Quality of Life After Total Laryngectomy

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Abstract

Objectives: To use the framework proposed by the International Classification of Functioning, Disability and Health (ICF) to review outcomes related to quality of life (QOL) after total laryngectomy.

Patients/Materials and Methods: Results from papers published on QOL after total laryngectomy were organized according to the ICF framework. Outcomes were summarized relative to the contribution of disease and treatment-related factors, those related to changes in body functions and structures, activities, and participation, and those related to contextual factors such as family and social support, and personal variables such as coping strategies, age, and gender.

Results: QOL after total laryngectomy is multidimensional. Outcomes are affected by management of the airway (stoma), success of alaryngeal speech and communication, and swallowing. Factors related to treatment (absence or presence of radiation or chemotherapy), those related to one’s environment (family and social support), and/or person (depression, coping strategies, age, and gender) are interactive and also predict outcomes. Longitudinal studies that include psychosocial variables are lacking.

Conclusions: The type of instrument used to assess quality of life, time after diagnosis, and study design must be considered when interpreting QOL postlaryngectomy. There is a continued need to perform multi-center, prospective studies to increase levels of evidence after treatment for advanced laryngeal cancer to ensure the most beneficial treatment for each individual is pursued.

Keywords: quality of life, total laryngectomy, International Classification of Functioning, Disability, and Health (ICF)
1. Introduction

Cancer of the larynx is among the most common cancers of the upper aerodigestive tract. Every year more than 11,300 new diagnoses of laryngeal cancer occur in the United States, with more than 3,660 associated deaths [American Cancer Society, 2007]. Worldwide, incidence and mortality rates are variable, following patterns and changes in exposure to alcohol and tobacco, even still with a 10-15 fold variation in male laryngeal mortality rates between males across European countries [Bosetti et al., 2006]. In the Developed World, 50% to 60% of patients present with early laryngeal cancer, defined by the American Joint Committee on Cancer as a T1 or T2 tumor without nodal involvement or distant metastases [Chen et al., 2006]. Advanced laryngeal cancer, on the other hand, corresponds to stages III and IV of the TNM classification, with current recommendations for management published by the National Comprehensive Cancer Network (NCCN) [National Comprehensive Cancer Network, 2008]. The recommendations are based on results of several phase II and phase III treatment studies, as well as expert opinion, and are constantly revised to assess the impact of therapy on survival and quality of life (QOL) outcomes.

While improved cure rates, prolonged disease-free survival, and organ preservation are the primary focus of the treatment of advanced laryngeal cancer, the implicit purpose of organ preservation is improved function and QOL. However, organ preservation does not necessarily equate to conservation of organ function, nor does it always increase QOL [Genden et al., 2008]. Thus, outcomes related to QOL after treatment for advanced laryngeal cancer should be reviewed with careful consideration of these issues. The difficulties faced by individuals diagnosed and treated for advanced laryngeal cancer are a topic of growing concern. QOL is a multidimensional construct that minimally includes physical, psychological, and social domains of functioning, and applies to the level of one’s general well-being and life satisfaction [Rogers, Fisher, Woolgar, 1999]. QOL has a particular relevance for those diagnosed and treated for advanced laryngeal cancer because of the myriad difficulties these individuals experience with everyday functioning, including difficulties with airway management, speech, and swallowing. However, multiple factors beyond breathing, speech and swallowing affect QOL in individuals with advanced laryngeal cancer, including time since diagnosis, treatment type, methods of coping, mental health, social support, gender and cultural issues, to name but a few [Hanna et al., 2004; Terrell, Fisher, Wolf, 1998; van den Brink et al., 2006; Vilaseca, Chen, Backscheider, 2005]. Consideration of multiple components of a person’s well-being and functioning are, therefore, necessary to facilitate the most effective treatment, rehabilitation, and end-of-life care in this clinical population [Hammerlid et al., 1999].
It is widely agreed that those diagnosed and treated for laryngeal cancer are best served by an interdisciplinary team of health care providers. In this regard, the conceptual framework underlying the World Health Organization’s (WHO) International Classification of Functioning, Disability and Health (ICF) provides a highly appropriate context for the structure of providing services to those with laryngeal cancer [ASHA, 2001; Eadie, 2007; 2003; WHO, 2001]. The primary advantage of the ICF centers around the fact that its basis is a biopsychosocial model of health and functioning; it requires that a variety of concerns are addressed to understand the impact and implications of any given disease or health condition. The usefulness of the ICF is highlighted by the example in which an individual is disease free (e.g., at five or 10 years after cancer diagnosis), yet that person continues to experience difficulty in everyday activities as a result of the cancer and/or its treatment. Measuring a person’s functioning, disability, and health-related QOL thereby requires consideration of multiple factors beyond that of “time of survival”, for example, psychological, social, and emotional status, as well as perceptions of satisfaction found in work, home life, spirituality, family, education, sexual function, or income [Doyle, 1994; Llewellyn, McGurk, Weinman, 2005].

For many years, total laryngectomy (i.e., total removal of the larynx) followed by radiotherapy was considered the standard treatment for advanced laryngeal cancer. In 1991, a prospective randomized clinical trial was performed by the Veterans Affairs (VA) Laryngeal Cancer Study group in the United States [Department of Veterans Affairs Laryngeal Cancer Study Group, 1991]. In this study, more than 300 patients with stage III or IV laryngeal cancer were randomized to 2 arms of treatment: induction chemotherapy followed by radiotherapy (RT), or total laryngectomy followed by radiotherapy. In most patients (62%) in the chemotherapy and RT arm, the larynx was preserved. Of most significance, no differences in survival rates were observed between the nonsurgical and surgical arms of the study. A similarly designed study in Europe also demonstrated no difference in overall survival between these treatment options, along with a 42% laryngeal preservation rate in the nonsurgical arm (Lefebvre et al., 1996). These landmark studies demonstrated the potential value for nonsurgical therapy in achieving laryngeal preservation with survival rates comparable to total laryngectomy (i.e., the “gold standard” at that time).

Recently, Chen and Halpern (2007) reported the results of a study involving more than 7000 patients from a nation hospital-based cancer registry. Individuals in this study included those who had undergone total laryngectomy, RT alone, or combined chemotherapy-RT. Contrary to the results of the prior clinical trials [Lefebvre et al., 1996; VA study group], Chen and Halpern (2007) found that overall, total laryngectomy was significantly associated with increased likelihood of survival compared with RT alone or chemo-RT. Specifically, they found that total laryngectomy was associated with significantly greater survival for those with stage IV disease; among patients with stage III disease, total laryngectomy and chemo-RT had similar impacts on survival, with both of these options
showing increased survival compared with RT alone. Chen and Halpern (2007) also found that overall survival was decreased among men, black patients (compared to white patients), and patients with Medicare or Medicaid or those who were uninsured (compared with those in private insurance). The authors stated that their findings may have reflected differences in patient mix between those enrolled in previous clinical trials with those in the broader population of patients with advanced laryngeal cancer involved in their study. Results from all of these studies highlight the need to take into consideration patient factors such as performance status, access to support services and close follow-up, as well as institutional factors when selecting a treatment regimen. In addition, results highlight the need and continued appropriate role of total laryngectomy in the treatment of advanced laryngeal cancer, as either a primary or salvage procedure, particularly among those with stage IV disease [Chen, Halpern, 2007]. Finally, even with comparable survival rates among different treatment options, the relative impact of the treatment on the patients' QOL becomes critical in selecting the “optimal” therapeutic approach.

Given that total laryngectomy continues to be a primary or secondary treatment (salvage) for advanced laryngeal cancer, and given the significant biological, psychological, and psychosocial impact after total laryngectomy, it is important to continue to review and evaluate post-laryngectomy outcomes related to QOL. Thus, the objective of this article is to provide a review of the literature related to QOL after total laryngectomy, to identify factors that influence QOL, and most importantly, to identify gaps in our knowledge related to QOL in this population. Although there are different methods for structuring this type of review (i.e., theme analysis, systematic review), the present review will be structured using the framework of the ICF to ensure inclusion of biopsychosocial factors. Through consideration of the ICF and its biopsychosocial model of care, proactive approaches to intervention for those treated for advanced laryngeal cancer will almost certainly emerge and be enhanced over time.

1.1. Using the ICF as a Framework to Measure QOL

In 2001, the WHO proposed a biopsychosocial model that integrates the concepts of health and functioning in the ICF (WHO, 2001). The ICF defines functioning and disability as the interaction between a “Health Condition” and “Contextual factors” relative to three levels: a) “Body Functions and Structures,” b) “Activities,” and c) “Participation.” “Body Functions and Structures” are defined as physiological functions of body systems or anatomical elements such as organs, limbs, and their components; “Activities” are the execution of specific actions, and “Participation” encompasses involvement in life situations (WHO, 2001). All three levels of functioning are therefore affected by contextual factors which include the physical, social, and attitudinal environment in which a person lives (i.e., “Environmental factors”), as well as aspects related to the person, including an individual’s gender, ethnicity, age, fitness, lifestyle, coping, social background, and education (i.e., “personal factors”).
The primary advantage of the ICF is based in its biopsychosocial model of health and functioning. Using this model to understand the impact of a disease or health condition requires the consideration of a number of factors, such as biological, psychological, or social well-being. The ICF model is multidirectional in its explanation of functioning and disability associated with health domains. In brief, the ICF not only explains how disease (e.g., advanced laryngeal cancer) creates an impairment in Body Structure (e.g., total removal of the larynx) and Body Function (e.g., alaryngeal speech), but it also demonstrates how Activity Limitations and Participation Restrictions may arise from social causes (e.g., embarrassment associated with alaryngeal voice and perceived disfigurement creates social isolation) [Eadie, 2007]. Thus, Contextual Factors such as the environment and personal characteristics interact with levels of functioning and influence outcomes. For example, the attitudes of friends or family, or physical barriers (e.g., background noise) in an environment may impact a person’s ability to perform an activity or participate in a life situation. Personal Factors such as age, gender, ethnic and cultural membership, and personal motivation also may affect functioning in all of the other components of the ICF. For example, willingness to engage in social behaviors under the Activities/Participation domain after surgery may be affected by an individual’s motivation to succeed, a Personal Factor. Viewed collectively, the biopsychosocial model can provide a broad framework from which one may evaluate the consequences of laryngeal cancer and its treatment on each individual. Readers are referred to Eadie (2003; 2007) for a more detailed description of the application of the ICF and its components after total laryngectomy.

In addition to providing a framework for functioning and disability, the ICF also provides a theoretical model for understanding QOL. As stated by the WHOQOL Group (1995, p. 1405), there exist primary needs for enquiry into the perception by individuals “of their [own] position in life in the context of the culture and value systems in which they live.” Thus, QOL, and specifically health-related QOL, may be seen as a coalescence of all factors involved in health and functioning within the ICF model. It is a construct which is best measured by individuals with health conditions, who make judgments of their current status and compare them with their own internalized standards of what is possible or ideal [Cella, Tulsky, 1990]. It is this subjectivity that has challenged the validity of QOL outcomes: there is no guarantee that each dimension of QOL measured in the instrument will be important and have the same salience to the respondent. In fact, the same measure of QOL can take on different meanings for individuals with different subjective views of reality [Stennar, Cooper, Skevington, 2003].

Despite some of these challenges in measuring QOL, a number of tools have been developed and validated. They are intended to measure generic health-related QOL, as well as measuring this construct in specialized populations (e.g., head and neck cancer), and for specific purposes (e.g., for voice-related QOL). Thus, to evaluate QOL outcomes associated with total laryngectomy, one must first examine tools that are available for assessing physical, social, and mental
well-being in this population. This summary will provide the basis for the review of QOL outcomes after total laryngectomy, which will follow the review of the assessment tools.

1.2. Common Tools that Measure QOL after Total Laryngectomy

Three types of QOL tools are commonly employed by researchers and clinicians in health-related fields. These tools include: (a) discipline-free measures, which transcend disciplines and generically define a problem, and have typically been used to evaluate health care; (b) disease-specific measures, which are used to measure health and functioning specific to a population, and; (c) discipline-specific measures, which explicitly define difficulties using specialized theoretical frameworks and terminology, and typically focus on particular domains within the scope of a particular discipline [McDowell, 2006]. Table 1 provides a summary of the most commonly used QOL instruments used to evaluate post-laryngectomy QOL. They are listed from top to bottom in order of generic QOL measures, disease-specific (cancer, head and neck cancer) instruments, to discipline-specific measures (e.g., those related to communication and swallowing specific to the disciplines of speech-language pathology (S-LP) and otolaryngology).

Table 1. Most commonly used QOL measures after total laryngectomy, including discipline free, disease-specific, discipline-specific instruments.
<table>
<thead>
<tr>
<th>Year</th>
<th>Author(s)</th>
<th>Type of Instrument</th>
<th>Instrument (Abbreviated)</th>
<th>Instrument Full Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>Ware et al.</td>
<td>General Health</td>
<td>SF-12</td>
<td>Medical Outcomes Study Short Form 12-item Health Survey</td>
</tr>
<tr>
<td>1993</td>
<td>Ware</td>
<td>General Health</td>
<td>SF-36</td>
<td>Medical Outcomes Study Short Form 36-item Health Survey</td>
</tr>
<tr>
<td>1999</td>
<td>Björdal et al.</td>
<td>Head and Neck Cancer</td>
<td>EORTC-HN35</td>
<td>European Organisation for Research and Treatment of Cancer Head and Neck Quality of Life Questionnaire 35</td>
</tr>
<tr>
<td>1993</td>
<td>Hassan, Weymuller</td>
<td>Head and Neck Cancer</td>
<td>UWQOL</td>
<td>University of Washington Quality of Life Scale</td>
</tr>
<tr>
<td>1997</td>
<td>Terell et al.</td>
<td>Head and Neck Cancer</td>
<td>HNQOL</td>
<td>University of Michigan Quality of Life Questionnaire</td>
</tr>
<tr>
<td>1993</td>
<td>Cella et al.</td>
<td>Cancer (applicable to other)</td>
<td>FACT-G</td>
<td>Functional Assessment of Cancer Therapy – General</td>
</tr>
<tr>
<td>1990</td>
<td>List et al.</td>
<td>Head and Neck Cancer</td>
<td>PSS_HN</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>Jacobson et al.</td>
<td>SLP-Otolaryngology</td>
<td>VHI</td>
<td>Voice Handicap Index</td>
</tr>
<tr>
<td>1999</td>
<td>Hogikvan, Semuthera</td>
<td>SLP-Otolaryngology</td>
<td>V-RQOL</td>
<td>Voice related Quality of Life Scale</td>
</tr>
<tr>
<td>2001</td>
<td>Chen et al.</td>
<td>SLP-Otolaryngology</td>
<td>MDADI</td>
<td>MD Anderson Dysphagia Index</td>
</tr>
</tbody>
</table>
Studies investigating outcomes related to total laryngectomy often include discipline-free measures that permit comparisons between QOL after total laryngectomy to QOL associated with other conditions. For example, many studies have used either the 12-item or 36-item versions of the Medical Outcomes Study Health Survey (SF-12 and SF-36, respectively) [Ware, 1993; Ware et al., 1996] (see Table 1) as a generic health indicator. The SF-36 generates scores for 8 domains: physical functioning, role limitations attributable to physical problems, bodily pain, general health perception, vitality, social functioning, role limitations because of emotional problems, and mental health.

While discipline-free measures are often used to document general health status, disease-specific instruments are often used to supplement information provided by the generic health measures. Disease-specific instruments can further be subdivided into those that are generic to a disease (e.g., cancer), or site specific (e.g., head and neck cancer). Because of the widespread effects on individuals who have undergone treatment for head and neck cancer, most site-specific QOL inventories include domains related to physical, emotional, psychological, and social functioning, and specifically include domains related to speech and swallowing, which may not be reflected on generic health measures. Common instruments used in the QOL literature for advanced laryngeal cancer are listed in Table 1. Because of their strong psychometric properties and frequency of use, it is important to recognize how these measures uniquely contribute to a discussion related to this clinical population.

Recently, Eadie (2007) provided a summary of instruments related to speech-language pathology used to describe functioning total laryngectomy using the ICF framework. Most discipline-specific measures (e.g., speech-language pathology instruments) are focused at evaluating post-laryngectomy communication and swallowing at the Body Functions and Structures level, as well as some at the Activity level. For example, Body Structures may be evaluated using laryngoscopy, while Body Functions may be assessed either directly (e.g., using videostroboscopy to view the function of the pseudoglottis in tracheoesophageal speech production; using fiberendoscopic examination of swallowing (FEES) to assess the function of the pseudoglottis in swallowing), or indirectly (e.g., acoustic measures of fundamental frequency (fo), perturbation measures; auditory-perceptual ratings; nutritional mode, ratings of function during modified barium swallow (MBS) examinations, etc.). In addition, speech impairments may be assessed with variables related to speaking rate (e.g., pause time) or intelligibility of speech sounds (e.g., using articulation measures that identify problematic phonemes). In contrast, communication activities may be assessed with speech intelligibility measures, such as the Sentence Intelligibility Test (SIT) [Yorkston, Buekelman, Tice, 1996], or auditory-perceptual measures (e.g., speech acceptability) that capture how much an alaryngeal voice distracts a communication partner from the content of the message, or functional measures that assess swallowing function with certain consistencies of food [Eadie, 2007]. In some cases, these measures also include interactions with Environmental
Factors (i.e., attitudes of other communication partners or mealtime partners) [Bennett, Weinberg, 1973]. Finally, it is notable that no exclusive measures of participation exist within the discipline of speech-language pathology [Eadie et al., 2006]. Although some discipline-specific measures include questions that measure aspects of Participation (communication or swallowing-related), no measures appear to be solely dedicated to measuring this construct as defined by the ICF [Eadie et al., 2006]. Instead, scales such as the Voice Handicap Index (VHI) [Jacobson et al., 1997], Voice-Related Quality of Life (V-RQOL) scale [Hogikyan, Sethuraman, 1999] measure voice-related QOL, whereas the M. D. Anderson Dysphagia Index [Chen et al., 2001] measures swallowing-related QOL. These measures include specific questions related to Body Functions and Structures, Activities, and Participation, as well as some Personal and Environmental factors that are specific to voice and swallowing. Because of the importance of both voice and swallowing after treatment for advanced cancer, these instruments are being used increasingly as outcome measures that may be more sensitive indicators of function in these areas (see Table 1). Yet, because QOL measures encompass all aspects of functioning across the ICF, it is important to understand the relationships between measures of Body Functions and Structures, Activities, and Participation and measures of QOL.

2. QOL Outcomes after Total Laryngectomy

The following section provides a brief summary of outcomes related to total laryngectomy, including its known impact on QOL. This summary is based upon use of many of the measures listed in Table 1. First, a summary is provided that examines the relationship between disease-and treatment-specific factors to QOL. Second, the roles of Body Functions and Structures, Activities/Participation, and Contextual factors are examined in their relationship with QOL. The review provides a context for recommended approaches to assessment and treatment of this clinical population, as well as implications for future research.

2.1. Effects of Laryngeal Cancer and its Treatment on QOL

Traditional healthcare frameworks have focused on outcomes related to the disease or treatment of a disease. Thus, the bulk of the literature for advanced laryngeal cancer relates to outcomes that focus on effects of the disease or specific treatments of the disease. Many factors related to the disease contribute to QOL after diagnosis and treatment for advanced laryngeal cancer. For example, acute and chronic physical symptoms (dysphagia, xerostomia, speech problems, pain and fatigue) following treatment are of substantial concern to most individuals [Ledeboer et al., 2005]. Symptoms vary by disease stage, treatment modality, and tumor site. For example, de Graeff et al. (2000) found more difficulties in individuals with advanced stage disease, as well as those who had experienced an increased number of treatments. However, more recent studies have failed to find an association between cancer stage and QOL, but
rather treatment type and modalities seem to override stage [Terrell et al., 2004]. For example, the extent of neck dissection has been shown to lead to poorer QOL [Terrell et al., 2004]. One general finding related to site of the disease is that individuals with oropharyngeal tumors tend to report more pain and dysphagia, and those with laryngeal tumors tend to report worse speech scores [Bjordal et al., 1999].

In the past 10 years, the effect of total laryngectomy, with or without radiotherapy (RT) has been studied extensively in comparison to chemoradiation (i.e., organ preservation) protocols [Finizia et al., 1998; Fung et al., 2005; Hanna et al., 2004; Hillman et al., 1998; Terrell et al., 1998]. More recently, studies have investigated the consequences of total laryngectomy versus other surgical approaches, such as supracricoid laryngectomy [Dworken et al., 2003; Weinstein et al., 2001] or partial laryngectomy procedures [Swenaik et al., 2005]. In general, results regarding QOL have been variable due to different research designs (e.g., cross-sectional vs. longitudinal; retrospective vs. prospective), sample sizes, characteristics of the subjects (e.g., laryngectomy as salvage vs. laryngectomy as primary treatment; laryngectomy with or without RT etc.), and time since diagnosis (e.g., immediately post-operatively vs. 3 months vs. 6 months vs. 2 years vs. 10 years etc.). In general, most studies that have used generic health-related QOL instruments have found poorer QOL in individuals who have undergone total laryngectomies when compared to those who have undergone laryngeal preservation protocols or other surgical approaches when QOL is measured directly after treatment, and up to one year after treatment. However, these differences have been found to dissipate over time, with most studies finding no differences in overall QOL between total laryngectomy versus CT and RT or partial laryngectomy many years post-treatment [Deleyiannis et al., 1999; Finizia et al., 1998; Sewnaik et al., 2005; Weymuller et al., 2000].

A few studies have investigated QOL after total laryngectomy using longitudinal designs [Armstrong et al., 2001; Campbell et al., 2000; List et al., 1996; Morton, 2003; Terrell, Fisher, Wolf, 1998; Weymuller et al., 2000]. Armstrong et al. (2001) investigated overall QOL in 34 laryngectomees from the pre-operative stage up to 6 months after surgery using the SF-36 and two non-standardized measures. Individuals in their study not only reported low pre-operative QOL scores, but they continued to exhibit significant and persistent difficulties in communication and swallowing, as well as continued poor emotional status 6 months after their surgery. The researchers concluded that while individuals showed improvement in most domains, that there were significant problems remaining at the 6 month period, suggesting that further rehabilitation was necessary and appropriate. Other studies that have focused on the time immediately following the laryngectomy also suggest that health-related QOL is poorer in those who have undergone total laryngectomy than those in laryngeal preservation protocols [van den Brink et al., 2006]. While some of these difficulties persist over time, they are usually not reflected in overall QOL scores, with many studies demonstrating no significant differences between those who have undergone total laryngectomy.
and those who have been treated with radiotherapy or other organ preservation protocols several years after treatment [Stewart, Chen, Stach, 1998]. For example, Finizia et al. (1998) investigated QOL in 14 patients who used tracheoesophageal speech compared to 14 patients who received radical radiotherapy (RT) for advanced laryngeal cancer. The majority of patients (12 in each group) reported that it had been more than 12 months since their last treatment. The only difference found between the groups for EORTC-QLQ-C30 or EORTC-QLQ-H&N35 scores related to a question about hoarseness, with those in the RT group reporting worse scores. Likewise, Sewnaik et al. (2005) reported no significant differences in QOL between a group of 12 patients who had undergone partial laryngectomies and 11 patients who had undergone total laryngectomies at least one year after their operations.

Although overall health-related QOL scores may not demonstrate differences, some researchers have found differences between total laryngectomy and other treatments for advanced laryngeal cancer when QOL is analyzed using domain scores. Terrell et al. (1998) performed a follow-up investigation to the original survival study by the Veterans Affairs group. In this study, patients were randomized either to the RT plus induction chemotherapy (CT) treatment arm, or to the RT plus total laryngectomy group. Twenty-five individuals from the surgery plus RT group and 21 from the CT plus RT group completed the SF-36 and the HNQOL instruments, the Beck Depression Inventory, as well as smoking and alcohol consumption surveys 10 years post-treatment. Terrell et al. (1998) found that patients with intact larynges had significantly less bodily pain (SF-36), better mental health (SF-36), as well as better HNQOL emotion scores. More patients in the total laryngectomy group also were found to be depressed. Although Terrell et al. (1998) found some differences between the two treatment groups using the generic QOL (SF-36) instrument, others have found no differences in overall QOL scores using similar instruments, or core questionnaires (e.g., cancer specific) [Finizia et al., 1998; Hanna et al., 2004]. In fact, Vilaseca et al. (2006) found that 49 patients who had undergone total laryngectomy more than 2 years post-treatment, showed very few differences in their overall health-related QOL scores (SF-12) than normal controls.

While overall QOL may not be affected, differences in QOL consistently have been found between those who have undergone total laryngectomy versus those who have undergone laryngeal preservation protocols using disease-specific scales that also permit analysis of subdomains. Hanna et al. (2004) reviewed 42 patients with advanced stage III or IV laryngeal cancer who were treated either with concurrent chemoradiotherapy or total laryngectomy with post-operative radiation therapy. QOL was measured using the EORTC-QLC-C30, as well as the EORTC-QLQ-H&N35. They found on the core questionnaire, that there were no statistically significant differences in overall QOL between the two groups. However, when subscales were analyzed using the head and neck cancer specific module, they found that those who had undergone total laryngectomy reported significantly greater difficulties with smell and taste, use of painkillers,
and coughing, whereas those treated with chemoradiotherapy reported significantly more problems with dry mouth. The authors concluded that both chemoradiation and total laryngectomy affect QOL of patients treated for advanced laryngeal cancer in different ways, and that these differences could only be revealed by functional and subscale analysis, and not in the overall QOL scores. Similarly, Sewnaik et al. (2005) found the only differences in QOL of patients after partial laryngectomy versus total laryngectomy was found to be smell and taste related (as measured by the EORTC-QLQ-H&N35), with the total laryngectomy group performing more poorly.

Results from these studies reveal an interesting trend: while functional disabilities persist, overall QOL does not seem to be affected after total laryngectomy after a 12 month period of adjustment. Interestingly, results obtained using disease-specific scales have not shown consistent differences related to speech or swallowing when total laryngectomy is compared to laryngeal preservation protocols many years post-treatment [Hanna et al., 2004; Terrell et al., 2004]. These results are surprising because difficulties related to airway management, speech, and swallowing are among those impairments most frequently reported after treatment for advanced laryngeal cancer [Gritz et al., 1999; List et al., 1996]. There are several reasons why these results have been observed. First, disease-specific QOL instruments may not be sensitive indicators of how much a person’s voice, communication, or swallowing affects QOL. Thus, it may be important to include discipline-specific QOL instruments to measure these outcomes.

In the past 10 years, several studies have included voice-related QOL instruments such as the VRQOL or VHI in their evaluation of QOL outcomes after total laryngectomy [Dworkin et al., 2003; Fung et al., 2005; Kazi et al., 2006; 2007; Stewart et al., 1998; Schuster et al., 2004; Sewnaik et al., 2005; Weinstein et al., 2001]. Results from these studies suggest that after total laryngectomy, there is a continued moderate difficulty with voice; outcomes after total laryngectomy are significantly poorer than those reported for laryngeal preservation protocols [Fung et al. 2005; Stewart et al., 1998], or healthy controls [Fung et al., 2005; Schuster et al., 2004; Weinstein et al. 2001]. Inconsistent results have been found between individuals who have undergone total laryngectomies with those who have undergone partial laryngectomies; some studies reported similar scores [Dworkin et al., 2003; Sewnaik et al., 2005], while one study found that voice-related QOL was poorer after total laryngectomy than supracricoid partial laryngectomy [Weinstein et al., 2001]. Schuster et al. (2004) compared voice-related QOL in 20 male laryngectomees who used tracheoesophageal speech with individuals who had voice disorders related to organic and functional etiologies, as well as healthy controls. The average total VHI scores for the laryngectomy group was 45.5 (SD = 24.10) (i.e., a moderate handicap), which was significantly higher than patients with functional voice disorders, but differed only slightly from patients with organic laryngeal dysphonia. Results from these studies show that while voice-related QOL may be affected after total laryngectomy, there is significant variability across individuals,
with some alaryngeal speakers reporting scores that are just as good, or even better than, individuals with preserved larynges [Schuster et al., 2004; Stewart et al., 1998]. Factors that may impact results include method of postlaryngectomy communication, age, gender of the speaker, presence of other physical problems, or overall health. While instrument sensitivity may impact interpretation of outcomes after total laryngectomy, a related complicating factor in interpreting changes related to QOL lies in the patient’s ability to adapt to their illness, in addition to coping with the after-effects of treatment for cancer. This “response shift” can be a valuable strategy for coping with the reality of chronic changes by recalibrating one’s expectations for health and functioning and the relative valuation of health states. The result can also be that changes in patient-rated QOL over time do not correspond to objective measures of loss of function, or disability.

2.2. Effects of Body Functions and Structures, Activities, and Participation on QOL

By applying the ICF framework, one may not only address consequences of the disease, but one may evaluate the function of the individual at three levels (Body Functions and Structures, Activities, and Participation), as well as their relationship with QOL. For example, total laryngectomy involves complete surgical removal of the larynx (i.e., a severe structural impairment), resulting in complete loss of laryngeal voice production (i.e., a severe impairment of function). The trachea is brought forward and sutured at the base of the neck, forming a tracheostoma. Consequently, the individual no longer inspires or expires through his mouth or nasal cavities, which also may lead to an impaired sense of smell. In addition to changes in phonation and breathing, the individual also may experience changes in taste, shoulder function, laughing, crying, and swallowing [Rohe, 1986]. All of these physical changes have the potential to impact one’s QOL. For example, difficulties with breathing have led to development of heat-moisture exchanger systems; with use, these systems may positively impact QOL [Hilgers, Ackerstaff, 2000]. Other functional impairments that may affect QOL include eating, swallowing, voice and speech. Outcomes are reviewed in the next sections.

2.2.1. Functions of Eating and Swallowing

Only a few studies have explored the impact of total laryngectomy and other types of treatments on eating and swallowing, though incidence of dysphagia following total laryngectomy has been reported to range from 10% to 60% [Balfe et al., 1982; Crary & Glowasky, 1996]. The inconsistency in incidence figures seems to stem from the various definitions of “successful” swallowing, as well as the time at which the assessments take place. Some researchers have equated swallowing “success” as oral intake without supplements. For example, Fung et al. (2005) evaluated the impact of organ preservation therapy with or without total laryngectomy as salvage on voice and swallowing function. They found that while
swallowing function was good in all patients, those with an intact larynx were more likely to obtain nutrition by oral intake without supplements, thereby showing an advantage over total laryngectomy. Dworkin et al. (2003) evaluated a series of subjects treated for advanced laryngeal cancer with supracricoid laryngectomy (n=10) versus total laryngectomy (n=10). Patients were evaluated using FEES, MBS, and other acoustic and aerodynamic measures, as well as listener impressions of speech and voice. They found that patients from both groups performed comparably with regard to speech intelligibility and voice quality. However, whereas individuals in the total laryngectomy group did not demonstrate the need for protracted exercises to remove their feeding tubes postoperatively, those in the supracricoid laryngectomy group required many sessions of swallowing therapy to obtain this objective and eliminate tube feeding supplementation. This result is important because distress in patients and caregivers has been found to be related to presence of a feeding tube [Verdonck-de Leeuw et al., 2007].

Finally, some researchers have defined swallowing “success” as ability to manage a normal diet. Ackerstaff et al. (1994) evaluated the functional disorders and lifestyle changes following total laryngectomy and found that as many as 25% of patients reported alterations to their diet, including the avoidance of certain consistencies as well modifications to their style of eating. Hillman et al. (1998) noted that 76% of their laryngectomy patients at 24 months post-surgery managed a normal diet, while Ward et al. (2002) reported that 58% of laryngectomy patients managed a normal diet, at least one year after their surgery. Ward et al. (2002) further reported that patients experiencing long-term dysphagia identified significantly increased levels of disability, handicap and distress. Interestingly, they found some patients who presented with the ability to manage a normal diet at follow-up who still experienced a mild level of handicap and distress related to their swallowing function. Interviews with these patients revealed that although these individuals could manage a normal diet, compensations such as taking additional time to complete a meal were negatively perceived. Other psychological and emotional issues (e.g., lack of smell and taste of foods) also were reported as negatively impacting the social pleasures of swallowing and eating.

2.2.2. Voice and Speech Function

Voice and speech may be restored after total laryngectomy through training and use of alternative methods of verbal communication, including esophageal, tracheoesophageal (TE), and electrolaryngeal speech. The success of these methods is often determined by evaluating the acoustic and perceptual parameters of speech for the dimensions of fo, sound pressure level, quality (e.g., perturbation measures), speaking rate, and intelligibility of speech sounds. Several studies have noted that both female esophageal and TE speakers may have difficulty achieving gender-appropriate fo levels [Eadie, 2003]. Esophageal speakers also may have lower than normal speaking rates because the
esophagus has to be recharged with air throughout speech production [Doyle, 1994]. In addition, reduced speech intelligibility often occurs with use of the electrolarynx particularly for the manner of voicing [Weiss & Basili, 1985], although it is rare to find any alaryngeal speaker who is 100% intelligible [Hillman et al., 1998].

When alaryngeal speech samples are presented to listeners, they identify alaryngeal speech as significantly less intelligible, acceptable and natural than normal laryngeal speech [Finizia et al., 1999; Pindzola & Cain, 1988]. The reduced intelligibility and acceptability of the speech signal by listeners might be hypothesized to penalize individuals who use alaryngeal speakers in their interactions with communication partners, thereby decreasing QOL. Yet, the relationship between both objective and subjective dimensions of alaryngeal voice and speech to QOL varies across studies. Meyer et al. (2004) investigated the relationship between word and speech intelligibility scores from a standardized instrument and QOL as measured by the UWQOL, FACT, FACT-H&N and PSS-HN. They found that in their group of individuals who had undergone total laryngectomy (n=16), there were no significant relationships between word or speech intelligibility measures with any QOL measures. Other studies have examined the relationship between voice quality, acceptability, and QOL after total laryngectomy. Finizia et al. (1999) found that upon self- and listener-assessments of voice quality and acceptability, TE speakers were judged to be less acceptable and worse in voice quality than both normal speakers and speakers who had undergone RT. Yet, these differences did not seem to translate to differences in QOL, at least as measured by generic or diseasespecific instruments [Finizia et al., 1998]. Eadie and Doyle (2004) investigated listeners’ perceptions of 28 TE speakers and the relationship between these measures and self-rated QOL, as measured by the HNQOL. Listeners’ perceptions of voice quality for speech acceptability, naturalness, voice quality, and pleasantness were only mildly to moderately related to HNQOL subscale scores (Pearson’s r ranged from .378 to .494). Thus, while results from auditory-perceptual studies would suggest that alaryngeal speakers remain identifiably different than normal speakers, these differences do not necessarily translate into poorer QOL.

Some investigators have hypothesized that post-laryngectomy communication mode may affect QOL. For example, because TE speakers are usually judged as being most intelligible and pleasant when compared to esophageal and artificial laryngeal speakers, it might be expected that they might exhibit the best QOL outcomes of any type of alaryngeal speaker. Some researchers have found that type of alaryngeal speech method may affect QOL outcomes. Finizia and Bergman (2001) reported no significant differences in QOL between those who used TE speech and those who had been treated with radical radiotherapy. However, they reported that a small group of speakers who used an electrolarynx (n=5) showed higher levels of dysfunction and emotional distress when compared with the TE group and those treated with RT. The authors found it
difficult to make definitive conclusions about how TE speakers function compared to electrolaryngeal speakers due to the small sample size. However, they hypothesized that speech rehabilitation with TE prostheses after laryngectomy may be as effective as conservative treatment with RT for advanced laryngeal cancer relative to communication and psychosocial adjustment. Eadie and Doyle (2005) similarly hypothesized that strong QOL scores (HNQOL) reported by 30 men who used TE speech in their study could have been due to a sample of exclusive TE speakers (vs. all types of communicators in the study by Terrell et al. (2004)). However, not all studies support the notion that TE speakers are the most successful among individuals who use an alaryngeal communication mode [Blood et al., 1992]. For example, Carr et al. (2000) concluded that there did not seem to be a measurable improvement in one’s QOL or ability to communicate using TE speech over any other post-laryngectomy communication method.

One reason why strong relationship may not be found between speech intelligibility or voice quality to QOL may relate to the types of instruments used to measure QOL. Specifically, if studies had included measures of voice-related QOL, it is unknown whether these relationships would have changed. Op de Coul et al. (2005) examined the sensitivity of EORTC questionnaires (both QLQ-C30 and QLQ-H&N35) to voice-related problems in 80 laryngectomized individuals who used TE speech. They found a good overall and voice specific-QOL level using the EORTC questionnaires. However, they found that use of these questionnaires masked some voice-related concerns, which were only revealed with use of additional, symptom-specific questionnaires. For example, despite an overall satisfaction with many aspects of voice (e.g., intelligibility, loudness, pitch, fluency), in their study more than half of the subjects (63%) reported serious problems with communicating in noisy environments. That is, had they used a measure such as VHI, perhaps these problems would have been detected. Several researchers have noted poorer functioning after total laryngectomy for voice-related QOL when compared to laryngeal preservation or partial laryngectomy procedures [Fung et al. 2005; Stewart et al., 1998; Weinstein et al. 2001]. However, it is equally possible that strong relationships between speech, voice, and QOL do not exist because after many years of living with total laryngectomy, individuals are bothered more by the physical consequences of surgery (i.e., presence of tracheostoma) and interference with social activities and social participation than impaired communication per se.

2.2.3. Activities and Participation and QOL

Total laryngectomy can affect one’s communication in a variety of social settings (e.g., at work, in the community), which may isolate an individual. It also may lead to disruptions in mealtimes with family and friends. Further, the presence of a tracheostoma may increase the risk of work disability [Taylor et al., 2004], or alter or reduce the frequency, ability, or enjoyment of performing activities of daily living (e.g., cannot blow on hot soup; bathing and eating may be altered) or participating in leisure activities (e.g., skiing; gardening; singing in a choir).
The relatively weak relationship observed between speech, voice, and swallowing impairments and QOL may reflect differences in how these constructs are measured. For example, most impairments (reduced or altered Body Functions and Structures) are measured by clinicians using instrumental as well as perceptual measures, whereas participation, and QOL are measured from the perspective of the individual with the health condition. For example, Palmer and Graham (2004) investigated relationships between demographic variables as well as functional abilities with overall QOL after total laryngectomy. They found that self-perceived ability to communicate exhibited the strongest relationship with QOL ($r = .52$). In addition, they found that individuals who communicated with others several to many times daily reported higher QOL scores than those who reported infrequent communication. These results indicate that social interaction and participation in social activities, rather than speech abilities or swallowing per se may be more important indicators of QOL [Mohide et al., 1992]. Unfortunately, as noted by Eadie (2007), there are fewer instruments available for measuring disruptions in activities and participation than impairments, which limits the study of the relationship between participation restrictions and QOL. A few studies have used adapted scales to measure functional outcomes. Hillman et al. (1998) assessed functional outcomes related to communication, swallowing and eating, and employment status using a Communication Profile (CP). The CP consisted of 24 statements about the individual's reaction to various communication situations/environments (e.g., “I avoid answering the telephone”), as well as data related to living environment, employment, swallowing and eating, and extent of speech and voice therapy. At the end of a 24-month rehabilitation period, CP scores for TE and esophageal speakers were slightly higher than or comparable to those achieved pre-surgery. Thus, although some “functional” disabilities persist, most domains related to QOL eventually return to pre-treatment levels after 12-36 months, including those related to communication [Bjordal et al., 2001; Deleyiannis et al., 1999]. Overall, results support the notion that even loss of the larynx may not impact overall QOL, but that QOL is a construct that changes over time, is specific to each person, and is affected by multiple factors.

2.3. Effect of Contextual Factors on QOL

One of the reasons why outcomes related to QOL after total laryngectomy are often inconsistent relates to the effect of a great number of contextual factors on functioning at other levels. These contextual factors include environmental facilitators/barriers such as one’s family, friends, and the attitudes of the society in which one lives. Personal factors include an individual’s coping strategies, age, gender, and mental health. Llewellyn et al. (2005) conducted a systematic review to evaluate studies investigating relationships between psychosocial/behavioral factors with health-related QOL in individuals with head and neck cancer. They found that in the 16 studies they reviewed, four main factors impacted QOL. These included: (a) personality (a personal factor), (b) social support (environmental factor), (c) satisfaction with consultation and information (interaction between person and environment), and (d) behavioral factors (e.g.,
alcohol consumption, smoking). In addition, depression levels before treatment were predictors of depression post-treatment, and QOL post-treatment. These results of this study highlight the importance of considering all of these factors when interpreting QOL outcomes.

2.3.1. Environmental Factors: Social Support

The importance of environmental factors on outcomes is highlighted by research showing that post-treatment distress is proportional to the extent of communication problems with friends and relatives [Friedman et al., 1994]. In contrast, openness to discussing malignancy in the family, emotional support, and a larger social network may positively affect rehabilitation outcomes [Mesters et al., 1997]. Verdonck-de Leeuw et al. (2007) found that distress in patients who had been treated for head and neck cancer, including laryngeal cancer, was related not only to the presence of a feeding tube, speech, and swallowing problems, but also to a passive coping style, fewer social contacts and non-expression of emotions. While speech intelligibility or voice quality alone may not relate strongly to overall QOL after total laryngectomy, communication is a necessary component of socialization. Thus, communication abilities and satisfaction with communication in everyday activities may more strongly relate to one’s QOL by affecting relationships with others. For example, Palmer and Graham (2004) found that individuals who communicated with others several to many times daily reported higher QOL scores than those who reported infrequent communication. Others have suggested that it is not the number of people involved in the social support after total laryngectomy, but rather, how satisfied individuals are with their support in terms of perceived availability from family, friends, and professionals [Richardson, Bourque, 1985]. One study reported that being single was also predictive of poorer QOL in the first 3 months following laryngectomy [van den Brink et al., 2006]. Results suggest that social interactions and interpersonal activities strongly and positively affect the QOL for those who are laryngectomized. In addition, familiarity of the communication partner and social support, as well as education of family members may increase success, whereas unfamiliar partners may reduce communicative participation and emotional functioning [Law, 2005; Mathieson, Stam, Scott, 1990; Zeine, Larson, 1999]. Likewise, changes in one’s physical appearance may result in alterations in body-image and self-concept, which may affect one’s socialization and QOL. These results have clear implications for interdisciplinary health care teams, and warrant consideration in general symptom assessment (i.e., beyond those that are solely physical in origin).

2.3.2. Personal Factors: Coping, adjustment, and depression

An individual’s ability to cope, as well as his or her mental health may affect one’s success post-laryngectomy. Blood et al. (1992) investigated coping, adjustment, self-esteem, perceived communication abilities, and preferred communication modes of 41 individuals who had undergone total laryngectomy. Patients also
were judged by external listeners for speech acceptability. Results revealed that individuals who were well adjusted also tended to view their voice rehabilitation as more beneficial and rated themselves as more easily understood by listeners than those subjects who demonstrated psychological distress and poor adjustment. Blood et al. also found a relationship among speech acceptability and adjustment, coping, self-esteem, and general well-being. Specifically, voice acceptability ratings were positively correlated with problem-focused and seeking-social-support coping strategies. Further, self-esteem and general well-being both showed positive correlation with voice acceptability ratings, with the highest correlations being found for voice acceptability and self-esteem (r = .63). However, low-to-moderate correlations were found for adjustment, self-esteem, coping, and general well-being. This led the investigators to suggest that individuals with good adjustment skills may be more optimistic about their voices, and that “Positive relationships between perceptual ratings and adjustment and coping encourage speech-language pathologists to continue their role in ‘holistic’ treatment of the patient” (p.68).

Several studies also have investigated the relationship between depressive symptoms and QOL. Hammerlid et al. (1999) studied mental distress in individuals with head and neck cancer, and found that one-third had mood disorders during their first year. De Leeuw et al. (2001) found that individuals with pre-existent depressive symptoms and women were more likely to develop depression after 6-36 months. De Graeff et al. (2000) also showed that depression and low performance status are risk factors for physical and psychological morbidity after treatment for head and neck cancer, and that these symptoms are predictive of QOL. Results from several studies suggest that depression is one factor that should be assessed pre- and post-operatively, and that psychosocial intervention may be warranted to improve QOL in this population [Hammerlid et al., 1999; Llewellyn et al., 2005].

2.3.3. Personal Factors: Gender

Several studies have investigated the differential impact of gender on outcomes. First, results do not show a consistent difference between men and women with regard to depression [Katz et al., 2003). Although some studies report higher levels of depression in women than men associated with disfigurement, these effects seem to be buffered by levels of social support. However, women indicate differential means of support than men, with women who are laryngectomized relying on family, reading, church services, and non-laryngectomized social groups as primary support systems [Graham, Palmer, 2002]. In contrast, men rely on laryngectomy group meetings, their work setting, and reading.

Second, studies that have investigated differences in overall QOL scores between men and women after total laryngectomy have shown inconsistent results. Some studies have shown that there are no differences between men and women with regard to QOL, and that gender has no predictive value for QOL.
outcomes, or even voice-related QOL [Eadie, Doyle, 2004; de Graeff et al., 2000; Kazi et al., 2007; Palmer, Graham, 2004], although women showed increased voice handicap in one study [Kazi et al., 2006]. Still, other studies have suggested some differences in how women and men experience symptoms [Vilaseca et al., 2006]. Despite the failure to find such differences using QOL instruments, some researchers have found that listeners differentially penalize female alaryngeal speakers more than male speakers when they make judgments of speech acceptability [Eadie, Doyle, 2004; Eadie et al., 2008]. If these attitudes are reflected in their communication partners, the quality of social interactions may be experienced differently by male and female laryngectomees. One qualitative study included five women who were treated for head and neck cancer, including two women who had undergone total laryngectomies. Results showed that all women experienced significant physical limitations that interfered with their ability to carry out daily tasks. All women described the ability to cope and adapt to changes in appearance and disfigurement, as well as their ability to maintain a positive attitude, and the importance of sharing their experiences with others [White, 2004]. Results from these studies demonstrate the complex relationship between gender and QOL that may produce differential effects on levels of function [Katz et al., 2003].

2.3.4. Personal Factors: Age

There is a paucity of data to suggest that age alone is associated with a higher risk of surgical complications. However, while age alone (in lieu of co-morbidities) may not impact surgical morbidity, it has a complicated relationship with QOL. For example, it is often assume that elderly individuals fare worse after treatment, but few data support this view [de Graeff et al., 2000]. In fact, some studies have shown an opposite effect, with younger patients more likely to express dissatisfaction with appearance and anxiety [Vilaseca et al., 2006]. Likewise, Woodard, Oplatek and Petruzzelli (2007) found better functional and QOL outcomes in at least one domain for individuals who were older than 65 years. They hypothesized that younger patients may have had better pre-treatment functional status, and therefore, when they are subjected to an extensive surgical procedure, their baseline functional status drastically declines. In contrast, older patients who may be retired may have had a more sedentary pre-operative lifestyle. Consequently, there may be little change in their baseline functional status after surgery. Therefore, their perception of QOL may not be as negatively affected. To fully evaluate this hypothesis, more longitudinal studies that include both pre- and post-operative measures should be performed.

3. Discussion

3.1. Implications for Future Research and Clinical Practice

The importance of using QOL questionnaires in evaluating individuals treated with laryngectomy has grown in the past decade because it shows promise as a
means of deciding between treatments when no survival advantage is afforded by one modality over another. In addition, QOL outcomes have become more mainstream as biopsychosocial models of health have gained acceptance. However, there are major obstacles to performing research on QOL outcomes in general, including those that are practical and those that are clearly methodological in origin. Practical considerations include the amount of time and resources required to collect and analyze large amounts of questionnaire data, the difficulty in selecting an appropriate instrument, and the bias created by missing data on those most severely affected by their disease. That is, there is a survivor bias in that individuals with recurrent disease are often excluded from evaluation; excluding these individuals from analysis results in artificially inflated QOL scores [Schwartz et al., 2001]. Methodological considerations include the inability of instruments to capture an individual’s adaptation to the conditions of their disease state, the difficulties in comparing outcomes across populations, and, lack of interpretation of what QOL score differences mean for clinical practice. In addition, specific domain scores may not be sensitive enough to detect real differences in function with small sample sizes. One part of this problem could be addressed by designing studies that investigate smaller, yet better defined groups of speakers. In addition, multi-center studies that investigate outcomes in a prospective, longitudinal design are necessary so that outcomes are better supported. These designs would allow better determination of relationships between psychosocial variables and how they may predict QOL at different times after surgery.

Results from this review showed that many factors (e.g., depression, coping skills, social support) interact with functioning and disability at all levels and lead to either poorer or enhanced QOL. These factors are often overlooked in traditional assessment measures, including QOL outcomes, and must be understood to facilitate optimal care in this population. However, not enough is known about the contribution of these factors at present, and therefore, we must employ additional methods (e.g., qualitative methods) to identify and define such areas of concern. In addition, not enough is known about how personal factors, such as cultural background, education, socioeconomic status, and gender affect QOL. These factors are important to investigate as the demographic characteristics of those who undergo total laryngectomy change, and to ensure that outcomes may be compared across countries and healthcare settings [Morton, 2003]. Through such endeavors, clinicians and researchers may better understand the influence of these factors on QOL, leading to more effective rehabilitation and consequently, better outcomes.

4. Conclusions

All individuals with advanced laryngeal cancer who undergo total laryngectomy will face numerous challenges, difficulties, and learn to cope with significant changes and restrictions in functioning following treatment. A successful program of short- and long-term rehabilitation must be designed to comprehensively
assess and provide effective intervention for these individuals. These considerations go beyond that of the narrow outcome of “time of survival” and need to include myriad issues related to QOL. By endorsing a comprehensive approach to assessment and intervention such as that proposed by the ICF, we are sure to continue to make meaningful changes in the lives of individuals who have undergone total laryngectomies.

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6. References


