "never". The total score indicates where there is a need for dental examination or a referral to a dentist.

3.3.12. Oral Assessment Sheet (OAS)

This tool assesses the oral health of seniors requiring nursing care in care facilities. Numerous professionals took part in developing the OAS, including, dentists, hygienists, social workers and doctors. The parameters measured by the OAS were chosen by the expert group following a review of literature on oral health

assessment tools. The OAS requires no dental instrument or equipment to use. It has three categories: oral hygiene, chewing and swallowing, and oral function. Each category has three sub-categories. Scoring is based on a three-point scale: A, B, and C represent scores of 2, 1 and 0 respectively, In the event of a high total score, the resident is referred to a dental professional.

3.3.13. The Holistic And Reliable Oral Assessment Tool (THROAT)

This tool was designed by nurses and dental hygienists for use by nurses in care facilities. It was developed in three phases, which respectively consisted of identifying existing tools, creating the tool itself, and analyzing its reliability. The THROAT assesses the condition of seniors' oral structures and allows users to estimate the outcome of measures to improve hygiene and oral health. It comprises nine categories: lips, teeth and dental prostheses (only concerning dental plaque), gums, mucosae, palate, tongue, floor of mouth, breath and saliva. While most tools assess the palate as part of the mucosae category, the THROAT assigns it a dedicated category. In addition, the floor of the mouth is often assessed as part of the tongue category, but again, the THROAT contains a dedicated category. It should be noted that the THROAT does not assess tooth decay. Assessments are based on a four-point scale, ranging from 0 (normal) to 3 (severe). Gloves and a pen lamp are required to examine the oral cavity of residents.

3.3.14. Mucosal Plaque Score (MPS)

This tool primarily assesses the oral hygiene of seniors in hospital or in other health facilities, such as care facilities. A group of experts in dentistry and geriatrics took part in creating the tool. The MPS can be used by nurses or dental professionals. For an intra-oral examination, the tool requires two dental mirrors and a source of natural or artificial light. The MPS has two categories: assessment of mucosae, particularly their level of inflammation (mucosal score) and the assessment of dental plaque (plaque score). Each category is scored on a four-point scale (1 to 4). The scores are then added together, with the minimum total being 2 points (acceptable) and the maximum total being 8 points (poor). No intervention is suggested following administration. The MPS has a number of distinguishing characteristics. For example, out of the tools identified by this review, it appears to be the only one that considers the presence of gingival hyperplasia and the inflammation of the opening of the parotid duct. In addition, the MPS does not account for food debris when assessing dental plaque.

3.3.15. Brief Oral Health Status Examination (BOHSE)

This tool allows nurses to assess the oral health of seniors in care facilities, regardless of the presence of neurocognitive disorders. The BOHSE was developed by nurses following a review of the main oral health tools available and based on the recommendations of the American Dental Association and dental faculties in the United States. It assesses ten items: lymph nodes; lips; tongue; mucosae on cheeks, floor of mouth and palate; gums; natural teeth; artificial teeth; number of occluding pairs of teeth; as well as teeth and dental prostheses hygiene. To assess residents, the examiner uses a tongue depressor, gloves, a source of light,

and, if needed, gauze. The BOHSE includes a column with instructions on examining the oral structures. Out of the other tools identified for this review, the BOHSE is the only one that assesses the swelling of lymph nodes in the neck and the duration of lesions on the lips and mucosae. In addition, the BOHSE accounts for the number of teeth with signs of inflammation in the surrounding gum tissue. Finally, the tool assesses tooth loss as part of the mucosae category. There is a three-point scale for scoring: 0 (healthy), 1 (change) and 2 (unhealthy). The resident is referred to a dentist if the lips, mucosae, gums or natural teeth receive a score of 1 or above, or if any one of the 10 structures assessed receives a score of 2.

3.4. Methodological quality of studies reviewed by measurement property

Table VIII presents the methodological quality of studies identified by measurement property, and Table IX presents the quality criteria for measurement properties in terms of reliability and validity. The identified studies[74–88] all analyzed at least one measurement property, but none of them explored all nine measurement properties suggested by the COSMIN checklist. The study focusing on the OHAT[77] was the only one to review five measurement properties. Out of the studies identified, InterRAI-HC[78] assessed the fewest measurement properties.

One study[80] had a methodological quality deemed “very good” or “adequate” for two measurement properties. These properties were criterion validity and inter-examiner reliability of the DHR. In addition, three studies[74,86,87] had “very good” or “adequate” methodological quality for only one measurement property. The studies in question were the OHSTNP and the GOHAI (criterion validity) and the MDS-HC (inter-examiner reliability). Studies were deemed to have “doubtful" methodological quality when information on the

measurement property in question was only partially available. If the information or supporting data were not included in the study, methodological quality was deemed to be “inadequate”.

Table VIII: Methodological quality of studies reviewed by measurement property and quality criteria for measurement property – Validity.

Tool	Content Validity		Criterion validity	
	Methodological Quality	Measurement Property Quality ·	Methodological Quality	Measurement Property Quality
OHAT	Doubtful	±	Inadequate	n/a
OHSTNP	Doubtful	-	Very good	? Sensitivity: ≤ 0.43 and ≥ 0.57 nurse; ≤ 0.67 and ≥ 0.71 caregiver Specificity: ≥ 0.80 nurse and ≥ 0.69 caregiver
ROAG	Doubtful	±	Inadequate	n/a
ROAG-J			Inadequate	n/a
MDS	Doubtful	-	Inadequate	n/a
MDS/RAP	Doubtful	-	Inadequate	n/a
MDS-HC	Doubtful	-	Inadequate	n/a
InterRAI-HC	Doubtful	-	Inadequate	n/a
OHR-InterRAI	Doubtful	+	Inadequate	n/a
DHR	Doubtful	±	Very good	+ rho = 0.78; p < 0.001 (DHR and OHI-S); rho = 0.83; p < 0.001 (DHR and MPS)
GOHAI	Doubtful	±	Very good	- r = 0.47; p < 0.001 (GOHAI – only item on oral health) et r = 0,33; p < 0,001 (GOHAI - No. of teeth)
OAS	Doubtful	±	Inadequate	n/a
THROAT	Doubtful	±	Inadequate	n/a
MPS	Doubtful	+	Inadequate	n/a
BHOSE	Doubtful	+	Inadequate	n/a

Abbreviations: Oral Health Screening Tool for Nursing Personnel (OHSTNP), Oral Health Assessment Tool (OHAT), Revised Oral Assessment Guide (ROAG), Revised Oral Assessment Guide-Jönköping (ROAG-J), Minimum Data Set (MDS), Minimum Data Set / Resident Assessment Protocols (MDS/RAP), Minimum Data Set for Home Care (MDS-HC), InterRAI Home Care (InterRAI-HC), optimized photograph-supported Oral Health-Related section-InterRAI (OHR-InterRAI), Dental Hygiene Registration (DHR), General Oral Health Assessment Index (GOHAI), Oral Assessment Sheet (OAS), The Holistic and Reliable Oral Assessment Tool (THROAT), Mucosal-Plaque Score (MPS), Brief Oral Health Status Examination (BOHSE), rho = Spearman correlation coefficient, p = p-value, r = Pearson correlation coefficient, number (No.).
n/a: Not applicable; when the methodological quality of a study is deemed inadequate. The COSMIN criteria qualify measurement properties as sufficient (+), insufficient (-), inconsistent (±) or indeterminate (?).

Table IX: Methodological quality of studies reviewed by measurement property and quality criteria for measurement property – Reliability.

Tool	Internal consistency		Intra-examiner reliability		Inter-examiner reliability		Test-retest	
	Methodological Quality	Measurement Property Quality	Methodological Quality	Measurement Property Quality	Methodological Quality	Measurement Property Quality	Methodological Quality	Measurement Property Quality
OHAT	Inadequate	n/a	Doubtful	+ ICC = 0.78; p < 0.001	Doubtful	+ ICC = 0.74; p < 0.001	Doubtful	?
OHSTNP	Inadequate	n/a			Doubtful	? rho = 0.810 (dentist - nurse); 0.845 (dentist - caregiver)		
ROAG	Inadequate	n/a			Doubtful	± K^w = 0.45 to 0.84 (nurse - DH)		
ROAG-J	Inadequate	n/a			Doubtful	? k = 0.45 to 0.84		
MDS	Inadequate	n/a			Doubtful	± ICC = 0.77 and 0.46 (nurse - nurse, sections L and M)		
MDS/RAP	Inadequate	n/a			Inadequate	n/a		
MDS-HC	Inadequate	n/a			Adequate	- K^w = 0.60 (nurse - nurse)		
InterRAI-HC	Inadequate	n/a						
OHR-InterRAI	Inadequate	n/a	Doubtful	? k = 0.45 to 0.92	Doubtful	? k = 0.13 to 0.60 (dentist - caregiver) and 0.27 to 0.63 (caregiver - caregiver)		
DHR	Inadequate	n/a			Adequate	? k = 0.4 (DH - nurse)		

Table IX: Methodological quality of the studies reviewed by measurement property and quality criteria for measurement property – Reliability (cont'd).

Tool	Internal consistency		Intra-examiner reliability		Inter-examiner reliability		Test-retest	
	Methodological quality	Quality of measurement property	Methodological quality	Quality of measurement property	Methodological quality	Quality of measurement property	Methodological quality	Quality of measurement property
GOHAI	Doubtful	? α = 0.79						
OAS	Doubtful	? α = 0.72					Doubtful	+ ICC = 0.71 and 0.89 (dental professional – patient care attendant)
THROAT	Inadequate	n/a	Doubtful	± K^w = 0 to 0.96 (95% CI 0.90–1.02)	Doubtful	± K^w = 0.56 (95% CI 0.41–0.71) to 0.80 (95% CI 0.68–0.92) Post-stroke specialist nurse - DH		
MPS	Inadequate	n/a	Doubtful	- K^w = 0.62	Doubtful	+ K^w = 0.70 (dentist 1, dentist 2) and 0.77 (dentist 1, 2 DH, 1 nurse)		
BHOSE	Inadequate	n/a			Doubtful	? r = 0.40 to 0.68 (dentist - nurse) k = - 0.02 to 0.82 (dentist - nurse)	Doubtful	? r = 0.79 – 0.88

Abbreviations: Oral Health Screening Tool for Nursing Personnel (OHSTNP), Oral Health Assessment Tool (OHAT), Revised Oral Assessment Guide (ROAG), Revised Oral Assessment Guide-Jönköping (ROAG-J), Minimum Data Set (MDS), Minimum Data Set / Resident Assessment Protocols (MDS/RAP), Minimum Data Set for Home Care (MDS-HC), InterRAI Home Care (InterRAI-HC), optimized photograph-supported Oral Health-Related section-InterRAI (OHR-InterRAI), Dental Hygiene Registration (DHR), General Oral Health Assessment Index (GOHAI), Oral Assessment Sheet (OAS), The Holistic and Reliable Oral Assessment Tool (THROAT), Mucosal-Plaque Score (MPS), Brief Oral Health Status Examination (BOHSE), dental hygienist (DH), not applicable (n/a), rho = Spearman correlation coefficient, r = Pearson correlation coefficient, ICC = interclass coefficient; k = kappa coefficient, K^w = weighted kappa coefficient, CI = confidence interval, α = Cronbach's alpha, p = p-value.
n/a: not applicable; when study methodological quality is considered inadequate. COSMIN criteria qualify a measurement property as sufficient (+), insufficient (-), inconsistent (±) or indeterminate (?).

It should be noted that methodological quality of the studies was deemed "questionable" when information related to the measurement property under consideration was partially available. If this information or supporting data was not provided in the study, the methodological quality of the study was considered "inadequate".

Measurement properties not assessed in the studies[74–88] included hypothesis testing of construct validity, structural validity, error measurement and responsiveness.

3.5. Quality criteria for measurement properties: Validity

As outlined in Table VIII, three tools (OHR-InterRAI, MPS and BOHSE) were found to have sufficient (+) content validity. Five tools were found to have insufficient (-) content validity, as the relevance of the tool elements or completeness of the items to be assessed proved questionable. Six tools were found to have inconsistent (±) content validity, as some of their COSMIN assessment parameters were scored as sufficient, while others were found to be insufficient.

Sensitivity and specificity tests and correlations were performed to analyze the criterion validity of the tools. Sensitivity and specificity were determined for the OHSTNP. When nurses administered the tool, sensitivity for the natural teeth, dentures and oral function–related categories was equal to or greater than 0.67 with a 95 % confidence interval (CI) of 0.51 to 0.78. Sensitivity for these same categories was 0.71 (95 % CI 0.58-0.75) and higher when the OHSTNP was used by caregivers. Sensitivity for the other OHSTNP

categories was lower than these figures. Specificity for all OHSTNP categories was equal to or greater than 0.80 (95 % CI 0.69-0.86) and 0.69 (95 % CI 0.59-0.76) when administered by nurses and caregivers, respectively. Despite the availability of these data, the quality of the criterion validity of the OHSTNP was considered to be indeterminate (?). According to the COSMIN evaluation criteria, correlations must be performed to qualify this measurement property. In this case, no correlations were performed.

Spearman and Pearson correlations were established in two studies[74,80] to explore the criterion validity of the DRH and GOHAI. In the study[80] examining the DHR, nurses used the tool with older adults, and a gold standard administered the OHI-S Debris Index and the MPS to these same people. The results of these assessments were correlated. The correlation between the DHR and the OHI-S Debris Index was found to be “strong” (rho = 0.78; $p < 0.001$), and the correlation between the DHR and the MPS was found to be “very strong” (rho = 0.83; $p < 0.001$). Since the correlations calculated exceeded 0.70, criterion validity was considered sufficient (+). In the study[74] examining the GOHAI, correlations were observed between GOHAI scores and the oral health self-assessment completed by participants. In addition, the GOHAI was correlated with clinical assessments performed for a dentist. These assessments involved the number of teeth, dental mobility, root and coronal caries, OHI-S index and the number of pathological oral conditions. Associations were found to be statistically significant between the GOHAI and the oral health self-assessment ($r = 0.47$; $p < 0.001$) and between the GOHAI and number of teeth ($r = 0.33$; $p < 0.001$). These correlations were considered “moderate”. The correlation between the GOHAI and the other clinical parameters collected by the dentist was less than 0.13 and not statistically significant. Since the correlations remained below 0.70, criterion validity of the GOHAI was considered insufficient (-).

3.6. Quality criteria for measurement properties: Reliability

Statistical data on internal consistency were published only in the GOHAI and OAS studies[74,88]. Cronbach's coefficient alpha for these two tools was 0.79 and 0.72, respectively. The p-values of these coefficients were not presented in these studies. Although these coefficients exceeded the threshold of 0.70 (as recommended by COSMIN evaluation criteria), there was not enough evidence to consider internal consistency sufficient. Internal consistency depends on content validity, which was found to be inconsistent in the validity analyses for the studies examining the GOHAI and OAS.

Intra-examiner reliability for the OHAT was considered sufficient (+), as the intraclass correlation coefficient was equal to or greater than 0.70 (ICC = 0.78; $p < 0.001$).

Intra-examiner reliability for THROAT was considered sufficient (+) for the lips, teeth, denture, gums, mucous membranes, palate and tongue categories. The weighted kappa coefficient for these categories varied from 0.73 (95 % CI 0.59-0.87) to 0.96 (95 % CI 0.90-1.02). However, intra-examiner reliability for THROAT was insufficient (-) for the breath, saliva and floor of the mouth categories. Weighted kappa coefficients for these categories varied from 0 to 0.69 (95 % CI 0.54-0.84). In sum, intra-examiner reliability for THROAT was considered to be inconsistent (±).

Intra-examiner reliability for the OHR-InterRAI was indeterminate (?), because the weighted kappa correlation coefficient was not calculated for this tool. Furthermore, intra-examiner reliability for the MPS was considered to be insufficient (-), owing to its weighted kappa coefficient, which was found to be low.

Twelve studies[75–77,79–87] assessed the inter-examiner reliability of the tools. Inter-examiner reliability was considered sufficient (+) in the OHAT and MPS studies[77,82]. The intraclass correlation coefficient for the OHAT was 0.74 ($p < 0.001$). The MPS had two weighted kappa coefficients: 0.70 (dentist 1 and dentist 2) and 0.77 (dentist 1, two dental hygienists and one nurse). Confidence intervals for the weighted kappa coefficients were not presented in these two studies.

Inter-examiner reliability was considered inconsistent (±) for three tools (ROAG, MDS and THROAT). For example, the ROAG had a weighted kappa coefficient of 0.84 for only the swallowing category (+), while the coefficient was below 0.70 (-) for the lips, mucous membranes, tongue, teeth and saliva categories. The weighted kappa coefficient was not calculated for the voice and gum categories in the ROAG. Similarly, Section L of the MDS had an intraclass coefficient equivalent to 0.77 (+), while section M of the MDS had an intraclass coefficient corresponding to 0.46 (-). Neither the confidence intervals of the weighted kappa coefficients nor the p-values of the intraclass correlations were detailed in the ROAG and MDS studies[75,81], respectively. For THROAT, inter-examiner reliability was considered sufficient (+) for the lips, gums, mucous membranes and palate categories. The weighted kappa values varied from 0.71 (95 % CI 0.57-0.85) to 0.80 (95 % CI 0.68-0.92). For the other THROAT categories, the weighted kappa coefficient remained below 0.7 (-).

Inter-examiner reliability was deemed indeterminate (?) for the OHSTNP, ROAG-J, OHR-InterRAI, DHR and BOHSE, since neither the weighted kappa coefficient nor the intraclass correlation coefficient were reported in the studies.

The MDS/RAP, InterRAI HC, GOHAI and OAS studies[74,76,78,88] did not assess inter-examiner reliability.

The “test-retest” measurement property was measured for three tools: OHAT, OAS and BOHSE. However, the OAS was the only tool for which test-retest reliability was reported as sufficient (+).

4. Discussion

This systematic review has identified 15 tools. Other recent systematic reviews[89,90] on the same subject have yielded fewer. For example, the systematic reviews conducted by Everaars et al.[89] and Thapa et al.[90] identified ten and eight tools, respectively. These differences would mainly result from the number of databases consulted in order to locate the tools. In the present systematic review, seven databases were searched, while in the review by Everaars and Thapa only three databases were searched.

The tools identified as part of this review assess oral health in different ways. This means we count tools that primarily assess oral structures; oral structures and oral function; oral function, psychosocial function and quality of life related to oral health; and the presence of dental plaque. The tools that assess the state of the oral structures (OHAT, BHOSE, THROAT, ROAG and ROAG-J) examine almost all of an individual's oral structures, but with some differences. For example OHAT and BOHSE assess the condition of the teeth based on the extent of tooth decay. THROAT assesses tooth condition based solely on the presence of dental plaque. This clearly shows THROAT's weakness, as tooth decay assessment gains importance with individuals like frail seniors in long-term care, where dental caries are known to be common.[28,29,57] The tools that assess both oral structures and function (MDS, MDS/RAP, MDS-HC, OHR-InterRAI, InterRAI-HC, OAS and OHSTNP) appear intriguing. It would be natural to assume that they are more complete. However, we found that with the exception of OHSTNP, they provide only a summary assessment of oral structures and function. With respect to assessing oral function, these tools primarily assess the individual's chewing ability, but in a subjective manner, by asking the resident if they have any chewing issues. The process requires that the person being examined have a certain level of understanding. To objectively assess chewing function, a

number of actions must be initiated that require several steps, some of which may not be carried out in this population within a limited time frame. We feel it becomes difficult to include a functionality dimension in oral health screening tools, even though oral function is important. This is owing to the complexity of the training needed for examiners to be able to administer the tool and the lack of cooperation that can be expected from residents with cognitive impairments. Other tools assess certain dimensions of oral health, such as GOHAI, which measures oral function and psychosocial functioning related to oral health, without necessarily distinguishing oral disease that can alter these functions. This means that oral health measurement is limited with this tool. DHR and MPS only assess dental plaque. Although its use is limited, it is completely relevant, particularly in a context where numerous oral health issues, such as dental caries and periodontal disease, begin with increased dental plaque accumulation.

4.1. Scoring system

Some tools, such as MDS, MDS/RAP, MDS-HC and InterRAI only identify the presence of abnormalities. Their grading system provides no information as to the severity of the condition. In these cases, determining the extent of the involvement is limited, and there is limited possibility of prioritizing any identified abnormalities. Regardless, these tools may be useful. They are easy to administer by professionals with limited oral health training, which limits the potential for error during screening for structure condition or the component to be assessed. Other tools, like OHAT, OHSTNP, ROAG, ROAG-J, THROAT, OHR-InterRAI, MPS and BOHSE use a grading system based on the extent to which the assessed structures are affected. The concept of severity is important in an oral health screening tool, as it directs the examiner toward the damaged oral structures. Observing the severity of the damage is important for determining the required intervention speed.

Assessment of the extent of involvement differs between tools. Determining the extent of structure involvement varies based on the number of levels of severity included in the tool and the severity measurement for each of those levels. Determining the ideal number of levels and their degrees of severity depends on a number of factors, including the qualifications of the examiner, the intended clientele, the individual or population objective of the collected data, possible administration time, and the availability (or lack thereof) of instruments that will enhance screening accuracy. For an oral health screening tool, with non-dental professional examiners and a potentially uncooperative clientele, a number of levels of achievement have to be allocated to a tool, but this limits variability with respect to measuring degrees of severity within those levels.

The OHSTNP, OHAT, ROAG, OHR-InterRAI, OAS and BOHSE tools determine the degree of severity of the elements measured in three states, while ROAG-J and THROAT assess the degree of severity using four states. The measured structures go from a normal state to an abnormal one, with the exception of the OAS, which puts a state of severe deterioration first and progresses toward a state with few or minimal problems. Degrees of severity in the notation system also vary from tool to tool, even in tools that include the same number of answer choices. For example, ROAG-J and THROAT qualify severity using four states of abnormality, but in different ways. The first two scores on ROAG-J qualify the normal state of dental structures using two degrees (normal [0] /normal, but with changes toward abnormality [1]) and the two other scores (2 to 3) indicate an abnormal condition of the oral structures based on two degrees of severity, as well. THROAT uses one normal state (0) and three abnormal states (1, 2, and 3). The tools that determine the involvement of dental structures in three states are more standardized, as the first degree of the assessment often involves the normal condition of the structures, while the two others refer to the abnormal state of the structures. It would be natural to assume that introducing more than three states of abnormality would be beneficial in

better assessing the state of dental structures. In an adult population without cognitive deficits, increased precision would be desirable and achievable. However, as described in the introduction to this systematic review, the ideal assessment tools must be short, owing in part to poor cooperation on the part of frail seniors.

A few of the identified tools[77,80,82,84,85,87] introduce a notion of quantity for determining the degree of involvement. The BOHSE, OHAT and OHSTNP are quite similar, as are the DHR, OHR-InterRAI and MPS dental plaque index. The concept of quantification is set out in the DHR and MPS plaque index, as they were designed to determine the amount of dental plaque present in the resident's mouth. However, the DHR requires estimating the number of teeth that have plaque. This is less feasible in situations where assessment time is limited with persons who have cognitive deficits. Quantification findings must be taken with a grain of salt. For example, with MPS, a resident can have very little dental plaque yet still have an elevated score, while another resident may have only a single tooth completely covered in plaque and obtain a low score, as only the number of teeth that have plaque was considered during the assessment. In this case, the importance of the presence of dental plaque on each of the teeth in the mouth was not considered. The results obtained using this tool are likely to skew the observed reality along with the conclusions that may be drawn regarding this aspect of the individual's oral health.

Quantification of involvement can be questionable under the BOHSE, OHAT and OHSTNP. For example, caries in one to three teeth is considered to be a "change", while if more than four decayed teeth, the structure is considered "unhealthy". It is difficult to consider the presence of one to three decayed teeth as "changes", as they can be severely decayed and may have caused an apical infection. Similarly, with OHAT and OHSTNP, the assessment of dentures in these tools is done by quantifying the length of time the dentures

have been in use. There are several reasons that may justify using duration of denture use for a frail individual and even explain why he or she does not wear them at all. Several of these are unrelated to the condition of the dentures or any discomfort, pain or injury they may cause. In long-term care settings, whether dentures are worn or not, as well as their daily usage time can be related to caregiver availability for oral care, the number of available caregivers on the unit, and the centre's policy. Denture use can also depend on the resident's general condition, their cooperation with mouth placement, or cognitive instability that may make the resident irritable and aggressive. In the above-mentioned tools, if the resident wears their dentures one to two hours per day, this is considered "changes", whereas not wearing dentures at all is considered "unhealthy". Already, the qualifications of "changes" and "unhealthy" do not initially seem appropriate when it comes to indicating the condition of a dental appliance or situation related to its use. In addition, regarding usage time, the determination of length of time attributed to these two categories seems vague, approximate and difficult to assess clinically. There is also a big difference in intervals between two hours of wearing the dental prosthesis and not wearing it at all for a whole day. The assessment of this item in a person who wears dentures three or four hours a day would probably not be considered in this assessment, given the lack of answer choices. Because the examiners are not continually present over long periods, certifying the length of time dentures are worn by the examined individuals becomes difficult. The authors of these tools do not explain how they arrived at the determination of denture wear time in their estimate of severity in the assessment scales. The concept of wear time does not seem adequate to qualify the severity of the dental appliance situation, nor does it examine the quality of the dentures (stability, retention) or the quality of their use.

The words chosen in some tools to qualify the extent of the structure's involvement are less appropriate in some cases. For example, in the MPS, the gums are assessed using the words "normal appearance of the

gum". A health care professional unfamiliar with oral health would likely find it difficult to determine what a normal appearance of the gum tissues looks like without at least a minimal description or reference image of what constitutes tissue normality. At first glance, the word "changes" in OHAT and BOHSE may designate any change that is pathological in nature. However, we can assume that the word "changes" refers to physiological changes related to the aging of the oral structures. Moreover, the word does not apply appropriately to denture condition, pain qualification, or the state of daily dental hygiene; even the word "unhealthy" used in these tools do not suitably qualify denture condition. Similarly, the words "acceptable" and "unacceptable" used by the OHR-InterRAI could be interpreted in various ways by the examiner, even if short text descriptions are provided. Words selected on the basis of severity are better presented in the ROAG, ROAG-J and THROAT assessment tools. This concept follows a seriousness or severity sequence recognized by all health professionals, such as "mild", "moderate" and "severe".

Compared to the textual descriptions generally used in oral health assessment tools, the use of illustrations of normal tissues and various levels of abnormality could better help professionals identify abnormal oral conditions. Using illustrations or images would decrease the likelihood of screening errors and thus the number of false positives and negatives. Ideally, an oral health screening tool should be able to give an indication of the extent to which oral health is compromised and, ultimately, how urgent it is to intervene. To do so, it must clearly qualify the extent of the damage and also detect when normality is present. Only the OAS and the OHR-InterRAI used images to assess the oral health status. However, these tools have a validity and reliability considered to be low.

4.2. Administration time

Administration time varies between tools. The tools that are quickest to administer are the DHR and MPS, which only assess the presence of dental plaque, which explains their short duration. OHSTNP, ROAG-J and the oral health section of the MDS/RAP take three to four minutes to administer. OHAT and BOHSE require about seven minutes. GOHAI (30 minutes) and OHR-InterRAI (35 minutes) took the longest to administer. It should be pointed out that there is not necessarily any link between a tool's administration time and the accuracy of its oral health assessment. In fact, the diversity of the dimensions of oral health is the most important factor in enhancing the accuracy of abnormality detection, but mainly to ensure the validity of the overall oral health assessment.

What we are looking for in an assessment tool is its ability to identify abnormalities in all the oral structures by tissue family or structure proximity, as well as abnormalities in other oral health components as accurately as possible, with a short administration time. The only way to know if the tools accurately identify dental structure abnormalities is by comparing, via statistical analysis, the results obtained by an examiner to those collected by a gold standard. In all cases, screening tools must be simple, quick and intuitive in its structure and administration sequence. It should be noted that the OHAT, BOHSE and MPS were administered primarily to individuals with neurocognitive impairments. The presence of this type of disorder makes it even more imperative to use a quickly administered tool that is nonetheless accurate at detecting oral abnormalities. In general, the length of administration of an assessment tool should ideally not exceed the average oral care cooperation time of a frail individual. This time may vary depending on the patient's level of cognitive or physical loss of independence.

4.3. Training and calibration

Detecting oral health abnormalities requires knowledge of the normal state of oral structures and other components that define oral health. Compared to other health care professionals, dental professionals have received training that allows them to recognize any deviations from the norm in oral structures and other oral health components. Most non-dental professionals probably have limited to nonexistent oral health training. Their experience with observing oral structures and other oral health components will likely be even more limited. This means that developing training on each of the dimensions assessed by the screening tool, along with a tool administration handbook, would potentially enhance the correlation with the gold standard, inter-examiner reliability, and likely even intra-examiner reliability. Prior training would also make it possible to identify abnormalities more quickly during screening, which would potentially lead to fewer false negatives and positives.

Examiner training and calibration was conducted for the use of the inventoried tools, with the exception of GOHAI, THROAT and OHSTNP. For GOHAI and THROAT, no information on training and calibration process was provided. For OHSTNP, the authors of the tool did not want the examiners to receive any training. It was found that the examiners correctly assessed three categories (teeth, dentures and oral function) among the 12 categories to be assessed. This means that when only a third of the categories to be assessed appear to have a sound correlation with the gold standard, the OHSTNP authors' decision is cast into doubt owing to the limited results. Questions also arise about the tool itself and its constitution with regard to its target examiners. We feel that at the time the tool is validated, it is important to check whether the examiner's level of knowledge is coordinated with the level required to administer the tool and obtain valid results. Once this

step is complete, standardized training should be used to enhance the knowledge of target examiners to a level that yields valid results.

Inventoried data[77] indicates that non-dental health professionals do not feel they are equipped to administer this type of tool. The data appears to indicate that the tools used by these professionals do not, in their estimation, allow them to determine the state of the oral structures based on the written description of the various levels of normality and abnormality described. Most of the available oral health assessment and screening tools are based on written descriptions of the oral structures and other components of oral health. Detecting an abnormality using a written description of an oral condition or structure means having to construct a mental image of the condition of the structure based on the description of normality or abnormality and then associating it with what is being observed in the resident's mouth. Adding photos to these descriptions could reduce the impact of lack of training on the part of non-dental professionals. According to the literature[85], training in addition to adding illustrations to the tools would potentially make it possible to enhance correlation with the gold standard, as well as intra- and inter-examiner reliability. Adding photos to the screening tool might possibly decrease the intensity of the training required in order for non-dental professionals to feel they are competent to administer the test. According to the literature[85], training in addition to adding illustrations to the tools would potentially increase gold standard correlation as well as intra and inter rater reliability. Adding photos to the screening tool would possibly decrease the intensity of the training needed for these non-oral health professionals so that they perceive themselves with better administrative skills.

4.4. Proposed interventions following assessments

An oral health assessment tool may or may not suggest further actions following its administration, depending on the purpose for which it was created. An oral health screening tool for frail individuals, administered by non-dental health professionals, would most likely have the objective of early detection of oral health abnormalities, along with suggested interventions following the assessment. We found that the most commonly preferred actions following the resident's assessment were referral to a dentist or to improve oral hygiene care. These actions make it possible to limit the scope of the interventions needed to return to a normal state.

To refer a resident to an oral health professional in a timely manner, screening for oral abnormalities must be as accurate as possible. For example, in the study[87] of the OHSTNP, we found that residents were more often referred to dentists when the resident's dentures were broken, although many other oral conditions may have been present. It is important to remember that the examiners of this tool were not trained in its use. The examiner's judgment was called upon as to whether the resident should be referred to a dentist or not, depending on the conditions identified during the oral examination.

A tool developed to screen for certain oral health conditions would benefit from including a guide that sets out the various management options when abnormalities or pathologies are found during the tool's administration. Currently, these individuals have limited access to dental professionals. It therefore becomes necessary to enable early detection of oral abnormalities by non-dental professionals who care for frail seniors. These professionals could reduce delays and the scope of the interventions needed by conducting oral health screening using a tool that includes a guide to managing any detected abnormalities. To improve oral health

in the group of frail individuals, a guide to managing oral health abnormalities should be part of or appended to the proposed screening tool. An individual oral health screening tool without a guide to managing oral pathologies or abnormalities, such as the MDS, MDS-HC or THROAT would not achieve the objective of a quick return to normality of the various oral health components.

4.5. Quality of the studies

Generally speaking, none of the inventoried studies assessed all the psychometric properties of the assessment tools. Only one tool, OHAT, explored more psychometric parameters in a single publication. These results are consistent with those published by Thapa[90] and Everaars[89].

With respect to validation, the studies do not present enough data supported by statistical analysis. Professionals from the disciplines in question (dentists, dental hygienists, geriatricians, nurses, physicians, and others) took part in developing the content of the inventoried tools, with the exception of ROAG-J. They were also questioned about the relevance of the contents of the tools. Despite this, the methodological approach undertaken to validate the relevance of the tools was deemed doubtful. The studies do not specify whether, during the development of the tools, the parameters to be assessed were tested on an appropriate number of professionals. Nor do we know whether an appropriate approach was used to analyze the preliminary data on the tool's design. This data is only available for the DHR tool. The instructions on the tool do not seem to be well understood by the examiners, which may affect the validity of the tools. In addition, only studies[74,80] of the DHR, OHSTNP and GOHAI compared the results obtained by an examiner (health

professional) to those collected by the gold standard (dentist or dental hygienist). The results of the tool validation were not conclusive.

Instead, most of the studies[75–77,79–87] focused on exploring inter-examiner reliability. The OHAT study[77] was the only one to assess data over time. Intra-examiner reliability and inter-examiner reliability for OHAT were deemed sufficient. The MDS had strong inter-examiner reliability, but only for problems with chewing, swallowing and pain. The OAS also offered good inter-examiner reliability before and after training on administering the tool, although the methodological process for that assessment was deemed doubtful owing to the fact that it was unknown whether the residents were stable for the period between the two examinations (intra- and inter-examiner) and whether the examinations were carried out under similar conditions. In some cases, the time interval between the assessments was inappropriate or not specified in the study.

GOHAI and OAS showed good internal coherence, meaning that the categories or questions presented in those tools were closely related. Nonetheless, these results provided no information as to the temporal stability of the tools.

BOHSE, OHAT, ROAG and DHR appeared to achieve an acceptable level of validity and reliability in oral health assessment by non-dental professionals, despite the tools' numerous limitations and design flaws. However, all the tools, except for the OAS and the OHR-InterRAI, which, overall, have a questionable reliability and validity, suffered from the lack of illustrations, both of normal and abnormal states of the oral health components to be assessed. The lack of images or illustrations means that non-dental professionals have to build a mental image of all these states by reading a written description, when they have neither basic

training in oral health nor clinical experience that would validate the image they constructed. This situation carries a significant risk of numerous false negatives and false positives following the administration of the tool. The lack of images and illustrations creates an obligation to provide longer and more intensive training to reduce the potential for error among non-dental examiners.

4.6. Limitations of the review

Generalizing the results on the basis of the tools' measurement properties is limited in this review. There are many articles focusing on any given tool, but not all of those articles have been included in this systematic review. For example, for OHAT, this review considered only the original article, which was primarily an assessment of the tool's reliability. It is possible that other studies have analyzed the tool's other psychometric properties (construct or transcultural validity, internal consistency). Assessing all the psychometric properties of all the existing assessment tools requires additional and even excessive effort. For example, if we wanted to explore a tool's transcultural validity, we would have had to inventory all the translated versions of the tool in languages other than English to determine its validity with other populations.

However, it is important to emphasize that the purpose of this review is to inventory the main assessment tools used with seniors, rather than evaluating the tools' psychometric properties.

4.7. Recommendations

The identified tools were analyzed to determine their ability to provide early detection of abnormalities in oral structure and other oral health components in individuals from a frail population when administered by non-dental health professionals. Although some tools obtained positive psychometric assessments, they all had design weaknesses and shortcomings that did not allow them to achieve the desired objectives at their maximum capacity. As a result, we recommend:

1. the design of an individual oral health screening tool for frail individuals, to be used by non-dental health professionals. It should be based on an assessment of oral structures and other components of oral health using images accompanied by a short text description;

2. the development of a user guide and algorithm for referral to a dental professional;

3. the creation of online training that would help achieve the level of knowledge required to obtain valid results.

5. Conclusion

This systematic review presents the key characteristics of oral health assessment tools used by health professionals working with the senior population. The tools mainly target the condition of the oral structures. Only a few tools provide suggested interventions after administration. Among the identified tools, the BOHSE, OHAT and ROAG appear to be the most complete with respect to oral health assessment, despite their weaknesses and shortcomings. OHAT appears to be the tool with the most valid and reliable psychometric properties, although some do not rise to that level. The DHR is the most relevant and appropriate tool for gauging the presence of dental plaque.

None of the identified tools met all the criteria of allowing for individual identification of abnormalities in the oral structure and other oral health components in the target population by non-dental healthcare professionals. This process should ideally make it possible to detect oral abnormalities early on, direct the assessed individual to an oral health professional in a timely manner, and limit the potential interventions needed to treat the identified oral conditions.

It is therefore necessary to develop a valid, reliable oral health screening tool that will achieve all these objectives and to institute adapted, accessible training to ensure its continued sustainability and validity.

Section III: Illustrated tool for oral health assessment in seniors

1.1 Background

This section of the report focuses on the process of developing an illustrated tool for assessing oral structure abnormalities and the dysfunctional condition of prosthodontics in Canadian seniors. More specifically, the tool described in this report is intended to assess the condition of oral structures and other oral health components in vulnerable seniors and to suggest specific interventions following its administration. The tool, designed for use by non-dental healthcare professionals, assesses the condition of the lips, cheek and lip mucosa, gums and palate, tongue, teeth, prosthodontics, dental implants, saliva, dental and prosthodontic hygiene, and oral pain.

The tool assesses all the oral structures by tissue group or proximity to structures, as well as other oral health components as accurately as possible. The number of items (i.e., oral structures or components) to be assessed and the overall administration time of the tool are limited, with no loss of validity. The tool is simple to use, quick to administer, and tailored to the senior population living in nursing homes or receiving health care services in the home setting.

What makes this tool different is that it contains images, in the form of photos; hence the use of the term “illustrated tool.” This type of tool makes it possible to minimize any uncertainty caused by having to build mental images. Most oral health assessment tools present information in written form, describing normal and abnormal oral tissues. This means that when a health professional administers an assessment tool that includes only text descriptions, the mental image the professional builds from that information may differ from the clinical reality of the tissues being assessed. It is important to emphasize that the illustrated tool also

features brief written descriptions to provide clear, concise information on the abnormalities for which to screen while keeping erroneous interpretations to a minimum.

Thanks to this tool, health professionals with or without oral health knowledge can quickly screen for abnormal oral conditions, estimate their severity and determine the condition of the oral health components using three levels of abnormality. It then becomes possible to report oral health problems more quickly, ensure early intervention, and thus minimize the scope and complexity of any required treatment.

1.2 Relevance of developing an illustrated tool for assessing oral health in Canada's vulnerable seniors

Oral health is a multidimensional concept. Assessing it means taking stock of the condition of each of the oral structures, which provides a picture of its overall condition. More specifically, an individual's oral health is determined based on an oral examination carried out by a dentist who is qualified to recognize the normality of oral structures and diagnose any abnormalities, diseases and pathological conditions that may affect them. Other components, such as pain, the condition of prosthodontics or dental implants, and the quality of the patient's oral hygiene are also part of the overall oral health assessment.

Ideally, every individual from every walk of life in the Canadian population would undergo an annual examination by an oral health professional. This is the case for most Canadian adults, who see dental professionals in private offices and knowingly have their oral health assessed and managed, when necessary. However, some segments of the Canadian population, such as vulnerable seniors, do not have ready access

to oral health professionals owing to their distance from dental offices, economic difficulties, or fragile overall health. Among Canada's vulnerable seniors, those living in long-term care facilities or who receive home care owing to physical or cognitive impairments have very limited access to professional dental care.

To ensure that the oral health of Canada's vulnerable seniors is monitored, it is essential to develop an oral health assessment tool based on identifying normal and abnormal conditions of each of the oral structures and oral health components. In a context where oral health professionals in nursing homes are scarce, the tool will allow non-dental professionals to screen for the most commonly encountered changes in oral health among vulnerable seniors. This screening will make it possible to identify oral changes early on, reduce delays in and the scope of any required interventions, and carry out an oral health assessment with a tool that includes a guide to interventions in response to any abnormal conditions observed.

1.3 Oral health measurement

In order to determine an individual's oral health status, we could, as other multidimensional measurement tools have done, determine the importance of each component or oral structure within the concept or oral health and assign each of them a weight within an overall score. Multidimensional quantitative measurement tools use this methodology in research when assessing groups of individuals in order to compare them and highlight any differences that may emerge. This methodology is notably employed in epidemiological research on populations with a view to establishing general or population measures to apply in order to enhance, for instance, a given health status within a defined population. A quantitative measurement tool could also be used to gauge an individual's oral health status in order to intervene and ultimately correct any health deficit.

The assessment tool presented in this report focuses on the individual's oral health rather than that of the group. In other words, it was developed for individual assessment purposes. The tool was not purposely developed to assess the epidemiology of oral health components. However, the data obtained, when grouped together within a given population, may provide valid information about the population in question.

Constituting an overall score incorporated into a tool does not provide a clear understanding of the interventions needed to correct the patient's health deficit. For this reason, the tool was developed so that in a later development phase, a weighted score could be attributed to each of the items assessed, based on their importance in maintaining optimal oral health. This weighted score, once developed, can help to determine the need for intervention associated with the identified abnormality. For example, advanced tooth decay might carry a high score because of its associated potential complications. Also, quick management by an oral health professional is a must in this case. Comparatively, lip dryness would carry a lower score, since severe complications from this condition are a rarity. Lip dryness can be treated with local corrective measures, such as applying lip balm. This means that the intervention of an oral health professional would probably not be required to treat the condition.

It is important to specify that score weighting will not be done in this stage of the tool's development. This process can take place later, once it is in common use for individual screening. The weighted scores will later have to be validated by statistical analysis to confirm the accuracy and importance assigned to each of the oral structures and components.

1.4 Development of the illustrated tool

For non-dental healthcare professionals, the written description of oral conditions that are common in seniors does not provide a mental image of the various states of normality and abnormality expressed by key words in an assessment tool. Written descriptions may even lead to false positives or false negatives in greater numbers than other ways of representing the condition of the various oral structures being examined. To address this potential issue, visual aids, such as colour photographs and indicators, and the integration of key words on the various conditions of oral structures could make the tool easier to administer. Being able to choose an image that matches what was seen during the patient's screening allows the evaluator to more readily integrate information, since building a mental image from a descriptive text is insufficient. The evaluator only needs to select the image of the structure in the tool that best matches the situation observed during the screening. In case of doubt, the evaluator can refer to the key words associated with the assessed structure. This reduces the likelihood that a non-dental health professional will make a mistake and generate erroneous results. To ensure that the most common oral conditions are well represented, the choice of images of oral structures and other components of oral health is a crucial factor. Because the tool image selection process was so rigorous, the images of situations involving each of the structures are more likely to match the clinical reality.

The tool needed to be concise so it would be adopted by the community for which it was developed, so the conditions presented are closely aligned with those most frequently encountered in reality. This can limit screening for and recognition of some atypical situations. However, the same can be said of tools that rely on written descriptions of oral conditions.

The development process for the illustrated tool took place in four steps:

- Step 1: determine the oral structures and components to assess;
- Step 2: Establish assessment parameters for the assessed oral structures and components;
- Step 3: Identify the abnormal oral conditions most frequently encountered in seniors;
- Step 4: select images that appropriately represent the concept to be assessed.

The sections that follow explain these four steps in greater detail.

Step 1: Determine the oral structures and components to be assessed

The oral structures and components of oral health assessed in the illustrated tool are:

1. condition of the lips;
2. condition of the mucosa of the cheeks and lips;
3. condition of the gums and palate;
4. condition of the tongue;
5. saliva;
6. condition of the teeth;
7. condition of the prosthodontics;
8. condition of the dental implants;
9. tooth and prosthodontic hygiene;
10. oral pain.

In the illustrated tool, the oral structures and other components of oral health to be assessed are called “items.” Adjacent oral structures and those related by tissue characteristics have been grouped together into an oral area under the same item. For example, the tongue and floor of the mouth have been incorporated into a single item owing to their anatomical proximity. The cheek and lip mucosae were made a single item, as they are both anatomically adjacent and similar in terms of tissue characteristics.

The gums and palate were grouped together owing to their proximity, at least in terms of the maxilla, and their tissue composition. On the maxilla, the tissues of the gums and palate are mostly keratinized, with the exception of the soft palate that covers only a small part of the total surface area of the palate. Also, the edentulous ridges of the maxilla, which often blend into the hard palate, were included in the “gums and palate” item. With respect to the mandible, the gums around the teeth and edentulous ridges were included in the “gums and palate” item. This association is based on the fact that the gums and edentulous ridges of the mandible have identical cell and tissue characteristics to the gum tissues of the maxilla, making their grouping possible.

The remaining oral structures, such as the teeth and lips, were included in the tooth without a grouping, owing both to their specific tissue characteristics and anatomical differences. The teeth are considered the primary oral structures. When they decay, they cause pain, food limitations and infections requiring significant professional interventions, making it reasonable that they have their own category within the tool.

The other oral health components were included in the tool without grouping, given their intrinsic differences. These include saliva, oral pain, dental implants, tooth hygiene and prosthodontics and their condition.

It should be specified that the Oral Health Assessment Tool (OHAT) was carefully studied for its structure during the development of the illustrated tool, as it is used worldwide and the availability of its psychometric data. In addition, according to the systematic review described in section II of this report, OHAT is one of the most complete oral health assessment tools available, despite its many shortcomings. The items to be assessed and the assessment sequence in our tool are nearly identical to those in the validated OHAT tool. However, there are some remarkable differences between OHAT and the tool we developed as part of this report. These differences are addressed in greater detail in section III, 1.11, Comparison between the illustrated tool and other existing oral health assessment tools.

Some aspects of oral health are not directly assessed in the tool described in this report. These are oral function and quality of life as related to oral health. The rationale for these choices is explained in the paragraphs below.

a. Oral function

Oral function, like speaking and chewing, is an important element in a person's oral quality of life. For example, effective chewing allows the person to properly grind foods, better taste them, and make them easier to swallow. With adequate chewing, the person can eat a range of different foods and take in a variety of nutrients to achieve optimal overall health.

For an individual to be able to chew properly, most oral structures must be free of pain and changes; dental implants and prosthodontics must be functional and intact when teeth are missing; and they must be able to produce enough saliva to initiate digestion and swallowing. However, as described in the first section of this report, frail seniors often suffer from a significant deterioration in the condition of their dental and periodontal structures related to deficient daily oral hygiene. They also often have decreased saliva production from medications for a variety of chronic disease and limited access to dental care and services. For these reasons, frail seniors may have reduced chewing ability.

Although the assessment of chewing ability is essential in seniors, it is difficult to envisage incorporating an objective or subjective measurement of chewing ability into an illustrated assessment tool for use by non-dental health professionals. This can be explained by the complexity of administering the tool and the time needed to complete the chewing function assessment.

One way to objectively measure chewing function is to count the number of posterior occlusive pairs of teeth. It can be time-consuming for a non-dental health professional to accurately determine this number in a senior who cooperates with the dental examination. It becomes nearly impossible to do quickly and accurately in a frail senior with cognitive impairments who is not cooperative.

Another way to measure chewing function objectively is to ask the senior to chew a food and spit it into a calibrated sieve so that the size of the chewed particles can be measured and the foods can be weighed in a methodical approach. Estimates based on chewing time and the initial weight of the selected food are made to assess the person's chewing function. It is complex to ask non-dental professionals to apply a standardized, rigorous protocol to determine the size of the chewed foods. In this context, the objective measurement of chewing function becomes difficult to incorporate into the oral health assessment.

Another possibility would be to subjectively assess the chewing function via a series of questions about the senior's chewing ability. In a context of loss of cognitive autonomy, it becomes difficult to obtain valid, reliable answers to determine the true chewing ability of the senior being assessed.

The chewing function, being a dynamic process, is also difficult to represent in images.

The illustrated assessment tool presented in this report focuses mainly on the visual appearance of oral structures and other oral health components, as well as on the patient's perceived pain. Oral function measurements were excluded in order to keep the tool short, reliable, valid and easy to administer, which would potentially limit the number of false negatives and false positives.

In this context, it becomes crucial to identify any changes in oral health and pain that are commonly encountered in seniors. These take precedence over assessing chewing ability or other oral functions; wherein the former must be corrected to ensure the quality of the latter. In long-term care settings, when seniors' chewing ability is affected, the presence of a nutritionist makes it possible to change food textures so that seniors can continue receiving adequate nutrition, even in this type of situation.

b. Oral health and quality of life

It should be specified that the illustrated tool is not intended to directly assess quality of life as it relates to an individuals quality of life. Nonetheless, using this tool makes possible to indirectly improve quality of life through early detection of abnormal oral conditions common among frail seniors and restoring altered dental structures and other oral health components to normality.

Generally speaking, any pain experienced by an individual will interfere with their well-being and quality of life. For this reason, the illustrated tool includes a section on screening for oral pain in seniors. Oral pain is generally acknowledged as being an indirect sign of a change in oral structures in most cases. Pain frequency and intensity determine the priority, both intrinsic and time-related, to be given to the oral intervention needed to correct abnormal conditions. Pain intensity is a reliable indicator of the need for rapid treatment of the change.

Pain screening via the illustrated tool is limited, however, to identifying physical signs, vocalizations, facial expressions and flinching or guarding movements and to determining the intensity of the pain using a three-step scale. In the tool, pain is analyzed by searching for its association with changes in oral structures or other components of oral health, or with a structural defect in prosthodontics or injuries that they may cause. This process is particularly relevant in a context where a large portion of long-term care residents suffer from moderate to severe neurocognitive disorders that prevent them from answering questions about the pain they are experiencing.

Step 2: Establish assessment parameters for the assessed oral structures and components

The assessment parameters group together the elements related to the characteristics of oral structures and components of oral health to which differing values can be attributed.

There are numerous parameters for assessing the health of oral structures and oral health components. In the tool presented in this report, the assessment parameters are those than can be determined visually by

examining oral health structures and components through images, such as the colour and texture of oral structures or the presence of breakage on dentures. These visual characteristics are of key importance in developing the illustrated tool. Table X shows the assessment parameters for each of the oral structures and components of oral health.

Table X: Assessment parameters for each of the oral structures and components of oral health used to develop the illustrated tool.

Oral structure or health component	Assessment parameters
Lips	Colour, texture, hydration, outline, swelling, bleeding, ulcers
Mucosa of the cheeks and lips	Colour, texture, whitish patches, ulcers
Gums and palate	Colour, texture, swelling, bleeding, ulcers
Tongue	Colour, texture, whitish patches, ulcers
Saliva	Quantity of saliva, appearance of tissues bathed in saliva
Teeth	Identification of teeth, cavities caused by tooth decay, dental fractures, tooth mobility
Prosthodontics	Determination of prosthodontic condition, stability and retention. Identification of prosthodontics
Implants	Peri-implant gum colour and swelling, implant mobility. Identification of biofilm, food debris or tartar
Tooth and prosthodontic hygiene	Identification of dental plaque, food debris or tartar
Oral pain	Behavioural, physical and verbal signs

Although they can be identified visually, some assessment parameters are not included in the tool because their assessment requires the use of dental instruments. For example, many oral health assessment tools recommend gauging the quantity and consistency of saliva. The quantity can readily be observed by checking the amount of saliva on the mouth floor or the appearance of the oral tissues bathed in saliva. However, determining the consistency of saliva is more complicated. It requires the use of additional instruments, more cooperation on the part of the person being assessed, and a longer assessment time. It is important to emphasize that identifying the saliva's consistency type will not result in immediate treatment of the person being assessed. However, it may indicate the person's level of risk for tooth decay.

Other parameters that can be identified through a visual assessment of the oral structures were eliminated from the tool because they are hard to identify. This is the case for the papillae of the tongue, which are assessed in other tools, such as the ROAG. The papillae are very fine structures located on the surface of the tongue. Identifying them requires explicit knowledge of the anatomy and physiology of the tongue papillae, along with close attention to their identification and sufficient observation time to be able to determine whether or not they are present. This means it can be difficult for the health professional to reliably identify the tongue papillae.

The pain assessment parameters included in the illustrated tool are based on the presence or absence of behavioural, physical and verbal signs on the part of the person being examined. This is justified by the fact that pain cannot be directly observed. It is a sensation the individual experiences and is identified following the clear expression of its presence. In seniors with neurocognitive disorders, it can be difficult to detect pain, determine its cause and gauge its severity because the individual may not be able to express it clearly. For example, such individuals may express oral pain by biting on objects as a way to partially relieve the discomfort, just as babies do when teething. They may also touch the affected area, which helps caregivers

identify which side is affected by the pain. The pain and its intensity can also be identified by the degree of grimacing, squinting and the absence of smiling. More intense pain may cause groans or even cries. These behaviours are associated with problems that must be addressed urgently. The pain can lead to aggressive behaviour toward caregivers, who have to provide care and be in physical contact with these individuals. For all these reasons, the pain assessment parameters chosen for the illustrated tool focus on behavioural, physical and verbal signs expressed by the individual.

Step 3: Identify the abnormal oral conditions most frequently encountered in seniors

In this step, we determined the most common abnormal oral conditions encountered in seniors (Table XI). This selection was made on the basis of evidence-based data in section I of this report, State of Knowledge.

Table XI: Most frequently encountered abnormal conditions in seniors, by oral structure or other oral health component assessed in the illustrated tool.

Oral structure or health component	Abnormal conditions
Lips	Lip dryness, angular cheilitis, cold sores
Mucosa of the cheeks and lips	Pseudomembranous candidiasis, aphthous or traumatic ulcer, aphthous stomatitis
Gums and palate	Gingivitis, prosthetic stomatitis, aphthous ulcer, gum bleeding
Tongue	Atrophied tongue, pseudomembranous candidiasis, traumatic ulcer
Saliva	Xerostomia
Teeth	Tooth decay, dental fractures, residual roots, tooth mobility, edentulousness
Prosthodontics	Breaks; inadequate stability and retention
Implants	Peri-implant mucositis, implant mobility
Tooth and prosthodontic hygiene	Dental plaque, tartar, food debris, halitosis
Oral pain	Behavioural, physical and verbal signs associated with an abnormal condition of the oral structures

Step 4: Select images that adequately represent the concept to be assessed

To ensure that the most common oral conditions among seniors are properly represented, the choice of images is crucial. The rigorous process used to select images for the tool boosts the odds of matching the various situations encountered for each of the structures with the clinical reality. To do this, a methodical process was used to properly select photos that best reflect the normal and abnormal conditions of oral

structures and other oral health components. To begin, we prepared a table with detailed written descriptions of what the photos should show for each oral structure and oral health component based on a scale with several different steps, ranging from normal to severely abnormal conditions. Secondly, a team of experts that were all dental specialists and full professors from the faculty of dental medicine at Université Laval à Québec selected images based on the previously prepared written descriptions. Most of the images they selected were photographs that were extracted from a database of at least 2,000 photos taken from oral health conditions of frail elders residing in nursing home. In more details, the photos were regrouped in each of the nine dimensions that needed to be screened. All the experts chose from each dimension database, the best photos that represent, normal condition, mild to moderate abnormality, and severe abnormality. Then the expert met to present the picture chosen in each dimension. The expert decided dimension by dimension, by consensus, which of the pictures were selected. The 10th dimension (implant) was added after he tool with nine dimensions, has been presented to a working group composed of oral health professionals and other medical professionals, indicated by a large majority that an implant dimension should be added to the tool. The pictures chosen for that dimension were selected and sent, based from a written description that respect the three categories; normal appearance, mild to moderate abnormality; severe abnormality. It is difficult to represent pain using photos of oral structures. As a result, pictograms of various facial expressions and colour indicators were also presented to the team of experts to have them select those that properly reflected oral pain. However, despite their usefulness, the pictograms were later dropped in order to allow space within the tool for other conditions that were crucial to show. In all cases, as far as possible, the selected images had to replace the written descriptions of the oral health structures and components and show their various possible states.

It should be pointed out that, in the tool validation process, statistical analyses were later conducted to determine whether the images selected by the experts properly reflected the concept being measured.

1.5 Description of the illustrated tool

The illustrated tool includes a series of images in the form of photos of various oral conditions. It incorporates a grading scale ranging from normal to abnormal states of oral structures and other components of oral health.

The images in the tool are set out in a table divided into lines and columns. On the one hand, each of the lines groups together images about an item (oral structure or component) to be assessed. On the other hand, each of the columns is a sequential and progressive representation of the range of levels from normal to abnormal for each of the items. These are assessed and categorized as “normal condition,” “mild to moderate abnormal condition,” and “severely abnormal condition.” Arranging the images in this way allows the health professional administering the tool to simultaneously see what a normal oral condition looks like, as well as the range of mild, moderate and severe abnormality. This makes it easier to select an image that most closely reflects the clinical reality. The illustrated tool is presented in Appendix III.

The illustrated tool is combined with an assessment sheet in Appendix IV that provides a short written description of the state of normality and two levels of abnormality set out in the illustrated tool. Its usefulness lies in allowing the assessor to consult the sheet if they need more information about the normal and abnormal oral conditions for which to screen. The document contains no images. The assessment sheet includes boxes for the assessor to check off if a particular oral condition is detected.

The following sections include tables showing the images used in the illustrated tool on the various conditions observed for the various oral structures and health components. The written descriptions on the assessment sheet are also included.

1.5.1. Lips

Table XII shows images of normal and abnormal lip conditions, with corresponding written descriptions.

Table XII: Images from the illustrated tool showing normal and abnormal lip conditions, with corresponding written descriptions.

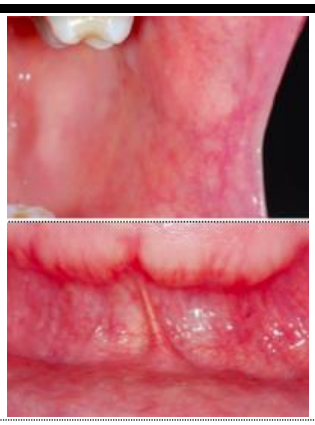
Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
		
Pinkish colour, uniform texture, clear lip contour	Red, dry and swollen	Ulcer, with or without bleeding

It is important to point out that oral structure colouring can vary depending on the person's ethnicity.

1.5.2. Mucosa of the lips and cheeks

Table XIII shows images of normal and abnormal lip and cheek mucosa conditions, with corresponding written descriptions.

Table XIII: Images from the illustrated tool showing normal and abnormal lip and cheek mucosa conditions, with corresponding written descriptions.

Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
		
Pinkish colour, uniform texture	Redness or localized whitish patches. Single ulcer, less than 0.5 cm	Generalized redness or whitish patches. Single ulcer, more than 0.5 cm, or multiple ulcers

In the written description of the lip and cheek mucosa assessment, the tool takes the diameter of the ulcerous lesions into account in determining severity. The conditions most often associated with ulcers are minor and major canker sores.

Minor canker sores are a common mucosal condition that can occur in the form of single or multiple ulcers. Minor canker sores measure less than 0.8 centimetres in diameter, usually around 0.5 centimetres. They are painful but fairly harmless. In the illustrated tool, minor canker sores are categorized as a mild to moderate abnormal condition. A major canker sore is generally a single ulcer of larger size. It measures more than

0.8 centimetres with a diameter of one to several centimetres. Major canker sores are more painful than the minor variety. Although benign in nature, they are categorized as a severe abnormality in the tool owing to their scope.

The illustrated tool places ulcers measuring less than 0.5 centimetres as a “mild to moderate abnormal condition,” as most canker sores are minor. Single sores exceeding 0.5 centimetres or multiple ulcers are considered a “severe abnormal condition” owing to the scope or their related symptoms.

1.5.3. Gums and palate

Table XIV shows images of normal and abnormal gum and palate conditions, with corresponding written descriptions.

Table XIV: Images from the illustrated tool showing normal and abnormal gum and palate conditions, with corresponding written descriptions.

Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
		
Pinkish colour and uniform texture	Redness or swelling localized to the gums or palate or beneath prosthodontics	Generalized redness or swelling of the gums or palate or beneath prosthodontics. Spontaneous bleeding. Ulcer(s).

1.5.4. Tongue

Table XV shows images of normal and abnormal tongue conditions, with corresponding written descriptions.

Table XV: Images from the illustrated tool showing normal and abnormal tongue conditions, with corresponding written descriptions.

Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
		
Pinkish colour and uniform texture	Circumscribed change in colour, smooth appearance, localized loss of texture uniformity, localized whitish patches	Generalized change in colour and appearance, generalized loss of texture uniformity, generalized whitish patches. Ulcer(s)

1.5.5. Saliva

Table XVI shows images of normal and abnormal saliva conditions, with corresponding written descriptions.

Table XVI: Images from the illustrated tool showing various normal and abnormal conditions that can be observed through a visual examination of saliva, with corresponding written descriptions.

Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
		
Plentiful saliva bathing the mucosa, tongue and teeth. Tissues appear shiny and moist	Thin layer of saliva coating the mucosa, tongue and teeth. Tissues appear shiny and moist	Apparent lack of saliva or minimal quantity of saliva coating the mucosa, tongue and teeth. Tissues appear dull and dry

1.5.6. Teeth

Table XVII shows images of normal and abnormal tooth conditions, with corresponding written descriptions. The tool includes boxes to check off for the tooth assessment to determine whether the person to whom the tool was administered had teeth or not

Table XVII: Images from the illustrated tool showing normal and abnormal tooth conditions, with corresponding written descriptions.

Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
		
No involvement of the tooth structure. No tooth mobility	Superficial appearing cavity, tooth with minor fracture. Tooth mobility with no risk of tooth detachment	Deep appearing cavity with loss of tooth structure, tooth with major fracture or bare root, sharp tooth edge. Tooth mobility with risk of tooth detachment

1.5.7. Dental protheses

Table XVIII shows images of normal and abnormal dental protheses conditions, with corresponding written descriptions.

Table XVIII: Images from the illustrated tool showing normal and abnormal dental protheses conditions, with corresponding written descriptions.

Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
		
Intact structure. Adequate stability and retention. Dental protheses identified	Minor break: one artificial tooth broken, worn or missing; alteration of portion of the structure having little to no impact on the dental protheses's function. Adequate stability and retention. Dental protheses not identified	Major break: several artificial teeth broken, worn or missing; alteration of portion of the structure, affecting the Dental protheses's function. Inadequate stability and retention. Dental protheses not identified

1.5.8. Implants

Table XIX shows images of normal and abnormal implant conditions, with corresponding written descriptions.

Table III: Images from the illustrated tool showing normal and abnormal dental implant conditions, with corresponding written descriptions.

Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
		
Obvious lack of redness and swelling of the mucosa around the implant. Obvious lack of biofilm, tartar or food debris	Redness of the mucosa around the implant. Localized presence of biofilm, tartar and food debris on the implant	Redness and swelling of the mucosa around the implant; implant mobility. Generalized presence of biofilm, tartar and food debris on the implant

1.5.9. Tooth and dental prothesis hygiene

Table XX shows images of normal and abnormal tooth and prosthodontic hygiene, with corresponding written descriptions.

Table XX: Images from the illustrated tool showing the various normal and abnormal tooth and prosthodontic conditions, with corresponding written descriptions.

Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
		
Obvious lack of dental plaque, tartar or food debris	Localized presence of dental plaque, tartar and food debris	Generalized presence of dental plaque, tartar and food debris. Foul mouth odour

Foul mouth odour refers to halitosis. Obviously, halitosis cannot be detected visually, since it is an olfactory phenomenon. Providing a scale of severity for this issue is difficult, as this would involve some subjectivity. In addition, perception of halitosis can be diminished if the assessor is wearing a procedure mask, which may skew the results of the assessment. Despite this, halitosis was included in the tool because its presence can indicate poor oral hygiene. Because halitosis cannot readily be divided into categories, the tool considers its presence a severe abnormality. No levels of severity were included.

1.5.10. Oral pain

In the illustrated tool, colour indicators were used to categorize pain levels. To capture the sensation, behaviours, gestures and vocalizations associated with pain were added to the written description (Table XXI).

Table IV: Colour indicators from the illustrated tool for the assessment of oral pain, with corresponding written descriptions.

Normal condition	Mild to moderate abnormal condition	Severe abnormal condition
Aucune	Occasionnelle	Fréquente
No signs of pain	Occasional signs of mild to moderate intensity: cries, aggressiveness, groaning, painful touch to the area, and mouthing	Frequent signs of severe intensity: cries, aggressiveness, groaning, painful touch to the area, and mouthing

1.6. Tool rating

The illustrated tool does not assign a number value to each of the levels of severity of normal and abnormal conditions of oral structures and other oral health components. In other words, using the tool does not produce an overall score that determines whether a given individual has good or poor oral health. To obtain a score that represents the reality of oral health, the anatomical structures of the mouth and other components of oral health need to be weighted according to their importance to oral health or disease. The overall score would then represent the actual status of the mouth that was assessed using the measurement tool. Further explanations were provided in Section III; 1.3 of this document entitled, Oral health measurement.

It is important to bear in mind that the key objective of the illustrated tool is to allow non-dental health professionals to carry out the early detection of quantitative and qualitative changes to the oral cavity, structures, tissues and prosthodontics to enable quick intervention and a return to normal. Gauging a person's state of oral health (good or poor) is not one of the illustrated tool's objectives, at least at this stage of its development.

1.7. Suggested interventions

As shown in the systematic review described in Section II of this report, most assessment tools only suggest referring the assessed individual to an oral health professional when one or more abnormal oral conditions are found. Compared to these other tools, the interventions we suggest after administering the illustrated tool are personalized and timely, as they will vary depending on the item assessed and the severity of the observed abnormal condition.

The suggested interventions after administering the illustrated tool are primarily intended to:

- monitor changes in the detected abnormal condition until it resolves or in accordance with the recommendations of the oral health professional or treating physician;
- reassess the detected abnormal condition after a defined period of time;
- direct the assessed individual to an oral health professional or physician for treatment of the detected abnormal condition;
- send the assessed individual back to the oral health professional or treating physician if clinical signs associated with the detected abnormal condition persist or worsen;
- ensure that daily oral care is continued;
- improve dental and prosthodontic hygiene measures.

A guide was prepared to help non-dental healthcare professionals quickly and easily consult information about suggested interventions (see Appendix V for the guide).

1.8. Administering the tool

A document on the conditions of use of the illustrated tool was prepared for non-dental healthcare professionals who will be administering the tool. The available information includes:

- what to do before the assessment;
- where to conduct the assessment;
- the materials needed for the senior's assessment
- the assessment sequence;
- what to do when abnormal conditions are detected.

See Appendix VI for this document.

1.9. Types of professionals who can administer the tool

In theory, this tool was developed to be administered by any non-dental healthcare professional. The healthcare professional must be in immediate contact with the vulnerable senior in order to understand the behavioural or physical changes associated with their condition.

It is important to point out that the tool makes it possible to screen for abnormal oral conditions and suggests interventions following the tool's administration. This means that the health professional administering the tool must, on the one hand, have basic knowledge of oral health and, on the other, be able to coordinate oral health care following the assessment of the nursing home resident.

Given the above, nurses seem to best meet these criteria, in part because of their level of training and role, as well as their obligations and responsibilities in nursing homes and long-term care settings. Nursing staff can thus screen for oral health abnormalities and coordinate any resulting required care. Other healthcare professionals would likely not be ideally placed to take these actions.

Nurses in long-term care centres play a key role in monitoring residents and the care they receive. They are also central to detecting abnormal systemic conditions in seniors in long-term care. Nurses are often familiar with the use of tools developed to screen for age-related conditions and are able to coordinate seniors' care.

Nurses, despite their familiarity with a range of tools and extensive training on assessing seniors' overall health, often have limited knowledge of oral health.

Minimal training on how to administer the tool is therefore needed to ensure reliable screening for abnormal oral conditions in seniors. The training would also make it possible to strongly correlate the results of oral examinations conducted by non-dental professionals to the results of an examination by an oral health professional under similar circumstances.

1.10. Training on administering the tool

There are many reasons to justify training non-dental healthcare professionals on the use of the tool.

First, healthcare professionals who screen for abnormal oral structure conditions need to know what constitutes normality and abnormality of the oral structures and other components of oral health. However, in most cases, such professionals receive only minimal training on oral health and care. They also tend to have limited experience in observing oral structures and components of oral health. This means they are poorly equipped to identify any deviation from normality in oral structures and identify any oral health abnormalities.

Second, although the document on administering the tool is necessary to structure and standardize the tool's use, it is not enough to bring the results up to the gold standard, i.e., a dentist's ability to detect oral health abnormalities. For this reason, providing training for healthcare professionals prior to administering the tool would ensure more accurate identification of abnormalities that may be present during screening. This would

potentially lower the rate of false positives and negatives while bringing the process closer to the gold standard, i.e., inter-examiner reliability and quite likely intra-examiner reliability, as well.

Third, the target population for the oral health assessment tool is frail Canadian seniors living in nursing homes or receiving care in the home setting. Many long-term care residents suffer from neurocognitive disorders that reduce their level of cooperation with medical care and clinical examinations. As a result of their cognitive impairments, they will likely not tolerate an oral health assessment for long. Healthcare professionals will thus have a limited amount of time to examine the condition of the various oral structures and other components of oral health. Given this, training on how to administer the tool will allow non-dental healthcare professionals to rapidly and accurately screen for abnormal oral conditions.

Development of the tool administration training should include an accurate and detailed description of the various conditions of oral structures and health components. Training content should be explicit, with a focus on illustrating the various oral conditions that may be encountered while administering the tool. This exercise should be carried out methodically and be conducted individually, one oral structure at a time, followed by each of the other oral health components.

A brief training course in the form of online video capsules, would be the most appropriate strategy in the current context. The training should be readily accessible at all times to allow for repeated use.

1.11. Comparison between the illustrated tool and other existing oral health assessment tools

Most oral health assessment tools are designed in written format, while the illustrated tool incorporates images and short written descriptions of the various levels of normality and abnormality of the assessed items. For non-dental healthcare professionals, a simple written description of the various states of normality and abnormality is not enough to cement a mental image of these states expressed in key words. The use of key words and integrated visual depictions of the states of oral structures and other health components appears to counter this potential issue. Images representing the situations encountered during screening allow the examiner to more readily integrate any information, as written descriptions are not enough to allow the examiner to build a mental image of the conditions.

Another difference between the illustrated tool and other oral health assessment tools is the fact that the illustrated tool provides a progressive description, using the appropriate terms, of physical and qualitative tissue changes in oral structures and other oral health components. The illustrated tool divides levels of severity into “normal condition,” “mild to moderate abnormal condition,” and “severe abnormal condition.” Other tools use more static qualifiers for the described condition or terms less tailored to the item being assessed. For example, OHAT uses the concepts of “healthy,” “changes” and “unhealthy” to describe the degree of achievement of the parameters it assesses. The progression from a “healthy” to an “unhealthy” condition of the oral structures is easy to comprehend. However, the “changes” concept involves only the presence of some variation in the analyzed structures without necessarily indicating either its direction or extent. In addition, for items assessed in OHAT that are not considered oral structures, the qualification of “healthy,” “changes” or “unhealthy” does not fully apply. It would be unusual to describe undamaged

prosthodontics, saliva quality or the concept of pain as healthy, changes or unhealthy. More specific terms would describe them better.

Compared to the illustrated tool presented in this report, most oral health assessment tools take an individual's overall point score into account when qualifying the person's state of oral health. However, as described in previous sections of this document, an overall score is not necessarily a reliable indicator of a given individual's oral health. Each of the elements that constitutes oral health must be analyzed using a dimension specific to it, as each element influences oral health differently. As a result, these components must be given a weighted point value based on their relative importance to determining a person's oral health status. Overall scoring would thus properly reflect the person's state of oral health.

In the illustrated tool, the principle of quantification of changes to the oral structures was eliminated during development. However, other tools, such as OHAT and BOHSE, estimate the number of changes as "one to three decayed teeth" or "four or more caries." Most non-dental healthcare professionals would be hard pressed to determine the exact number of decayed teeth, in part owing to inexperience in spotting dental caries and also in a context where the person being examined may provide limited cooperation. OHAT also indicates that the presence of "one to three decayed teeth" falls into the "changes" category, while the presence of "four or more caries" is in the "unhealthy" category. On the one hand, questions arise as to the choice of these quantities as benchmarks in categorizing the condition of a person's teeth. The reasoning behind making "one to three decayed teeth" to "four or more caries" lead to a change in level of tooth condition, to the point that they end up in different categories, was neither evoked nor scientifically justified. On the other hand, in this rating system, tooth decay severity does not seem to enter into OHAT's categorization of tooth

condition. In the illustrated tool, the assessment is different and progressive throughout all levels of the various categories. We focus on the concept of severity and extent, both with caries and other abnormal oral conditions, by using photographs. This allows users without advanced oral health training to recognize the scope of the involvement without having to build a mental image they have neither the training nor the experience to construct. Adopting these principles for the illustrated tool makes it easier to assess an individual's oral health within a limited time frame. It is important to emphasize that the illustrated tool refers to the concept of quantity solely in assessing removable prosthodontics, as these can be removed from the individual's mouth and subsequently assessed. Quantifying changes in removable prosthodontics thus becomes feasible, with a low risk of error.

Lastly, the illustrated tool is the only existing oral health assessment tool to include a category for dental implants. Adding this category was justified by the increasingly common presence of dental implants within the senior population. Abnormal conditions are also associated with them, such as peri-implant mucositis and peri-implantitis, which may require intervention to enable recovery.

Section IV: Conclusion

Data collected on the oral health status of vulnerable seniors in Canada is worrisome. Seniors have particular difficulty maintaining their oral health owing to loss of autonomy, limited access to professional dental care in dentists' offices and low numbers of oral health professionals in nursing homes. For these reasons, it was determined that early screening for abnormal oral conditions in frail seniors would make it possible to manage these conditions in a timely manner, thus limiting both any worsening of the abnormal condition and the complexity of the required treatments. It was also determined that the screening could be carried out by non-dental healthcare professionals, as they are in regular contact with frail seniors. Developing a tool for oral health assessment in seniors designed to be administered by non-dental professionals would appear to be an effective solution that will help maintain optimal oral health.

Conducted as part of this report, the systematic review of tools for oral health assessment in seniors designed for non-dental healthcare professionals found that the OHAT, BOHSE, ROAG and DHR tools had a certain reliability and limited validity in screening for abnormal oral conditions. Overall, all the tools had significant shortcomings and numerous weaknesses. For this reason, they did not meet the criteria to be considered reference tools for oral health assessment or abnormal oral condition detection in seniors. One major shortcoming was the lack of experience in and knowledge of oral health on the part of healthcare professionals with respect to the condition of oral structures and other oral health components. It is difficult for non-dental healthcare professionals to construct a mental image of the condition of an oral health structure or component based solely on a short written description. Including images in a tool for assessing seniors' oral health that is designed for non-dental healthcare professionals was a must.

Following the conclusions drawn from the systematic review, a tool for assessing seniors' oral health that was primarily image-based, with accompanying brief written descriptions, was developed for use by non-dental healthcare professionals. Thanks to the images, the tool supports professionals' decision making in detecting

the most common abnormal oral conditions among seniors and prevents professionals from building an erroneous mental image of the condition based on the provided written description. To support healthcare professionals through the process, a brief training course on what to look for in assessing oral structures should be provided. This would improve screening for abnormal oral conditions. The next step should be to begin the tool validation process, which will accurately determine whether the tool's psychometric properties, i.e., those that provide information about the quality of the tool's measurement, are adequate.

References

1. Fülöp T. Biologie du vieillissement. Dans: Arcand M, rédacteur. Précis pratique de gériatrie. St-Hyacinthe: Edisem; 2011. p. 17-35.
2. [Online]. Statistics Canada. Age and sex structure: Canada, provinces and territories, 2010; 2010. Available: https://www150.statcan.gc.ca/n1/pub/91-209-x/2011001/article/11511-eng.htm
3. [Online]. Government of Canada. Aging and chronic diseases: A profile of Canadian seniors; Dec 2020. Available: https://www.canada.ca/en/public-health/services/publications/diseases-conditions/aging-chronic-diseases-profile-canadian-seniors-executive-summary.html
4. Dörfer C, Benz C, Aida J, Campard G. The relationship of oral health with general health and NCDs: a brief review. Int Dent J. Sept 2017;67 Suppl 2:14-8.
5. Merck Manual: Professional version [Online]. Tunkel AR. Bacteremia. Available: https://www.merckmanuals.com/en-ca/professional/infectious-diseases/biology-of-infectious-disease/bacteremia
6. van der Maarel-Wierink CD, Vanobbergen JNO, Bronkhorst EM, Schols JMGA, de Baat C. Oral health care and aspiration pneumonia in frail older people: a systematic literature review. Gerodontology. Mar 2013;30(1):3-9.
7. Dick G, Lederman B, Hyde S. Oral Diseases & Disorders. Dans: Williams BA, Chang A, Ahalt C, Chen H, Conant R, Landefeld CS, et al., editors. Current Diagnosis & Treatment: Geriatrics, 2nd [Online]. New York, NY: McGraw-Hill Education; 2014 [cited on 14 Jan 2019]. Available: accessmedicine.mhmedical.com/content.aspx?aid=1100069239
8. Macentee MI, Hole R, Stolar E. The significance of the mouth in old age. Social Science & Medicine [Online]. Nov 1997 [cited on 11 Jul 2021];45(9):1449-58. Available: https://linkinghub.elsevier.com/retrieve/pii/S0277953697000774
9. Marshall TA, Warren JJ, Hand JS, Xie X-J, Stumbo PJ. Oral health, nutrient intake and dietary quality in the very old. The Journal of the American Dental Association [Online]. Oct 2002 [cited on 11 Jul 2021];133(10):1369-79. Available: https://linkinghub.elsevier.com/retrieve/pii/S0002817714636230
10. Soini H, Routasalo P, Lauri S, Ainamo A. Oral and nutritional status in frail elderly. Special Care in Dentistry [Online]. Nov 2003 [cited on 11 Jul 2021];23(6):209-15. Available: https://onlinelibrary.wiley.com/doi/10.1111/j.1754-4505.2003.tb00314.x
11. N'Gom PI, Woda A. Influence of impaired mastication on nutrition. The Journal of Prosthetic Dentistry [Online]. Jun 2002 [cited on 11 Jul 2021];87(6):667-73. Available: https://linkinghub.elsevier.com/retrieve/pii/S002239130200029X
12. Tessier J-F, Pareaud M. Maintien à domicile. Dans: Clément J-P, rédacteur. Psychiatrie de la personne âgée. Paris: Flammarion médecine-sciences; 2010. p. 512-22.
13. Saintrain MV de L, Saintrain SV, Sampaio EGM, Ferreira BSP, Nepomuceno TC, Frota MA, et al. Older adults' dependence in activities of daily living: Implications for oral health. Public Health Nursing [Online]. Nov 2018 [cited on 5 Jul 2021];35(6):473-81. Available: http://doi.wiley.com/10.1111/phn.12529
14. Brennan LJ, Strauss J. Cognitive Impairment in Older Adults and Oral Health Considerations. Dental Clinics of North America [Online]. Oct 2014 [cited on 23 May 2018];58(4):815-28. Available: http://linkinghub.elsevier.com/retrieve/pii/S0011853214000640

15. Brennan LJ, Strauss J. Cognitive Impairment in Older Adults and Oral Health Considerations. Dental Clinics of North America [Online]. Oct 2014 [cited on 27 Aug 2018];58(4):815-28. Available: http://linkinghub.elsevier.com/retrieve/pii/S0011853214000640
16. Saintrain MV de L, Saintrain SV, Sampaio EGM, Ferreira BSP, Nepomuceno TC, Frota MA, et al. Older adults' dependence in activities of daily living: Implications for oral health. Public Health Nursing [Online]. 16 Jul 2018 [cited on 3 Oct 2018]; Available: http://doi.wiley.com/10.1111/phn.12529
17. Klotz A-L, Zajac M, Ehret J, Kilian S, Rammelsberg P, Zenthöfer A. Which factors influence the oral health of nursing-home residents with cognitive and motor impairments? Aging Clin Exp Res. Jan 2021;33(1):85-93.
18. Nangle MR, Riches J, Grainger SA, Manchery N, Sachdev PS, Henry JD. Oral Health and Cognitive Function in Older Adults: A Systematic Review. Gerontology. 2019;65(6):659-72.
19. Kang J, Wu B, Bunce D, Ide M, Pavitt S, Wu J. Cognitive function and oral health among ageing adults. Community Dent Oral Epidemiol. Jun 2019;47(3):259-66.
20. Lauritano D, Moreo G, Della Vella F, Di Stasio D, Carinci F, Lucchese A, et al. Oral Health Status and Need for Oral Care in an Aging Population: A Systematic Review. Int J Environ Res Public Health. 18 Nov 2019;16(22):E4558.
21. Gil-Montoya JA, Barrios R, Sánchez-Lara I, Carnero-Pardo C, Fornieles-Rubio F, Montes J, et al. Prevalence of Drug-Induced Xerostomia in Older Adults with Cognitive Impairment or Dementia: An Observational Study. Drugs Aging. 2016;33(8):611-8.
22. Vijayakumar D, Jankovic J. Drug-Induced Dyskinesia, Part 1: Treatment of Levodopa-Induced Dyskinesia. Drugs. May 2016;76(7):759-77.
23. Almomani F, Hamasha AA-H, Williams KB, Almomani M. Oral health status and physical, mental and cognitive disabilities among nursing home residents in Jordan. Gerodontology. England; Jun 2015;32(2):90-9.
24. Bourque M, Voyer P. La gestion des symptômes comportamentaux et psychologiques de la démence. Dans: Voyer P, rédacteur. Soins infirmiers aux aînés en perte d'autonomie. Montréal: Pearson/ERPI; 2013. p. 451-78.
25. Roe B, Howell F, Riniotis K, Beech R, Crome P, Ong BN. Older people's experience of falls: understanding, interpretation and autonomy. J Adv Nurs. Sept 2008;63(6):586-96.
26. Hébert R, Tessier D. Perte d'autonomie. Dans: Arcand M, rédacteur. Précis pratique de gériatrie. St-Hyacinthe: Edisem; 2011. p. 171-85.
27. Batista LM, Portela de Oliveira MT, Magalhaes WB, Bastos PL. Oral Hygiene in Patients with Parkinson's Disease. R I Med J (2013). 2 Nov 2015;98(11):35-7.
28. [Online]. Canadian Dental Association. Position Paper on Access to Oral Health Care for Canadians; 2010. Available: https://www.cda-adc.ca/en/about/position_statements/accesstocarepaper
29. Canadian Academy of Health Sciences. Improving access to oral health care for vulnerable people living in Canada. [Online]. 2014 [cited on 5 Dec 2020]. Available: https://www.deslibris.ca/ID/243917
30. Melladee F. M. Les inquiétudes que soulève l'accès aux soins dentaires pour les personnes âgées. Journal Canadian Dental Association. 2001;67(9):504-6.
31. Caron C. Consultation publique sur les conditions de vie des aînés. Québec: Centre d'excellence

pour la santé buccodentaire et le vieillissement; 2007.
32. Catteau C, Piaton S, Nicolas E, Hennequin M, Lassauzay C. Assessment of the oral health knowledge of healthcare providers in geriatric nursing homes: additional training needs required. Gerodontology [Online]. 2016;33(1):11-9. Available: https://www.embase.com/search/results?subaction=viewrecord&id=L620641551&from=export
33. Preston AJ, Punekar S, Gosney MA. Oral care of elderly patients: nurses' knowledge and views. Postgrad Med J. Feb 2000;76(892):89-91.
34. Paulsson G, Nederfors T, Fridlund B. Conceptions of oral health among nurse managers. A qualitative analysis. J Nurs Manag. Sept 1999;7(5):299-306.
35. Chen X, Clark JJ, Chen H, Naorungroj S. Cognitive impairment, oral self-care function and dental caries severity in community-dwelling older adults. Gerodontology [Online]. 2015;32(1):53-61. Available: https://www.embase.com/search/results?subaction=viewrecord&id=L615082638&from=export
36. Hatipoglu MG, Kabay SC, Güven G. The clinical evaluation of the oral status in Alzheimer-type dementia patients. Gerodontology. Dec 2011;28(4):302-6.
37. Emami E, Kabawat M, De Koninck L, Gauthier G, De Grandmont P, Barbeau J. LA STOMATITE PROTHÉTIQUE : NOUVELLE PERSPECTIVE. Journal de l'Ordre des dentistes du Québec. 2013;50(4):7-12.
38. Syrjälä A-MH, Ylöstalo P, Ruoppi P, Komulainen K, Hartikainen S, Sulkava R, et al. Dementia and oral health among subjects aged 75 years or older: Dementia and oral health. Gerodontology. Mar 2012;29(1):36-42.
39. Chen X, Shuman SK, Hodges JS, Gatewood LC, Xu J. Patterns of tooth loss in older adults with and without dementia: a retrospective study based on a Minnesota cohort. J Am Geriatr Soc. Dec 2010;58(12):2300-7.
40. Nazir M, Al-Ansari A, Al-Khalifa K, Alhareky M, Gaffar B, Almas K. Global Prevalence of Periodontal Disease and Lack of Its Surveillance. ScientificWorldJournal. 2020;2020:2146160.
41. Elsig F, Schimmel M, Duvernay E, Giannelli SV, Graf CE, Carlier S, et al. Tooth loss, chewing efficiency and cognitive impairment in geriatric patients. Gerodontology. Jun 2015;32(2):149-56.
42. Kulak-Ozkan Y, Kazazoglu E, Arikan A. Oral hygiene habits, denture cleanliness, presence of yeasts and stomatitis in elderly people. J Oral Rehabil. Mar 2002;29(3):300-4.
43. Yoon MN, Ickert C, Slaughter SE, Lengyel C, Carrier N, Keller H. Oral health status of long-term care residents in Canada: Results of a national cross-sectional study. Gerodontology [Online]. Dec 2018 [cited on 7 Dec 2020];35(4):359-64. Available: https://onlinelibrary.wiley.com/doi/abs/10.1111/ger.12356
44. Hoeksema AR, Peters LL, Raghoebar GM, Meijer HJA, Vissink A, Visser A. Oral health status and need for oral care of care-dependent indwelling elderly: from admission to death. Clin Oral Investig. Sept 2017;21(7):2189-96.
45. Frenkel H, Harvey I, Newcombe RG. Oral health care among nursing home residents in Avon. Gerodontology. England; Jul 2000;17(1):33-8.
46. Zenthöfer A, Schröder J, Cabrera T, Rammelsberg P, Hassel AJ. Comparison of oral health among older people with and without dementia. Community Dent Health. Mar 2014;31(1):27-31.
47. Zenthöfer A, Navratil SD, Rammelsberg P, Cabrera T, Gorenc L, Urbanowitsch N, et al. Oral health

and apraxia among institutionalized elderly people—A pilot study. Acta Odontologica Scandinavica [Online]. 17 Feb 2015;73(2):150-5. Available: https://doi.org/10.3109/00016357.2014.961956
48. Gil-Montoya JA, Sánchez-Lara I, Carnero-Pardo C, Fornieles-Rubio F, Montes J, Barrios R, et al. Oral Hygiene in the Elderly with Different Degrees of Cognitive Impairment and Dementia. J Am Geriatr Soc. Mar 2017;65(3):642-7.
49. Chen X, Clark JJ, Naorungroj S. Oral health in nursing home residents with different cognitive statuses. Gerodontology [Online]. 2013;30(1):49-60. Available: https://www.embase.com/search/results?subaction=viewrecord&id=L563020594&from=export
50. Hopcraft MS, Morgan MV, Satur JG, Wright FA, Darby IB. Oral hygiene and periodontal disease in Victorian nursing homes. Gerodontology [Online]. 2012;29(2):e220-228. Available: https://www.embase.com/search/results?subaction=viewrecord&id=L366359158&from=export
51. [Online]. Canadian Dental Association. The State of Oral Health in Canada; Mar 2017. Available: https://www.cda-adc.ca/stateoforalhealth/_files/TheStateofOralHealthinCanada.pdf
52. [Online]. Government of Quebec. Tooth Decay; 2019. Available: https://www.quebec.ca/en/health/health-issues/a-z/tooth-decay
53. Delwel S, Binnekade TT, Perez RSGM, Hertogh CMPM, Scherder EJA, Lobbezoo F. Oral health and orofacial pain in older people with dementia: a systematic review with focus on dental hard tissues. Clin Oral Investig. Jan 2017;21(1):17-32.
54. Zhang J, Leung KCM, Sardana D, Wong MCM, Lo ECM. Risk predictors of dental root caries: A systematic review. Journal of Dentistry [Online]. Oct 2019 [cited on 2 Jul 2021];89:103166. Available: https://linkinghub.elsevier.com/retrieve/pii/S0300571219301484
55. Locker D, Leake JL. Coronal and Root Decay Experience in Older Adults in Ontario, Canada. J Public Health Dent [Online]. Sept 1993 [cited on 2 Jul 2021];53(3):158-64. Available: http://doi.wiley.com/10.1111/j.1752-7325.1993.tb02695.x
56. Kuc IM, Samaranayake LP, van Heyst EN. Oral health and microflora in an institutionalised elderly population in Canada. Int Dent J. Feb 1999;49(1):33-40.
57. Matthews DC, Clovis JB, Brillant MGS, Filiaggi MJ, McNally ME, Kotzer RD, et al. Oral health status of long-term care residents-a vulnerable population. J Can Dent Assoc. 2012;78:c3.
58. Müller F, Shimazaki Y, Kahabuka F, Schimmel M. Oral health for an ageing population: the importance of a natural dentition in older adults. Int Dent J [Online]. Oct 2017 [cited on 6 Dec 2020];67:7-13. Available: http://doi.wiley.com/10.1111/idj.12329
59. Van der Putten G-J, De Visschere L, van der Maarel-Wierink C, Vanobbergen J, Schols J. The importance of oral health in (frail) elderly people – a review. European Geriatric Medicine [Online]. Nov 2013 [cited on 30 Mar 2021];4(5):339-44. Available: https://linkinghub.elsevier.com/retrieve/pii/S187876491300123X
60. Wong FMF, Ng YTY, Leung WK. Oral Health and Its Associated Factors Among Older Institutionalized Residents—A Systematic Review. IJERPH [Online]. 26 Oct 2019 [cited on 31 Mar 2021];16(21):4132. Available: https://www.mdpi.com/1660-4601/16/21/4132
61. Ziebolz D, Werner C, Schmalz G, Nitschke I, Haak R, Mausberg RF, et al. Oral Health and nutritional status in nursing home residents-results of an explorative cross-sectional pilot study. BMC

Geriatr. 31 Jan 2017;17(1):39.
62. [Online]. Government of Canada . Report on the findings of the oral health component of the Canadian Health Measures Survey 2007-2009; 2010 [cited on 2 Dec 2020]. Available: http://www.publications.gc.ca/site/fra/9.693376/publication.html
63. McKeown L, Woodbeck H, Lloyd M. A journey to improve oral care with best practices in long-term care. CANADIAN JOURNAL OF DENTAL HYGIENE. 2014;48(2):57-62.
64. Adam H, Preston AJ. The oral health of individuals with dementia in nursing homes. Gerodontology. Jun 2006;23(2):99-105.
65. Aragón F, Zea-Sevilla MA, Montero J, Sancho P, Corral R, Tejedor C, et al. Oral health in Alzheimer's disease: a multicenter case-control study. Clin Oral Investig. Dec 2018;22(9):3061-70.
66. Burke FJ, Wilson NH. Measuring oral health: an historical view and details of a contemporary oral health index (OHX). Int Dent J. Dec 1995;45(6):358-70.
67. Chalmers JM, Pearson A. A systematic review of oral health assessment by nurses and carers for residents with dementia in residential care facilities. Spec Care Dentist. Oct 2005;25(5):227-33.
68. Grönbeck Lindén I, Andersson P, Dahlin-Ivanoff S, Gahnberg L, Hägglin C. Development of an instrument to assess oral hygiene ability in older adults: The oral hygiene ability instrument. Gerodontology [Online]. Mar 2020 [cited on 25 Apr 2021];37(1):19-27. Available: https://onlinelibrary.wiley.com/doi/abs/10.1111/ger.12437
69. Miremadi S, Cosyn J, Janssens B, De Bruyn H, Vanobbergen J, De Visschere L. A pilot assessment tool of the need for oral health care and cost prediction in institutionalized elderly people. Int J Dent Hygiene [Online]. Nov 2017 [cited on 25 Apr 2021];15(4):306-12. Available: http://doi.wiley.com/10.1111/idh.12222
70. Ohno T, Heshiki Y, Kogure M, Sumi Y, Miura H. Comparison of Oral Assessment Results Between Non-Oral and Oral Feeding Patients: A Preliminary Study. J Gerontol Nurs. 1 Apr 2017;43(4):23-8.
71. Porter J, Ntouva A, Read A, Murdoch M, Ola D, Tsakos G. The impact of oral health on the quality of life of nursing home residents. Health Qual Life Outcomes [Online]. Dec 2015 [cited on 25 Apr 2021];13(1):102. Available: http://hqlo.biomedcentral.com/articles/10.1186/s12955-015-0300-y
72. Schüler IM, Kurtz B, Heinrich-Weltzien R, Lehmann T, Kwetkat A. Testing the ability for autonomous oral hygiene in hospitalized geriatric patients-clinical validation study. Clin Oral Investig. Mar 2021;25(3):1059-68.
73. MacEntee MI, Brondani M, Avivi-Arber L, Bartlett D, Donnelly L, Duyck J, et al. Clinical Oral Disorders in Adults Screening Protocol (CODA-SP) from the 2019 Vancouver IADR Consensus Symposium. Gerodontology [Online]. Mar 2021 [cited on 1 May 2021];38(1):5-16. Available: https://onlinelibrary.wiley.com/doi/10.1111/ger.12496
74. Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. J Dent Educ. Nov 1990;54(11):680-7.
75. Andersson P, Hallberg IR, Renvert S. Inter-rater reliability of an oral assessment guide for elderly patients residing in a rehabilitation ward. Special Care in Dentistry [Online]. Sept 2002 [cited on 25 Apr 2021];22(5):181-6. Available: http://doi.wiley.com/10.1111/j.1754-4505.2002.tb00268.x
76. Arvidson-Bufano UB, Blank LW, Yellowitz JA. Nurses' oral health assessments of nursing home

residents pre- and post-training: A pilot study. Special Care in Dentistry [Online]. Mar 1996 [cited on 25 Apr 2021];16(2):58-64. Available: http://doi.wiley.com/10.1111/j.1754-4505.1996.tb00835.x
77. Chalmers J, King P, Spencer A, Wright F, Carter K. The Oral Health Assessment Tool — Validity and reliability. Aust Dental J [Online]. Sept 2005 [cited on 25 Apr 2021];50(3):191-9. Available: http://doi.wiley.com/10.1111/j.1834-7819.2005.tb00360.x
78. de Almeida Mello J, Tran TD, Krausch-Hofmann S, Meehan B, van Hout H, Turcotte L, et al. Cross-Country Validation of the Association Between Oral Health and General Health in Community-Dwelling Older Adults. Journal of the American Medical Directors Association [Online]. Sept 2019 [cited on 25 Apr 2021];20(9):1137-1142.e2. Available: https://linkinghub.elsevier.com/retrieve/pii/S1525861019302464
79. Dickinson H, Watkins C, Leathley M. The development of the THROAT: the holistic and reliable oral assessment tool. Clinical Effectiveness in Nursing [Online]. Sept 2001 [cited on 25 Apr 2021];5(3):104-10. Available: https://linkinghub.elsevier.com/retrieve/pii/S1361900401902213
80. Fjeld KG, Eide H, Mowe M, Hove LH, Willumsen T. Dental hygiene registration: development, and reliability and validity testing of an assessment scale designed for nurses in institutions. J Clin Nurs [Online]. Jul 2017 [cited on 25 Apr 2021];26(13-14):1845-53. Available: http://doi.wiley.com/10.1111/jocn.13452
81. Hawes C, Morris JN, Phillips CD, Mor V, Fries BE, Nonemaker S. Reliability Estimates for The Minimum Data Set for Nursing Home Resident Assessment and Care Screening (MDS). The Gerontologist [Online]. 1 Apr 1995 [cited on 25 Apr 2021];35(2):172-8. Available: https://academic.oup.com/gerontologist/article-lookup/doi/10.1093/geront/35.2.172
82. Henriksen BM, Ambjørnsen E, Axéll TE. Evaluation of a mucosal-plaque index (MPS) designed to assess oral care in groups of elderly. Spec Care Dentist. Aug 1999;19(4):154-7.
83. Johansson I, Jansson H, Lindmark U. Oral Health Status of Older Adults in Sweden Receiving Elder Care: Findings From Nursing Assessments. Nursing Research [Online]. May 2016 [cited on 25 Apr 2021];65(3):215-23. Available: https://journals.lww.com/00006199-201605000-00006
84. Kayser-Jones J, Bird WF, Paul SM, Long L, Schell ES. An Instrument To Assess the Oral Health Status of Nursing Home Residents. The Gerontologist [Online]. 1 Dec 1995 [cited on 25 Apr 2021];35(6):814-24. Available: https://academic.oup.com/gerontologist/article-lookup/doi/10.1093/geront/35.6.814
85. Krausch-Hofmann S, Tran TD, Janssens B, Declerck D, Lesaffre E, de Almeida Mello J, et al. Assessment of oral health in older adults by non-dental professional caregivers—development and validation of a photograph-supported oral health–related section for the interRAI suite of instruments. Clin Oral Invest [Online]. 16 Nov 2020 [cited on 25 Apr 2021]; Available: http://link.springer.com/10.1007/s00784-020-03669-8
86. Morris JN, Fries BE, Steel K, Ikegami N, Bernabei R, Carpenter GI, et al. Comprehensive Clinical Assessment in Community Setting: Applicability of the MDS-HC. Journal of the American Geriatrics Society [Online]. Aug 1997 [cited on 25 Apr 2021];45(8):1017-24. Available: http://doi.wiley.com/10.1111/j.1532-5415.1997.tb02975.x
87. Tsukada S, Ito K, Stegaroiu R, Shibata S, Ohuchi A. An oral health and function screening tool for nursing personnel of long-term care facilities to identify the need for dentist referral without preliminary training. Gerodontology [Online]. Jun 2017 [cited on 25 Apr 2021];34(2):232-9. Available:

http://doi.wiley.com/10.1111/ger.12255
88. Yanagisawa S, Nakano M, Goto T, Yoshioka M, Shirayama Y. Development of an Oral Assessment Sheet for Evaluating Older Adults in Nursing Homes. Research in Gerontological Nursing [Online]. Sept 2017 [cited on 25 Apr 2021];10(5):234-9. Available: http://journals.healio.com/doi/10.3928/19404921-20170621-04
89. Everaars B, Weening-Verbree LF, Jerković-Ćosić K, Schoonmade L, Bleijenberg N, de Wit NJ, et al. Measurement properties of oral health assessments for non-dental healthcare professionals in older people: a systematic review. BMC Geriatr [Online]. Dec 2020 [cited on 25 Apr 2021];20(1):4. Available: https://bmcgeriatr.biomedcentral.com/articles/10.1186/s12877-019-1349-y
90. Thapa R, Chimoriya R, Arora A. The development and psychometric properties of oral health assessment instruments used by non-dental professionals for nursing home residents: a systematic review. BMC Geriatr [Online]. Dec 2021 [cited on 25 Apr 2021];21(1):35. Available: https://bmcgeriatr.biomedcentral.com/articles/10.1186/s12877-020-01989-8
91. McInnes MDF, Moher D, Thombs BD, McGrath TA, Bossuyt PM, and the PRISMA-DTA Group. Preferred Reporting Items for a Systematic Review and Meta-analysis of Diagnostic Test Accuracy Studies: The PRISMA-DTA Statement. JAMA [Online]. 23 Jan 2018 [cited on 28 Dec 2020];319(4):388-96. Available: https://doi.org/10.1001/jama.2017.19163
92. Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ [Online]. 2 Jan 2015 [cited on 29 Dec 2020];349(Jan02 1):g7647-g7647. Available: https://www.bmj.com/lookup/doi/10.1136/bmj.g7647
93. [Online]. Consortium national de formation en santé - Volet Université d'Ottawa. Protocoles d'évaluation; 2021. Available: https://cnfs.ca/agees/protocoles-d-evaluation
94. Mokkink LB, de Vet HCW, Prinsen CAC, Patrick DL, Alonso J, Bouter LM, et al. COSMIN Risk of Bias checklist for systematic reviews of Patient-Reported Outcome Measures. Qual Life Res [Online]. May 2018 [cited on 25 Apr 2021];27(5):1171-9. Available: http://link.springer.com/10.1007/s11136-017-1765-4
95. Mokkink L, Prinsen C, Donald Patrick, Jordi Alonso, Bouter L, de Vet HCW, et al. COSMIN methodology for systematic reviews of Patient-Reported Outcome Measures (PROMs). 2018 p. 1-78.
96. Fields A, Uppal S, LaRochelle-Côté S. The impact of aging on labour market participation rates [Online]. Canada: Statistics Canada; Jun 2017 p. 11. Report no No 75-006-X in the catalogue. Available: https://www150.statcan.gc.ca/n1/en/pub/75-006-x/2017001/article/14826-eng.pdf?st=UHypFwta
97. Tsukada S, Shibata S, Kajii Y, Stegaroiu R, Ohuchi A. Investigation of screening sheet for multiple-professional use to judge necessity for dental intervention in inpatients: Considerations based on comparison of screening results by dentist and dental hygienist. J Jpn Soc Dent Hyg. 2012;7:43-54.
98. Eilers J, Berger AM, Petersen MC. Development, testing, and application of the oral assessment guide. Oncol Nurs Forum. Jun 1988;15(3):325-30.
99. Greene JC, Vermillion JR. THE SIMPLIFIED ORAL HYGIENE INDEX. J Am Dent Assoc. Jan 1964;68:7-13.

Appendix I: Research Equations

MEDLINE via PUBMED		
#1	"assess*"[All Fields] OR "oral assessment*"[Title/Abstract] OR "screening"[All Fields] OR "instrument*"[Title/Abstract] OR "index"[Title/Abstract] OR "geriatric assessment*"[MeSH Terms] OR "Nursing Assessment"[MeSH Terms] OR "Tool assessment"[Title/Abstract]	**624**
#2	"oral health"[MeSH Terms] OR "oral health"[Title/Abstract] OR "oral health"[All Fields] OR "Oral Hygiene"[MeSH Terms] OR "oral disorder"[Title/Abstract] OR "dental"[Title/Abstract] OR "Toothache"[All Fields] OR "Dental Care for Aged"[MeSH Terms] OR "dental prosthesis"[Title/Abstract]	
#3	"aged"[MeSH Terms] OR "older adults"[Title/Abstract] OR "Frail Elderly"[MeSH Terms] OR "aged, 80 and over"[MeSH Terms]	
#4	"nurs*"[Title/Abstract] OR "caregiver*"[MeSH Terms] OR "Nursing"[MeSH Major Topic:noexp] OR "carer*"[Title/Abstract] OR ("nursing homes"[MeSH Terms] OR ("Nursing"[All Fields] AND "home*"[All Fields]) OR "nursing home*"[All Fields])	
#5	#1 AND #2 AND # 3 AND #4	

MEDLINE via OVID		
#1	assess$.af. or oral assessment$.ab,ti. or screening.af. or instrument.ab,ti. or index.ab,ti. or geriatric assessment.sh. or Nursing Assessment.sh. or Tool assessment.ab,ti.	**588**
#2	oral health.sh. or oral health.ab,ti. or oral health.af. or Oral Hygiene.sh. or oral disorder.ab,ti. or dental.ab,ti. or Toothache.af. or Dental Care for Aged.sh. or dental prosthesis.ab,ti.	
#3	aged.sh. or older adults.ab,ti. or Frail Elderly.sh. or "aged 80 and over".sh.	
#4	nurs$.ab,ti. or caregiver$.sh. or Nursing.sh. or carer$.ab,ti. or nursing homes.sh. or (Nursing and home$).af. or nursing home$.af.	
#5	#1 AND #2 AND #3 AND #4	

EMBASE		
#1	geriatric assessment'/exp OR 'dental disease assessment'/exp OR 'assess*' OR 'screening' OR 'instrument':ab,ti OR 'index':ab,ti OR 'oral assessment':ti,ab OR 'nursing assessment'/exp OR 'clinical assessment tool'/exp OR tool:ab,ti	**619**
#2	tooth disease'/exp OR 'dental health'/exp OR 'dental care' OR 'tooth pain'/exp OR 'mouth hygiene'/exp OR 'oral hygiene index'/exp OR 'dental':ab,ti OR 'dental prevention'/exp	
#3	aged'/exp OR 'elderly care':ti,ab OR 'functionally impaired':ab,ti OR 'frail elderly':ab,ti OR 'institutionalized elderly':ab,ti OR 'very elderly':ab,ti	
#4	nursing home personnel'/exp OR 'nursing'/exp OR 'nursing home'/exp OR 'caregiver'/exp OR 'nurs*':ab,ti OR 'paramedical personnel':ab,ti OR 'nursing assistant':ab,ti	

COCHRANE		
#1	MeSH descriptor: [Geriatric Assessment] this term only	**145**
#2	MeSH descriptor: [Nursing Assessment] this term only	
#3	("assessment") OR ("screening") OR ("instrument*"):ti,ab,kw OR ("index"):ti,ab,kw OR ("oral assessment"):ti,ab,kw	
#4	#1 OR #2 OR #3	
#5	MeSH descriptor: [Oral Health] this term only	
#6	MeSH descriptor: [Oral Hygiene] this term only	
#7	MeSH descriptor: [Dental Care for Aged] explode all trees	
#8	("oral health"):ti,ab,kw OR ("dental"):ti,ab,kw	
#9	#5 OR #6 OR #7 OR #8	
#10	MeSH descriptor: [Aged] in all MeSH products	
#11	MeSH descriptor: [Frail Elderly] explode all trees	
#12	MeSH descriptor: [Aged, 80 and over] explode all trees	
#13	("older adults"):ti,ab,kw OR ("elderly care"):ti,ab,kw OR ("elderly care"):ti,ab,kw	
#14	#10 OR #11 OR #12 OR #13	
#15	MeSH descriptor: [Caregivers] this term only	
#16	MeSH descriptor: [Nursing] in all MeSH products	
#17	MeSH descriptor: [Nursing Homes] explode all trees	
#18	("carer*"):ti,ab,kw OR ("nurs*"):ti,ab,kw	
#19	#15 OR #16 OR #17 OR #18	
#20	#4 AND #9 AND 14 AND 19	

CINAHL

#1	DE "Geriatric Assessment" OR TI ("oral assessment" OR "assessment tools" OR "instrument*" OR "index") OR AB ("oral assessment" OR "assessment tools" OR "instrument*" OR "index") OR TX ("assess*" OR "screening")	**467**
#2	DE ("Oral Health" OR "Dental Health" OR "Teeth") OR TI ("oral health" OR "oral disorders" OR "oral hygiene" OR "Oral care" OR "mouth care" OR "dental" OR "Dental prothesis") OR AB ("oral health" OR "oral disorders" OR "oral hygiene" OR "Oral care" OR "mouth care" OR "dental" OR "Dental prosthesis") OR TX ("oral health" OR "toothache")	
#3	DE ("Older Adults" OR "Frail Elderly" OR "80 ") OR TI ("older adults" OR "elderly" OR "geriatric*" OR "aging" OR "senior*" OR "older people" OR "65+") OR AB ("older adults" OR "elderly" OR "geriatric*" OR "aging" OR "senior*" OR "older people" OR "65+")	
#4	DE ("Caregivers" OR "Nursing" OR "Nursing Homes") OR TI ("nurs*" OR "carer*") OR AB ("nurs*" OR "carer*") OR TX ("nursing home*")	
#5	#1 AND #2 AND #3 AND #4	

AGELINE

#1	DE "Geriatric Assessment" OR TI ("oral assessment" OR "assessment tools" OR "instrument*" OR "index") OR AB ("oral assessment" OR "assessment tools" OR "instrument*" OR "index") OR TX ("assess*" OR "screening")	**144**
#2	DE ("Oral Health" OR "Dental Health" OR "Teeth") OR TI ("oral health" OR "oral disorders" OR "oral hygiene" OR "Oral care" OR "mouth care" OR "dental" OR "Dental prothesis") OR AB ("oral health" OR "oral disorders" OR "oral hygiene" OR "Oral care" OR "mouth care" OR "dental" OR "Dental prosthesis") OR TX ("oral health" OR "toothache")	
#3	DE ("Older Adults" OR "Frail Elderly" OR "80 ") OR TI ("older adults" OR "elderly" OR "geriatric*" OR "aging" OR "senior*" OR "older people" OR "65+") OR AB ("older adults" OR "elderly" OR "geriatric*" OR "aging" OR "senior*" OR "older people" OR "65+")	
#4	DE ("Caregivers" OR "Nursing" OR "Nursing Homes") OR TI ("nurs*" OR "carer*") OR AB ("nurs*" OR "carer*") OR TX ("nursing home*")	
#5	#1 AND #2 AND #3 AND #4	

WEB OF SCIENCE		
#1	ALL=("assess*" OR "screening") OR TS=("oral assessment" OR "instrument*" OR "index" OR "tool assessment" OR "geriatric assessment" OR "Nursing assessment")	**466**
#2	TS=("Oral health" OR "Oral disorder" OR "dental" OR "dental prosthesis" OR "Oral hygiene") OR ALL=("Oral health" OR "Toothache")	
#3	TS=("Aged" OR "Frail elderly" OR "aged 80" OR "Older adults")	
#4	ALL=("Nursing homes") OR TS=("Nurs*" OR "Caregiver*" OR "Carer*")	
#5	#1 AND #2 AND #3 AND #4	

GOOGLE SCHOLAR	
("assessment" OR "screening" OR "instrument" OR "index" OR "tool")	**980**
("Oral health" OR "Oral disorder" OR "Oral disease" OR "dental" OR "dental prosthesis" OR "Oral hygiene" OR "Toothache")	
("Frail elderly" OR "aged 80" OR "Older adults")	
("Nursing homes" OR "Nursing" OR "Carers" OR "Caregiver")	
("assessment" OR "screening" OR "instrument" OR "index" OR "tool") AND ("Oral health" OR "Oral" OR "dental" OR "dental prosthesis" OR "Oral hygiene" OR "Toothache") AND ("Frail elderly" OR "Older adults") AND ("Nursing homes" OR "Nursing" OR "Carers")	
("assessment" OR "screening" OR "tool") AND ("Oral health" OR "Oral" OR "dental") AND ("Frail elderly" OR "Older adults") AND ("Nursing homes" OR "Nursing" OR "Carers")	
assessment screening tool instrument index Oral dental "dental prosthesis" toothache elderly Older Nursing Carers Caregiver	
assessment screening tool "Oral health" Oral dental "Frail elderly" "Older adults" "Nursing homes" Nursing Carers	
assessment screening tool oral dental elderly "Older adults" Nursing Carers "Oral Health"	

Appendix II: Identified Tools

a. Oral Health Screening Tool for Nursing Personnel (OHSTNP)

Oral Health Screening Tool for Nursing Personnel (OHSTNP)

ID:	Resident Name:	Gender: Male/Female	Age:
Completed by:	Date: Year Month Day	Length of Examination:	min
Occupation: □Nurse □Caregiver □Dental Hygienist □Dentist □Other ( )			
Number of teeth:	Wearing dentures: □Upper □Lower □Not worn		

Please give a score (0, 1, or 2) for each category (A-L) and enter it in the Category Score column.
Alternatively, please circle individual words (findings) marked with a-f. (Multiple answers possible)

Categories	0 = Good	1 = Fair	2 = Poor	Category Score
A. Lips	a Smooth b Pink c Moist	a Dry b Chapped c Red at corners	a Swelling b White/red/ulcerated patch c Bleeding/ulcerated at corners	
B. Tongue	a Pink b Moist c Roughness	a Fissured b Red c Coated	a Patch that is red and/or white, ulcerated b Swollen	
C. Gums and tissues	a Pink b Moist c Smooth d No bleeding	a Dry b Shiny c Rough d Red e Swollen f One ulcer/sore spot under dentures	a Swollen b Bleeding c Ulcers d White/red patches e Generalized redness under dentures	
D. Saliva	a Moist tissues b Watery and free flowing saliva	a Dry b Sticky tissues c Little saliva present	a Red tissues b Very little saliva present c Saliva is thick	
E. Natural teeth condition	a No decayed teeth b No broken teeth c No decayed/broken roots	a 1-3 decayed or broken teeth/roots	a Four or more decayed or broken teeth/roots	
F. Denture condition	a Not broken b Regularly worn	a One broken area b Only worn for 1-2 h daily c Loose	a More than one broken area b Missing or not worn c Loose and comes off easily	
G. Oral cleanliness	a Clean mouth/ b dentures c No food particles No tartar	a Food particles/tartar/plaque in 1-2 areas of the mouth or on small area of dentures b Halitosis (bad breath)	a Food particles/tartar/plaque in most areas of the mouth or dentures b Sever halitosis (bad breath)	
H. Tongue protrusion beyond the lower lip	a Possible	a Tongue protrusion cannot surpass the lower lip	a Impossible b Impossible because of communication difficulties	
I. Cheek puffing test (Closing the lips and puffing out the cheeks)	a Possible	a Incomplete closing of lips	a Impossible b Impossible because of communication difficulties	
J. Articulation (Pronounce "Pa-n-da-no-ta-ka-ra-mo-no")	a Possible	a Unclear	a Impossible b Impossible because of communication difficulties	
K. Oral intake (as reported by resident/staff)*	a Possible (3 meals per day)	a 1 meal per day or just some spoonfuls	a Impossible	
L. Coughing during meals (as reported by resident/staff)*	a Impossible	a Sometimes	a Often	
* Please circle the respondent.			Total score	/24
Do you think the resident needs to be referred to a dentist?		□Yes	□No	
Please circle the categories (A-L) that led you to determine need for dentist referral.		A B C D E F G H I J K L		

Categories A-G and their descriptors were adapted from the first 7 items of the Oral Health Assessment Tool (OHAT) by Chalmers et al (2004)[5] (with author permission); categories H-L and their descriptors are the translation into English, with modifications, of the last 5 items from the New Oral Screening Sheet by Tsukada et al[2](with permission from J Jpn Soc Dent Hyg)

Tsukada S, Ito K, Stegaroiu R, Shibata S, Ohuchi A. An oral health and function screening tool for nursing personnel of long-term care facilities to identify the need for dentist referral without preliminary training. Gerodontology [Online]. Jun 2017 [cited on 25 Apr 2021];34(2):232-9. Available: http://doi.wiley.com/10.1111/ger.12255

b. Oral Health Assessment Tool (OHAT)

Resident:_____ Completed by:_____				Date:___/___/___
	Scores – *You can circle individual words as well as giving a score in each category (* if 1 or 2 scored for any category please organize for a dentist to examine the resident)*			
Category	0 = healthy	1 = changes*	2 = unhealthy*	Category scores
Lips	smooth, pink, moist	dry, chapped, or red at corners	swelling or lump, white/red/ulcerated patch; bleeding/ulcerated at corners	
Tongue	normal, moist roughness, pink	patchy, fissured, red, coated	patch that is red and/or white, ulcerated, swollen	
Gums and tissues	pink, moist, smooth, no bleeding	dry, shiny, rough, red, swollen, one ulcer/sore spot under dentures	swollen, bleeding, ulcers, white/red patches, generalized redness under dentures	
Saliva	moist tissues, watery and free flowing saliva	dry, sticky tissues, little saliva present, resident thinks they have a dry mouth	tissues parched and red, very little/no saliva present, saliva is thick, resident thinks they have a dry mouth	
Natural teeth Yes/No	no decayed or broken teeth/roots	1-3 decayed or broken teeth/ roots or very worn down teeth	4 + decayed or broken teeth/roots, or very worn down teeth, or less than 4 teeth	
Dentures Yes/No	no broken areas or teeth, dentures regularly worn, and named	1 broken area/tooth or dentures only worn for 1-2 hrs daily, or dentures not named, or loose	more than 1 broken area/tooth, denture missing or not worn, loose and needs denture adhesive, or not named	
Oral cleanliness	clean and no food particles or tartar in mouth or dentures	food particles/tartar/plaque in 1-2 areas of the mouth or on small area of dentures or halitosis (bad breath)	food particles/tartar/plaque in most areas of the mouth or on most of dentures or severe halitosis (bad breath)	
Dental pain	no behavioural, verbal, or physical signs of dental pain	are verbal &/or behavioural signs of pain such as pulling at face, chewing lips, not eating, aggression	are physical pain signs (swelling of cheek or gum, broken teeth, ulcers), as well as verbal &/or behavioural signs (pulling at face, not eating, aggression)	
□ Organize for resident to have a dental examination by a dentist □ Resident and/or family/guardian refuses dental treatment □ Complete Oral Hygiene Care Plan and start oral hygiene care interventions for resident □ Review this resident's oral health again on Date:___/___/___				TOTAL SCORE: ___ **16**

Chalmers J, King P, Spencer A, Wright F, Carter K. The Oral Health Assessment Tool — Validity and reliability. Aust Dental J [Online]. Sept 2005 [cited on 25 Apr 2021];50(3):191-9. Available: http://doi.wiley.com/10.1111/j.1834-7819.2005.tb00360.x

c. Revised Oral Assessment Guide (ROAG)

Category	Method	Numerical and Descriptive Rating			Procedures
		1	2	3	
Voice	Converse with the patient	Normal	Deep or rasping	Difficulty talking or painful	Consult physician
Lips	Observe	Smooth and pink	Dry or cracked, and/or angular chelitis	Ulcerated or bleeding	Consult physician or dentist
Mucous membranes Dentures remove	Observe Use light and mouth mirror	Pink and moist	Dry and/or change in color, red, blue-red or white	Very red, or thick, white coating Blisters or ulceration with or without bleeding	Consult physician or dentist
Tongue	Observe Use light and mouth mirror	Pink, moist and papillae present	Dry, no papillae present or change in color, red or white	Very thick white coating Blisters or ulceration	Consult physician or dentist
Gums	Observe Use light and mouth mirror	Pink and firm	Edematous and/or red	Bleeding easily under finger pressure	Support with oral care Consult dentist or dental hygienist
Teeth/dentures	Observe Use light and mouth mirror	Clean, no debris	1) Plaque or debris in local areas 2) Decayed teeth or damage dentures	Plaque or debris generalized	1) Support with oral care 2) Consult dentist
Saliva	Slide a mouth mirror along the buccal mucosa	No friction between the mouth mirror and mucosa	Slightly increased friction, no tendency for the mirror to adhere the mucosa	Significantly increased friction, the mirror adhering or tending to adhere to the mucosa	Support with oral care Artificial saliva substitute
Swallow	Ask the patient to swallow Observe Ask the patient	Normal swallow	Some pain or difficulty on swallowing	Unable to swallow	Consult physician

Andersson P, Hallberg IR, Renvert S. Inter-rater reliability of an oral assessment guide for elderly patients residing in a rehabilitation ward. Special Care in Dentistry [Online]. Sept 2002 [cited on 25 Apr 2021];22(5):181-6. Available: http://doi.wiley.com/10.1111/j.1754-4505.2002.tb00268.x

d. Revised Oral Assessment Guide-Jönköping (ROAG-J)

Item	Grade 0	Grade 1	Grade 2	Grade 3
Lips		Smooth; bright red; moist	Dry, cracked, sore corners of the mouth	Ulcerated, bleeding
Voice		Normal voice	Dry, hoarse, smacking	Difficult to speak
Mucous membranes		Bright red; moist	Red; dry or areas of discoloration, coating	Wounds, with or without bleeding, blisters
Tongue		Pink, moist with papillae	No papillae, red, dry coating	Ulcers with or without bleeding, blistering
Gums	No gums, only oral mucosa	Light red and solid	Swollen, reddened	Spontaneous bleeding
Teeth	No natural teeth	Clean; no visible coating, food debris	Coating or food debris locally	Coating, food debris generally or broken teeth
Dentures	No prosthetic	Clean; works	Coating or food debris	Not used or malfunctioning
Saliva		Runs freely	Runs sluggishly	Does not run at all

Note. Grades 0 and 1 do not require any actions. Deviations of Grade 2 are to be treated by the nursing staff at the unit with recommended preventive care action. The recommendation for deviations of Grade 3 is to contact a dentist or physician for treatment (Senior Alert, 2015).

Johansson I, Jansson H, Lindmark U. Oral Health Status of Older Adults in Sweden Receiving Elder Care: Findings From Nursing Assessments. Nursing Research [Online]. May 2016 [cited on 25 Apr 2021];65(3):215-23. Available: https://journals.lww.com/00006199-201605000-00006

e. Minimum Data Set (MDS)

MINIMUM DATA SET FOR NURSING FACILITY RESIDENT ASSESSMENT AND CARE SCREENING (MDS)
(Status in last 7 days, unless otherwise indicated)

Assessment Date: Month ___ Day ___ Year ___

Signature of RN Assessment Coordinator _____

SECTION A. IDENTIFICATION AND BACKGROUND INFORMATION

1.	RESIDENT NAME	_____
2.	SOCIAL SECURITY NO.	___ – ___ – ____
3.	MEDICAID NO. (If applicable)	
4.	MEDICAL RECORD NO.	
5.	REASON FOR ASSESSMENT	1. Initial admission assess. 2. Hosp/Medicare reassess. 3. Readmission assessment 4. Annual assess. 5. Significant change in status
6.	OPPORTUNITY TO PARTICIPATE IN ASSESSMENT	*(Code the correct response)* a. Resident 1. Given opportunity 2. Not given opportunity b. Family 1. Given opportunity 2. Not given opportunity 3. No family
7.	CURRENT PAYMENT SOURCE(S) FOR N.H. STAY	*(Billing Office to indicate; **check all that apply**)* Medicaid [a] Medicare [b] CHAMPUS [c] VA [d] Self pay/Private insur. [e] Other [f]
8.	RESPONSIBILITY/ LEGAL GUARDIAN	*(**Check all that apply**)* Legal guardian [a] Other legal oversight [b] Durable power attrny./ health care proxy [c] Family member responsible [d] Resident responsible [e]
9.	ADVANCED DIRECTIVES	*(For those items with supporting documentation in the medical record, **check all that apply**)* Living will [a] Do not resuscitate [b] Do not hospitalize [c] Organ donation [d] Autopsy request [e] Feeding restrictions [f] Medication restrictions [g] Other treatment restrictions [h] *NONE OF ABOVE* [i]
10.	DISCHARGE PLANNED WITHIN 3 MOS.	*(Does not include discharge due to death; **code correct response**)* 0. No 1. Yes 2. Unknown/uncertain

SECTION B. COGNITIVE PATTERNS

1.	COMATOSE	*(No discernible consciousness/persistent vegetative state)* 0. No 1. Yes ***(Skip to SECTION E)***
2.	MEMORY	*(Recall of what was learned or known; **code correct response**)* a. Short-term memory OK—seems/appears to recall after 5 minutes 0. Memory OK 1. Memory problem b. Long-term memory OK—seems/appears to recall long past 0. Memory OK 1. Memory problem
3.	MEMORY/ RECALL ABILITY	*(**Check** all that resident normally able to recall during last 7 days)* Current season [a] Location of own room [b] Staff names/faces [c] That he/she is in a nursing facility *NONE OF ABOVE* are recalled
4.	COGNITIVE SKILLS FOR DAILY DECISION-MAKING	Made decisions regarding tasks of daily life ***(Code response)*** 0. Independent—decisions consistent/reasonable 1. Modified independence—some difficulty in new situations only 2. Moderately impaired—decisions poor; cues/supervision required 3. Severely impaired—never/rarely made decisions
5.	INDICATORS OF DELIRIUM – PERIODIC DISORDERED THINKING/ AWARENESS	*(**Check** where condition over last 7 days appears different from usual functioning)* Less alert, easily distracted [a] Changing awareness of environment [b] Episodes of incoherent speech [c] Periods of motor restlessness or lethargy [d] *NONE OF ABOVE* [e]
6.	CHANGE IN COGNITIVE STATUS	Change in resident's cognitive status, skills, or abilities—**in last 90 days** 0. No change 1. Improved 2. Deteriorated

SECTION C. COMMUNICATION/HEARING PATTERNS

1.	HEARING	*(With hearing appliance, if used)* 0. Hears adequately—normal talk, TV, phone 1. Minimal difficulty when not in quiet listening conditions 2. Hears in special situation only—speaker has to adjust tonal quality and speak distinctly 3. Highly impaired/absence of useful hearing
2.	COMMUNICATION DEVICES/ TECHNIQUES	*(**Check all that apply** during last 7 days)* Hearing aid, present and used [a] Hearing aid, present and not used [b] Other receptive comm. technique used (e.g., lip read) [c] *NONE OF ABOVE* [d]
3.	MODES OF EXPRESSION	*(**Check all used** by resident to make needs known)* Speech [a] Writing messages to express or clarify needs [b] Signs/gestures/sounds [c] Communication board [d] Other [e] *NONE OF ABOVE* [f]
4.	MAKING SELF UNDERSTOOD	*(Express information content—however able)* 0. Understood 2. Sometimes understood 1. Usually understood 3. Rarely/never understood
5.	ABILITY TO UNDERSTAND OTHERS	*(Understanding verbal information content—however able)* 0. Understands 2. Sometimes understands 1. Usually understands 3. Rarely/never understands
6.	CHANGE IN COMMUNICATION/ HEARING	Resident's ability to express, understand or hear information has changed over **last 90 days** 0. No change 1. Improved 2. Deteriorated

SECTION D. VISION PATTERNS

1.	VISION	*(Ability to see in adequate light and with glasses if used)* 0. Adequate—sees fine detail, including regular print in newspapers/books 1. Impaired—sees large print, but not regular print in newspapers/books 2. Highly impaired—limited vision, not able to see newspaper headlines, appears to follow objects with eyes 3. Severely impaired—no vision—e.g., may/appears to see light, color, or shapes
2.	VISUAL LIMITATIONS/ DIFFICULTIES	*(**Check all that apply** for last 7 days)* Side vision problems—decreased peripheral vision; e.g., leaves food on one side of tray, difficulty traveling, bumps into people and objects, misjudges placement of chair when seating self [a] Experiences any of following: sees halos or rings around lights, sees flashes of light; sees "curtains" over eyes [b] *NONE OF ABOVE* [c]
3.	VISUAL APPLIANCES	Glasses; contact lenses; lens implant 0. No 1. Yes

= Code the appropriate response

b. = Check all the responses that apply

SECTION E. PHYSICAL FUNCTIONING AND STRUCTURAL PROBLEMS

1. ADL SELF-PERFORMANCE

***(Code for resident's PERFORMANCE during last 7 days** —Not including setup)*

0. *INDEPENDENT* — No help or oversight — OR — Help/oversight provided only 1 or 2 times during last 7 days.
1. *SUPERVISION* — Oversight help only; provided 3+ times during last 7 days — OR — Additional assistance provided only 1 or 2 times during last 7 days.
2. *LIMITED ASSISTANCE* — Resident highly involved in process, received physical help in guided maneuvering of limbs, or other nonweight bearing assistance 3+ times — OR — More help provided only 1 or 2 times during last 7 days.
3. *EXTENSIVE ASSISTANCE* — While resident performed part of activity, over last 7-day period, help of following type(s) provided 3 or more times:
   — Weight-bearing support
   — Full staff performance during part (but not all) of last 7 days.
4. *TOTAL DEPENDENCE* — Full staff performance of activity during entire 7 days.

			1 SELF-PERF	2 SUPPORT
2.	ADL SUPPORT PROVIDED — ***(Code for MOST SUPPORT PROVIDED; code regardless** of resident's self-performance classification)* 0. No setup or physical help from staff 1. Setup help only 2. One-person physical assist 3. Two+ persons physical assist			
a.	BED MOBILITY	How resident moves to and from lying position, turns side to side, and positions body while in bed		
b.	TRANSFER	How resident moves between surfaces—to/from: bed, chair, wheelchair, standing position (EXCLUDE to/from bath/toilet)		
c.	LOCO-MOTION	How resident moves between locations in his/her room and adjacent corridor on same floor. If in wheelchair, self-sufficiency once in chair		
d.	DRESSING	How resident puts on, fastens, and takes off all items of street clothing, including donning/removing prosthesis		
e.	EATING	How resident eats and drinks (regardless of skill)		
f.	TOILET USE	How resident uses the toilet room (or commode, bedpan, urinal); transfers on/off toilet, cleanses, changes pad, manages ostomy or catheter, adjusts clothes		
g.	PERSONAL HYGIENE	How resident maintains personal hygiene, including combing hair, brushing teeth, shaving, applying makeup, washing/drying face, hands, and perineum (EXCLUDE baths and showers)		
3.	BATHING	How resident takes full-body bath, sponge bath, and transfers in/out of tub/shower (EXCLUDE washing of back and hair and ***code for most dependent***. Bathing Self-Performance codes appear below.) 0. Independent—No help provided 1. Supervision—Oversight help only 2. Physical help limited to transfer only 3. Physical help in part of bathing activity 4. Total dependence	a.	b.
4.	BODY CONTROL PROBLEMS	***(Check all that apply** during last 7 days)* Balance—partial or total loss of ability to balance self while standing — a. Bedfast all or most of the time — b. Contracture to arms, legs, shoulders, or hands — c. Hemiplegia/hemiparesis — d. Quadriplegia — e. Arm—partial or total loss of voluntary movement — f. Hand—lack of dexterity (e.g., problem using toothbrush or adjusting hearing aid) — g. Leg—partial or total loss of voluntary movement — h. Leg—unsteady gait — i. Trunk—partial or total loss of ability to position, balance, or turn body — j. *NONE OF ABOVE* — k.		
5.	MOBILITY APPLIANCES/ DEVICES	***(Check all that apply** during last 7 days)* Cane/walker — a. Brace/prosthesis — b. Wheeled self — c. Other person wheeled — d. Lifted (manually/ mechanically) — e. *NONE OF ABOVE* — f.		

6.	TASK SEGMENTATION	Resident's memory or mood problem requires that some or all of ADL activities be broken into a series of subtasks so that resident can perform them. 0. No 1. Yes	
7.	ADL FUNCTIONAL REHAB. POTENTIAL	***(Check all that apply** during last 7 days)* Resident believes he/she capable of increased independence in at least some ADLs — a. Direct care staff believe resident capable of increased independence in at least some ADLs — b. Resident able to perform tasks/activity but is very slow — c. Major difference in ADL Self-Performance or ADL Support in mornings and evenings (at least a one category change in Self-Performance or Support in any ADL) — d. *NONE OF ABOVE* — e.	
8.	CHANGE IN ADL FUNCTION	Change in ADL function in **last 90 days** 0. No change 1. Improved 2. Deteriorated	

SECTION F. CONTINENCE IN LAST 14 DAYS

1.	CONTINENCE SELF-CONTROL CATEGORIES ***(Code for resident performance over all shifts.)*** 0. CONTINENT — Complete control 1. USUALLY CONTINENT — BLADDER, incontinent episodes once a week or less; BOWEL, less than weekly 2. OCCASIONALLY INCONTINENT — BLADDER, 2+ times a week but not daily; BOWEL, once a week 3. FREQUENTLY INCONTINENT — BLADDER, tended to be incontinent daily, but some control present (e.g., on day shift); BOWEL, 2-3 times a week 4. INCONTINENT — Had inadequate control. BLADDER, multiple daily episodes; BOWEL, all (or almost all) of the time.		
a.	BOWEL CONTINENCE	Control of bowel movement, with appliance or bowel continence programs, if employed	
b.	BLADDER CONTINENCE	Control of urinary bladder function (if dribbles, volume insufficient to soak through underpants), with appliances (e.g., foley) or continence programs, if employed	
2.	IF INCONTINENT OF BLADDER	***(Skip** if resident's bladder continence code equals 0 or 1 and no catheter is employed)* Resident has been tested for a urinary tract infection — a. Resident has been checked for presence of a fecal impaction, or there is adequate bowel elimination — b. *NONE OF ABOVE* — c.	
3.	APPLIANCES AND PROGRAMS	Any scheduled toileting plan — a. External (condom) catheter — b. Indwelling catheter — c. Intermittent catheter — d. Did not use toilet room/ commode/urinal — e. Pads/briefs used — f. Enemas/irrigation — g. Ostomy — h. *NONE OF ABOVE* — i.	
4.	CHANGE IN URINARY CONTINENCE	Change in urinary continence in **last 90 days** 0. No change 1. Improved 2. Deteriorated	

SECTION G. PSYCHOSOCIAL WELL-BEING

(Check all that apply** during last 7 days. **If COMATOSE, SKIP to Section J.)

1.	SENSE OF INITIATIVE/ INVOLVEMENT	Easy interactions with others	a.
		At ease doing planned or structural activities	b.
		At ease doing self-initiated activities	c.
		Establishes own goals	d.
		Pursues involvement in life of facility (e.g., makes/keeps friends; involved in group activities; responds positively to new activities; assists at religious services)	e.
		Accepts invitations into most group activities	f.
		NONE OF ABOVE	g.
2.	UNSETTLED RELATIONSHIPS	Covert/open conflict with and/or repeated criticism of staff	a.
		Unhappy with roommate	b.
		Unhappy with residents other than roommate	c.
		Openly expresses conflict/anger with family or friends	d.
		Absence of personal contact with family/friends	e.
		Recent loss of close family member/friend	f.
		NONE OF ABOVE	g.

3.	PAST ROLES	Strong identification with past roles and life status	a.
		Expresses sadness/anger/empty feeling over lost roles/status	b.
		NONE OF ABOVE	c.

SECTION H. MOOD AND BEHAVIOR PATTERNS

1.	SAD OR ANXIOUS MOOD	***(Check all that apply during last 30 days)***	
		VERBAL EXPRESSIONS of DISTRESS by resident (sadness, sense that nothing matters, hopelessness, worthlessness, unrealistic fears, vocal expressions of anxiety or grief)	a.
		DEMONSTRATED (OBSERVABLE) SIGNS of mental DISTRESS	
		— Tearfulness, emotional groaning, sighing, breathlessness	b.
		— Motor agitation such as pacing, handwringing or picking	c.
		— Failure to eat or take medications, withdrawal from self-care or leisure activities	d.
		— Pervasive concern with health	e.
		— Recurrent thoughts of death—e.g., believes he/she about to die, have a heart attack	f.
		— Suicidal thoughts/actions	g.
		NONE OF ABOVE	h.
2.	MOOD PERSISTENCE	Sad or anxious mood intrudes on daily life over last 7 days—not easily altered, doesn't "cheer up" 0. No 1. Yes	
3.	PROBLEM BEHAVIOR	***(Code for behavior in last 7 days)*** 0. Behavior not exhibited in last 7 days 1. Behavior of this type occurred less than daily 2. Behavior of this type occurred daily or more frequently	
		WANDERING (moved with no rational purpose; seemingly oblivious to needs or safety)	a.
		VERBALLY ABUSIVE (others were threatened, screamed at, cursed at)	b.
		PHYSICALLY ABUSIVE (others were hit, shoved, scratched, sexually abused)	c.
		SOCIALLY INAPPROPRIATE BEHAVIOR (made disrupting sounds, noisy, screams, self-abusive acts, sexual behavior or disrobing in public, smeared/threw food/feces, rummaged through others' belongings)	d.
4.	BEHAVIOR MANAGEMENT PROGRAM	Behavior problem has been addressed by clinically developed behavior management program. (Note: Do not include programs that involve only physical restraints or psychotropic medications in this category.) 0. No behavior problem 1. Yes, addressed 2. No, not addressed	
5.	RESIDENT RESISTS CARE	***(Check all types of resistance** that occurred in the last 7 days)*	
		Resisted taking medications/injection	a.
		Resisted ADL assistance	b.
		NONE OF ABOVE	c.
6.	CHANGE IN MOOD	Change in mood in **last 90 days** 0. No change 1. Improved 2. Deteriorated	
7.	CHANGE IN PROBLEM BEHAVIOR	Change in problem behavioral signs in **last 90 days** 0. No change 1. Improved 2. Deteriorated	

SECTION I. ACTIVITY PURSUIT PATTERNS

1.	TIME AWAKE	***(Check appropriate time periods**—last 7 days)* Resident awake all or most of time (i.e., no naps or naps no more than one hour per time period) in the:			
		Morning	a	Evening	c.
		Afternoon	b	*NONE OF ABOVE*	d.
2.	AVERAGE TIME INVOLVED IN ACTIVITIES	***(Code correct response)*** 0. Most 2. Little 1. Some 3. None			
3.	PREFERRED ACTIVITY SETTINGS	***(Check all settings** in which activities are preferred)*			
		Own room	a	Outside facility	d.
		Day/activity room	b	*NONE OF ABOVE*	e.
		Inside NH/off unit	c		

4.	GENERAL ACTIVITIES PREFERENCES (adapted according to resident's current abilities)	***(Check all specific activity preferences)***			
		Cards/other games	a.	Spiritual/religious activ.	f.
		Crafts/arts	b.	Trips/shopping	g.
		Exercise	c.	Walking/wheeling outdoors	h.
		Music	d.	Watch TV	i.
		Read/write	e.	*NONE OF ABOVE*	j.
5.	PREFERS MORE OR DIFFERENT ACTIVITIES	Resident expresses/indicates preference for other activities/choices. 0. No 1. Yes			

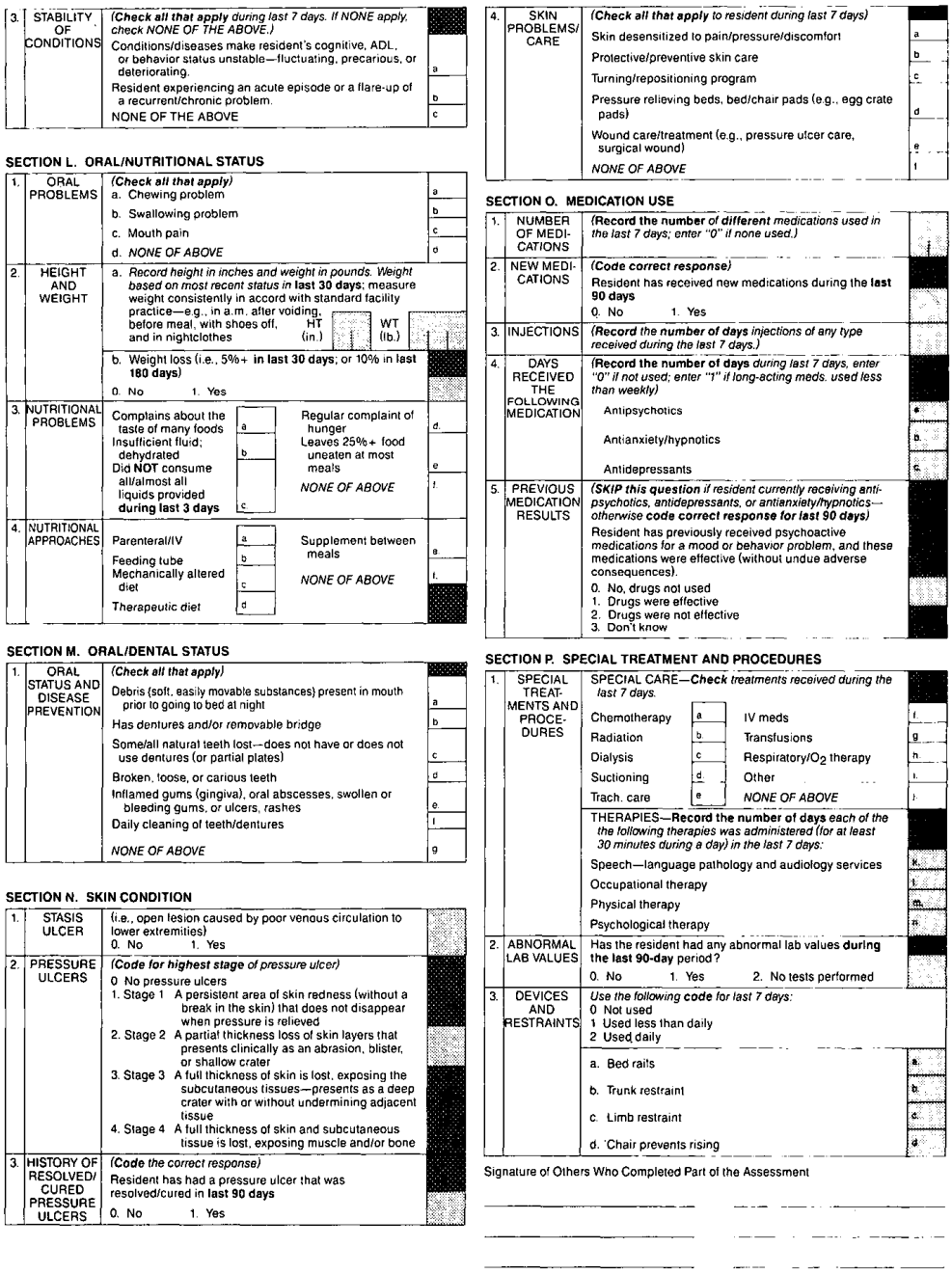
SECTION J. DISEASE DIAGNOSES

***Check only those diseases present that have a relationship** to current ADL status, cognitive status, behavior status, medical treatments, or risk of death. (Do not list old/inactive diagnoses.)*

1.	DISEASES	*(If none apply, **CHECK the** NONE OF ABOVE box)*			
		HEART/CIRCULATION		**PSYCHIATRIC/MOOD**	
		Arteriosclerotic heart disease (ASHD)	a.	Anxiety disorder	n.
		Cardiac dysrhythmias	b.	Depression	o.
		Cerebrovascular accident(stroke)	c.	Manic depressive (bipolar disease)	p.
		Congestive heart failure	d.	**SENSORY**	
		Hypertension	e.	Cataracts	q.
		Hypotension	f.	Glaucoma	r.
		Peripheral vascular disease	g.	**OTHER**	
		Other cardiovascular disease	h.	Anemia	s.
				Arthritis	t.
		NEUROLOGICAL		Cancer	u.
		Alzheimer's	i.	Diabetes mellitus	v.
		Dementia other than Alzheimer's	j.	Explicit terminal prognosis	w.
		Parkinson's disease	k.	Hypothyroidism	x.
				Osteoporosis	y.
		PULMONARY		Seizures	z.
		Emphysema/asthma/COPD	l.	Septicemia	aa.
		Pneumonia	m.	Urinary tract infection—**in last 30 days**	bb.
				NONE OF ABOVE	cc.
2.	OTHER CURRENT DIAGNOSES AND ICD-9 CODES	a.			
		b.			
		c.			
		d.			

K. HEALTH CONDITIONS

1.	PROBLEM CONDITIONS	***(Check all problems** that are present; **last 7 days unless noted**)*			
		Allergies	a.	Internal bleeding	j.
		Aphasia	b.	Joint pain	k.
		Constipation	c.	Pain—resident complains or shows evidence of pain daily or almost daily	l.
		Diarrhea	d.		
		Dizziness/vertigo	e.	Recurrent lung aspirations in **last 90 days**	m.
		Edema	f.		
		Fecal impaction	g.	Shortness of breath	n.
		Fever	h.	Syncope	o.
		Hallucinations/delusions	i.	*NONE OF ABOVE*	p.
2.	ACCIDENTS	***(Check all problems** that are present; **last 7 days unless noted**)*			
		Fell—**past 30 days**	a.	Hip fracture in **last 180 days**	c.
		Fell—**past 31-180 days**	b.	*NONE OF ABOVE*	d.



3. STABILITY OF CONDITIONS
(Check all that apply during last 7 days. If NONE apply, check NONE OF THE ABOVE.)
Conditions/diseases make resident's cognitive, ADL, or behavior status unstable—fluctuating, precarious, or deteriorating. a
Resident experiencing an acute episode or a flare-up of a recurrent/chronic problem. b
NONE OF THE ABOVE c

SECTION L. ORAL/NUTRITIONAL STATUS

1. ORAL PROBLEMS
(Check all that apply)
a. Chewing problem a
b. Swallowing problem b
c. Mouth pain c
d. *NONE OF ABOVE* d

2. HEIGHT AND WEIGHT
a. *Record height in inches and weight in pounds. Weight based on most recent status in* **last 30 days**; measure weight consistently in accord with standard facility practice—e.g., in a.m. after voiding, before meat, with shoes off, and in nightclothes HT (in.) WT (lb.)
b. Weight loss (i.e., 5%+ **in last 30 days**; or 10% in **last 180 days**)
0. No 1. Yes

3. NUTRITIONAL PROBLEMS
Complains about the taste of many foods a
Insufficient fluid; dehydrated b
Did **NOT** consume all/almost all liquids provided **during last 3 days** c
Regular complaint of hunger d
Leaves 25%+ food uneaten at most meals e
NONE OF ABOVE f

4. NUTRITIONAL APPROACHES
Parenteral/IV a
Feeding tube b
Mechanically altered diet c
Therapeutic diet d
Supplement between meals e
NONE OF ABOVE f

SECTION M. ORAL/DENTAL STATUS

1. ORAL STATUS AND DISEASE PREVENTION
(Check all that apply)
Debris (soft, easily movable substances) present in mouth prior to going to bed at night a
Has dentures and/or removable bridge b
Some/all natural teeth lost—does not have or does not use dentures (or partial plates) c
Broken, loose, or carious teeth d
Inflamed gums (gingiva), oral abscesses, swollen or bleeding gums, or ulcers, rashes e
Daily cleaning of teeth/dentures f
NONE OF ABOVE g

SECTION N. SKIN CONDITION

1. STASIS ULCER
(i.e., open lesion caused by poor venous circulation to lower extremities)
0. No 1. Yes

2. PRESSURE ULCERS
(Code for highest stage of pressure ulcer)
0 No pressure ulcers
1. Stage 1 A persistent area of skin redness (without a break in the skin) that does not disappear when pressure is relieved
2. Stage 2 A partial thickness loss of skin layers that presents clinically as an abrasion, blister, or shallow crater
3. Stage 3 A full thickness of skin is lost, exposing the subcutaneous tissues—presents as a deep crater with or without undermining adjacent tissue
4. Stage 4 A full thickness of skin and subcutaneous tissue is lost, exposing muscle and/or bone

3. HISTORY OF RESOLVED/ CURED PRESSURE ULCERS
(Code the correct response)
Resident has had a pressure ulcer that was resolved/cured in **last 90 days**
0. No 1. Yes

4. SKIN PROBLEMS/ CARE
(Check all that apply to resident during last 7 days)
Skin desensitized to pain/pressure/discomfort a
Protective/preventive skin care b
Turning/repositioning program c
Pressure relieving beds, bed/chair pads (e.g., egg crate pads) d
Wound care/treatment (e.g., pressure ulcer care, surgical wound) e
NONE OF ABOVE f

SECTION O. MEDICATION USE

1. NUMBER OF MEDICATIONS
(Record the number of ***different*** *medications used in the last 7 days; enter "0" if none used.)*

2. NEW MEDICATIONS
(Code correct response)
Resident has received new medications during the **last 90 days**
0. No 1. Yes

3. INJECTIONS
(Record the number of days injections of any type received during the last 7 days.)

4. DAYS RECEIVED THE FOLLOWING MEDICATION
(Record the number of days during last 7 days, enter "0" if not used; enter "1" if long-acting meds. used less than weekly)
Antipsychotics a
Antianxiety/hypnotics b
Antidepressants c

5. PREVIOUS MEDICATION RESULTS
(SKIP this question if resident currently receiving antipsychotics, antidepressants, or antianxiety/hypnotics—otherwise code correct response for last 90 days)
Resident has previously received psychoactive medications for a mood or behavior problem, and these medications were effective (without undue adverse consequences).
0. No, drugs not used
1. Drugs were effective
2. Drugs were not effective
3. Don't know

SECTION P. SPECIAL TREATMENT AND PROCEDURES

1. SPECIAL TREATMENTS AND PROCEDURES
SPECIAL CARE—*Check treatments received during the last 7 days.*
Chemotherapy a
Radiation b
Dialysis c
Suctioning d
Trach. care e
IV meds f
Transfusions g
Respiratory/O_2 therapy h
Other i
NONE OF ABOVE j
THERAPIES—**Record the number of days** *each of the the following therapies was administered (for at least 30 minutes during a day) in the last 7 days:*
Speech—language pathology and audiology services k
Occupational therapy l
Physical therapy m
Psychological therapy n

2. ABNORMAL LAB VALUES
Has the resident had any abnormal lab values **during the last 90-day** period?
0. No 1. Yes 2. No tests performed

3. DEVICES AND RESTRAINTS
Use the following ***code*** *for last 7 days:*
0 Not used
1 Used less than daily
2 Used daily
a. Bed rails a
b. Trunk restraint b
c. Limb restraint c
d. Chair prevents rising d

Signature of Others Who Completed Part of the Assessment

Hawes C, Morris JN, Phillips CD, Mor V, Fries BE, Nonemaker S. Reliability Estimates for The Minimum Data Set for Nursing Home Resident Assessment and Care Screening (MDS). The Gerontologist [Online]. 1 Apr 1995 [cited on 25 Apr 2021];35(2):172-8. Available: https://academic.oup.com/gerontologist/article-lookup/doi/10.1093/geront/35.2.172

f. Minimum Data Set / Resident Assessment Protocols (MDS/RAP) – Section oral health

SECTION L. ORAL/NUTRITIONAL STATUS

1.	ORAL PROBLEMS	*(Check all that apply)* a. Chewing problem	a
		b. Swallowing problem	b
		c. Mouth pain	c
		d. *NONE OF ABOVE*	d

SECTION M. ORAL/DENTAL STATUS

1.	ORAL STATUS AND DISEASE PREVENTION	*(Check all that apply)* Debris (soft, easily movable substances) present in mouth prior to going to bed at night	a
		Has dentures and/or removable bridge	b
		Some/all natural teeth lost—does not have or does not use dentures (or partial plates)	c
		Broken, loose, or carious teeth	d
		Inflamed gums (gingiva), oral abscesses, swollen or bleeding gums, or ulcers, rashes	e
		Daily cleaning of teeth/dentures	f
		NONE OF ABOVE	g

Resident Assessment Protocol (RAP) Summary

A. RAP Problem Area	(a) Check if triggered	Location and date of RAP Assessment Documentation	(b) Care Planning Decision- Check of addressed in the care plan
15. ORAL/ DENTAL CARE			

Arvidson-Bufano UB, Blank LW, Yellowitz JA. Nurses' oral health assessments of nursing home residents pre- and post-training: A pilot study. Special Care in Dentistry [Online]. Mar 1996 [cited on 25 Apr 2021];16(2):58-64. Available: http://doi.wiley.com/10.1111/j.1754-4505.1996.tb00835.x

g. Minimum Data Set for Home Care (MDS-HC)

SECTION AA. NAME AND IDENTIFICATION NUMBERS

1.	NAME OF CLIENT	a. (Last/Family Name) b. (First Name) c. (Middle Initial)
2.	CASE RECORD NO.	
3.	GOVERNMENT PENSION AND HEALTH INSURANCE NUMBERS	a. Pension (Social Security) Number b. Health insurance number (or other comparable insurance number)

SECTION BB. PERSONAL ITEMS *(Complete at Intake Only)*

1.	GENDER	1. Male 2. Female	
2.	BIRTHDATE	Month Day Year	
3.	RACE/ ETHNICITY	(*Check all that apply*) *RACE* American Indian/Alaskan Native Asian Black or African American Native Hawaiian or other Pacific Islander White *ETHNICITY:* Hispanic or Latino	a. b. c. d. e. f.
4.	MARITAL STATUS	1. Never married 2. Married 3. Widowed 4. Separated 5. Divorced 6. Other	
5.	LANGUAGE	Primary Language 0. English 1. Spanish 2. French 3. Other	
6.	EDUCATION (*Highest Level Completed*)	1. No schooling 2. 8th grade/less 3. 9-11 grades 4. High school 5. Technical or trade school 6. Some college 7. Bachelor's degree 8. Graduate degree	
7.	RESPONSIBILITY/ ADVANCED DIRECTIVES	(*Code for responsibility/advanced directives*) 0. No 1. Yes a. Client has a legal guardian b. Client has advanced medical directives in place (for example, a do not hospitalize order)	

SECTION CC. REFERRAL ITEMS *(Complete at Intake Only)*

1.	DATE CASE OPENED/ REOPENED	Month Day Year	
2.	REASON FOR REFERRAL	1. Post hospital care 2. Community chronic care 3. Home placement screen 4. Eligibility for home care 5. Day care 6. Other	
3.	GOALS OF CARE	(*Code for client/family understanding of goals of care*) 0. No 1. Yes a. Skilled nursing treatments b. Monitoring to avoid clinical complications c. Rehabilitation d. Client/family education e. Family respite f. Palliative care	
4.	TIME SINCE LAST HOSPITAL STAY	Time since discharge from last in-patient setting (*Code for most recent instance in LAST 180 DAYS*) 0. No hospitalization within 180 days 1. Within last week 2. Within 8 to 14 days 3. Within 15 to 30 days 4. More than 30 days ago	
5.	WHERE LIVED AT TIME OF REFERRAL	1. Private home/apt. with no home care services 2. Private home/apt. with home care services 3. Board and care/assisted living/group home 4. Nursing home 5. Other	
6.	WHO LIVED WITH AT REFERRAL	1. Lived alone 2. Lived with spouse only 3. Lived with spouse and other(s) 4. Lived with child (not spouse) 5. Lived with other(s) (not spouse or children) 6. Lived in group setting with non-relative(s)	
7.	PRIOR NH PLACEMENT	Resided in a nursing home at anytime during **5 YEARS** prior to case opening 0. No 1. Yes	
8.	RESIDENTIAL HISTORY	Moved to current residence within last two years 0. No 1. Yes	

SECTION A. ASSESSMENT INFORMATION

1.	ASSESSMENT REFERENCE DATE	*Date of assessment* Month Day Year	
2.	REASONS FOR ASSESSMENT	*Type of assessment* 1. Initial assessment 2. Follow-up assessment 3. Routine assessment at fixed intervals 4. Review within 30-day period prior to discharge from the program 5. Review at return from hospital 6. Change in status 7. Other	

SECTION B. COGNITIVE PATTERNS

1.	MEMORY RECALL ABILITY	(*Code for recall of what was learned or known*) 0. Memory OK 1. Memory problem a. Short-term memory OK — seems/appears to recall after 5 minutes b. Procedural memory OK—Can perform all or almost all steps in a multitask sequence without cues for initiation	
2.	COGNITIVE SKILLS FOR DAILY DECISION-MAKING	a. How well client made decisions about organizing the day (e.g., when to get up or have meals, which clothes to wear or activities to do) 0. *INDEPENDENT*—Decisions consistent/reasonable/safe 1. *MODIFIED INDEPENDENCE*—Some difficulty in new situations only 2. *MINIMALLY IMPAIRED*—In specific situations, decisions become poor or unsafe and cues/supervision necessary at those times 3. *MODERATELY IMPAIRED*—Decisions consistently poor or unsafe, cues/supervision required at all times 4. *SEVERELY IMPAIRED*—Never/rarely made decisions b. Worsening of decision making as compared to status of **90 DAYS AGO** (or since last assessment if less than 90 days) 0. No 1. Yes	
3.	INDICATORS OF DELIRIUM	a. Sudden or new onset/change in mental function over **LAST 7 DAYS** (including ability to pay attention, awareness of surroundings, being coherent, unpredictable variation over course of day) 0. No 1. Yes b. In the **LAST 90 DAYS** (or since last assessment if less than 90 days), client has become agitated or disoriented such that his or her safety is endangered or client requires protection by others 0. No 1. Yes	

SECTION C. COMMUNICATION/HEARING PATTERNS

1.	HEARING	(*With hearing appliance if used*) 0. *HEARS ADEQUATELY*—Normal talk, TV, phone, doorbell 1. *MINIMAL DIFFICULTY*—When not in quiet setting 2. *HEARS IN SPECIAL SITUATIONS ONLY*—Speaker has to adjust tonal quality and speak distinctly 3. *HIGHLY IMPAIRED* —Absence of useful hearing	
2.	MAKING SELF UNDERSTOOD (Expression)	(*Expressing information content—however able*) 0. *UNDERSTOOD*—Expresses ideas without difficulty 1. *USUALLY UNDERSTOOD*—Difficulty finding words or finishing thoughts BUT if given time, little or no prompting required 2. *OFTEN UNDERSTOOD*—Difficulty finding words or finishing thoughts, prompting usuallly required 3. *SOMETIMES UNDERSTOOD*—Ability is limited to making concrete requests 4. *RARELY/NEVER UNDERSTOOD*	
3.	ABILITY TO UNDERSTAND OTHERS (Comprehension)	(*Understands verbal information—however able*) 0. *UNDERSTANDS*—Clear comprehension 1. *USUALLY UNDERSTANDS*—Misses some part/intent of message, BUT comprehends most conversation with little or no prompting 2. *OFTEN UNDERSTANDS*—Misses some part/intent of message; with prompting can often comprehend conversation 3. *SOMETIMES UNDERSTANDS*—Responds adequately to simple, direct communication 4. *RARELY/NEVER UNDERSTANDS*	
4.	COMMUNICATION DECLINE	Worsening in communication (making self understood or understanding others) as compared to status of **90 DAYS AGO** (or since last assessment if less than 90 days) 0. No 1. Yes	

SECTION D. VISION PATTERNS

1.	VISION	(*Ability to see in adequate light and with glasses if used*) 0. *ADEQUATE*—Sees fine detail, including regular print in newspapers/ books 1. *IMPAIRED*—Sees large print, but not regular print in newspapers/ books 2. *MODERATELY IMPAIRED*—Limited vision; not able to see newspaper headlines, but can identify objects 3. *HIGHLY IMPAIRED*—Object identification in question, but eyes appear to follow objects 4. *SEVERELY IMPAIRED*—No vision or sees only light, colors, or shapes; eyes do not appear to follow objects	
2.	VISUAL LIMITATION/ DIFFICULTIES	Saw halos or rings around lights, curtains over eyes, or flashes of lights 0. No 1. Yes	
3.	VISION DECLINE	Worsening of vision as compared to status of **90 DAYS AGO** (or since last assessment if less than 90 days) 0. No 1. Yes	

SECTION E. MOOD AND BEHAVIOR PATTERNS

1. INDICATORS OF DEPRESSION, ANXIETY, SAD MOOD (*Code for observed indicators irrespective of the assumed cause*)

0. Indicator not exhibited in last 3 days
1. Exhibited 1-2 of last 3 days
2. Exhibited on each of last 3 days

- **a. A FEELING OF SADNESS OR BEING DEPRESSED**, that life is not worth living, that nothing matters, that he or she is of no use to anyone or would rather be dead
- **b. PERSISTENT ANGER WITH SELF OR OTHERS**—e.g., easily annoyed, anger at care received
- **c. EXPRESSIONS OF WHAT APPEAR TO BE UNREALISTIC FEARS**—e.g., fear of being abandoned, left alone, being with others
- **d. REPETITIVE HEALTH COMPLAINTS**—e.g., persistently seeks medical attention, obsessive concern with body functions
- **e. REPETITIVE ANXIOUS COMPLAINTS, CONCERNS**—e.g., persistently seeks attention/reassurance regarding schedules, meals, laundry, clothing, relationship issues
- **f. SAD, PAINED, WORRIED FACIAL EXPRESSIONS**—e.g., furrowed brows
- **g. RECURRENT CRYING, TEARFULNESS**
- **h. WITHDRAWAL FROM ACTIVITIES OF INTEREST**—e.g., no interest in long standing activities or being with family/friends
- **i. REDUCED SOCIAL INTERACTION**

2. MOOD DECLINE — Mood indicators have become worse as compared to status of **90 days ago** (or since last assessment if less than 90 days)
0. No 1. Yes

3. BEHAVIORAL SYMPTOMS — Instances when client exhibited behavioral symptoms. If EXHIBITED, ease of altering the symptom when it occurred.

0. Did not occur in last 3 days
1. Occurred, easily altered
2. Occurred, not easily altered

- **a. WANDERING**—Moved with no rational purpose, seemingly oblivious to needs or safety
- **b. VERBALLY ABUSIVE BEHAVIORAL SYMPTOMS**—Threatened, screamed at, cursed at others
- **c. PHYSICALLY ABUSIVE BEHAVIORAL SYMPTOMS**—Hit, shoved, scratched, sexually abused others
- **d. SOCIALLY INAPPROPRIATE/DISRUPTIVE BEHAVIORAL SYMPTOMS**—Disruptive sounds, noisiness, screaming, self-abusive acts, sexual behavior or disrobing in public, smears/throws food/feces, rummaging, repetitive behavior, rises early and causes disruption
- **e. RESISTS CARE**—Resisted taking medications/injections, ADL assistance, eating, or changes in position

4. CHANGES IN BEHAVIOR SYMPTOMS — Behavioral symptoms have become worse or are less well tolerated by family as compared to **90 DAYS AGO** (or since last assessment if less than 90 days)
0. No, or no change in behavioral symptoms 1. Yes

SECTION F. SOCIAL FUNCTIONING

1. INVOLVEMENT
- **a.** At ease interacting with others (e.g., likes to spend time with others)
  0. At ease 1. Not at ease
- **b.** Openly expresses conflict or anger with family/friends
  0. No 1. Yes

2. CHANGE IN SOCIAL ACTIVITIES — As compared to **90 DAYS AGO** (or since last assessment if less than 90 days ago), decline in the client's level of participation in social, religious, occupational or other preferred activities. IF THERE WAS A DECLINE, client distressed by this fact
0. No decline
1. Decline, not distressed
2. Decline, distressed

3. ISOLATION
- **a.** Length of time client is alone during the day (morning and afternoon)
  0. Never or hardly ever
  1. About one hour
  2. Long periods of time—e.g., all morning
  3. All of the time
- **b.** Client says or indicates that he/she feels lonely
  0. No 1. Yes

SECTION G. INFORMAL SUPPORT SERVICES

1. TWO KEY INFORMAL HELPERS — Primary (A) and Secondary (B)

NAME OF PRIMARY AND SECONDARY HELPERS

	(A) Prim	(B) Secn
a. (Last/Family Name) **b.** (First)		
c. (Last/Family Name) **d.** (First)		
e. Lives with client 0. Yes 1. No 2. No such helper [skip other items in the appropriate column]		
f. Relationship to client 0. Child or child-in-law 1. Spouse 2. Other Relative 3. Friend/neighbor		
Areas of help: 0. Yes 1. No		
g. — Advice or emotional support		
h. — IADL care		
i. — ADL care		

1. TWO KEY INFORMAL HELPERS — Primary (A) and Secondary (B) (cont)

	(A) Prim	(B) Secn
If needed, willingness (with ability) to increase help: 0. More than 2 hours 1. 1-2 hours per day 2. No		
j. — Advice or emotional support		
k. — IADL care		
l. — ADL care		

2. CAREGIVER STATUS (*Check all that apply*)
- A caregiver is unable to continue in caring activities—e.g., decline in the health of the caregiver makes it difficult to continue — **a.**
- Primary caregiver is not satisfied with support received from family and friends (e.g., other children of client) — **b.**
- Primary caregiver expresses feelings of distress, anger or depression — **c.**
- *NONE OF ABOVE* — **d.**

3. EXTENT OF INFORMAL HELP (HOURS OF CARE, ROUNDED) — For instrumental and personal activities of daily living received over the **LAST 7 DAYS**, indicate extent of help from family, friends, and neighbors

HOURS
- **a.** Sum of time across five weekdays
- **b.** Sum of time across two weekend days

SECTION H. PHYSICAL FUNCTIONING:
• IADL PERFORMANCE IN 7 DAYS
• ADL PERFORMANCE IN 3 DAYS

1. IADL SELF PERFORMANCE—Code for functioning in routine activities around the home or in the community during the **LAST 7 DAYS**,

(A) IADL SELF PERFORMANCE CODE (***Code*** *for client's* ***performance during LAST 7 DAYS***)
0. *INDEPENDENT*—did on own
1. *SOME HELP*—help some of the time
2. *FULL HELP*—performed with help all of the time
3. *BY OTHERS*—performed by others
8. *ACTIVITY DID NOT OCCUR*

(B) IADL DIFFICULTY CODE *How difficult it is (or would it be) for client to do activity on own*
0. *NO DIFFICULTY*
1. *SOME DIFFICULTY*—e.g., needs some help, is very slow, or fatigues
2. *GREAT DIFFICULTY*—e.g., little or no involvement in the activity is possible

	(A) Performance	(B) Difficulty
a. MEAL PREPARATION—How meals are prepared (e.g., planning meals, cooking, assembling ingredients, setting out food and utensils)		
b. ORDINARY HOUSEWORK—How ordinary work around the house is performed (e.g., doing dishes, dusting, making bed, tidying up, laundry)		
c. MANAGING FINANCE—How bills are paid, checkbook is balanced, household expenses are balanced		
d. MANAGING MEDICATIONS—How medications are managed (e.g., remembering to take medicines, opening bottles, taking correct drug dosages, giving injections, applying ointments)		
e. PHONE USE—How telephone calls are made or received (with assistive devices such as large numbers on telephone, amplification as needed)		
f. SHOPPING—How shopping is performed for food and household items (e.g., selecting items, managing money)		
g. TRANSPORTATION—How client travels by vehicle (e.g., gets to places beyond walking distance)		

2. ADL SELF-PERFORMANCE—The following address the client's physical functioning in routine personal activities of daily life, for example, dressing, eating, etc. during the **LAST 3 DAYS**, **considering all episodes of these activities.** For clients who performed an activity independently, be sure to determine and record whether others encouraged the activity or were present to supervise or oversee the activity [*Note—For bathing, code for most dependent single episode in* ***LAST 7 DAYS***]

0. *INDEPENDENT*—No help, setup, or oversight —OR— Help, setup, oversight provided only 1 or 2 times (with any task or subtask)
1. *SETUP HELP ONLY*—Article or device provided within reach of client 3 or more times
2. *SUPERVISION*—Oversight, encouragement or cueing provided 3 or more times during last 3 days —OR— Supervision (1 or more times) plus physical assistance provided only 1 or 2 times (for a total of 3 or more episodes of help or supervision)
3. *LIMITED ASSISTANCE*—Client highly involved in activity; received physical help in guided maneuvering of limbs or other non-weight bearing assistance 3 or more times —OR— Combination of non-weight bearing help with more help provided only 1 or 2 times during period (for a total of 3 or more episodes of physical help)
4. *EXTENSIVE ASSISTANCE*—Client performed part of activity on own (50% or more of subtasks), but help of following type(s) were provided 3 or more times:
   — Weight-bearing support —OR—
   — Full performance by another during part (but not all) of last 3 days
5. *MAXIMAL ASSISTANCE*—Client involved and completed less than 50% of subtasks on own (includes 2+ person assist), received weight bearing help or full performance of certain subtasks 3 or more times
6. *TOTAL DEPENDENCE*—Full performance of activity by another
8. *ACTIVITY DID NOT OCCUR* (regardless of ability)

2.	ADL SELF-PERFORMANCE (cont)	
	a. MOBILITY IN BED—Including moving to and from lying position, turning side to side, and positioning body while in bed.	
	b. TRANSFER—Including moving to and between surfaces—to/from bed, chair, wheelchair, standing position. [*Note—Excludes to/from bath/toilet*]	
	c. LOCOMOTION IN HOME—[Note—If in wheelchair, self-sufficiency once in chair]	
	d. LOCOMOTION OUTSIDE OF HOME—[Note—If in wheelchair, self-sufficiency once in chair]	
	e. DRESSING UPPER BODY—How client dresses and undresses (**street clothes, underwear**) above the waist, includes prostheses, orthotics, fasteners, pullovers, etc.	
	f. DRESSING LOWER BODY—How client dresses and undresses (**street clothes, underwear**) from the waist down, includes prostheses, orthotics, belts, pants, skirts, shoes, and fasteners	
	g. EATING—Including taking in food by any method, including tube feedings.	
	h. TOILET USE—Including using the toilet room or commode, bedpan, urinal, transferring on/off toilet, cleaning self after toilet use or incontinent episode, changing pad, managing any special devices required (ostomy or catheter), and adjusting clothes.	
	i. PERSONAL HYGIENE—Including combing hair, brushing teeth, shaving, applying makeup, washing/drying face and hands (EXCLUDE baths and showers)	
	j. BATHING—How client takes full-body bath/shower or sponge bath (**EXCLUDE** washing of back and hair). Includes how each part of body is bathed: arms, upper and lower legs, chest, abdomen, perineal area. ***Code for most dependent episode in LAST 7 DAYS***	
3.	**ADL DECLINE** — ADL status has become worse (i.e., now more impaired in self performance) as compared to status **90 days ago** (or since last assessment if less than 90 days) 0. No 1. Yes	
4.	**PRIMARY MODES OF LOCOMOTION** 0. No assistive device 3. Scooter (e.g., Amigo) 1. Cane 4. Wheelchair 2. Walker/crutch 8. ACTIVITY DID NOT OCCUR	
	a. Indoors	
	b. Outdoors	
5.	**STAIR CLIMBING** — In the **last 3 days**, how client went up and down stairs (e.g., single or multiple steps, using handrail as needed) 0. Up and down stairs without help 1. Up and down stairs with help 2. Not go up and down stairs	
6.	**STAMINA** — **a.** In a typical week, during the **LAST 30 DAYS** (or since last assessment), code the number of days client usually went out of the house or building in which client lives (no matter how short a time period) 0. Every day 2. 1 day a week 1. 2-6 days a week 3. No days	
	b. Hours of physical activities in the **last 3 days** (e.g., walking, cleaning house, exercise) 0. Two or more hours 1. Less than two hours	
7.	**FUNCTIONAL POTENTIAL** — Client believes he/she capable of increased functional independence (ADL, IADL, mobility) — a.	
	Caregivers believe client is capable of increased functional independence (ADL, IADL, mobility) — b.	
	Good prospects of recovery from current disease or conditions, improved health status expected — c.	
	NONE OF ABOVE — d.	

SECTION I. CONTINENCE IN LAST 7 DAYS

1.	**BLADDER CONTINENCE**	**a. In LAST 7 DAYS** control of urinary bladder function (with appliances such as catheters or incontinence program employed) [Note—if dribbles, volume insufficient to soak through underpants] 0. *CONTINENT*—Complete control; DOES NOT USE any type of catheter or other urinary collection device 1. *CONTINENT WITH CATHETER*—Complete control with use of any type of catheter or urinary collection device that does not leak urine 2. *USUALLY CONTINENT*—Incontinent episodes once a week or less 3. *OCCASIONALLY INCONTINENT*—Incontinent episodes 2 or more times a week but not daily 4. *FREQUENTLY INCONTINENT*—Tends to be incontinent daily, but some control present 5. *INCONTINENT*—Inadequate control, multiple daily episodes 8. *DID NOT OCCUR*—No urine output from bladder	
		b. Worsening of bladder incontinence as compared to status **90 DAYS AGO** (or since last assessment if less than 90 days) 0. No 1. Yes
2.	**BLADDER DEVICES**	(***Check all that apply in LAST 7 DAYS***)
		Use of pads or briefs to protect against wetness — a.
		Use of an indwelling urinary catheter — b.
		NONE OF ABOVE — c.

3.	**BOWEL CONTINENCE**	In **LAST 7 DAYS**, control of bowel movement (with appliance or bowel continence program if employed) 0. *CONTINENT*—Complete control; DOES NOT USE ostomy device 1. *CONTINENT WITH OSTOMY*—Complete control with use of ostomy device that does not leak stool 2. *USUALLY CONTINENT*—Bowel incontinent episodes less than weekly 3. *OCCASIONALLY INCONTINENT*—Bowel incontinent episode once a week 4. *FREQUENTLY INCONTINENT*—Bowel incontinent episodes 2-3 times a week 5. *INCONTINENT*—Bowel incontinent all (or almost all) of the time 8. *DID NOT OCCUR*—No bowel movement during entire 7 day assessment period	

SECTION J. DISEASE DIAGNOSES

Disease/infection that doctor has indicated is present and affects client's status, requires treatment, or symptom management. Also include if disease is monitored by a home care professional or is the reason for a hospitalization in **LAST 90 DAYS** (or since last assessment if less than 90 days)

[blank]. Not present
1. Present—not subject to focused treatment or monitoring by home care professional
2. Present—monitored or treated by home care professional
[If no disease in list, check **J1ac**, *None of Above*]

1.	**DISEASES**				
		HEART/CIRCULATION		p. Osteoporosis	
		a. Cerebrovascular accident (stroke)		**SENSES**	
		b. Congestive heart failure		q. Cataract	
		c. Coronary artery disease		r. Glaucoma	
		d. Hypertension		**PSYCHIATRIC/MOOD**	
		e. Irregularly irregular pulse		s. Any psychiatric diagnosis	
		f. Peripheral vascular disease		**INFECTIONS**	
		NEUROLOGICAL		t. HIV infection	
		g. Alzheimer's		u. Pneumonia	
		h. Dementia other than Alzheimer's disease		v. Tuberculosis	
		i. Head trauma		w. Urinary tract infection (**in LAST 30 DAYS**)	
		j. Hemiplegia/hemiparesis		**OTHER DISEASES**	
		k. Multiple sclerosis		x. Cancer—(in past 5 years) not including skin cancer	
		l. Parkinsonism		y. Diabetes	
		MUSCULO-SKELETAL		z. Emphysema/COPD/asthma	
		m. Arthritis		aa. Renal Failure	
		n. Hip fracture		ab. Thyroid disease (hyper or hypo)	
		o. Other fractures (e.g., wrist, vertebral)		ac. *NONE OF ABOVE*	ac.
2.	**OTHER CURRENT OR MORE DETAILED DIAGNOSES AND ICD-9 CODES**	a. _____			| | | | . | |
		b. _____			| | | | . | |
		c. _____			| | | | . | |
		d. _____			| | | | . | |

SECTION K. HEALTH CONDITIONS AND PREVENTIVE HEALTH MEASURES

1.	**PREVENTIVE HEALTH (PAST TWO YEARS)**	(***Check all that apply—in PAST 2 YEARS***)	
		Blood pressure measured	a.
		Received influenza vaccination	b.
		Test for blood in stool or screening endoscopy	c.
		IF FEMALE: Received breast examination or mammography	d.
		NONE OF ABOVE	e.

2.	**PROBLEM CONDITIONS PRESENT ON 2 OR MORE DAYS**	(***Check all that were present on at least 2 of the last 3 days***)			
		Diarrhea	a.	Loss of appetite	d.
		Difficulty urinating or urinating 3 or more times at night	b.	Vomiting	e.
		Fever	c.	*NONE OF ABOVE*	f.

3.	**PROBLEM CONDITIONS**	(***Check all present at any point during last 3 days***)			
		PHYSICAL HEALTH		Shortness of breath	e.
		Chest pain/pressure at rest or on exertion	a.	**MENTAL HEALTH**	
				Delusions	f.
		No bowel movement in 3 days	b.	Hallucinations	g.
		Dizziness or lightheadedness	c.	*NONE OF ABOVE*	h.
		Edema	d.		

4.	PAIN	**a.** Frequency with which client complains or shows evidence of pain 0. No pain (score b-e as 0) 2. Daily - one period 1. Less than daily 3. Daily - multiple periods (e.g., morning and evening)	
		b. Intensity of pain 0. No pain 2. Moderate 4. Times when pain is horrible 1. Mild 3. Severe or excruciating	
		c. From client's point of view, pain intensity disrupts usual activities 0. No 1. Yes	
		d. Character of pain 0. No pain 1. Localized - single site 2. Multiple sites	
		e. From client's point of view, medications adequately control pain 0. Yes or no pain 1. Medications do not adequately control pain 2. Pain present, medication not taken	
5.	FALLS FREQUENCY	Number of times fell in **LAST 90 DAYS** (or since last assessment if less than 90 days) If none, code "0"; if more than 9, code "9"	
6.	DANGER OF FALL	(***Code for danger of falling***) 0. No 1. Yes	
		a. Unsteady gait	
		b. Client limits going outdoors due to fear of falling (e.g., stopped using bus, goes out only with others)	
7.	LIFESTYLE (Drinking/ Smoking)	(***Code for drinking or smoking***) 0. No 1. Yes	
		a. In the LAST 90 DAYS (or since last assessment if less than 90 days), client felt the need or was told by others to cut down on drinking, or others were concerned with client's drinking	
		b. In the LAST 90 DAYS (or since last assessment if less than 90 days), client had to have a drink first thing in the morning to steady nerves (i.e., an "eye opener") or has been in trouble because of drinking	
		c. Smoked or chewed tobacco daily	
8.	HEALTH STATUS INDICATORS	(**Check all that apply**)	
		Client feels he/she has poor health (when asked)	a.
		Has conditions or diseases that make cognition, ADL, mood, or behavior patterns unstable (fluctuations, precarious, or deteriorating)	b.
		Experiencing a flare-up of a recurrent or chronic problem	c.
		Treatments changed in **LAST 30 DAYS** (or since last assessment if less than 30 days) because of a new acute episode or condition	d.
		Prognosis of less than six months to live—e.g., physician has told client or client's family that client has end-stage disease	e.
		NONE OF ABOVE	f.
9.	OTHER STATUS INDICATORS	(**Check all that apply**)	
		Fearful of a family member or caregiver	a.
		Unusually poor hygiene	b.
		Unexplained injuries, broken bones, or burns	c.
		Neglected, abused, or mistreated	d.
		Physically restrained (e.g., limbs restrained, used bed rails, constrained to chair when sitting)	e.
		NONE OF ABOVE	f.

SECTION L. NUTRITION/HYDRATION STATUS

1.	WEIGHT	(***Code for weight items***) 0. No 1. Yes	
		a. Unintended weight loss of 5% or more in the **LAST 30 DAYS** [or 10% or more in the **LAST 180 DAYS**]	
		b. Severe malnutrition (cachexia)	
		c. Morbid obesity	
2.	CONSUMPTION	(***Code for consumption***) 0. No 1. Yes	
		a. In at least 2 of the last 3 days, ate one or fewer meals a day	
		b. In last 3 days, noticeable decrease in the amount of food client usually eats or fluids usually consumes	
		c. Insufficient fluid—did not consume all/almost all fluids during last 3 days	
		d. Enteral tube feeding	
3.	SWALLOWING	0. *NORMAL*—Safe and efficient swallowing of all diet consistencies 1. *REQUIRES DIET MODIFICATION TO SWALLOW SOLID FOODS* (mechanical diet or able to ingest specific foods only) 2. *REQUIRES MODIFICATION TO SWALLOW SOLID FOODS AND LIQUIDS* (puree, thickened liquids) 3. *COMBINED ORAL AND TUBE FEEDING* 4. *NO ORAL INTAKE (NPO)*	

SECTION M. DENTAL STATUS (ORAL HEALTH)

1.	ORAL STATUS	(**Check all that apply**)	
		Problem chewing (e.g., poor mastication, immobile jaw, surgical resection, decreased sensation/motor control, pain while eating)	a.
		Mouth is "dry" when eating a meal	b.
		Problem brushing teeth or dentures	c.
		NONE OF ABOVE	d.

SECTION N. SKIN CONDITION

1.	SKIN PROBLEMS	Any troubling skin conditions or changes in skin condition (e.g., burns, bruises, rashes, itchiness, body lice, scabies) 0. No 1. Yes	
2.	ULCERS (Pressure/ Stasis)	Presence of an ulcer anywhere on the body. Ulcers include any area of persistent skin redness (Stage 1); partial loss of skin layers (Stage 2); deep craters in the skin (Stage 3); breaks in skin exposing muscle or bone (Stage 4). [**Code 0 if no ulcer, otherwise record the highest ulcer stage (Stage 1-4).**]	
		a. Pressure ulcer—any lesion caused by pressure, shear forces, resulting in damage of underlying tissues	
		b. Stasis ulcer—open lesion caused by poor circulation in the lower extremities	
3.	OTHER SKIN PROBLEMS REQUIRING TREATMENT	(***Check all that apply***)	
		Burns (second or third degree)	a.
		Open lesions other than ulcers, rashes, cuts (e.g., cancer)	b.
		Skin tears or cuts	c.
		Surgical wound	d.
		Corns, calluses, structural problems, infections, fungi	e.
		NONE OF ABOVE	f.
4.	HISTORY OF RESOLVED PRESSURE ULCERS	Client previously had (at any time) or has an ulcer anywhere on the body 0. No 1. Yes	
5.	WOUND/ ULCER CARE	(***Check for formal care in LAST 7 DAYS***)	
		Antibiotics, systemic or topical	a.
		Dressings	b.
		Surgical wound care	c.
		Other wound/ulcer care (e.g., pressure relieving device, nutrition, turning, debridement)	d.
		NONE OF ABOVE	e.

SECTION O. ENVIRONMENTAL ASSESSMENT

1.	HOME ENVIRONMENT [Check any of following that make home environment hazardous or uninhabitable (if none apply, check *NONE OF ABOVE*; if temporarily in institution, base assessment on home visit)]	Lighting in evening (including inadequate or no lighting in living room, sleeping room, kitchen, toilet, corridors)	a.
		Flooring and carpeting (e.g., holes in floor, electric wires where client walks, scatter rugs)	b.
		Bathroom and toiletroom (e.g., non-operating toilet, leaking pipes, no rails though needed, slippery bathtub, outside toilet)	c.
		Kitchen (e.g., dangerous stove, inoperative refrigerator, infestation by rats or bugs)	d.
		Heating and cooling (e.g., too hot in summer, too cold in winter, wood stove in a home with an asthmatic)	e.
		Personal safety (e.g., fear of violence, safety problem in going to mailbox or visiting neighbors, heavy traffic in street)	f.
		Access to home (e.g., difficulty entering/leaving home)	g.
		Access to rooms in house (e.g., unable to climb stairs)	h.
		NONE OF ABOVE	i.
2.	LIVING ARRANGEMENT	**a.** As compared to **90 DAYS AGO** (or since last assessment), client now lives with other persons—e.g., moved in with another person, other moved in with client 0. No 1. Yes	
		b. Client or primary caregiver feels that client would be better off in another living environment 0. No 1. Client only 2. Caregiver only 3. Client and caregiver	

SECTION P. SERVICE UTILIZATION (IN LAST 7 DAYS)

1.	FORMAL CARE (Minutes rounded to even 10 minutes)	Extent of care or care management in **LAST 7 DAYS** (or since last assessment if less than 7 days) involving	(A) # of Days	(B) Hours	(C) Mins
		a. Home health aides			
		b. Visiting nurses			
		c. Homemaking services			
		d. Meals			
		e. Volunteer services			
		f. Physical therapy			
		g. Occupational therapy			
		h. Speech therapy			
		i. Day care or day hospital			
		j. Social worker in home			

2. SPECIAL TREATMENTS, THERAPIES, PROGRAMS

Special treatments, therapies, and programs received or scheduled during the **LAST 7 DAYS** (or since last assessment if less than 7 days) and adherence to the required schedule. Includes services received in the home or on an outpatient basis.

[Blank]. Not applicable 2. Scheduled, partial adherence
1. Scheduled, full adherence as prescribed 3. Scheduled, not received
[If no treatments provided, check *NONE OF ABOVE* **P2aa**]

RESPIRATORY TREATMENTS		o. Occupational therapy	
a. Oxygen		p. Physical therapy	
b. Respirator for assistive breathing		**PROGRAMS**	
c. All other respiratory treatments		q. Day center	
		r. Day hospital	
OTHER TREATMENTS		s. Hospice care	
d. Alcohol/drug treatment program		t. Physician or clinic visit	
		u. Respite care	
e. Blood transfusion(s)		**SPECIAL PROCEDURES DONE IN HOME**	
f. Chemotherapy			
g. Dialysis		v. Daily nurse monitoring (e.g., EKG, urinary output)	
h. IV infusion - central		w. Nurse monitoring less than daily	
i. IV infusion - peripheral			
j. Medication by injection		x. Medical alert bracelet or electronic security alert	
k. Ostomy care			
l. Radiation		y. Skin treatment	
m. Tracheostomy care		z. Special diet	
THERAPIES		aa. *NONE OF ABOVE*	aa.
n. Exercise therapy			

3. MANAGEMENT OF EQUIPMENT (In Last 3 Days)

Management codes:
0. Not used
1. Managed on own
2. Managed on own if laid out or with verbal reminders
3. Partially performed by others
4. Fully performed by others

a. Oxygen		c. Catheter	
b. IV		d. Ostomy	

4. VISITS IN LAST 90 DAYS OR SINCE LAST ASSESSMENT

Enter 0 if none, if more than 9, code "9"

a. Number of times ADMITTED TO HOSPITAL **with** an overnight stay

b. Number of times VISITED EMERGENCY ROOM **without** an overnight stay

c. EMERGENT CARE—including unscheduled nursing, physician, or therapeutic visits to office or home

5. TREATMENT GOALS

Any treatment goals that have been met in the **LAST 90 DAYS** (or since last assessment if less than 90 days)
0. No 1. Yes

6. OVERALL CHANGE IN CARE NEEDS

Overall self sufficiency has changed significantly as compared to status of **90 DAYS AGO** (or since last assessment if less than 90 days)
0. No change 1. Improved—receives fewer supports 2. Deteriorated—receives more support

7. TRADE OFFS

Because of limited funds, during the last month, client made trade-offs among purchasing any of the following: prescribed medications, sufficient home heat, necessary physician care, adequate food, home care
0. No 1. Yes

SECTION Q. MEDICATIONS

1. NUMBER OF MEDICATIONS

Record the number of different medicines (prescriptions and over the counter), including eye drops, taken regularly or on an occasional basis in the **LAST 7 DAYS** (or since last assessment)[*If none, code "0", if more than 9, code "9"*]

2. RECEIPT OF PSYCHOTROPIC MEDICATION

Psychotropic medications taken in the **LAST 7 DAYS** (or since last assesssment) [Note—Review client's medications with the list that applies to the following categories] 0. No 1. Yes

a. Antipsychotic/neuroleptic		c. Antidepressant	
b. Anxiolytic		d. Hypnotic	

3. MEDICAL OVERSIGHT

Physician reviewed client's medications as a whole in **LAST 180 DAYS** (or since last assessment)
0. Discussed with at least one physician (or no medication taken)
1. No single physician reviewed all medications

4. COMPLIANCE/ ADHERENCE WITH MEDICATIONS

Compliant all or most of time with **medications** prescribed by physician (both during and between therapy visits) in **LAST 7 DAYS**

0. Always compliant
1. Compliant 80% of time or more
2. Compliant less than 80% of time, including failure to purchase prescribed medications
3. *NO MEDICATIONS PRESCRIBED*

5. LIST OF ALL MEDICATIONS

List prescribed and nonprescribed medications taken in **LAST 7 DAYS** (or since last assessment)
a. Name and Dose—Record the name of the medication and dose ordered.
b. Form: Code the route of Administration using the following list:

1. By mouth (PO)
2. Sub lingual (SL)
3. Intramuscular (IM)
4. Intravenous (IV)
5. Subcutaneous (SQ)
6. Rectal (R)
7. Topical
8. Inhalation
9. Enteral tube
10. Other

c. Number taken— Record the amount of medication administered each time the medication is given

d. Freq: Code the number of times per day, week, or month the medication is administered using the following list:

PRN.	As necessary	5D.	Five times daily
QH.	Every hour	QOD.	Every other day
Q2H.	Every two hours	QW.	Once each wk
Q3H.	Every three hours	2W.	Two times every week
Q4H.	Every four hours	3W.	Three times every week
Q6H.	Every six hours	4W.	Four times each week
Q8H.	Every eight hours	5W.	Five times each week
QD.	Once daily	6W.	Six times each week
BID.	Two times daily (includes every 12 hrs)	1M.	Once every month
		2M.	Twice every month
TID.	Three times daily	C.	Continuous
QID.	Four times daily	O.	Other

a. Name and Dose	b. Form	c. Number Taken	d. Freq.
a.			
b.			
c.			
d.			
e.			
f.			
g.			
h.			
i.			
j.			
k.			

SECTION R. ASSESSMENT INFORMATION

1. SIGNATURES OF PERSONS COMPLETING THE ASSESSMENT:

a. Signature of Assessment Coordinator

b. Title of Assessment Coordinator

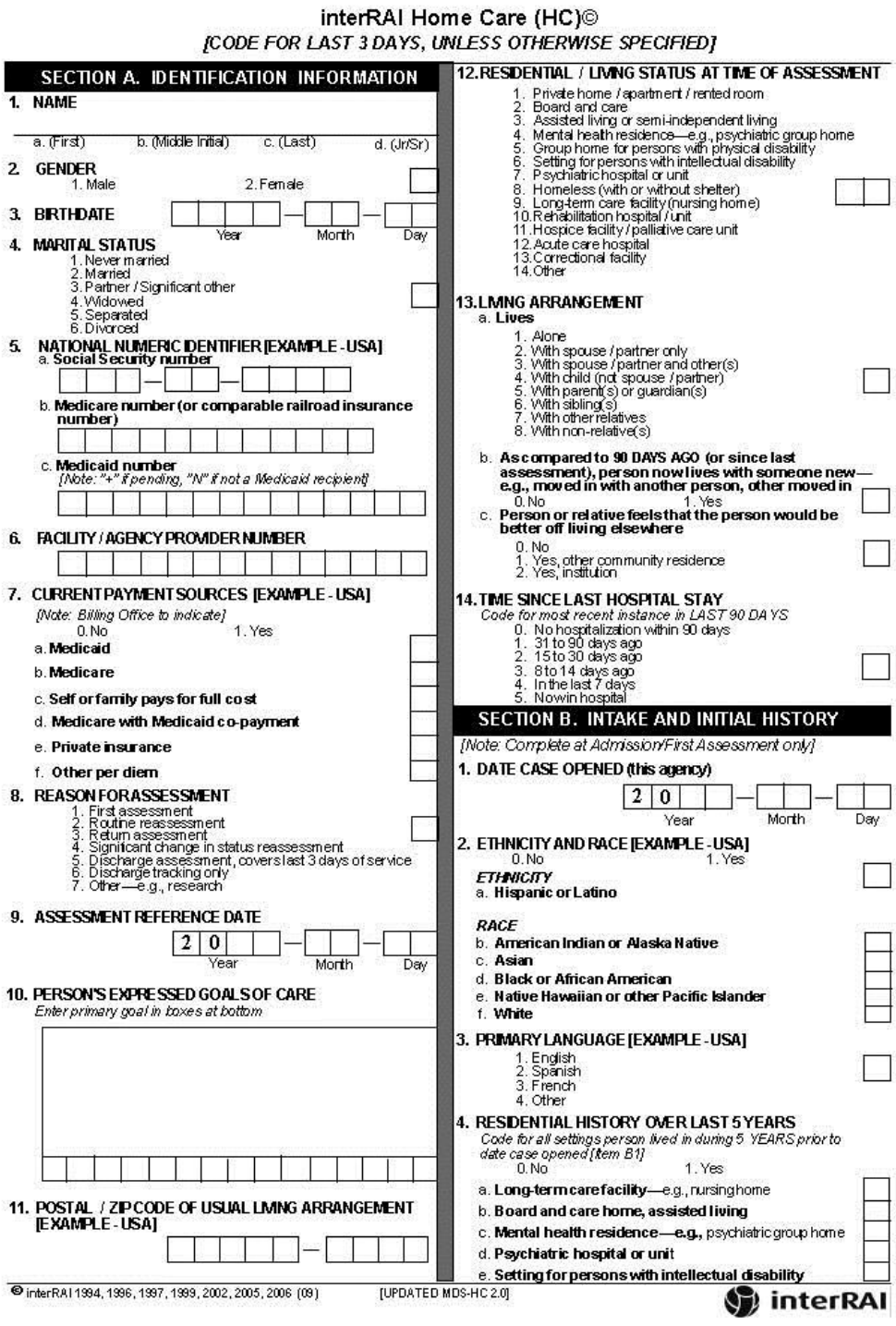
c. Date Assessment Coordinator signed as complete — Month — Day — Year

d. Other Signatures	Title	Sections	Date
e.			Date
f.			Date
g.			Date
h.			Date
i.			Date

☐ = When box blank, must enter number or letter [a.] = When letter in box, check if condition applies

@ Country specific

h. InterRAI Home Care (InterRAI-HC)



interRAI Home Care (HC)©

[CODE FOR LAST 3 DAYS, UNLESS OTHERWISE SPECIFIED]

SECTION A. IDENTIFICATION INFORMATION

1. NAME
   a. (First) b. (Middle Initial) c. (Last) d. (Jr/Sr)
2. GENDER
   1. Male 2. Female
3. BIRTHDATE
   Year Month Day
4. MARITAL STATUS
   1. Never married
   2. Married
   3. Partner / Significant other
   4. Widowed
   5. Separated
   6. Divorced
5. NATIONAL NUMERIC IDENTIFIER [EXAMPLE - USA]
   a. **Social Security number**
   b. **Medicare number (or comparable railroad insurance number)**
   c. **Medicaid number**
   [Note: "+" if pending, "N" if not a Medicaid recipient]
6. FACILITY / AGENCY PROVIDER NUMBER
7. CURRENT PAYMENT SOURCES [EXAMPLE - USA]
   [Note: Billing Office to indicate]
   0. No 1. Yes
   a. **Medicaid**
   b. **Medicare**
   c. **Self or family pays for full cost**
   d. **Medicare with Medicaid co-payment**
   e. **Private insurance**
   f. **Other per diem**
8. REASON FOR ASSESSMENT
   1. First assessment
   2. Routine reassessment
   3. Return assessment
   4. Significant change in status reassessment
   5. Discharge assessment, covers last 3 days of service
   6. Discharge tracking only
   7. Other—e.g., research
9. ASSESSMENT REFERENCE DATE
   2 0 — — —
   Year Month Day
10. PERSON'S EXPRESSED GOALS OF CARE
    Enter primary goal in boxes at bottom
11. POSTAL / ZIP CODE OF USUAL LIVING ARRANGEMENT [EXAMPLE - USA]
12. RESIDENTIAL / LIVING STATUS AT TIME OF ASSESSMENT
    1. Private home / apartment / rented room
    2. Board and care
    3. Assisted living or semi-independent living
    4. Mental health residence—e.g., psychiatric group home
    5. Group home for persons with physical disability
    6. Setting for persons with intellectual disability
    7. Psychiatric hospital or unit
    8. Homeless (with or without shelter)
    9. Long-term care facility (nursing home)
    10. Rehabilitation hospital / unit
    11. Hospice facility / palliative care unit
    12. Acute care hospital
    13. Correctional facility
    14. Other
13. LIVING ARRANGEMENT
    a. **Lives**
    1. Alone
    2. With spouse / partner only
    3. With spouse / partner and other(s)
    4. With child (not spouse / partner)
    5. With parent(s) or guardian(s)
    6. With sibling(s)
    7. With other relatives
    8. With non-relative(s)
    b. **As compared to 90 DAYS AGO (or since last assessment), person now lives with someone new—e.g., moved in with another person, other moved in**
    0. No 1. Yes
    c. **Person or relative feels that the person would be better off living elsewhere**
    0. No
    1. Yes, other community residence
    2. Yes, institution
14. TIME SINCE LAST HOSPITAL STAY
    Code for most recent instance in LAST 90 DAYS
    0. No hospitalization within 90 days
    1. 31 to 90 days ago
    2. 15 to 30 days ago
    3. 8 to 14 days ago
    4. In the last 7 days
    5. Now in hospital

SECTION B. INTAKE AND INITIAL HISTORY

[Note: Complete at Admission/First Assessment only]

1. DATE CASE OPENED (this agency)
   2 0 — — —
   Year Month Day
2. ETHNICITY AND RACE [EXAMPLE - USA]
   0. No 1. Yes
   ETHNICITY
   a. **Hispanic or Latino**
   RACE
   b. **American Indian or Alaska Native**
   c. **Asian**
   d. **Black or African American**
   e. **Native Hawaiian or other Pacific Islander**
   f. **White**
3. PRIMARY LANGUAGE [EXAMPLE - USA]
   1. English
   2. Spanish
   3. French
   4. Other
4. RESIDENTIAL HISTORY OVER LAST 5 YEARS
   Code for all settings person lived in during 5 YEARS prior to date case opened [Item B1]
   0. No 1. Yes
   a. **Long-term care facility**—e.g., nursing home
   b. **Board and care home, assisted living**
   c. **Mental health residence—e.g.,** psychiatric group home
   d. **Psychiatric hospital or unit**
   e. **Setting for persons with intellectual disability**

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SECTION C. COGNITION

1. COGNITIVE SKILLS FOR DAILY DECISION MAKING
Making decisions regarding tasks of daily life—e.g., when to get up or have meals, which clothes to wear or activities to do
0. *Independent*—Decisions consistent, reasonable, and safe
1. *Modified independence*—Some difficulty in new situations only
2. *Minimally impaired*—In specific recurring situations, decisions become poor or unsafe; cues / supervision necessary at those times
3. *Moderately impaired*—Decisions consistently poor or unsafe; cues / supervision required at all times
4. *Severely impaired*—Never or rarely makes decisions
5. *No discernable consciousness, coma [Skip to Section G]*

2. MEMORY / RECALL ABILITY
Code for recall of what was learned or known
0. Yes, memory OK 1. Memory problem
a. **Short-term memory OK**—Seems / appears to recall after 5 minutes
b. **Procedural memory OK**—Can perform all or almost all steps in a multitask sequence without cues
c. **Situational memory OK**—Both: recognizes caregivers' names / faces frequently encountered AND knows location of places regularly visited (bedroom, dining room, activity room, therapy room)

3. PERIODIC DISORDERED THINKING OR AWARENESS
[Note: Accurate assessment requires conversations with staff, family or others who have direct knowledge of the person's behavior over this time]
0. Behavior not present
1. Behavior present, consistent with usual functioning
2. Behavior present, appears different from usual functioning (e.g., new onset or worsening; different from a few weeks ago)
a. **Easily distracted**—e.g., episodes of difficulty paying attention; gets sidetracked
b. **Episodes of disorganized speech**—e.g., speech is nonsensical, irrelevant, or rambling from subject to subject; loses train of thought
c. **Mental function varies over the course of the day**—e.g., sometimes better, sometimes worse

4. ACUTE CHANGE IN MENTAL STATUS FROM PERSON'S USUAL FUNCTIONING–*e.g., restlessness, lethargy, difficult to arouse, altered environmental perception*
0. No 1. Yes

5. CHANGE IN DECISION MAKING AS COMPARED TO 90 DAYS AGO (OR SINCE LAST ASSESSMENT)
0. Improved 2. Declined
1. No change 8. Uncertain

SECTION D. COMMUNICATION AND VISION

1. MAKING SELF UNDERSTOOD (Expression)
Expressing information content—both verbal and non-verbal
0. *Understood*—Expresses ideas without difficulty
1. *Usually understood*—Difficulty finding words or finishing thoughts BUT if given time, little or no prompting required
2. *Often understood*—Difficulty finding words or finishing thoughts AND prompting usually required
3. *Sometimes understood*—Ability is limited to making concrete requests
4. *Rarely or never understood*

2. ABILITY TO UNDERSTAND OTHERS (Comprehension)
Understanding verbal information content (however able, with hearing appliance normally used)
0. ***Understands***—Clear comprehension
1. ***Usually understands***—Misses some part / intent of message BUT comprehends most conversation
2. ***Often understands***—Misses some part / intent of message BUT with repetition or explanation can often comprehend conversation
3. ***Sometimes understands***—Responds adequately to simple, direct communication only
4. ***Rarely or never understands***

3. HEARING
Ability to hear (with hearing appliance normally used)
0. ***Adequate***—No difficulty in normal conversation, social interaction, listening to TV
1. ***Minimal difficulty***—Difficulty in some environments (e.g., when person speaks softly or is more than 6 feet [2 meters] away)
2. ***Moderate difficulty***—Problem hearing normal conversation, requires quiet setting to hear well
3. ***Severe difficulty***—Difficulty in all situations (e.g., speaker has to talk loudly or speak very slowly, or person reports that all speech is mumbled)
4. ***No hearing***

4. VISION
Ability to see in adequate light (with glasses or with other visual appliance normally used)
0. ***Adequate***—Sees fine detail, including regular print in newspapers / books
1. ***Minimal difficulty***—Sees large print, but not regular print in newspapers / books
2. ***Moderate difficulty***—Limited vision; not able to see newspaper headlines, but can identify objects
3. ***Severe difficulty***—Object identification in question, but eyes appear to follow objects; sees only light, colors, shapes
4. ***No vision***

SECTION E. MOOD AND BEHAVIOR

1. INDICATORS OF POSSIBLE DEPRESSED, ANXIOUS, OR SAD MOOD
Code for indicators observed in last 3 days, irrespective of the assumed cause [Note: Whenever possible, ask person]
0. Not present
1. Present but not exhibited in last 3 days
2. Exhibited on 1-2 of last 3 days
3. Exhibited daily in last 3 days
a. **Made negative statements**—e.g., "*Nothing matters; Would rather be dead; What's the use; Regret having lived so long; Let me die*"
b. **Persistent anger with self or others**—e.g., easily annoyed, anger at care received
c. **Expressions, including non-verbal, of what appear to be unrealistic fears**—e.g., fear of being abandoned, being let alone, being with others; intense fear of specific objects or situations
d. **Repetitive health complaints**—e.g., persistently seeks medical attention, incessant concern with body functions
e. **Repetitive anxious complaints / concerns (non-health related)**—e.g., persistently seeks attention / reassurance regarding schedules, meals, laundry, clothing, relationships
f. **Sad, pained, or worried facial expressions**—e.g., furrowed brow, constant frowning
g. **Crying, tearfulness**
h. **Recurrent statements that something terrible is about to happen**–e.g., believes he or she is about to die, have a heart attack
i. **Withdrawal from activities of interest**—e.g., long-standing activities, being with family / friends
j. **Reduced social interactions**
k. **Expressions, including non-verbal, of a lack of pleasure in life (anhedonia)**—e.g., "*I don't enjoy anything anymore*"

2. SELF-REPORTED MOOD
0. Not in last 3 days
1. Not in last 3 days, but often feels that way
2. In 1-2 of last 3 days
3. Daily in the last 3 days
8. Person could not (would not) respond
Ask: "In the last 3 days, how often have you felt..."
a. ***Little interest or pleasure in things you normally enjoy?***
b. ***Anxious, restless, or uneasy?***
c. ***Sad, depressed, or hopeless?***

3. BEHAVIOR SYMPTOMS
Code for indicators observed, irrespective of the assumed cause
0. Not Present
1. Present but not exhibited in last 3 days
2. Exhibited on 1-2 of last 3 days
3. Exhibited daily in last 3 days
a. **Wandering**—Moved with no rational purpose, seemingly oblivious to needs or safety
b. **Verbal abuse**—e.g., others were threatened, screamed at, cursed at
c. **Physical abuse**—e.g., others were hit, shoved, scratched, sexually abused
d. **Socially inappropriate or disruptive behavior**—e.g., made disruptive sounds or noises, screamed out, smeared or threw food or feces, hoarded, rummaged through other's belongings
e. **Inappropriate public sexual behavior or public disrobing**
f. **Resists care**—e.g., taking medications / injections, ADL assistance, eating

SECTION F. PSYCHOSOCIAL WELL-BEING

1. SOCIAL RELATIONSHIPS

[Note: Whenever possible, ask person]

0. Never
1. More than 30 days ago
2. 8 to 30 days ago
3. 4 to 7 days ago
4. In last 3 days
8. Unable to determine

a. **Participation in social activities of long-standing interest**
b. **Visit with a long-standing social relation or family member**
c. **Other interaction with long-standing social relation or family member**—e.g., telephone, e-mail
d. **Conflict or anger with family or friends**
e. **Fearful of a family member or close acquaintance**
f. **Neglected, abused, or mistreated**

2. LONELY

Says or indicates that he / she feels lonely

0. No 1. Yes

3. CHANGE IN SOCIAL ACTIVITIES IN LAST 90 DAYS (OR SINCE LAST ASSESSMENT IF LESS THAN 90 DAYS AGO)

Decline in level of participation in social, religious, occupational or other preferred activities

IF THERE WAS A DECLINE, person distressed by this fact

0. No decline
1. Decline, not distressed
2. Decline, distressed

4. LENGTH OF TIME ALONE DURING THE DAY (MORNING AND AFTERNOON)

0. Less than 1 hour
1. 1-2 hours
2. More than 2 hours but less than 8 hours
3. 8 hours or more

5. MAJOR LIFE STRESSORS IN LAST 90 DAYS—*e.g., episode of severe personal illness; death or severe illness of close family member/friend; loss of home; major loss of income / assets; victim of a crime such as robbery or assault; loss of driving license/car*

0. No 1. Yes

SECTION G. FUNCTIONAL STATUS

1. IADL SELF PERFORMANCE AND CAPACITY

Code for PERFORMANCE in routine activities around the home or in the community during the LAST 3 DAYS

Code for CAPACITY based on presumed ability to carry out activity as independently as possible. This will require "speculation" by the assessor.

0. *Independent*—No help, setup, or supervision
1. *Setup help only*
2. *Supervision*—Oversight /cuing
3. *Limited assistance*—Help on some occasions
4. *Extensive assistance*—Help throughout task, but performs 50% or more of task on own
5. *Maximal assistance*—Help throughout task, but performs less than 50% of task on own
6. *Total dependence*—Full performance by others during entire period
8. *Activity did not occur*—During entire period [DO NOT USE THIS CODE IN SCORING CAPACITY]

	PERFORMANCE	CAPACITY
a. **Meal preparation**—How meals are prepared (e.g., planning meals, assembling ingredients, cooking, setting out food and utensils)		
b. **Ordinary housework**—How ordinary work around the house is performed (e.g., doing dishes, dusting, making bed, tidying up, laundry)		
c. **Managing finances**—How bills are paid, checkbook is balanced, household expenses are budgeted, credit card account is monitored		
d. **Managing medications**—How medications are managed (e.g., remembering to take medicines, opening bottles, taking correct drug dosages, giving injections, applying ointments)		
e. **Phone use**—How telephone calls are made or received (with assistive devices such as large numbers on telephone, amplification as needed)		
f. **Stairs**—How full flight of stairs is managed (12-14 stairs)		
g. **Shopping**—How shopping is performed for food and household items (e.g., selecting items, paying money) - EXCLUDE TRANSPORTATION		
h. **Transportation**—How travels by public transportation (navigating system, paying fare) or driving self (including getting out of house, into and out of vehicles)		

2. ADL SELF-PERFORMANCE

Consider all episodes over 3-day period.

***If all** episodes are performed at the same level, score ADL at that level*
***If any** episodes at level 6, and others less dependent, score ADL as 5.*

Otherwise, focus on the three most dependent episodes [or all episodes if performed fewer than 3 times]. If most dependent episode is 1, score ADL as 1. If not, score ADL as least dependent of those episodes in range 2-5.

0. *Independent*—No physical assistance, setup, or supervision in any episode
1. *Independent, setup help only*—Article or device provided or placed within reach, no physical assistance or supervision in any episode
2. *Supervision*—Oversight /cuing
3. *Limited assistance*—Guided maneuvering of limbs, physical guidance without taking weight
4. *Extensive assistance*—Weight-bearing support (including lifting limbs) by 1 helper where person still performs 50% or more of subtasks
5. *Maximal assistance*—Weight-bearing support (including lifting limbs) by 2+ helpers —OR—Weight-bearing support for more than 50% of subtasks
6. *Total dependence*—Full performance by others during all episodes
8. *Activity did not occur during entire period*

a. **Bathing**—How takes a full-body bath / shower. Includes how transfers in and out of tub or shower AND how each part of body is bathed: arms, upper and lower legs, chest, abdomen, perineal area - EXCLUDE WASHING OF BACK AND HAIR
b. **Personal hygiene**—How manages personal hygiene, including combing hair, brushing teeth, shaving, applying make-up, washing and drying face and hands - EXCLUDE BATHS AND SHOWERS
c. **Dressing upper body**—How dresses and undresses (street clothes, underwear) above the waist, including prostheses, orthotics, fasteners, pullovers, etc.
d. **Dressing lower body**—How dresses and undresses (street clothes, underwear) from the waist down including prostheses, orthotics, belts, pants, skirts, shoes, fasteners, etc.
e. **Walking**—How walks between locations on same floor indoors
f. **Locomotion**—How moves between locations on same floor (walking or wheeling). If in wheelchair, self-sufficiency once in chair
g. **Transfer toilet**—How moves on and off toilet or commode
h. **Toilet use**—How uses the toilet room (or commode, bedpan, urinal), cleanses self after toilet use or incontinent episode(s), changes pad, manages ostomy or catheter, adjusts clothes - EXCLUDE TRANSFER ON AND OFF TOILET
i. **Bed mobility**—How moves to and from lying position, turns from side to side, and positions body while in bed
j. **Eating**—How eats and drinks (regardless of skill). Includes intake of nourishment by other means (e.g., tube feeding, total parenteral nutrition)

3. LOCOMOTION /WALKING

a. **Primary mode of locomotion**

0. Walking, no assistive device
1. Walking, uses assistive device—e.g., cane, walker, crutch, pushing wheelchair
2. Wheelchair, scooter
3. Bedbound

b. **Timed 4-meter (13 foot) walk**

[Lay out a straight unobstructed course. Have person stand in still position, feet just touching start line]

Then say: "When I tell you begin to walk at a normal pace (with cane/walker if used). This is not a test of how fast you can walk. Stop when I tell you to stop. Is this clear?" Assessor may demonstrate test.

Then say: "Begin to walk now" Start stopwatch (or can count seconds) when first foot falls. End count when foot falls beyond 4-meter mark.

Then say: "You may stop now"

Enter time in seconds, up to 30 seconds.
30. 30 or more seconds to walk 4-meters
77. Stopped before test complete
88. Refused to do the test
99. Not tested—e.g., does not walk on own

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c. **Distance walked**–Farthest distance walked at one time without sitting down in the LAST 3 DAYS (with support as needed)
0. Did not walk
1. Less than 15 feet (under 5 meters)
2. 15-149 feet (5-49 meters)
3. 150-299 feet (50-99 meters)
4. 300+ feet (100+ meters)
5. 1/2 mile or more (1+ kilometers)

d. **Distance wheeled self**–Farthest distance wheeled self at one time in the LAST 3 DAYS (includes independent use of motorized wheelchair)
0. Wheeled by others
1. Used motorized wheelchair / scooter
2. Wheeled self less than 15 feet (under 5 meters)
3. Wheeled self 15-149 feet (5-49 meters)
4. Wheeled self 150-299 feet (50-99 meters)
5. Wheeled self 300+ feet (100+ meters)
8. Did not use wheelchair

4. ACTIVITY LEVEL

a. **Total hours of exercise or physical activity in LAST 3 DAYS**—e.g., walking
0. None
1. Less than 1 hour
2. 1-2 hours
3. 3-4 hours
4. More than 4 hours

b. In the LAST 3 DAYS, number of days went out of the house or building in which he/she resides (no matter how short the period)
0. No days out
1. Did not go out in last 3 days, but usually goes out over a 3-day period
2. 1-2 days
3. 3 days

5. PHYSICAL FUNCTION IMPROVEMENT POTENTIAL
0. No 1. Yes

a. **Person believes he / she is capable of improved performance in physical function**

b. **Care professional believes person is capable of improved performance in physical function**

6. CHANGE IN ADL STATUS AS COMPARED TO 90 DAYS AGO, OR SINCE LAST ASSESSMENT IF LESS THAN 90 DAYS AGO
0. Improved
1. No change
2. Declined
3. Uncertain

7. DRIVING

a. **Drove car (vehicle) in the LAST 90 DAYS**
0. No 1. Yes

b. **If drove in LAST 90 DAYS, assessor is aware that someone has suggested that person limits OR stops driving**
0. No, or does not drive 1. Yes

SECTION H. CONTINENCE

1. BLADDER CONTINENCE
0. *Continent*—Complete control; DOES NOT USE any type of catheter or other urinary collection device
1. *Control with any catheter or ostomy over last 3 days*
2. *Infrequently incontinent*—Not incontinent over last 3 days, but does have incontinent episodes
3. *Occasionally incontinent*—Less than daily
4. *Frequently incontinent*—Daily, but some control present
5. *Incontinent*—No control present
8. *Did not occur*—No urine output from bladder in last 3 days

2. URINARY COLLECTION DEVICE (Exclude pads / briefs)
0. None
1. Condom catheter
2. Indwelling catheter
3. Cystostomy, nephrostomy, ureterostomy

3. BOWEL CONTINENCE
0. ***Continent***—Complete control; DOES NOT USE any type of ostomy device
1. ***Control with ostomy***—Control with ostomy device over last 3 days
2. ***Infrequently incontinent***—Not incontinent over last 3 days, but does have incontinent episodes
3. ***Occasionally incontinent***—Less than daily
4. ***Frequently incontinent***—Daily, but some control present
5. ***Incontinent***—No control present
8. ***Did not occur***—No bowel movement in the last 3 days

4. PADS OR BRIEFS WORN
0. No 1. Yes

SECTION I. DISEASE DIAGNOSES

Disease code
0. Not present
1. Primary diagnosis/diagnoses for current stay
2. Diagnosis present, receiving active treatment
3. Diagnosis present, monitored but no active treatment

1. DISEASE DIAGNOSES

MUSCULOSKELETAL
a. **Hip fracture during last 30 days (or since last assessment if less than 30 days)**
b. **Other fracture during last 30 days (or since last assessment if less than 30 days)**

NEUROLOGICAL
c. **Alzheimers disease**
d. **Dementia other than Alzheimers disease**
e. **Hemiplegia**
f. **Multiple sclerosis**
g. **Paraplegia**
h. **Parkinson's disease**
i. **Quadriplegia**
j. **Stroke / CVA**

CARDIAC OR PULMONARY
k. **Coronary heart disease**
l. **Chronic obstructive pulmonary disease**
m. **Congestive heart failure**

PSYCHIATRIC
n. **Anxiety**
o. **Bipolar disorder**
p. **Depression**
q. **Schizophrenia**

INFECTIONS
r. **Pneumonia**
s. **Urinary tract infection in last 30 days**

OTHER
t. **Cancer**
u. **Diabetes mellitus**

2. OTHER DISEASE DIAGNOSES

	Diagnosis	Disease Code	ICD code
a.			
b.			
c.			
d.			
e.			
f.			

[Note: Add additional lines as necessary for other disease diagnoses]

SECTION J. HEALTH CONDITIONS

1. FALLS
0. No fall in last 90 days
1. No fall in last 30 days, but fell 31-90 days ago
2. One fall in last 30 days
3. Two or more falls in last 30 days

2. RECENT FALLS
[Skip if last assessed more than 30 days ago or if this is first assessment]
0. No
1. Yes
[blank] Not applicable (first assessment, or more than 30 days since last assessment)

3. PROBLEM FREQUENCY
Code for presence in last 3 days
0. Not present
1. Present but not exhibited in last 3 days
2. Exhibited on 1 of last 3 days
3. Exhibited on 2 of last 3 days
4. Exhibited daily in last 3 days

BALANCE

a. **Difficult or unable to move self to standing position unassisted**

b. **Difficult or unable to turn self around and face the opposite direction when standing**

c. **Dizziness**

d. **Unsteady gait**

CARDIAC OR PULMONARY

e. **Chest pain**

f. **Difficulty clearing airway secretions**

PSYCHIATRIC

g. **Abnormal thought process**—e.g., loosening of associations, blocking, flight of ideas, tangentiality, circumstantiality

h. **Delusions**—Fixed false beliefs

i. **Hallucinations**—False sensory perceptions

NEUROLOGICAL

j. **Aphasia**

GI STATUS

k. **Acid reflux**—Regurgitation of acid from stomach to throat

l. **Constipation**—No bowel movement in 3 days or difficult passage of hard stool

m. **Diarrhea**

n. **Vomiting**

SLEEP PROBLEMS

o. **Difficulty falling asleep or staying asleep; waking up too early; restlessness; non-restful sleep**

p. **Too much sleep**—Excessive amount of sleep that interferes with person's normal functioning

OTHER

q. **Aspiration**

r. **Fever**

s. **GI or GU bleeding**

t. **Hygiene**—Unusually poor hygiene, unkempt, disheveled

u. **Peripheral edema**

4. DYSPNEA (Shortness of breath)

0. Absence of symptom
1. Absent at rest, but present when performed moderate activities
2. Absent at rest, but present when performed normal day-to-day activities
3. Present at rest

5. FATIGUE

Inability to complete normal daily activities—e.g., ADLs, IADLs

0. ***None***
1. ***Minimal***—Diminished energy but completes normal day-to-day activities
2. ***Moderate***—Due to diminished energy, UNABLE TO FINISH normal day-to-day activities
3. ***Severe***—Due to diminished energy, UNABLE TO START SOME normal day-to-day activities
4. ***Unable to commence any normal day-to-day activities***—Due to diminished energy

6. PAIN SYMPTOMS

[Note: Always ask the person about pain frequency, intensity, and control. Observe person and ask others who are in contact with the person.]

a. **Frequency with which person complains or shows evidence of pain (including grimacing, teeth clenching, moaning, withdrawal when touched, or other non-verbal signs suggesting pain)**

0. No pain
1. Present but not exhibited in last 3 days
2. Exhibited on 1-2 of last 3 days
3. Exhibited daily in last 3 days

b. **Intensity of highest level of pain present**

0. No pain
1. Mild
2. Moderate
3. Severe
4. Times when pain is horrible or excruciating

c. **Consistency of pain**

0. No pain
1. Single episode during last 3 days
2. Intermittent
3. Constant

d. **Breakthrough pain**—Times in LAST 3 DAYS when person experienced sudden, acute flare-ups of pain

0. No 1. Yes

e. **Pain control**—Adequacy of current therapeutic regimen to control pain (from person's point of view)

0. No issue of pain
1. Pain intensity acceptable to person; no treatment regimen or change in regimen required
2. Controlled adequately by therapeutic regimen
3. Controlled when therapeutic regimen followed, but not always followed as ordered
4. Therapeutic regimen followed, but pain control not adequate
5. No therapeutic regimen being followed for pain; pain not adequately controlled

7. INSTABILITY OF CONDITIONS

0. No 1. Yes

a. **Conditions / diseases make cognitive, ADL, mood or behavior patterns unstable** (fluctuating, precarious, or deteriorating)

b. **Experiencing an acute episode, or a flare-up of a recurrent or chronic problem**

c. **End-stage disease, 6 or fewer months to live**

8. SELF-REPORTED HEALTH

Ask: "In general, how would you rate your health?"

0. Excellent
1. Good
2. Fair
3. Poor
8. Could not (would not) respond

9. TOBACCO AND ALCOHOL

a. **Smokes tobacco daily**

0. No
1. Not in last 3 days, but is usually a daily smoker
2. Yes

b. **Alcohol**—Highest number of drinks in any "single sitting" in LAST 14 DAYS

0. None
1. 1
2. 2-4
3. 5 or more

SECTION K. ORAL AND NUTRITIONAL STATUS

1. HEIGHT AND WEIGHT [INCHES AND POUNDS– COUNTRY SPECIFIC]

Record (a.) height in inches and (b.) weight in pounds. Base weight on most recent measure in LAST 30 DAYS.

a. **HT (in.)** ☐☐ b. **WT (lb.)** ☐☐☐

2. NUTRITIONAL ISSUES

0. No 1. Yes

a. **Weight loss of 5% or more in LAST 30 DAYS, or 10% or more in LAST 180 DAYS**

b. **Dehydrated or BUN / Cre ratio>25** [Ratio, country specific]

c. **Fluid intake less than 1,000 cc per day (less than four 8 oz cups/day)**

d. **Fluid output exceeds input**

3. MODE OF NUTRITIONAL INTAKE

0. ***Normal***—Swallows all types of foods
1. ***Modified independent***—e.g., liquid is sipped, takes limited solid food, need for modification may be unknown
2. ***Requires diet modification to swallow solid food***—e.g., mechanical diet (e.g., puree, minced, etc.) or only able to ingest specific foods
3. ***Requires modification to swallow liquids***—e.g., thickened liquids
4. ***Can swallow only pureed solids —AND— thickened liquids***
5. ***Combined oral and parenteral or tube feeding***
6. ***Nasogastric tube feeding only***
7. ***Abdominal feeding tube***—e.g., PEG tube
8. ***Parenteral feeding only***—Includes all types of parenteral feedings, such as total parenteral nutrition (TPN)
9. **Activity did not occur**—During entire period

4. DENTAL OR ORAL
0. No 1. Yes

a. **Wears a denture (removable prosthesis)**
b. **Has broken, fragmented, loose, or otherwise non-intact natural teeth**
c. **Reports having dry mouth**
d. **Reports difficulty chewing**

SECTION L. SKIN CONDITION

1. MOST SEVERE PRESSURE ULCER
0. No pressure ulcer
1. Any area of persistent skin redness
2. Partial loss of skin layers
3. Deep craters in the skin
4. Breaks in skin exposing muscle or bone
5. Not codeable, e.g., necrotic eschar predominant

2. PRIOR PRESSURE ULCER
0. No 1. Yes

3. PRESENCE OF SKIN ULCER OTHER THAN PRESSURE ULCER—*e.g., venous ulcer, arterial ulcer, mixed venous-arterial ulcer, diabetic foot ulcer*
0. No 1. Yes

4. MAJOR SKIN PROBLEMS—*e.g., lesions, 2nd or 3rd degree burns, healing surgical wounds*
0. No 1. Yes

5. SKIN TEARS OR CUTS—*Other than surgery*
0. No 1. Yes

6. OTHER SKIN CONDITIONS OR CHANGES IN SKIN CONDITION—*e.g., bruises, rashes, itching, mottling, herpes zoster, intertrigo, eczema*
0. No 1. Yes

7. FOOT PROBLEMS—*e.g., bunions, hammer toes, overlapping toes, structural problems, infections, ulcers*
0. No foot problems
1. Foot problems, no limitation in walking
2. Foot problems limit walking
3. Foot problems prevent walking
4. Foot problems, does not walk for other reasons

SECTION M. MEDICATIONS

1. LIST OF ALL MEDICATIONS

List all active prescriptions, and any non-prescribed (over the counter) medications taken in the LAST 3 DAYS

[Note: Use computerized records if possible; hand enter only when absolutely necessary]

For each drug record:

a. **Name**

b. **Dose**—A positive number such as 0.5, 5, 150, 300. [Note: Never write a zero by itself after a decimal point (X mg). Always use a zero before a decimal point (0.X mg)]

c. **Unit**—Code using the following list:

gtts	(Drops)	**mEq**	(Milli-equivalent)	**Puffs**	
gm	(Gram)	**mg**	(Milligram)	%	(Percent)
L	(Liters)	**ml**	(Milliliter)	**Units**	
mcg	(Microgram)	**oz**	(Ounce)	**OTH**	(Other)

d. **Route of administration**—Code using the following list:

PO	(By mouth/oral)	**REC**	(Rectal)	**ET**	(Enteral Tube)
SL	(Sublingual)	**TOP**	(Topical)	**TD**	(Transdermal)
IM	(Intramuscular)	**IH**	(Inhalation)	**EYE**	(Eye)
IV	(Intravenous)	**NAS**	(Nasal)	**OTH**	(Other)
Sub-Q	(Subcutaneous)				

e. **Freq**—Code the number of times per day, week, or month the medication is administered using the following list:

Q1H	(Every hour)	**5D**	(5 times daily)
Q2H	(Every 2 hours)	**Q2D**	(Every other day)
Q3H	(Every 3 hours)	**Q3D**	(Every 3 days)
Q4H	(Every 4 hours)	**Weekly**	
Q6H	(Every 6 hours)	**2W**	(2 times weekly)
Q8H	(Every 8 hours)	**3W**	(3 times weekly)
Daily		**4W**	(4 times weekly)
BED	(At bedtime)	**5W**	(5 times weekly)
BID	(2 times daily) (includes every 12 hrs)	**6W**	(6 times weekly)
		1M	(Monthly)
TID	(3 times daily)	**2M**	(Twice every month)
QID	(4 times daily)	**OTH**	(Other)

f. **PRN**
0. No 1. Yes

g. **Computer-entered drug code**

	a. Name	b. Dose	c. Unit	d. Route	e. Freq.	f. PRN	g. ATC or NDC code
1.							
2.							
3.							
4.							
5.							

[NOTE: Add additional lines, as necessary, for other drugs taken]
[Abbreviations are Country Specific for Unit, Route, Frequency]

2. ALLERGY TO ANY DRUG
0. No known drug allergies 1. Yes

3. ADHERENT WITH MEDICATIONS PRESCRIBED BY PHYSICIAN
0. Always adherent
1. Adherent 80% of time or more
2. Adherent less than 80% of time, including failure to purchase prescribed medications
8. No medications prescribed

SECTION N. TREATMENT AND PROCEDURES

1. PREVENTION
0. No 1. Yes

a. **Blood pressure measured in LAST YEAR**
b. **Colonoscopy test in LAST 5 YEARS**
c. **Dental exam in LAST YEAR**
d. **Eye exam in LAST YEAR**
e. **Hearing exam in LAST 2 YEARS**
f. **Influenza vaccine in LAST YEAR**
g. **Mammogram or breast exam in LAST 2 YEARS (for women)**
h. **Pneumovax vaccine in LAST 5 YEARS or after age 65**

2. TREATMENTS AND PROGRAMS RECEIVED OR SCHEDULED IN THE LAST 3 DAYS (OR SINCE LAST ASSESSMENT IF LESS THAN 3 DAYS)
0. Not ordered AND did not occur
1. Ordered, not implemented
2. 1-2 of last 3 days
3. Daily in last 3 days

TREATMENTS
a. **Chemotherapy**
b. **Dialysis**
c. **Infection control**—e.g., isolation, quarantine
d. **IV medication**
e. **Oxygen therapy**
f. **Radiation**
g. **Suctioning**
h. **Tracheostomy care**
i. **Transfusion**
j. **Ventilator or respirator**
k. **Wound care**

PROGRAMS
l. **Scheduled toileting program**
m. **Palliative care program**
n. **Turning / repositioning program**

3. FORMAL CARE
Days (A) and Total minutes (B) of care in last 7 days

Extent of care/treatment in LAST 7 DAYS (or since last assessment or admission, if less than 7 days) involving:

	(A) # of Days	(B) Total Minutes in last week
a. **Home health aides**		
b. **Home nurse**		
c. **Homemaking services**		
d. **Meals**		
e. **Physical therapy**		
f. **Occupational therapy**		
g. **Speech-language pathology and audiology services**		
h. **Psychological therapy (by any licensed mental health professional)**		

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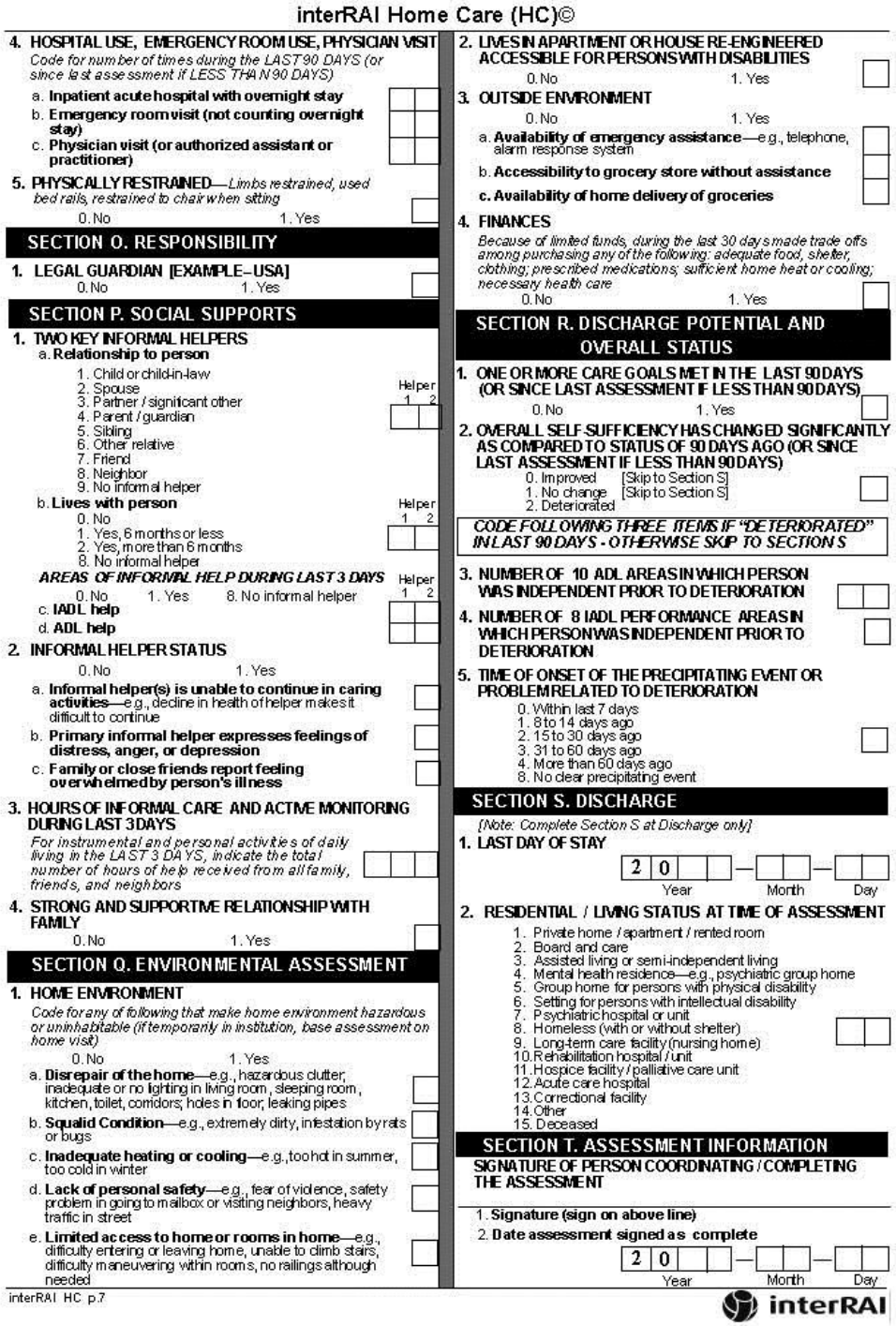

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4. HOSPITAL USE, EMERGENCY ROOM USE, PHYSICIAN VISIT
Code for number of times during the LAST 90 DAYS (or since last assessment if LESS THAN 90 DAYS)
a. **Inpatient acute hospital with overnight stay**
b. **Emergency room visit (not counting overnight stay)**
c. **Physician visit (or authorized assistant or practitioner)**

5. PHYSICALLY RESTRAINED—*Limbs restrained, used bed rails, restrained to chair when sitting*
0. No 1. Yes

SECTION O. RESPONSIBILITY

1. LEGAL GUARDIAN [EXAMPLE–USA]
0. No 1. Yes

SECTION P. SOCIAL SUPPORTS

1. TWO KEY INFORMAL HELPERS
a. **Relationship to person**
1. Child or child-in-law
2. Spouse
3. Partner / significant other
4. Parent / guardian
5. Sibling
6. Other relative
7. Friend
8. Neighbor
9. No informal helper
Helper 1 2

b. **Lives with person**
0. No
1. Yes, 6 months or less
2. Yes, more than 6 months
8. No informal helper
Helper 1 2

AREAS OF INFORMAL HELP DURING LAST 3 DAYS
0. No 1. Yes 8. No informal helper
Helper 1 2
c. **IADL help**
d. **ADL help**

2. INFORMAL HELPER STATUS
0. No 1. Yes
a. **Informal helper(s) is unable to continue in caring activities**—e.g., decline in health of helper makes it difficult to continue
b. **Primary informal helper expresses feelings of distress, anger, or depression**
c. **Family or close friends report feeling overwhelmed by person's illness**

3. HOURS OF INFORMAL CARE AND ACTIVE MONITORING DURING LAST 3 DAYS
For instrumental and personal activities of daily living in the LAST 3 DAYS, indicate the total number of hours of help received from all family, friends, and neighbors

4. STRONG AND SUPPORTIVE RELATIONSHIP WITH FAMILY
0. No 1. Yes

SECTION Q. ENVIRONMENTAL ASSESSMENT

1. HOME ENVIRONMENT
Code for any of following that make home environment hazardous or uninhabitable (if temporarily in institution, base assessment on home visit)
0. No 1. Yes
a. **Disrepair of the home**—e.g., hazardous clutter, inadequate or no lighting in living room, sleeping room, kitchen, toilet, corridors; holes in floor, leaking pipes
b. **Squalid Condition**—e.g., extremely dirty, infestation by rats or bugs
c. **Inadequate heating or cooling**—e.g., too hot in summer, too cold in winter
d. **Lack of personal safety**—e.g., fear of violence, safety problem in going to mailbox or visiting neighbors, heavy traffic in street
e. **Limited access to home or rooms in home**—e.g., difficulty entering or leaving home, unable to climb stairs, difficulty maneuvering within rooms, no railings although needed

2. LIVES IN APARTMENT OR HOUSE RE-ENGINEERED ACCESSIBLE FOR PERSONS WITH DISABILITIES
0. No 1. Yes

3. OUTSIDE ENVIRONMENT
0. No 1. Yes
a. **Availability of emergency assistance**—e.g., telephone, alarm response system
b. **Accessibility to grocery store without assistance**
c. **Availability of home delivery of groceries**

4. FINANCES
Because of limited funds, during the last 30 days made trade offs among purchasing any of the following: adequate food, shelter, clothing; prescribed medications; sufficient home heat or cooling; necessary health care
0. No 1. Yes

SECTION R. DISCHARGE POTENTIAL AND OVERALL STATUS

1. ONE OR MORE CARE GOALS MET IN THE LAST 90 DAYS (OR SINCE LAST ASSESSMENT IF LESS THAN 90 DAYS)
0. No 1. Yes

2. OVERALL SELF-SUFFICIENCY HAS CHANGED SIGNIFICANTLY AS COMPARED TO STATUS OF 90 DAYS AGO (OR SINCE LAST ASSESSMENT IF LESS THAN 90 DAYS)
0. Improved [Skip to Section S]
1. No change [Skip to Section S]
2. Deteriorated

CODE FOLLOWING THREE ITEMS IF "DETERIORATED" IN LAST 90 DAYS - OTHERWISE SKIP TO SECTION S

3. NUMBER OF 10 ADL AREAS IN WHICH PERSON WAS INDEPENDENT PRIOR TO DETERIORATION

4. NUMBER OF 8 IADL PERFORMANCE AREAS IN WHICH PERSON WAS INDEPENDENT PRIOR TO DETERIORATION

5. TIME OF ONSET OF THE PRECIPITATING EVENT OR PROBLEM RELATED TO DETERIORATION
0. Within last 7 days
1. 8 to 14 days ago
2. 15 to 30 days ago
3. 31 to 60 days ago
4. More than 60 days ago
8. No clear precipitating event

SECTION S. DISCHARGE

[Note: Complete Section S at Discharge only]

1. LAST DAY OF STAY
2 0 — — —
Year Month Day

2. RESIDENTIAL / LIVING STATUS AT TIME OF ASSESSMENT
1. Private home / apartment / rented room
2. Board and care
3. Assisted living or semi-independent living
4. Mental health residence—e.g., psychiatric group home
5. Group home for persons with physical disability
6. Setting for persons with intellectual disability
7. Psychiatric hospital or unit
8. Homeless (with or without shelter)
9. Long-term care facility (nursing home)
10. Rehabilitation hospital / unit
11. Hospice facility / palliative care unit
12. Acute care hospital
13. Correctional facility
14. Other
15. Deceased

SECTION T. ASSESSMENT INFORMATION

SIGNATURE OF PERSON COORDINATING / COMPLETING THE ASSESSMENT

1. **Signature (sign on above line)**
2. **Date assessment signed as complete**
2 0 — — —
Year Month Day

interRAI HC p.7

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Exerpt from the following address: www.interrai.org

i. Optimized photograph-supported Oral Health-Related section-InterRAI (OHR-InterRAI)

Optimized photograph-supported ohr-interRAI section

1. General utilization guidelines

Relevance

- Good oral health contributes to general health and well-being.

Aim

- Detect clients who need assistance with daily oral hygiene and/or referral to a dentist

Communication

- Inform clients that you will ask questions about the mouth and that you will look into the mouth as well.
- Talk to clients themselves. Turn to family or caregivers only if clients are not able to communicate.

Inspection of the mouth

- Ask clients to take out dentures. Help, if necessary.
- Make sure that the head of clients is supported during the inspection.
- Wear examination gloves and use flashlights for illumination.
- Ask clients to open the mouth. For better view, pull cheeks and lips away with your finger or with the handle of a toothbrush.

If you are not certain, register presence of oral health problems.

2. Definitions and guidelines per item

2.a Chewing problems

How well could you chew in the last 3 days?

- I could chew all kinds of food.
- I only had problems with hard or chewy food (e.g. nuts, raw apples, steak).
- I also had problems with soft food (e.g. cooked potatoes, banana, cake).
- Cannot be assessed/mixed food due to swallowing issues

Guidelines and definitions

- If clients don't have or don't wear dentures during meals, ask how chewing goes without dentures. If clients wear dentures during meals, assess chewing with the dentures.
- If food is blended/pureed due to chewing problems, register accordingly. If food is blended/pureed due to other reasons such as dysphagia, register that chewing cannot be assessed.
- If clients are not able to communicate, turn to primary caregivers and family or observe clients during meals and look out for nonverbal signs.

2.b Discomfort or pain

How often did you had discomfort or pain in the last 3 days?

- Not in last 3 days
- Not every day
- Every day
- Cannot be assessed

Guidelines and definitions

- Register discomfort or pain regardless of the underlying cause and whether appearing in rest, during meals or during oral care. Dentures might also cause discomfort or pain.
- If clients are not able to communicate, turn to primary caregivers and family or observe clients and look out for nonverbal signs.

2.c Dry mouth

How often did you had discomfort or pain in the last 3 days?

- Not in last 3 days
- Not every day
- Every day
- Cannot be assessed

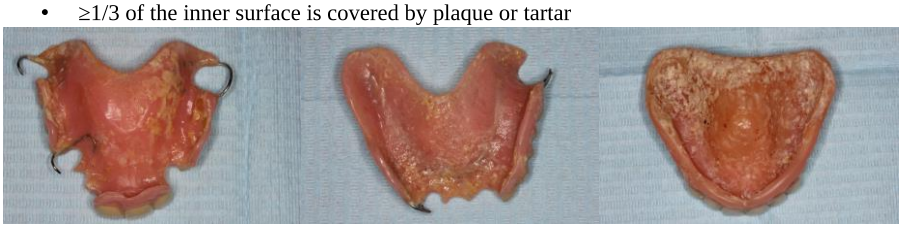
Guidelines and definitions

- The mouth can feel dry in rest or during meals. Clients might also mention dry lips.
- If clients are not able to communicate, turn to primary caregivers and family or observe and look out for nonverbal signs.

2.d Denture hygiene

- <1/3 of the inner surface is covered by plaque or tartar

- ≥1/3 of the inner surface is covered by plaque or tartar



- Cannot be assessed/does not have or does not wear dentures

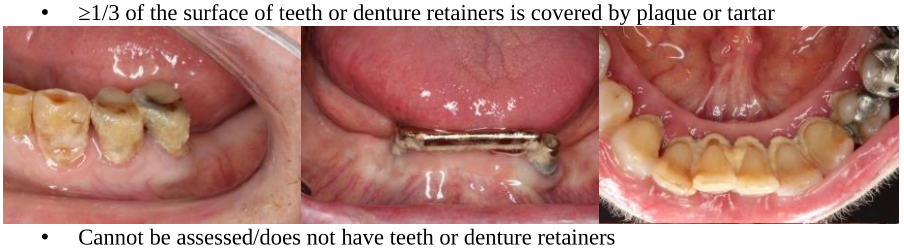
Guidelines and definitions

- Inner surface: surface that covers and rests on the gums.
- Plaque: sticky deposit that is white or pale yellow, can be removed with toothbrushing.
- Tartar: hard deposit that is yellow or brown, cannot be removed with toothbrushing.
- Take out dentures and rinse under water to remove food remnants.
- If clients wear dentures in upper and lower jaw, assess the denture with the poorest hygiene.

2.e Oral hygiene

- <1/3 of the surface of teeth or denture retainers is covered by plaque or tartar

- ≥1/3 of the surface of teeth or denture retainers is covered by plaque or tartar



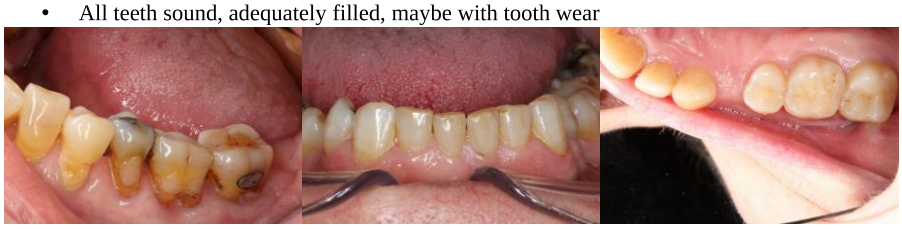
- Cannot be assessed/does not have teeth or denture retainers

Guidelines and definitions

- Denture retainers: attachments that are fixed in the mouth to anchor the denture.
- Inspect all surfaces of teeth, spaces between teeth and denture retainers.
- Assess the area of the mouth with the poorest hygiene.

2.f Teeth

- All teeth sound, adequately filled, maybe with tooth wear



- One or more teeth broken, decayed or with defect fillings; root remnants

- Cannot be assessed/does not have teeth

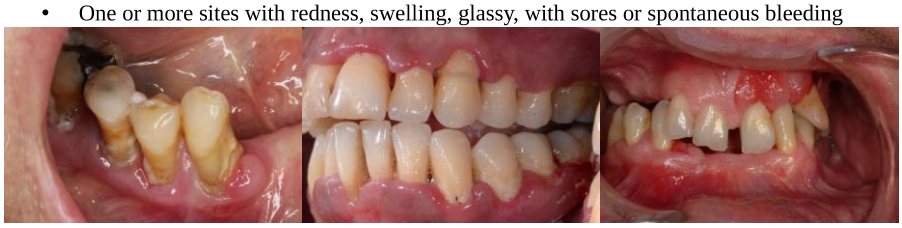
Guidelines and definitions

- Wear: teeth evenly flat and shortened.
- Tooth decay: cavities that are stained orange or brown; large cavities can cause breakage of teeth.
- Defect filling: filling fell out or is broken; space or tooth decay at interface between tooth and filling.
- Root remnant: crown of tooth is missing; upper part of the remaining root is visible.
- Inspect the different surfaces of all teeth.

2.g Gums

- Pink and firm, maybe minor aberration in color or texture

- One or more sites with redness, swelling, glassy, with sores or spontaneous bleeding



- Cannot be assessed

Guidelines and definitions

- Gums: pink tissue surrounding teeth or denture retainers.
- If clients don’t have teeth or denture retainers, inspect the areas of the jaws where usually the teeth are located.
- Look out for general and localized gum problems.

2.h Tongue

- Pink, moist, healthy

- One or more sites red, dry, swollen, with sores or patches

- Cannot be assessed

Guidelines and definitions

- Ask the client to extend the tongue out of the mouth. Inspect the upper and the lateral surfaces of the tongue.
- Than ask the client to curl the tongue upward to inspect the lower surface and the area under the tongue.

2.i Palate and inner surfaces of cheeks and lips

- Smooth, moist, pink

- One or more sites red, dry, swollen, with sores or patches

- Cannot be assessed

Guidelines and definitions

- Inspect the palate and the inner surfaces of cheeks and lips.

Krausch-Hofmann S, Tran TD, Janssens B, Declerck D, Lesaffre E, de Almeida Mello J, et al. Assessment of oral health in older adults by non-dental professional caregivers—development and validation of a photograph-supported oral health–related section for the interRAI suite of instruments. Clin

Oral Invest [Online]. 16 Nov 2020 [cited on 25 Apr 2021]; Available: http://link.springer.com/10.1007/s00784-020-03669-8

j. Dental Hygiene Registration (DHR)

Upper jaw	Lower jaw
0 = No teeth with plaque 1 = Visible plaque on one or more, but less than half of the teeth have plaque 2 = Visible plaque on more than half/all teeth	0 = No teeth with plaque 1 = Visible plaque on one or more, but less than half of the teeth have plaque 2 = Visible plaque on more than half/all teeth
Sum: Add score for upper and lower jaw	
Efforts: 0: Continue as usual 1: Check for deterioration and pay attention to difficult areas 2–4: Dental hygiene needs to improve	

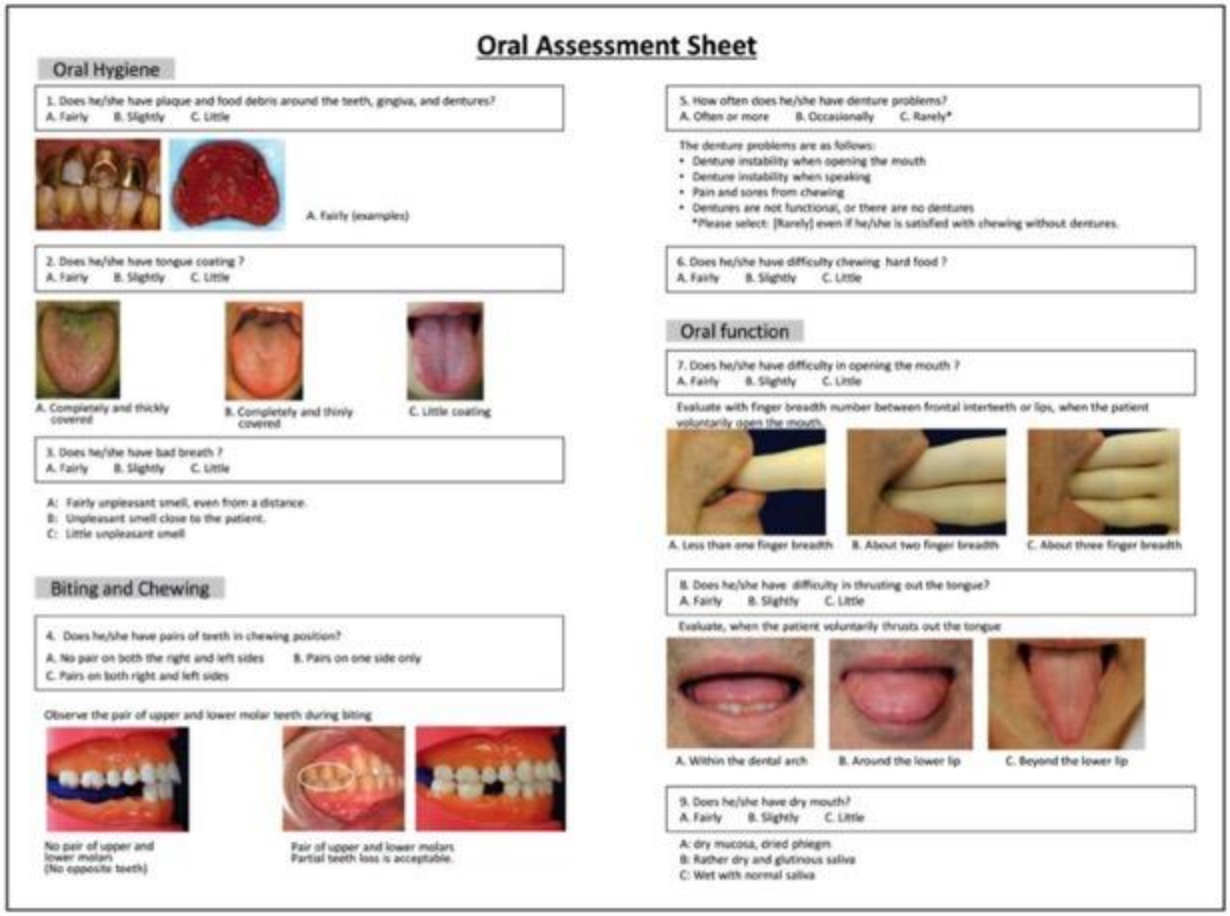
Fjeld KG, Eide H, Mowe M, Hove LH, Willumsen T. Dental hygiene registration: development, and reliability and validity testing of an assessment scale designed for nurses in institutions. J Clin Nurs [Online]. Jul 2017 [cited on 25 Apr 2021];26(13-14):1845-53. Available: http://doi.wiley.com/10.1111/jocn.13452

k. General Oral Health Assessment Index (GOHAI)

During the past three months	always	often	sometimes	seldom	never
1. How often did you limit the kinds or amounts of food you eat because of problems with your teeth or dentures?					
2. How often did you have trouble biting or chewing any kinds of food, such as firm meat or apples?					
3. How often were you able to swallow comfortably?					
4. How often have your teeth or dentures prevented you from speaking the way you wanted?					
5. How often were you able to eat anything without feeling discomfort?					
6. How often did you limit contacts with people because of the condition of your teeth or dentures?					
7. How often were you pleased or happy with the looks of your teeth and gums, or dentures?					
8. How often did you use medication to relieve pain or discomfort from around your mouth?					
9. How often were you worried or concerned about the problems with your teeth, gums, or dentures?					
10. How often did you feel nervous or self-conscious because of problems with your teeth, gums, or dentures?					
11. How often did you feel uncomfortable eating in front of people because of problems with your teeth or dentures?					
12. How often were your teeth or gums sensitive to hot, cold, or sweets?					

Adapted from Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. J Dent Educ. Nov 1990;54(11):680-7.

I. Oral Assessment Sheet (OAS)



Oral Assessment Sheet

Oral Hygiene

1. Does he/she have plaque and food debris around the teeth, gingiva, and dentures?
A. Fairly B. Slightly C. Little

A. Fairly (examples)

2. Does he/she have tongue coating ?
A. Fairly B. Slightly C. Little

A. Completely and thickly covered
B. Completely and thinly covered
C. Little coating

3. Does he/she have bad breath ?
A. Fairly B. Slightly C. Little

A: Fairly unpleasant smell, even from a distance.
B: Unpleasant smell close to the patient.
C: Little unpleasant smell

Biting and Chewing

4. Does he/she have pairs of teeth in chewing position?
A. No pair on both the right and left sides B. Pairs on one side only
C. Pairs on both right and left sides

Observe the pair of upper and lower molar teeth during biting

No pair of upper and lower molars (No opposite teeth)
Pair of upper and lower molars Partial teeth loss is acceptable.

5. How often does he/she have denture problems?
A. Often or more B. Occasionally C. Rarely*

The denture problems are as follows:
- Denture instability when opening the mouth
- Denture instability when speaking
- Pain and sores from chewing
- Dentures are not functional, or there are no dentures

*Please select: [Rarely] even if he/she is satisfied with chewing without dentures.

6. Does he/she have difficulty chewing hard food ?
A. Fairly B. Slightly C. Little

Oral function

7. Does he/she have difficulty in opening the mouth ?
A. Fairly B. Slightly C. Little

Evaluate with finger breadth number between frontal interteeth or lips, when the patient voluntarily open the mouth.

A. Less than one finger breadth
B. About two finger breadth
C. About three finger breadth

8. Does he/she have difficulty in thrusting out the tongue?
A. Fairly B. Slightly C. Little

Evaluate, when the patient voluntarily thrusts out the tongue

A. Within the dental arch
B. Around the lower lip
C. Beyond the lower lip

9. Does he/she have dry mouth?
A. Fairly B. Slightly C. Little

A: dry mucosa, dried phlegm
B: Rather dry and glutinous saliva
C: Wet with normal saliva

Yanagisawa S, Nakano M, Goto T, Yoshioka M, Shirayama Y. Development of an Oral Assessment Sheet for Evaluating Older Adults in Nursing Homes. Research in Gerontological Nursing [Online]. Sept 2017 [cited on 25 Apr 2021];10(5):234-9. Available: http://journals.healio.com/doi/10.3928/19404921-20170621-04

m. The Holistic and Reliable Oral Assessment Tool (THROAT)

	Normal-0	Mild 1	THROAT Moderate 2	Study NO Severe 3	Score	Comment
1) Lips	Smooth/pink/moist	Dry/no cracks	Dry/cracks	Ulceration/sores/bleeding		
2) Teeth	Clean	Film localised plaque over teeth	Film of plaque over teeth in most areas	Heavy visible deposits of plaque on and between teeth		
Dentures	Clean	Film localised plaque over teeth	Film of plaque over teeth in most areas	Heavy visible deposits of plaque on and between teeth		
Both	Clean	Film localised plaque over teeth	Film of plaque over teeth in most areas	Heavy visible deposits of plaque on and between teeth		
3) Gums/Gingiva	Coral Pink/moist	Mild inflammation/slight redness/slight oedema	Moderate inflammation/redness/ oedema/glazing	Severe inflammation/marked redness/ oedema/ulceration/bleeding		
4) Mucous membrane	Coral Pink/moist	Mild inflammation/slight redness/slight oedema	Moderate inflammation/redness/ oedema/glazing	Severe inflammation/marked redness/ oedema/ulceration/bleeding		
5) Palate	Coral Pink/moist	Mild inflammation/slight redness/slight oedema	Moderate inflammation/redness/ oedema/glazing	Severe inflammation/marked redness/ oedema/ulceration/bleeding/thick mucous patches		
6) Tongue	Pink/moist/no coating	Slight coating evident	coating evident/cracks/small ulcers	thick coating/discoloured/blistered/ ulcerations/cracks/bleeding		
7) Floor of mouth	Pink/moist/no coating	Slight coating evident	coating evident/cracks/small ulcers	thick coating/discoloured/blistered/ ulcerations/cracks/bleeding		
8) Smell	No smell	Slight smell on breath only noticed close up	Noticeable smell on breath	Strong smell on breath		
9) Saliva	Watery consistency	Slight thickening	Thick and Ropy	No saliva		

Dickinson H, Watkins C, Leathley M. The development of the THROAT: the holistic and reliable oral assessment tool. Clinical Effectiveness in Nursing [Online]. Sept 2001 [cited on 25 Apr 2021];5(3):104-10. Available: https://linkinghub.elsevier.com/retrieve/pii/S1361900401902213

n. Mucosal-Plaque Score (MPS)

Criteria	Score
Mucosa	
Normal appearance of gingiva and oral mucosa	1
Mild inflammation = slight redness and or hypertrophy/hyperplasia	2
Slight redness in some areas of the palatal mucosa; red spots indicating inflamed salivary duct orifices	
Moderate inflammation = marked redness and hypertrophy/hyperplasia of the gingiva, which bleeds easily when pressure is applied and/or any of the following:	3
Marked redness in large areas (≥2/3) of palate	
Marked inflammatory redness of the oral mucosa in sites other than the palate	
Presence of ulcerations	
Red and inflamed fibroepithelial hyperplasia	
Severe inflammation = severe redness and hypertrophy/hyperplasia of the gingiva	4
Spontaneous gingival bleeding	
Marked palatal granulations	
Inflamed oral mucosal areas that "break" easily and bleed under pressure	
Plaque	
No easily visible plaque	1
Small amounts of hardly visible plaque	2
Moderate amounts of plaque	3
Abundant amounts of confluent plaque	4

Adapted from Henriksen BM, Ambjørnsen E, Axéll TE. Evaluation of a mucosal-plaque index (MPS) designed to assess oral care in groups of elderly. Spec Care Dentist. Aug 1999;19(4):154-7.

o. Brief Oral Health Status Examination (BOHSE)

KAYSER-JONES BRIEF ORAL HEALTH STATUS EXAMINATION

Resident's Name _____ Date _____

Examiner's Name _____ **TOTAL SCORE** _____

CATEGORY	MEASUREMENT	0	1	2
LYMPH NODES	Observe and feel nodes	No enlargement	Enlarged, not tender	Enlarged and tender*
LIPS	Observe, feel tissue and ask resident, family or staff (e.g. primary caregiver)	Smooth, pink, moist	Dry, chapped, or red at corners*	White or red patch, bleeding or ulcer for 2 weeks*
TONGUE	Observe, feel tissue and ask resident, family or staff (e.g. primary caregiver)	Normal roughness, pink and moist	Coated, smooth, patchy, severely fissured or some redness	Red, smooth, white or red patch; ulcer for 2 weeks*
TISSUE INSIDE CHEEK, FLOOR AND ROOF OF MOUTH	Observe, feel tissue and ask resident, family or staff (e.g. primary caregiver)	Pink and moist	Dry, shiny, rough red, or swollen*	White or red patch, bleeding, hardness; ulcer for 2 weeks*
GUMS BETWEEN TEETH AND/OR UNDER ARTIFICIAL TEETH	Gently press gums with tip of tongue blade	Pink, small indentations; firm, smooth and pink under artificial teeth	Redness at border around 1-6 teeth; one red area or sore spot under artificial teeth*	Swollen or bleeding gums, redness at border around 7 or more teeth, loose teeth; generalized redness or sores under artificial teeth*
SALIVA (EFFECT ON TISSUE)	Touch tongue blade to center of tongue and floor of mouth	Tissues moist, saliva free flowing and watery	Tissues dry and sticky	Tissues parched and red, no saliva*
CONDITION OF NATURAL TEETH	Observe and count number of decayed or broken teeth	No decayed or broken teeth/roots	1-3 decayed or broken teeth/roots*	4 or more decayed or broken teeth/roots; fewer than 4 teeth in either jaw*
CONDITION OF ARTIFICIAL TEETH	Observe and ask patient, family or staff (e.g. primary caregiver)	Unbroken teeth, worn most of the time	1 broken/missing tooth, or worn for eating or cosmetics only	More than 1 broken or missing tooth, or either denture missing or never worn*
PAIRS OF TEETH IN CHEWING POSITION (NATURAL OR ARTIFICIAL)	Observe and count pairs of teeth in chewing position	12 or more pairs of teeth in chewing position	8-11 pairs of teeth in chewing position	0-7 pairs of teeth in chewing position*
ORAL CLEANLINESS	Observe appearance of teeth or dentures	Clean, no food particles/tartar in the mouth or on artificial teeth	Food particles/tartar in one or two places in the mouth or on artificial teeth	Food particles/tartar in most places in the mouth or on artificial teeth

Upper dentures labeled: Yes ____ No ____ None ____ Lower dentures labeled: Yes ____ No ____ None ____

Is your mouth comfortable? Yes ____ No ____ If no, explain: _____

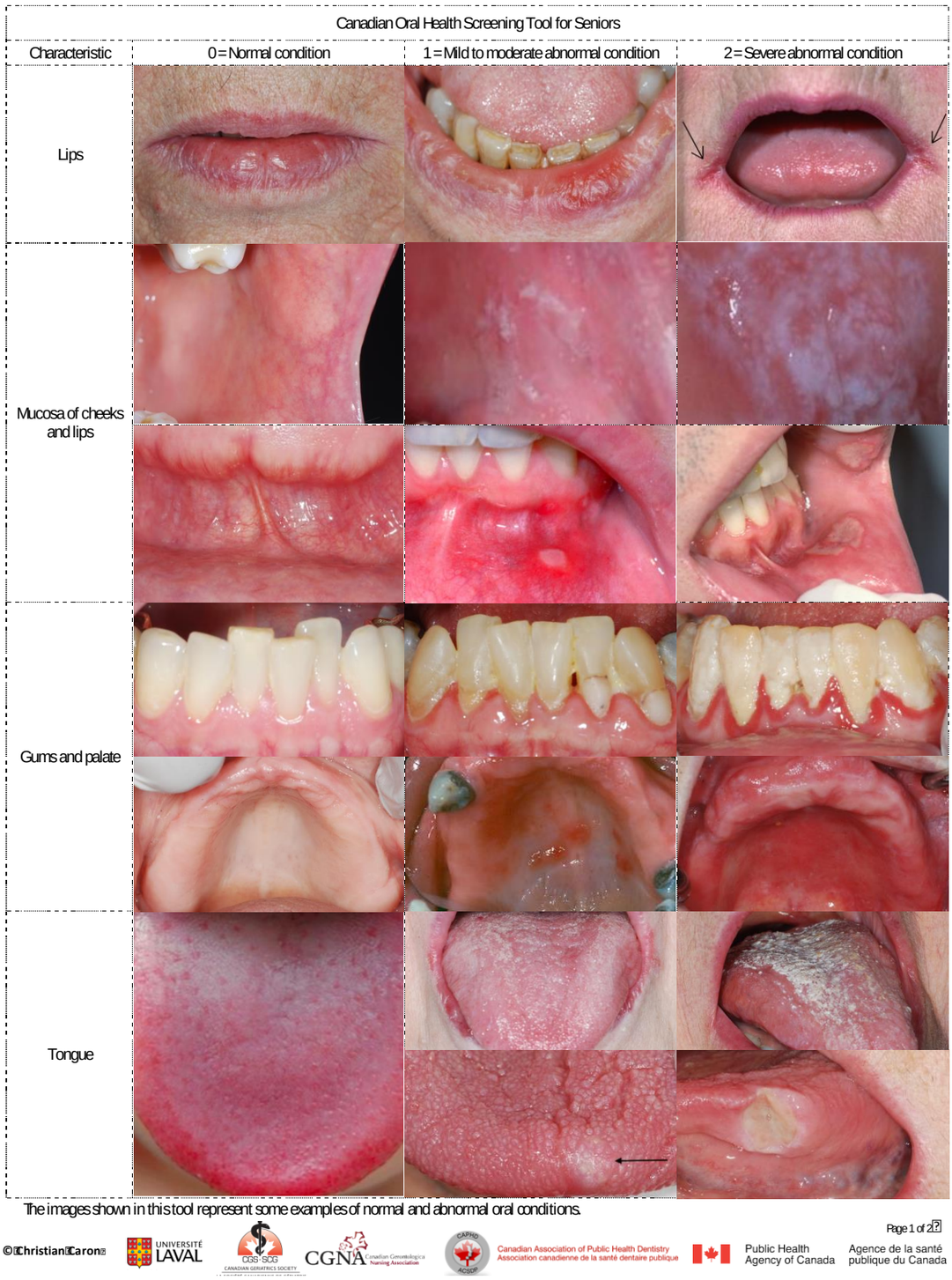
Additional comments: _____

Underlined* -refer to dentist immediately

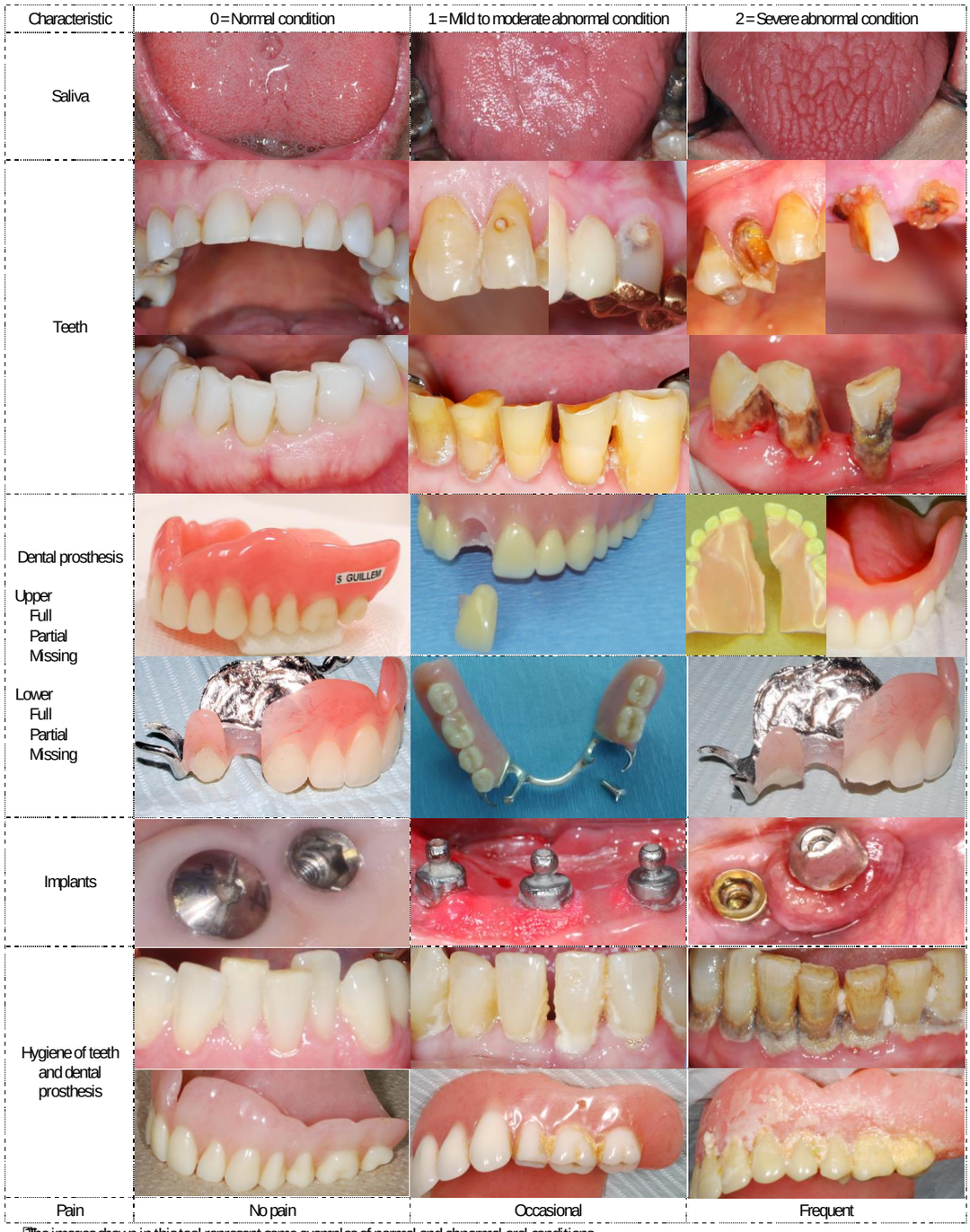
Jeanie Kayser-Jones, R.N., Ph.D., School of Nursing, University of California, San Francisco

Kayser-Jones J, Bird WF, Paul SM, Long L, Schell ES. An Instrument To Assess the Oral Health Status of Nursing Home Residents. The Gerontologist [Online]. 1 Dec 1995 [cited on 25 Apr 2021];35(6):814-24. Available: https://academic.oup.com/gerontologist/article-lookup/doi/10.1093/geront/35.6.814

Appendix III: Canadian Oral Health Screening Tool for seniors



The images included in this tool represent only a few examples of normal and abnormal oral conditions.



The images shown in this tool represent only a few examples of normal and abnormal oral conditions.

Appendix IV: Assessment record - Canadian Oral Health Screening Tool for Seniors

Canadian Oral Health Screening Tool for Seniors – Assessment record

Name of person assessed: _____ Date of birth (YYYY/MM/DD): ____/__/__ Date of evaluation (YYYY/MM/DD): ___/__/__

Characteristic	0 = Normal condition	1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Lips	☐ Pink color* and uniform texture, well-defined lip contour	☐ Red, dry and swollen	☐ Ulcer with or without bleeding
Mucosa of cheeks and lips	☐ Pink color* and uniform texture	☐ Localized redness or white patch(es). Single ulcer of less than 0.5 cm	☐ Generalized redness or white patch(es). Single ulcer larger than 0.5 cm or multiple ulcers
Gums and palate	☐ Pink color* and uniform texture	☐ Localized redness or swelling of the gums, palate or under the dental prosthesis	☐ Generalized redness or swelling of the gums, palate or under the dental prosthesis. Spontaneous bleeding. Ulcer(s)
Tongue	☐ Pink color* and uniform texture	☐ Circumscribed change in color, smooth surface, localized loss of texture uniformity, localized white patch(es).	☐ Generalized change in color or appearance, extensive loss of texture uniformity, generalized white patch(es). Ulcer(s)
Saliva	☐ Abundant saliva covering mucosa, tongue, and teeth. Shiny and moist oral tissues	☐ Thin film of saliva covering oral mucosa, tongue, and teeth. Shiny and moist oral tissues	Visible lack of saliva or limited amount of saliva covering the mucosa, tongue, and teeth. Dull and dry-looking oral tissues
Teeth ☐ Present ☐ Missing	☐ No observable damage to the tooth structure. No dental mobility	☐ Surface cavity(ies), minor tooth fracture. Dental mobility without risk of tooth falling out	☐ Deep cavity(ies) with loss of tooth structure, teeth with major fracture or broken at the root, presence of sharp tooth edge. Dental mobility with risk of tooth falling out
Dental Prosthesis Upper: ☐ Full ☐ Partial ☐ Missing Lower: ☐ Full ☐ Partial ☐ Missing	☐ Structure undamaged. Adequate stability and retention. Denture's (partial or full) identification labeling is done	☐ Minor break: one artificial tooth broken, worn or missing; alteration of portion of the structure having little to no impact on the denture's (partial or full) function. Adequate stability and retention. Denture's (partial or full) not identified	☐ Major break: several artificial teeth broken, worn or missing; alteration of portion of the structure, affecting the denture's (partial or full). Inadequate stability and retention. Denture's (partial or full) not identified
Implants	☐ Absence of redness and swelling of the mucosa around the implant. Absence of dental plaque, calculus, or food debris	☐ Redness of mucosa around the implant. Localized dental plaque, calculus, and food debris	☐ Redness and swelling of the mucosa around the implant; mobility of the implant. Generalized dental plaque, calculus, and food debris on the implant
Hygiene of teeth and dental prosthesis	☐ Absence of dental plaque, calculus, and food debris	☐ Localized dental plaque, calculus, and food debris	☐ Generalized dental plaque, calculus, and food debris. Foul mouth odour
Pain**	☐ No sign of dental pain	☐ Occasional signs of mild to moderate intensity: screams, aggressiveness, moaning, tendency to touch or bite the painful area	☐ Frequent signs of severe intensity: screams, aggressiveness, moaning, tendency to touch or bite the painful area

*Color may vary from one ethnic group to another. **Pain must be associated with an abnormal condition of the oral structures. ☐ Local intervention measures may be necessary.
☐ Refer to an oral health professional or a physician. For more information, please consult the Intervention Guide.

Université Laval · CGS·SCG Canadian Geriatrics Society / La Société canadienne de gériatrie · CGNA Canadian Gerontological Nursing Association · CAPHD ACSDP Canadian Association of Public Health Dentistry / Association canadienne de la santé dentaire publique · Public Health Agency of Canada / Agence de la santé publique du Canada

Appendix V: Intervention Guide - Canadian Oral Health Screening Tool for Seniors

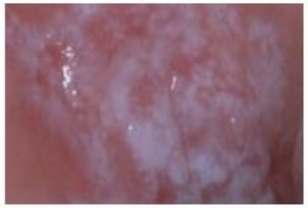
Canadian Oral Health Screening Tool for Seniors

Intervention Guide

Lips

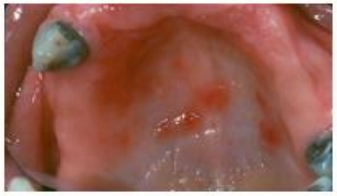
1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Red and swollen: • Monitor the condition until it resolves (1 week). If the condition has not resolved, direct the assessed individual to an oral health professional or physician for management of the condition	Ulcer with and without bleeding: • Ensure that daily oral hygiene is maintained, avoiding the ulcerated area • Immediately direct the assessed individual to a dentist or physician for management of the condition • Monitor the condition for two weeks in accordance with the recommendations of the dentist or treating physician • Redirect the assessed individual to the dentist or treating physician if clinical signs persist or worsen
Dryness: • Lubricate the lips with a water-based lip balm • Monitor the condition until it resolves (1 week). If the condition has not resolved, direct the assessed individual to oral health professional or physician for management of the condition	
	

Mucosa of the cheeks and lips

1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Localized redness or whitish patch(es) • Ensure that daily oral hygiene is maintained • Monitor the condition until it resolves (1 to 3 days). If the condition has not resolved, direct the assessed individual to a dentist or physician for management of the condition	Generalized redness or whitish patch(es): • Ensure that daily oral hygiene is maintained • Immediately direct the assessed individual to a dentist or physician for management of the condition • Monitor the condition for two weeks, in accordance with the recommendations of the dentist or physician • Redirect the assessed individual to the dentist or treating physician if clinical signs persist or worsen
Single ulcer of less than 0.5 cm: • Ensure that daily oral hygiene is maintained, avoiding the ulcerated area • Direct the assessed individual to a dentist or physician for management of the condition • Monitor the condition for two weeks and take pain control measures as needed in accordance with the recommendations of the dentist or treating physician	Single ulcer larger than 0.5 cm or multiple ulcers: • Ensure that daily oral hygiene is maintained, avoiding the ulcerated area • Monitor the condition for two weeks and take pain control measures as needed in accordance with the recommendations of the dentist or treating physician • Redirect the assessed individual to the dentist or treating physician if clinical signs persist or worsen
 	 

Gums and palate

1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Localized redness or swelling of the gums, palate, or beneath the denture (partial or full): • Improve dental and denture (partial or full) hygiene measures, even in the presence of gum bleeding • Monitor the condition daily until it resolves (1 to 3 days). If the condition does not resolve, direct the assessed individual to a dentist or physician for management of the condition	Generalized redness or swelling of the gums or palate, or beneath the dental protheses spontaneous bleeding: • Improve dental and denture (partial or full) hygiene measures, even in the presence of gum bleeding • Immediately direct the assessed individual to a dentist or physician for management of the condition • Monitor the condition in accordance with the recommendations of the dentist or treating physician • Redirect the assessed individual to the dentist or treating physician if clinical signs persist or worsen
	Ulcer(s): • Ensure that daily oral hygiene is maintained, avoiding the ulcerated area • Immediately direct the assessed individual to a dentist or physician for management of the condition • Monitor the condition for two weeks and take pain control measures in accordance with the recommendations of the dentist or treating physician • Redirect the assessed individual to the dentist or treating physician if clinical signs persist or worsen

Tongue

1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Circumscribed change in colour, smooth appearance, localized loss of texture uniformity, localized whitish patches: • Ensure that daily oral hygiene is maintained • Monitor the condition until it resolves (1 to 3 days). If the condition has not resolved, direct the assessed individual to a dentist or physician for management of the condition	Generalized change in colour and appearance, generalized loss of texture uniformity, generalized whitish patches: • Ensure that daily oral hygiene is maintained • Immediately direct the assessed individual to a dentist or physician for management of the condition • Monitor the condition for two weeks in accordance with the recommendations of the dentist or treating physician • Redirect the assessed individual to the dentist or treating physician if the clinical signs persist or worsen
	Ulcer(s): • Ensure that daily oral hygiene is maintained, avoiding the ulcerated area • Immediately direct the assessed individual to a dentist or physician for management of the condition • Monitor the condition for two weeks and take pain control measures in accordance with the recommendations of the dentist or treating physician • Redirect the assessed individual to the dentist or treating physician if the clinical signs persist or worsen
	
	

Saliva

1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Thin layer of saliva coating the mucosa, tongue and teeth. Tissues appear shiny and moist: • Ensure that daily oral hygiene is maintained • Monitor the condition until it resolves (1 to 3 days). If the condition has not resolved, direct the assessed individual to a dentist or physician for management of the condition	Apparent lack of saliva or minimal quantity of saliva coating the mucosa, tongue and teeth. Tissues appear dull and dry: • Ensure that daily oral hygiene is maintained • Immediately direct the assessed individual to a dentist or physician for management of the condition • Monitor the condition and ensure that tissue hydration measures are taken in accordance with the recommendations of the dentist or physician, i.e., drinking water in small quantities or moistening tissues with artificial saliva • Redirect the assessed individual to the dentist or treating physician if the clinical signs persist or worsen
	

Teeth

1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Superficial appearing cavity, tooth with minor fracture. Tooth mobility with no risk of tooth detachment: • Ensure that daily oral hygiene is maintained • Direct the assessed individual to a dentist for management of the condition • Monitor the condition and be alert for signs of pain* that may indicate the worsening of the condition until management is taken over by the dentist	Deep appearing cavity with loss of tooth structure, tooth with major fracture or bare root, sharp tooth edge. Tooth mobility with risk of tooth detachment: • Ensure that daily oral hygiene is maintained • Immediately direct the assessed individual to a dentist for management of the condition • Monitor the condition and be alert for signs of pain* that may indicate worsening of the condition until management is taken over by the dentist
 	 
	

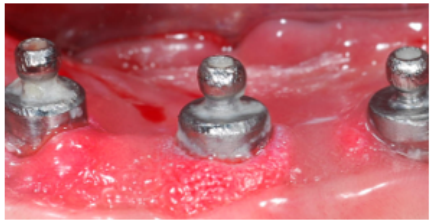
*Refer to the Pain section.

Dental prosthesis

1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Minor break: one artificial tooth broken, worn or missing; alteration of portion of the structure having little to no impact on the denture's (partial or full) function. Adequate stability and retention. Denture's (partial or full) not identified: • Direct the assessed individual to a dentist or denturist* for management of the condition	Major break: several artificial teeth broken, worn or missing; alteration of portion of the structure, affecting the denture's (partial or full). Inadequate stability and retention. Denture's (partial or full) not identified: • Immediately direct the assessed individual to a dentist or denturist* for management of the condition
 	  

*Depending on the presence of this professional at the provincial level.

Implants

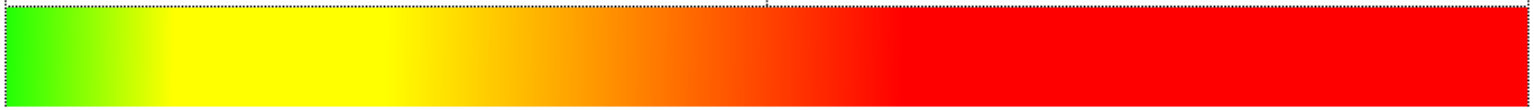
1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Localized presence of biofilm, tartar and food debris on the implant; gum redness around the implant: • Ensure that daily oral hygiene is maintained • Direct the assessed individual to a dentist for management of the condition	Generalized presence of biofilm, tartar and food debris on the implant; gum redness and swelling around the implant: • Ensure that daily oral hygiene is maintained • Immediately direct the assessed individual to a dentist for management of the condition
	

Hygiene of teeth and dental prosthesis

1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Localized presence of dental plaque, tartar and food debris: • Increase tooth and dental protheses hygiene measures, even in the presence of gum bleeding • Monitor the condition daily until it resolves (one week). If the condition has not resolved, direct the assessed individual to an oral health professional for management of the condition	Generalized presence of dental plaque, tartar and food debris. Foul mouth odour: • Increase tooth and dental protheses hygiene measures, even in the presence of gum bleeding • Immediately direct the assessed individual to an oral health professional for management of the condition • Monitor the condition in accordance with the recommendations of the oral health professional • Redirect the assessed individual to the treating oral health professional if the clinical signs persist or worsen
 	 

Pain

1 = Mild to moderate abnormal condition	2 = Severe abnormal condition
Occasional signs of mild to moderate pain: cries, aggressiveness, groaning, painful touch to the area, and mouthing: • Direct the assessed individual to a physician or dentist for management of the condition • Monitor the pain and take pain reduction measures as needed in accordance with the recommendations of the treating physician or dentist	Frequent signs of severe intensity: cries, aggressiveness, groaning, painful touch to the area, and mouthing: • Immediately direct the assessed individual to a physician or dentist for management of the condition • Monitor the pain and take pain reduction measures as needed in accordance with the recommendations of the treating physician or dentist



The pain must be related to an abnormal condition of the oral structures.

Appendix VI: Guidance for administration - Canadian Oral Health Screening Tool for Seniors

Guidance for administration

The illustrated tool for assessing oral health makes it possible to identify the most common abnormal oral and dysfunctional prosthesis conditions among seniors. Here is some information about its use.

Persons who can be assessed using the illustrated tool

Any senior who, for health or autonomy reasons, cannot get to an oral health professional office

Health professionals who can administer the tool

The illustrated assessment tool was designed for use by non-dental health professionals.

Place of administration

The tool must be administered in a safe, quiet setting where aseptic measures can be followed. The senior should preferably be seated in a chair, wheelchair or geriatric chair. If necessary, the senior may remain lying down in bed.

Instruments

Headlamp (preferred) or sufficient artificial light with a tongue depressor. The use of 2x2" gauze pads is optional.

Aseptic measures

Using the illustrated tool requires that universal aseptic measures be applied and followed. These include handwashing and wearing of masks, single-use gloves, and protective eyewear. It should be noted that the assessment sheet, on which observations made during the assessment are noted, must be completed while following applicable aseptic measures.

Administration of the tool

- Remove any removable denture (partial or full) from the senior's mouth before beginning the assessment.
- Begin by assessing the oral structures, followed by the other components of oral health, such as saliva, dental protheses, implants, dental and dental protheses hygiene, and pain. It should be noted that the dental protheses must be assessed outside of the senior's mouth.
- Systematically follow the order of the items to be assessed as they are set out in the tool.

- For each item in the tool, select one of the three photos that best matches the condition of the structure or oral health component, with the help of the written description on the tool's assessment sheet.
- Keep alert for any verbal or facial expression of pain—words, cries of pain, gestures, or physical or behavioural signs—that will help you select the pain level. The pain must be related to the presence of an abnormal oral condition.

After the assessment

If any abnormal oral conditions were observed during the assessment, consult the suggested instructions and actions in the tool's Intervention Guide.