Determining functional outcome criteria in wait list assessment for patients with head and neck cancer

by

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ABSTRACT

The purpose of this study was to contribute to the development of a waiting list prioritization tool, the Jaw Reconstruction Rehabilitation (JRR) tool, for use with head and neck cancer patients who are waiting for oral rehabilitation with osseointegrated implants. The JRR had previously included subjective ratings of speech and swallowing function after reconstructive surgery that were made by a maxillofacial prosthodontist (MFP). However, these ratings were not found to be predictive of patient urgency ratings (based on function and other relevant factors) that were made by the same clinicians. This was of concern given the importance of function to patients. The current study involved the addition of two objective performance-based measures of function: the Modified Barium Swallow Impairment Tool (MBSImp) and the Computerized Assessment of Intelligibility in Dysarthric Speakers (C-AIDS), and two patient-reported measures of function: the M.D. Anderson Dysphagia Inventory (MDADI) and the Speech Handicap Index (SHI). Regression analysis indicated that the JRR tool, even with the addition of the new outcome measures, is only a weak predictor of the statistical variance in patients' urgency ratings and, thus, should not be used as a prioritization tool. Recommendations for future work on the development of this tool include the addition of inter-rater reliability testing and training clinicians to use the tool.

PREFACE

This thesis is an original work by Genevieve Roberts. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name "Determining functional outcome criteria for waiting list assessment in head and neck cancer", No. Pro00057349, July 16th, 2015.

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Table 1. Means and standard deviations of the independent variables: MBSImp Overall Impression scores, SHI scores, and MDADI scores. A high score on the SHI represents the presence of difficulties with speech (i.e., a higher level of impairment). A high score on the MDADI indicates a high level of swallowing function (i.e., low level of impairment).

Table 2. Descriptive statistics for the nominal variables on the JRR Tool: MFP Clinician ratings of psychosocial need, xersostomia, level of speech impairment, and level of swallowing impairment.

Introduction

The treatment of head and neck cancer is an area of increasing importance for a variety of healthcare professionals, including surgeons, oncologists, maxillofacial prosthodontists, and speech-language pathologists. The 2014 issue of Canadian Cancer Statistics reported that the combined number of estimated new cases of the two most commonly diagnosed types of head and neck cancer (oral and laryngeal) is approximately 5,350. While this number may be relatively small compared to other types of cancer, the unique nature of the disease can have devastating effects for the patient, and present a variety of challenges to the multidisciplinary team required to treat head and neck cancer. It is economically very costly, requires highly specialized surgical skills as well as the expertise and involvement of up to 14 medical professionals, and often permanently impacts the organs responsible for breathing, speaking and eating (MacMillan Cancer Support, 2016). Head and neck cancer patients are extremely vulnerable and have incredibly complex needs, starting from the time of diagnosis.

Head and neck cancer is often treated with surgical removal of the cancerous tissue, followed by chemotherapy and/or radiation therapy, or some combination thereof. Surgical removal of the tissue and subsequent reconstruction often causes the loss or distortion of critical structures and associated dentition (Beesley et al., 2012; Rieger, Lam Tang, Wolfaardt, Harris, & Seikaly, 2011; Lam-Tang, Rieger, & Wolfaardt, 2008). Over time, the effects of chemotherapy and/or radiation therapy can also lead to a continually declining condition for patients, and tooth loss can occur as a result of these treatments as well (Beesley et al., 2012). Given the importance of teeth to functions such as speech and swallowing, it is not surprising that patients often experience severe activity limitations related to these areas of function. In addition to speech and swallowing, tooth loss can impact nutrition, overall physical health, psychological health, social relationships, and quality of life (Bassi et al., 2013; Rieger et al., 2010; Kirschneck, Sabariego, Singer, & Tschiesner, 2014, Languis JAE, et al., 2013). These impacts cannot be overstated. With respect to eating, tooth loss can cause not only challenges in getting adequate nutrition and associated weight loss, but also psychological distress due to the loss of the social participation around the act of sharing meals (McQuestion et al., 2011). The altered diets that patients are placed on can pose an added financial burden to patients, who are already extremely vulnerable to financial loss and a complete cessation of employment (Verdonck-de Leeuw et al., 2010). Barriers to return to employment for these patients include high levels of anxiety, diminished energy levels, and oral dysfunction (MacMillan Report, 2016).

It is therefore not surprising that studies have indicated that restoration of function after cancer treatment is of vital importance to patients. Tschiesner and colleagues (2013) surveyed head and neck cancer patients at varying points in the treatment process and asked them to select five priorities from a list of 14 that were derived from the International Classification of Functioning, Disability and Health Core Set for Head and Neck Cancer (ICF-HNC). The top five priorities rated by all patients included the ability to continue to perform all tasks of daily living, and to be able to speak clearly. The fact that these priorities were rated more highly than reduction of pain, being able to retain body structures, and the reduction of the cosmetic consequences of treatment by the majority of patients emphasizes the importance of functional outcomes. Other studies that surveyed patients with a variety of different types of head and neck cancer have confirmed the importance of speech and swallowing functions for these patients (Metcalfe, Lowe, & Rogers, 2014).

Oral rehabilitation involving implant-retained prostheses can greatly reduce the level of functional impairment associated with treatment for head and neck cancer (Lam-Tang et al., 2008; Bassi et al., 2013). In some cases, mastication and swallowing can be returned to near-normal levels and quality of life can be greatly improved. Unfortunately, there are currently excessively long waits to access this service and, in the absence of any standardized tools for prioritizing patients, the provision of necessary care is in jeopardy.

The Current State of Affairs of Waiting Times

The Canadian health care system, like other publicly-funded health care systems, has been plagued by long wait times to access specialized services. This has been evident in the proliferation of media coverage of the issue, as well as in government policies aimed at reducing wait times. Despite the fact that the Canadian system is not the only health care system that has been unable to meet the demand for specialized services in a timely manner, this has been a significant source of anxiety for the public and policy-makers alike (Lewis et al., 2000; DeCoster et al., 2006; Arnett, Hadorn, & the Steering Committee of the Western Canada Waiting List Project, 2003; Hadorn, 2000). When patients wait too long for services that are deemed medically necessary, there is the potential for harm, including a reduction in activities of daily living, diminished quality of life, poorer health outcomes, and reduced benefits from that service (McGurran & Noseworthy, 2002).

In 2004, the First Minister's Health Accord included a serious government commitment to target the issue of long waiting times in Canada, but Canadians are still waiting too long to access necessary medical services (WTA, 2014). For many, this problem brings into question the quality of care that Canadians are receiving, and ultimately the legitimacy of the system itself (McGurran & Noseworthy, 2002). Several important issues regarding long waiting times and their management will be explored in order to understand the complexity of this issue: measuring access time, fairness, cost, medical liability, and the benefits of waiting.

Measuring Waiting Time. When there is increased demand for a health care service that is in short supply, patients are placed in a queue, referred to as a "waiting list" (Hadorn, 2000). However, determining the point along the continuum of care that waiting time actually starts has been a cause of confusion in how waiting lists are measured and managed (Lewis et al., 2000). Does waiting time start once the specialist physician has determined that a patient needs a specific treatment? Or does the process begin once a patient sees their family physician for a referral to the specialist? In practice, there are often two existing lists: one for the initial appointment with the specialist to determine if the patient should undergo the treatment, and one to receive the actual treatment (Hadorn, 2000). The second is the list that is commonly referred to as the "waiting list", although the preliminary list can often involve longer waits (Hadorn, 2000).

Despite this distinction in the literature, the confusion regarding when waiting time begins has pervaded attempts to determine the length of existing waiting times (Lewis et al., 2000). Various websites have been established to offer the public estimates of waiting times, but, according to Lewis et al. (2000), the consequence of this confusion is that the accuracy of these waiting time estimates is in question unless it can be determined that the waiting time began that the same point for all patients. Lewis and colleagues (2000) suggest that the paucity of standardized data on waiting lists is just part of a system-wide lack of management of waiting times. There are some specialty services for which it is virtually impossible to find any estimates on current waiting times, including oral rehabilitation with osseointegrated implants for head and neck cancer patients. It is likely that any overall waiting times for services have been underestimated, as certain areas are potentially ignored. Without standardized data regarding waiting times and where the greatest need is, government solutions have often been piece-meal, ad-hoc injections of funds based on anecdotal evidence and interest-group pressures (Lewis et al., 2000; Arnett et al., 2003; McGurran & Noseworthy, 2002).

The Wait Time Alliance (WTA) set out to establish benchmarks by which it is medically recommended to complete surgery for a number of priority areas. These benchmarks were intended to serve as targets for efforts to reduce waiting lists, but in many cases these have been established without standardized data and with little empirical evidence of the effect of waiting on health-related quality of life and health outcomes of patients (Conner-Spady et al., 2007; Conner-Spady et al., 2009), and with little data on "appropriateness" for surgery. This is another area where there is a lack of attention paid to patients requiring dental implants after reconstructive surgery for head and neck cancer, where benchmarks don't exist. Part of the solution for managing waiting lists should therefore include policies that require the collection of valid and reliable data on the current state of affairs.

The establishment of waiting time benchmarks for healthcare service delivery mandating that patients have access to a specific treatment or surgery have also been used as a method to reduce wait times. By pairing waiting time benchmarks with economic sanctions or rewards, governments have been initially successful in reducing the wait times in certain areas (Siciliani et al, 2014). However, it has been noted that unless the demand for that procedure can be reduced, or productivity increased, eventually it becomes unfeasible to ensure that they are met, and even more costly for healthcare providers (Siciliani et al, 2014).

Fairness. Of primary concern to the public, and arguably one of the tenets of the publicly funded system, is the issue of fairness with regards to waiting lists (Lewis et al., 2000; DeCoster et al., 2006; Arnett et al., 2003, McGurran & Noseworthy, 2002; Conner-Spady et al., 2009). According to Pitt, Noseworthy, Guilbert, and Williams (2003), fairness in terms of accessing health care services for which there is a waiting list could be determined in a number of possible ways, including a lottery, or a first-come-first-served basis, or according to level of need or urgency.

Although a first-come-first-served approach requires very little energy in terms of administration and appears to be fair in some respects, it also can be considered undesirable in several ways. First, from a clinical perspective, the time that a patient spends waiting can seem like an arbitrary criterion when compared to variables such as patient urgency or potential to benefit from treatment (Cunningham et al., 2013). Second, a first-come-first-served system favors patients who are simply able to put their names on the list sooner, because they are geographically closer or have the financial means to travel. This is especially true for patients in the Canadian healthcare system, in which barriers to accessing healthcare are a real challenge for patients living in rural areas. A study investigating waiting times for computed tomography scanning revealed that wait times actually vary by as much as months among different communities in a province, and individuals who can afford to travel received the service faster than others in their region (Cunningham et al., 2013).

The last option, clinical prioritization based on clinically-determined patient urgency, is the only one that has been deemed reasonable according to clinicians and certain groups of patients (Pitt et al., 2003). All else being equal, patients with a higher need for the service should go first. Surveys of patients on the waiting list for hip and knee arthroplasty have indicated that the majority of patients waiting feel that those with a higher level of pain or a loss of mobility should go before them (Connor-Spady et al., 2009). In a study by Cipriano et al. (2008), clinical prioritization was compared to other methods of waiting list management (waiting time guarantees, reduction in surgical demand, common waiting list management) through the use of an event simulation model. Although common waiting list management was deemed to be an effective strategy to improve efficiency in waiting, clinical prioritization was successful not only in reducing waiting times for high-priority patients, but also in increasing (by 9.3%) the number of patients at all priority levels who received surgery each year within recommended maximum waiting times.

Although ensuring fairness in terms of waiting list management seems possible, fairness is at risk in a health care system where the procedures for queuing patients lack standardization and vary widely according to surgeon, hospital, or even health authority (Hadorn, 2000). In some cases, the length of time that a patient may wait is not associated with the severity of their condition (Hadorn, 2000; Conner-Spady et al., 2004). One popular method for prioritizing patients involves placing them in broad categories that supposedly represent their level of urgency, such as "urgent," "semi-urgent," and "routine." However, these category descriptions lack specificity, patients within each category are not prioritized, and judgments made regarding who receives treatment are subjective (Connor-Spady et al, 2004; Hadorn, 2003). Ultimately, patients feel that the process is not transparent and cannot guarantee fairness of access.

Cost. The economic burden that occurs as a result of patients who wait longer than medically recommended for necessary services is substantial. In a report commissioned by the Canadian Medical Association (Centre for Spatial Economics, 2008), the estimated cost of waiting too long for treatment was calculated for 4 of the 5 priority areas identified in the 2004 Health Accord (cataract surgery, joint replacement, cardiac surgery, and magnetic resonance imaging (MRI) scanning), based on the medically recommended benchmarks for waiting times for each area. As of 2007, the cumulative cost of waiting for treatment in these areas was approximately $14.8 billion. However, the true cost is likely much higher, as this report only examined a small number of specialty areas with long waiting times.

Accurate estimates of the cost of waiting require the inclusion of 3 sources of economic loss: cost to the patient, cost to the caregiver, and costs to the health system as a whole. First, costs to the patient include the direct impact of the inability to return to work, as well as indirect impact the economy from reduction in activity. Increased cost to the patient can also result from the need for medication or treatment that is not covered by the health care system. Second, costs to the caregiver involve losses resulting from staying home from work to care for a sick spouse or family member, measured in direct losses as a result of not working, and indirect losses to the economy as a whole. Third, additional costs to the health care system result from patients who are waiting in the form of additional appointments, tests, and medications that may not be required if the patient received treatment in a shorter period of time. It should be mentioned that although this increased expenditure on health services can partially offset the cost of waiting (for example, through the addition of jobs), this represents government spending that could have been used to reduce waiting times in the first place, rather than to help fund their existence (CSE, 2008).

Finally, the cost of waiting too long for health care services can also be measured in terms of its impact on government revenue. When patients wait too long for medical services, the cost of health care spending was shown to rise, so provincial government personal income taxes must be raised to offset this cost (CSE, 2008). Higher taxes result in a reduction in personal income, which results in a reduction of spending, ultimately affecting sales and excise tax revenues. It becomes clear that the cost of waiting can ultimately affect the government at all levels, and it also can become a self-perpetuating cycle. In fact, according to Lewis et al. (2000), the government's strategy of pouring in more funds without making system-wide changes, such as the establishment of transparent and standardized processes, can even add to the cost of the system. Isolated solutions in the form of funding directed towards one procedure over another has proven to be ineffective or only a temporary solution (Lewis et al., 2000).

Studies have shown that financial worries rank high amongst the concerns of head and neck cancer patients. Patients surveyed in the study by Tschiesner et al. (2013) even rated "having cancer treatments covered by health insurance" as the second highest priority regarding cancer treatment. Head and neck cancer patients have been shown to be at particular risk for financial burden as a result of unemployment or being unable to return to work, with roughly 50% of patients reporting financial trouble since they were diagnosed (Tschiesner et al, 2013).

Medical Liability. The issue of responsibility for the harm that may befall patients whose access to care is delayed is murky territory. The Canadian Medical Protective Association (CMPA) expressed concerns in a publication that there is a lack of clarity regarding where accountability should fall (CMPA, 2007). Physicians have a legal duty of care to their patients, and part of this duty involves advocating, to the best of their ability, in order to obtain resources for their patients (Pitt et al., 2003; CMPA, 2007). However, in a situation where there is a lack of resources, health authorities, rather than physicians themselves, often make the final decisions regarding who gets access to services (CMPA, 2007). Physicians can find themselves in the position of being unable to fulfill their duty of care obligations for a patient due to difficulty accessing resources. They essentially become responsible for a problem that they did not create.

In addition to duty of care, physicians are obligated by the standard of care to inform patients when long waiting times exist. Failure to do so may result in the accusation of nonavailability of a standard of care (Pitt et al., 2003). It has been argued, therefore, that physicians are at risk for liability in situations where a patient has experienced harm due to lengthy waiting times (Pitt et al., 2003; CMPA, 2007). In fact, according to Pitt et al. (2003), a lack of resources has not been accepted by any court in Canada as an acceptable excuse for negligence. To further complicate the issue of liability, physicians share risk with hospitals. In Canada, the majority of legal action in these situations takes place after an event has happened in a hospital. The plaintiff's lawyer, in deciding whom to sue, will often name the hospital, which can then file a cross-claim against the physician who was involved (Pitt et al., 2003).

Benefits of Waiting. Despite all of the negative effects that can result from waiting times for services, benefits to waiting have been investigated. The CMA report on the economic cost of waiting identified two potential benefits of waiting lists. First, there is the potential for waiting lists to reduce the problem of over-consumption of healthcare. Second, patients on the waiting list may require services that boost the revenue of certain sectors, such as pharmaceuticals.

Research focusing on patient perspectives on waiting for treatment has yielded some additional arguments for having patients wait. Surveys of patients on the waiting list for elective hip and knee arthroplasty indicated that patients prefer to have a minimum waiting time, to allow them to be emotionally and physically prepared for surgery (Conner-Spady et al., 2009). When the patient requires surgery, it can cause anxiety and it may therefore be beneficial for patients to have some time to adjust. However, it is important to emphasize that patients in this study also identified maximum waiting times that were due to health and quality of life issues related to waiting, such as pain and limitations to mobility (Conner-Spady et al., 2007; Conner-Spady et al., 2009). Therefore, it seems that waiting by itself is not intrinsically negative to all patients, but in excess can cause problems.

Another argument in favor of waiting, related to avoiding the overconsumption of health care, is adaptation. Patients may adapt to a disability or chronic illness through the use of such strategies as acquiring new skills (for example, compensatory mechanisms), re-evaluation of goals and interests, and lowered expectations regarding health (McKie, Hurworth, Shrimpton, Richardson, & Bell, 2014). These patients may then decide that they do not want to undergo treatment, and ask to be dropped from the waiting list. Receiving immediate treatment would preclude the ability to adapt, and would use resources that could be diverted elsewhere. It should be mentioned, however, that adaptation to illness can be positive or negative, and should not automatically be taken to mean that a patient is considering forgoing treatment (McKie et al., 2014).

Patients at iRSM

Patients currently on the waiting list at the Institute for Reconstructive Sciences in Medicine (iRSM) (Edmonton, Alberta) are illustrative of the issues surrounding waiting lists. Patients wait an excessive amount of time to receive oral rehabilitation with osseointegrated implants and associated prostheses necessary to improve speech and swallowing functions. As a result, many report being unable to work until the treatment is provided. Patients are typically not funded to go out-of-province for treatment. Without prosthetic rehabilitation, many patients may be forced to remain on liquid diets or are reliant on feeding tubes. Even though there is the potential to adapt to an altered diet, abstaining from using the structures involved in mastication can result in the resorption of bone, and limited use of swallowing musculature for a long period of time can also negatively impact rehabilitation. This is compounded by the risk of aspiration that these patients may face as a result of impaired swallowing. Patients also report that their condition impacts their social life and the level of intimacy of their spousal relationships.

Subjective decisions regarding who goes first can be complicated. There are as many as 4 different treatment pathways at iRSM that patients can be placed on, depending on their diagnosis and what type of surgery is deemed most appropriate for them. Some patients stand to make real functional gains if they receive implant-supported prostheses, whereas others do not have the potential to make the same functional gains, but are desperate for the psychosocial benefits of receiving the implant-retained prosthesis. Furthermore, a difficult distinction may have to be made between a younger patient who has a high likelihood of recovery, and an older patient who is experiencing very severe levels of impairment, and who may not be as likely to improve as a result of treatment. Procedures also need to be in place to ensure that the list is monitored and re-ranked to reflect patients who voluntarily drop off the list, or who pass away. Failure to do so can result in inflation of the waiting list. A recent review of records at iRSM indicated that 11 patients (out of a total of 111) elected to be dropped from the list, possibly to due to adaptation to their condition, or because they were tired of waiting for a surgery that was being delayed for an excessive amount of time. Unless patients are prioritized in a way that minimizes the risks associated with waiting too long for treatment and maximizes the potential for benefit, the harm associated with waiting will continue.

Previous work has been done in an attempt to improve the prioritization of patients on waiting lists in other specialty areas, and there is great potential to build on it for use with patients at iRSM.

Previous Work: the Western Canada Waiting List Project

The most concerted effort to-date to coordinate, standardize, and improve the way in which patients are queued has been completed by the Western Canada Waiting List Project (WCWL). The WCWL, a federally-funded partnership composed of 7 regional health authorities, 4 medical associations, 4 provincial ministries of health, and 4 health research centers, was established to address the problem of waiting list management. Efforts were focused on the development of standardized waiting list prioritization tools for use in 5 priority areas (hip and knee arthroplasty, cataract removal, general surgery, children's mental health services, and MRI scanning) (McGurran, Noseworthy et al 2002). The WCWL tools are point-count scoring systems that were created based on clinical expertise in each area (McGurran & Noseworthy, 2002; Arnett et al., 2003; DeCoster et al., 2006).

Point-count systems have been in widespread use in medical practice for many years; well-known examples include the APGAR score used to assess the health status of a newborn, and the Glasgow Coma scale, which is used to determine the likelihood of recovery from a coma (McGurran & Noseworthy, 2002; Hadorn, 2003). Statistically, point-count systems function as linear models, composed of two or more factors (or criteria). Each factor can have several levels (ex. presence of swallowing impairment – none, mild, mod, severe), and each level is assigned a numerical weight. These weights are assigned based on the relative importance of that factor in determining the overall score, and are then added to determine the patient's overall score (Hadorn, 2003).

The WCWL prioritization tools are unique in that they assess both the severity of a patient's condition and the extent to which that patient is expected to benefit from the service in question. Collectively, these two measures define that patients' level of "urgency" (Hadorn, 2003). For each of the 5 clinical areas originally identified, the prioritization tool was created in a very similar manner. An expert panel developed a draft of the tool, comprising of major clinical criteria that are used to determine the severity of the patient's condition, as well as personal measures such as the ability to perform acts of daily living (Noseworthy, McGurran, Hadorn, &

the Steering Committee of the Western Canada Waiting List Project, 2003). This was followed by pilot testing, in which clinicians were first trained to use the tool, and then used it to score a series of patients (in the context of a patient interview and clinical exam). At the end of the assessment, they were asked to indicate their overall judgment of urgency on a visual analogue scale, which would serve as the dependent variable for regression analysis. Each patient interview and exam was videotaped and scored by a second independent clinician, and individual criteria items were examined for inter and intra-rater reliability. To ensure that the tool was effectively predicting overall urgency, regression analysis was then used to determine the optimal set of weights for each criteria item. This process was repeated as necessary to refine the tool for more wide-spread clinical use.

The resulting tools were deemed to be short and easy to administer, reliable, and to have good face-validity by practicing clinicians (Noseworthy et al., 2003; DeCoster et al., 2006). They were also well-received by the public, who felt that the tools were fair, relevant, and would allow for individual physician's lists to be audited, ensuring that it would be difficult to "game the system" (McGurran & Noseworthy, 2002). However, the WCWL has identified several limitations to the prioritization tools, including appropriateness of patients who are placed on the list, and the exclusion of patient-reported outcomes in criteria items.

Appropriateness. The WCWL tools were created based on the assumption that the treatment in question was appropriate for each patient on the list, and therefore the criteria were not developed with the intention of evaluating appropriateness (DeCoster et al, 2006). It would therefore be necessary in implementing the tools to emphasize that they are not meant to replace physician judgment of appropriateness of treatment, and that proper management of existing lists should include procedures for re-evaluating the appropriateness of a medical intervention for each patient on the list, in the event that their condition changes (e.g., adaptation) or worsens.

Exclusion of patient-reported outcomes. According to Noseworthy et al. (2003), the tools were designed to model clinical judgment, which, despite being the basis of judgments of urgency, may not always reflect best practice. Most clinical exams, including those for the purpose of administering the WCWL tools, are based on clinician ratings of structure and function. However, these subjective and relatively cursory measures may not result in accurate representations of patient outcomes, and therefore patient-reported outcomes (PROs) are increasingly gaining attention in healthcare research.

Clinical practice for the treatment of head and neck cancer is increasingly utilizing PROs, especially for the purpose of assessing symptoms and quality-of-life (Rinkel, Verdonck-de Leeuw, de Bree, Aaronson, & Leemans, 2015). One study investigated both PROs and performance-based measures and found that PROs provided correlated but complementary data on patients' functional outcomes (Rinkel et al, 2015), and that assessments should include both methods of data collection. Given the importance that these patients place on functional outcomes, creating valid functional outcome criteria, whether they involve patient-reported or performance-based measures of function, or a combination of both, for determining these outcomes will be crucial in developing a valid and reliable prioritization tool for these patients.

The Jaw Reconstruction Rehabilitation Assessment Tool

The Jaw Reconstruction Rehabilitation (JRR) assessment tool was created to be used with patients on the waiting list for oral rehabilitation with osseointegrated implants at the Institute for Reconstructive Sciences in Medicine (iRSM) (Edmonton, Alberta). Until the tool could be properly validated, it was used to collect information on patients who were on the waiting list, rather than for clinical prioritization. The JRR tool (see Appendix A) contained 10 criteria based on relevant literature and clinical expertise and included prosthodontic variables, as well as functional outcome variables, specifically with regards to speech and swallowing. A maxillofacial prosthodontist (MFP), in the context of an interview and physical exam, generated ratings of function for each patient, as a speech-language pathologist (SLP) (who would typically be involved in assessing those functions) could not be made available. Prior to the MFPs filling out the JRR, objective performance-based measures of speech and swallowing function had been collected for each patient on the list by a SLP. These were not accessible at the time to the MFPs who were assessing the patients for the purpose of the waiting list; therefore, they had to rely on making cursory measures partially based on patient statements of function.

Patients from the waiting list at iRSM were called in for an assessment with the MFPs. During that appointment, they were assigned ratings for each criteria item on the scale. The MFPs gave each patient an overall urgency score at the end of the assessment, which was indicated using a visual analogue scale ranging from a score of 1, or “low urgency,” to a score of 10, or “high urgency.” Prior to the present study, a regression analysis performed on a sample of 49 patients indicated that the MFPs’ ratings of speech and swallowing function were not significant predictors of urgency. This finding was of concern in light of what is known from the literature about patient concerns with functional outcomes. Given this, it was considered that subjective, MFP clinician-driven ratings of function are relatively cursory measures, and more objective performance-based measures are required to accurately represent functional outcomes for these patients.

Purpose

The primary purpose of the present study was to contribute to the development of the JRR as an effective priority-setting tool for patients in need of oral rehabilitation with osseointegrated implants. Given that a large proportion of these patients experience adverse effects on speech and swallowing, and that dental implant surgery and related rehabilitation have direct impact on those functions, exploration of valid functional predictors was of primary importance. It was hypothesized that objective performance-based measures of functional outcomes after reconstructive surgery, as collected by a SLP would be better predictors than subjective MFP clinician-driven ratings of a patient's overall urgency score. This study also explored the validity of using patient-reported measures of function in determining relative urgency.

Design

A retrospective study design was used to explore if two performance-based objective measures of function (as collected by an SLP) and two patient-reported outcome measures were better predictors of patient's urgency scores on the JRR tool than subjective ratings by a MFP of speech and swallowing function.

Statistical Analyses

Linear regression modeling was used to determine the relative contribution of the SLP performance-based objective measures and the patient-reported outcome measures to the ability of the model to predict the MFPs' urgency ratings.

Method

Materials

This study utilized the completed JRR forms for patients on the iRSM waiting list, as well as scores that were previously collected at iRSM on speech and swallowing outcomes through SLP performance-based and patient-reported measures of function. The SLP performance-based outcome measures included the Modified Barium Swallow Impairment Tool and the Computerized Assessment of Intelligibility in Dysarthric Speakers. These are considered to be objective measures of function. The patient-reported measures of function included the M.D. Anderson Dysphagia Inventory and the Speech Handicap Index.

The Modified Barium Swallow Impairment Tool. The Modified Barium Swallow Impairment tool (MBSImp) is a modified and standardized version of the Modified Barium Swallow Study (MBSS). The MBSS consists of a videofluoroscopic examination of the process of swallowing, and is in widespread use by clinicians to visualize flow of the bolus and the structures involved in swallowing in real time. Additionally, it allows clinicians to detect the presence and physiologic cause of aspiration. Despite being so ubiquitous, historically the use of the original MBSS has lacked standardization. The MBSImp was created by Martin-Harris et al. (2008) and was validated in a study using 300 patients with diverse diagnoses who were referred for an MBSS at a university clinic and private hospital. The MBSImp includes 17 physiologic components of swallowing, with a unique score associated with each and a final overall score. It also includes a standardized set of Barium preparations (e.g., thin liquid, pudding, and cookie) and order of presentation. This allows clinicians to determine which presentation is associated with the highest level of impairment for a patient, with high scores on the MBSImp indicating a high level of impairment. The MBSImp was shown to be a practical and reliable tool that allows for the quantification of swallowing impairment and for comparison across patients and diagnoses.

According to the standardized presentation of Barium for the MBSImp, each patient should trial presentations of thin liquid, pudding, and a shortbread cookie, obtaining an Overall Impression (OI) score for each (which is scored by adding the scores for the 17 components of the swallow). The most severe OI score is then chosen as being representative of that patients' swallowing functional impairment. Any deviations from the protocol, though necessary for patient safety (e.g., patients who are edentulous and unable to properly masticate the cookie, or who try but require a liquid wash), cannot be scored using the MBSImp. For the current study, the majority of patients were unable to trial the cookie according to protocol, so this presentation was not scored (31% of patents trialed the cookie but required a liquid wash to clear it from their oral or pharyngeal cavities, 53% of patients did not trial a cookie at all, and 16% were able to safely trial the cookie, and these swallows could have been scored according to protocol). Each patient was assigned a worst OI score for either the thin liquid or pudding presentation of Barium.

The Computerized Assessment of Intelligibility in Dysarthric Speakers. The Computerized Assessment of Intelligibility in Dysarthric Speakers (C-AIDS) is a SLP clinician-driven standardized assessment of the intelligibility of speech for patients with dysarthria. It is typically completed by having a naive listener transcribe a recording of the patient speaking a standardized set of words and sentences. The accuracy of the transcription is used to quantify word and sentence intelligibility, and allows clinicians to estimate the patient's overall communicative efficiency by determining the rate of intelligible words per minute. Standardized tools for evaluating the intelligibility of people with dysarthria, including the C-AIDS tool, have also been shown to be appropriate and valid for use with patients with head and neck cancer in a number of studies (Rieger, Wolfaardt, Seikaly, & Jha, 2002; Rieger et al, 2011).

The M. D. Anderson Dysphagia Inventory. The M. D. Anderson Dysphagia Inventory (MDADI) is a patient-reported assessment of the effects of dysphagia on quality of life. The MDADI consists of 20 items that ask patients to rate on a 5-point Likert scale their extent of agreement with various statements relating to dysphagia (e.g., I have low self-esteem because of my swallowing problem). A high score on the MDADI indicates better functioning in daily life and quality of life. This tool was validated using a sample of patients with head and neck cancer and was deemed especially important for assessing the impact of treatment, as well as for improving medical care for these patients (Chen et al., 2001).

The Speech Handicap Index. The Speech Handicap Index (SHI) is a patient-reported outcome tool comprised of a questionnaire with 30 items that focus specifically on speech-related impairments in patients with head and neck cancer. Patients are asked to rate the frequency that they experience a series of negative events associated with speech (e.g., how often their speech makes it difficult for others to understand them), and to provide an overall rating of their own speech at the end of the assessment. A high score on the SHI indicates that problems with speech are having a high level of impact on a patient's life. This tool was validated with 120 patients who had received treatment for head and neck cancer, and was designed for use with both individual patients as well as groups of patients that are being tracked for a period of time (Rinkel, Verdonck-de Leeuw, van Reij, Aaronson, & Leemans, 2008).

Procedure

Patient files were accessed at iRSM in order to obtain scores on each of the above measures. Each patient completed all of the assessments at the examination appointment that took place before they were first put on the waiting list by a prosthodontist. For the MBSImp scores, existing videos (at the iRSM) for each patient were reviewed and scored according to the MBSImp protocol (by a reviewer who was blind to urgency rating and other patient information). The C-AIDS score was obtained by having the patient read a set of standard utterances (50 words and 22 sentences) generated by the C-AIDS program, which were recorded using a head-mounted unidirectional microphone. The utterances were later played for volunteer listeners who were given a standardized set of instructions to record what they heard the patient say. The examiner then used a scoring key to determine the percent of words that were correctly identified by the naïve listener. The SHI and MDADI scores were also retrieved from the completed questionnaires in the patient files.

The following criteria items were retrieved for each patient from their original JRR assessment form: time on the wait list (previously defined as <1 yr = 0, 1 yr = 3, 2 years = 6, >2 years = 10), clinically perceived psychosocial need (a visual analogue scale with possible ratings from 1 to 10), a subjective rating of xerostomia (0 = normal saliva, 4 = minimal, 8 = moderate, 10 = severe), and clinically-perceived level of urgency for care (a visual analogue scale with possible ratings from 1 to 10). The original MFP subjective ratings of problems with speech (0 = none, 2 = mild, 4 = moderate, 5 = severe) and swallowing (0 = none, 4 = mild, 8 = moderate, 10 = severe) were also collected from the assessment forms. Each patient's urgency score served as the dependent variable in three different linear multiple regression analyses (performed using SPSS Statistics).

Data Analysis

Reliability Analysis. Ten percent of the data was chosen for the reliability analysis of the MBS-Imp scorings. Two SLP clinicians independently (who were blinded to urgency ratings and other patient information) scored each patient's MBS-Imp in order to calculate inter-rater reliability. The Intraclass Correlation Coefficient (ICC) was .936, indicating excellent inter-rater reliability.

Multiple Regression. Three multiple regression models were compared: 1) the model derived from the original JRR tool with subjective MFP clinician ratings of speech and swallowing, 2) the model derived using the objective, SLP performance-based speech and swallowing assessments (MBSImp and C-AIDS), and 3) the model that was derived using the patient-reported outcomes of function (MDADI and SHI). For each model, the patients' overall urgency rating served as the dependent variable. The new outcome measures served as the independent variables, along with MFP clinician ratings of xerostomia and psychosocial need.

Results

This study utilized existing data from 70 patients out of 111 in total (currently on the waiting list for oral rehabilitation at iRSM) who participated in the initial administration of the JRR. Patients were excluded from the study if they were determined not to be candidates for oral rehabilitation, if the JRR form was not completed for a patient, or if the patients had not completed the objective or patient-reported measures of function. The remaining 70 patients included 43 males and 27 females, with an average age of 62 years. The majority of patients were diagnosed with squamous cell carcinoma (n = 56). Other diagnoses included ameloblastoma, adenoid cystic carcinoma, clear cell carcinoma, mucoepidermoid, olfactory neuroblastoma, osteoblastic carcinoma, pleomorphic carcinoma, posterior pharyngeal carcinoma, sarcoma, and retromolar trigone. It was not explored in the current study if diagnosis affected urgency ratings.

The means and standard deviations for patient outcomes on the MBSImp, C-AIDS, MDADI and SHI are shown in Table 1. The MFP clinician ratings of psychosocial need, xerostomia, problems with speech and problems with swallowing are shown in Table 2.

Regression analysis indicated that for all three models, the only predictor variable that correlated with patient urgency was the MFPs' ratings of clinically-perceived psychosocial need ($r = .454$, $p < .01$). The model that used the subjective MFP ratings of speech and swallowing from the JRR tool was able to account for only 26% of the variance in patient urgency, $F(4, 65) = 5.603$, $p < .001$, $R^2 = .256$, Adjusted $R^2 = .211$, 90% CI [-5.35, .3.797].

The model that used the objective, SLP performance-based measures of speech and swallowing (MBSImp and C-AIDS) was able to account for approximately 27% of the variance in patient urgency, $F(4, 65) = 5.909$, $p < .001$, $R^2 = .267$, Adjusted $R^2 = .222$, 90% CI [-1.891, .8.809].

The third model, which used the patient-reported outcome measures of speech and swallowing function, was able to account for 23% of the variance in patient urgency, $F(4, 65) = 4.875$, $p < .001$, $R^2 = .231$, Adjusted $R^2 = .183$, 90% CI [-4.530, 9.269].

Table 1. Means and standard deviations of the independent variables.

Independent Variable	**Mean**	**Standard Deviation**
MBSImp (worst Overall Impression score)	16.30	5.350
C-AIDS (single word and sentence intelligibility)	84.0393	17.137
SHI (overall score) (higher score = higher level of impairment)	40.30	27.151
MDADI (overall score) (higher score = lower level of impairment)	65.33	15.248

Table 2. Descriptive statistics for the nominal variables on the JRR Tool

Independent Variable	**Mean**	**Median**	**Mode**
Psychosocial Need (1 – 10)	6.81	8	8
Xerostomia (0 = normal, 4 = minimal, 8 = moderate, 10 = severe)	5.13	4.00	4
MFP Subjective rating of problems with speech (0 = none, 2 = mild, 4 = moderate, 5 = severe)	1.73	1.0	0
MFP Subjective rating of problems with swallowing (0 = none, 4 = mild, 8 = moderate, 10 = severe)	4.37	4	4

Discussion

Previous work in the area of waiting list management has revealed that the creation of clinical prioritization tools can be effective in ensuring fairness with regards to how these lists are managed, and also in increasing the number of patients at all levels of urgency who receive surgery (Cipriano et al., 2008, Pitt et al., 2003). The purpose of the present study was to contribute to the development of a prioritization tool, the JRR tool, for use with head and neck cancer patients who are on a waiting list for oral rehabilitation with osseointegrated implants. As a precursor to the present study, it was determined that subjective MFP clinician ratings of speech and swallowing function were not significant predictors of patients' overall urgency ratings. Given that maintenance or restoration of these functions after head and neck cancer treatment is a top priority for patients (Tschiesner at al., 2013), it was hypothesized that this would show itself in the clinical assessment and that the subsequent MFP rating of speech and swallowing would be related to urgency ratings. Thus, in an effort to understand if the lack of relationship was due to the subjective nature of the MFPs' ratings, objective SLP performance-based measures of function (the MBSImp and the C-AIDS), and patient-reported outcome measures (the SHI and the MDADI) were assessed in a statistical model; it was hypothesized that they may be better predictors of urgency ratings on the JRR tool. The results of this study, however, demonstrated that none of these measures of function adequately predict patients' urgency scores. Furthermore, the only variable that was found to be moderately related to urgency was the MFPs' rating of perceived psychosocial need. Thus, with what is known about patients' desire to have a return to normal function, the use of the JRR as a clinical prioritization tool must be questioned.

Objective measures of function.

The results of the multiple regression analysis using the SLP clinician-driven measures to predict patient urgency indicated that the model was predicting only approximately 20% of the variance in patients' urgency ratings, which was similar to the predictive ability of the model that contained the original MFP subjective clinician measures. The Priority Criteria Scores, as developed by the WCWL Project, were able to predict around two-thirds of the variance in the clinicians' urgency ratings, which was determined to be much more acceptable in terms of predicting urgency scores, and which was within the range of other prioritization tools used by other countries that have adopted this strategy (Arnett et al., 2003). The two objective measures (MBSImp and C-AIDS) were not found to be correlated with patient's urgency scores. This is understandable due to the fact that the clinicians who made the patients' urgency ratings did not have access to these scores at the time of assessment.

Furthermore, there was a discrepancy between the MFP ratings of function and the SLP performance-based measures of function. The average MFP ratings of speech and swallowing impairment were low (4.37 and 1.73 respectively), suggesting that patients were functioning quite well in these areas (a score of 4 indicated a mild level of impairment, and a score of 10 indicated a severe level of impairment). For the MBSImp, however, scores obtained for these patients indicate that patients' swallowing function was impaired. For example, an Overall Impression (OI) score of between 16 – 24 has been shown to be associated with the recommendation that patients be restricted to a non-oral diet (Martin-Harris, 2008). On average, the patients in the present study scored 16.30 in terms of their OI, suggesting that many of them might be experiencing severe impairments in terms of their ability to eat. Regarding the C-AIDS, the patients in the present study were experiencing speech impairments as well. One study (Al-Qahtani et al. 2014), examining the functional outcomes of head and neck cancer patients after reconstructive surgery reported that a speech intelligibility score of 94% could be considered "highly functional," whereas patients in the present study had an average intelligibility score of 84%. Reconciling these differences between MFP ratings of function and SLP performance-based measures of function for the purpose of determining urgency for treatment will be crucial for the continued development of the JRR tool for clinical use.

Patient-Reported outcomes.

Similar to the objective SLP performance-based measures of function, including the patient-reported outcomes (the SHI and MDADI) in the regression model only allowed the JRR tool to account for approximately 20% of the statistical variance in patients' urgency scores. Although these are patient-reported measures of function, which can be argued as being not quite commensurate with the domain of psychosocial need, speech and swallowing have been shown to be an integral part of the quality of life of head and neck cancer patients (Metcalfe, Lowe, & Rogers, 2014), and both measures relate to how functional impairments are directly impacting patients' daily life. They, therefore, have the potential to allow clinicians to have a more objective method of determining how a patient is managing psychosocially.

Like the results found for the objective measures of function, there was a discrepancy between the MFP ratings of speech and swallowing function and the patient-reported outcome measures of the same functions. Scores on the SHI can range from 0 – 120, with higher scores indicating the presence of speech-related problems. The patients in the present study had an average overall score of 40. This suggests that, according to their own perspectives, patients are experiencing impairments in their speech. However, the average MFP ratings of speech impairments were low, with an average of 1.37, indicating that they rated the patients as functioning well in terms of speech (a score of 2 indicated a mild level of impairment). For the MDADI, where a high score indicates a high level of functioning (with scores ranging from 0 – 100), patients in the present study had an average score of 65. This again suggests that patients perceived that they are experiencing impairments in their swallowing functions. As mentioned previously, the average MFP ratings of swallowing impairment were low, which indicated that their perception of patient swallowing function was different.

The MFP ratings of speech and swallowing function were based on a single clinical visit, and they did not have access to the patient-reported measures of function and were denied access to SLP performance-based measures of function in order to help them rate the patients. Giving the MFPs access to both of these sources of information regarding patient function could have the potential to influence their own ratings of function, and could contribute to the development of the JRR as a prioritization tool.

Clinical Considerations at iRSM

At iRSM, there are currently differing opinions regarding how patients on the waiting list should be managed. A focus group was held with patients in the spring of 2015, during which one of the main topics of discussion was management of the waiting list and how the length of patients' wait should be determined. Patients in the focus group were given the choice between a first-come-first-served approach, and clinical prioritization using an assessment tool such as the JRR tool. It was agreed by this group of patients that a first-come-first served approach was the only fair way for the list to be managed. This strong opinion is quite contrary to how the idea of clinical prioritization had been previously received by groups of patients who had participated in the validation of some of the WCWL Project tools, such as the tool for prioritization of hip and knee arthroplasty patients (Pitt et al., 2003). This difference could be due to the nature of head and neck cancer, and that patients are experiencing a wider range of critical activity limitations or physical impairments (e.g., speaking, swallowing, and breathing) than hip and knee arthroplasty patients (e.g., walking).

The ethics of using clinical prioritization with patients at the iRSM has also been called into question. The decision of who to treat is thus being placed on clinicians, who then become accountable for a situation that was created at the level of the health care system, which is a problem that ultimately relates to the use of waiting lists in general (CMPA, 2007). Cancer Care Ontario has improved treatment for patients though the development of Multidisciplinary Cancer Conferences (MCCs), or "tumor boards", whereby healthcare providers (representatives from surgery, medical oncology, radiation oncology, nursing, pathology, and diagnostic imaging) can discuss individual cases together. These tumor boards not only have the benefit of ensuring that patients are receiving care according to practice guidelines, but also streamlines treatment and promotes standardization of care (Cancer Care Ontario, 2016). Currently, there is also a body of research around participatory action in healthcare that has driven the growing importance of the point of view of the patient receiving care in making such sensitive decisions (Beauchamp & Childress, 2013). This has resulted in the development of patient-advocacy groups who are charged with making the decision of who to treat in situations where there is a resource allocation problem, as with waiting lists. However, when the question of who makes the ultimate decision of who to treat was posed to the patient focus group at the iRSM, the group indicated that the decision should be made at the level of the health care system, higher than even the clinicians who treat them, or the administration of the iRSM.

The conflict resulting from such competing interests poses a challenge in terms of what waiting list management strategies should be implemented in order to deal with the resource allocation problem currently being experienced at the iRSM. The concept of Evidence-Based Practice (EBP), which has emerged as an important principle in the delivery of not only Speech-Language Pathology services (ASHA Report), but health care in general, can be implemented in this situation as a potential guide to solving this conflict. According to EBP, healthcare practitioners should integrate equally, wherever possible, three sources of evidence when making clinical decisions: research evidence, client or patient values, and clinical expertise. With regards to the waiting list at the iRSM, this will involve somehow balancing the values of the patients who have expressed that they prefer a first-come-first-served approach, with the growing evidence that clinical prioritization via assessment tools is an effective waiting list management strategy. An important first step in balancing these competing interests is the development of an assessment tool that can effectively predict patient urgency, which has been properly validated, and is therefore defensible to patients. Including patients wherever possible in the process, as well as providing further education regarding waiting list management strategies that are shown to be effective, will also be necessary in terms of the development of an effective strategy at the iRSM.

Limitations of the study

Due to time constraints surrounding the development of the tool, the MFP clinicians were not trained to use the JRR to assess patients before using it clinically, so it is possible that they were working from different standards and subsequently judged patient urgency very differently. When the urgency ratings from the three MFP clinicians were each averaged, it was noted that one of the MFP's average urgency rating was 8.3, whereas another MFP's average rating was only 4.2. It is uncertain whether the MFP with the higher average was consistently rating patients with a higher level of urgency than the other MFP, or if, by chance, he assessed a greater number of patients who were functioning at a lower level and rated them appropriately. During the process of piloting the WCWL Priority Criteria Scores, inter-rater reliability for each item was assessed by having a second independent clinician rate the patient by viewing a videotape of their session, and then calculating an ICC for that item. This was followed by revisions to the instrument, as well as the recommendation to create a set of operational definitions and instructions to accompany each Priority Criteria Score. These steps should be included in future work to further the development of the JRR tool for clinical use, in order to increase its reliability and validity as a prioritization tool.

Another limitation of the current study was a small sample size. The WCWL Project, in the creation of their Priority Criteria Scores, had the advantage of combining patient data from multiple centres and provinces for their analyses, and had sample sizes ranging in the hundreds. iRSM is unique in the type of care being provided, and obtaining data from other centres (even out-of-province) is not possible at this time.

Finally, it was mentioned previously that although this patient population is treated by the waiting list as representing a single body of patients, there are as many as 4 different treatment pathways for patients at the iRSM. It is possible that using a single assessment tool with a population that is diverse and complex is not valid in terms of measuring urgency and determining clinical prioritization. Future work at this institute may require the development of separate waiting list assessment tools for each treatment pathway.

Conclusion

This study sought to further the development of a waiting list prioritization tool, the JRR tool, for use with head and neck cancer patients who are waiting for dental implant surgery. Based on the results of this study, the JRR tool is not yet an effective prioritization tool for use with head and neck cancer patients who are waiting for dental implant surgery. The two SLP performance-based measures of speech and swallowing functions, as well as the two patient-reported measures of the same functions, were not predictive of the MFP urgency ratings for the patients on the waiting list. However, it is hypothesized that some adjustments to the procedure of the current study in future work could reveal the potential of these new measures to predict patient urgency. First, it could be beneficial for the MFP clinicians to have access to the SLP performance-based measures when making urgency ratings for patients using the JRR tool, given the discrepancy between their ratings of function, and the SLP performance-based measures of function. Second, the development of the JRR tool should include establishing inter-rater reliability for each item on the instrument. Third, the JRR tool should be accompanied by a set of operational definitions for its items, as well as training instructions, to help ensure that clinicians' ratings are standardized. After such steps have been implemented, the resulting tool could offer patients a defensible, reliable, and fair method for prioritizing the waiting list at the iRSM.

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Appendix A

JAW RECONSTRUCTION REHABILITATION TREATMENT ASSESSMENT
Version #1 (04/July/14)

Patient Name: ____________________ (Last Name) ____________________ (First Name) DoB: ____________________ (dd-mmm-yy)

Date of Assessment: ____________________ (dd-mmm-yy) Clinician: ____________________

Referring Surgeon: ____________________

Date Entered on Waitlist: ____________________ (dd-mmm-yy) Months on Waitlist: **0**

A. GENERAL ASSESSMENT

1. Comorbidities — SCORE

1.1 Radiation Therapy Sequelae
None = 0, Moderate = 5, Severe = 10 ☐

1.2 Other Comorbidities considered Significant
None = 0, Moderate = 5, Severe = 10 ☐

Note: ☐ NIL/ ____________________

2. Anatomy

Jaw Anatomy - Osseous

Affected Jaw

☐ Maxilla	☐ Unaltered Anatomy
☐ Mandible	☐ Free Grafted
	☐ Bone Containing Free Flap

Opposite Jaw

☐ Maxilla	☐ Unaltered Anatomy
☐ Mandible	☐ Free Grafted
	☐ Bone Containing Free Flap

Jaw to be treated

☐ Treat Maxilla
☐ Treat Mandible

Note: ☐ NIL/ ____________________

2.1 Osseous Structure - Available Bone Volume
Treat As Is = 0, Free Graft = 5, Bone Containing Free Flap = 10 ☐

2.2 Relationship
Treat As Is = 5, Surgically Modify = 10 ☐ Untreatable ☐

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2.3 Soft Tissue Coverage
Treat As Is = 5, Preprosthetic Surgery Required = 10 ☐ Untreatable
Note: ☐ NIL/ ______________________________

2.4 Oral Opening (Microstomia)
No challenge to access = 5, Treatable Access = 10 ☐ Untreatable
Note: ☐ NIL/ ______________________________

3. Physiology
3.1 Xerostomia
Normal Saliva = 0, Minimal = 4, Moderate = 8, Severe = 10
Note: ☐ NIL/ ______________________________

4. Function
4.1 Jaw Opening
Normal (>40 mm) = 5, Treatment Possible (<40 mm, >25 mm) = 10
☐ Untreatable

4.2 TMJ Dysfunction
Normal = 5, Moderate = 8, Severe = 10

4.3 Speech
4.3.1 Problems with Intelligibility
None = 0, Mild = 2, Moderate = 4, Severe = 5

4.3.2 Problems with Voice Quality
None = 0, Mild = 2, Moderate = 4, Severe = 5

4.4 Problems with Swallowing
None = 0, Mild = 4, Moderate = 8, Severe = 10

4.5 Tongue Motility
Normal = 0, Mild Loss = 4, Moderate Loss = 8, Severe Loss = 10
Note: ☐ NIL/ ______________________________

5. Psychosocial
5.1 Clinicially Perceived Psychosocial Need
1 2 3 4 5 6 7 8 9 10
Low High
Note: ☐ NIL/ ______________________________

Complexity of Care Score: Total Score: $\frac{0}{130}$ = 0%

B. TREATMENT INDEX

1. Clinically Perceived Potential for Improvement in Function ☐
None = 0, Minimal = 4, Moderate = 8, Major = 10

2. Patient Perceived Pyschosocial Need ☐
1 2 3 4 5 6 7 8 9 10
Low High

3. Complexity of Care 0
Score 0%

4. Time on Waitlist ☐
<1 yr = 0, 1 yr = 3, 2 yrs = 6, >2 yrs = 10

5. Clinically Perceived Urgency for Care ☐
1 2 3 4 5 6 7 8 9 10
Low High

Treatment Index Score: Total Score: $\frac{0}{50}$ = **0%**

C. SUMMARY OF ASSESSMENT

1. Potential for treatment

☐ Treatable → ☐ Functional Domain
→ ☐ Dignity/Comfort Domain

☐ Untreatable

IF TREATABLE, PROCEED TO ITEMS C2-C5

2. Clinically Perceived Potential for Global Gain from care

☐ Low (0-50%)
☐ Moderate (50-75%)
☐ High (75-100%)

3. Treatment Classification

Category
☐ 1 - Obturation
☐ 2 - Unaltered Osseous Jaw Anatomy
☐ 3 - Prefabricated Fibular Flap
☐ 4 - Alberta Reconstruction Technique
☐ 5 - Standard Free Flap Approach

4. Treatment Score: 0 %

5. Modifier of Special Significance for Consideration:

Based on your review and written evaluation in the box on the right, insert your modification of Treatment Index Score e.g. +10% or -10% in the box below.

Modification of Treatment Index Score: % (indicate positive or negative % change)

6. Final Treatment Score **0** % (item C4 +/- item C5)