

## Quality of life in male tracheoesophageal (TE) speakers

Tanya L. Eadie, PhD;<sup>1\*</sup> Philip C. Doyle, PhD<sup>2</sup>

<sup>1</sup>Department of Speech and Hearing Sciences, University of Washington, Seattle, WA; <sup>2</sup>Voice Production and Perception Laboratory, Doctoral Program in Rehabilitation Sciences, University of Western Ontario, London, Ontario, Canada

**Abstract**—For this study, we determined the quality of life (QOL) in individuals who had undergone total laryngectomy (TL) and who used tracheoesophageal (TE) speech as their primary method of postlaryngectomy communication. We also descriptively compared present QOL outcomes with those found in an extension of the Department of Veterans Affairs' (VA) Laryngeal Cancer Study. Thirty laryngectomized men with TE speech as their primary mode of communication were recruited for participation in the investigation. Participants completed a general information form as well as the University of Michigan Head and Neck Quality of Life (HNQOL) instrument. Results revealed a high level of self-perceived QOL in the domains of communication, eating, pain, and emotion that was empirically better than results found in a previous study involving individuals who had undergone TL and who were treated in VA hospitals. Possible reasons for the improved self-reported QOL among individuals in the present group include use of TE speech for postlaryngectomy communication, a higher level of education, and membership in a support group. The results suggest to us that these factors should be considered in postlaryngectomy care in the veteran population to optimize rehabilitation outcomes.

**Key words:** HNQOL instrument, laryngeal cancer, quality of life scales, rehabilitation, surgical-prosthetic voice restoration, tracheoesophageal speech, veterans.

### INTRODUCTION

Clinical efforts that measure quality of life (QOL) are an important component in evaluating a person's performance status relative to a variety of health conditions and requisite medical treatment. QOL is a multidimensional

construct that minimally includes broadly defined assessments of the physical, psychological, and social domains of functioning. Numerous and often interrelated areas of concern also evolve from these three primary functional domains and may further influence one's QOL. For example, defining QOL perhaps should be expanded to include social or family roles, pain and chronic treatment-related toxicities, and one's emotional status, as well as numerous other areas [1–2]. QOL is a highly individualized construct defined and/or interpreted within specific functional contexts (i.e., current health status, functional limitations, defined losses and needs, support systems available, etc.). Inclusion of formal and often multifaceted QOL measures has gained widespread attention in the literature in recent years as a means of documenting treatment outcomes. Support for the use of multifaceted QOL measurement instruments is justified because one's comprehensive "health" status will change

**Abbreviations:** CT = chemotherapy, HME = humidifier moisture exchange, HNQOL = head and neck quality of life, IAL = International Association of Laryngectomees, QOL = quality of life, RT = radiotherapy, TE = tracheoesophageal, TL = total laryngectomy, VA = Department of Veterans Affairs.

**This material was based on work supported by the Canadian Institutes of Health Research (CIHR).**

\*Address all correspondence to Tanya L. Eadie, Department of Speech and Hearing Sciences, University of Washington, 1417 NE 42nd St., Seattle, WA 98105; 206-616-2753; fax: 206-543-1093; email: teadie@u.washington.edu

DOI: 10.1682/JRRD.2004.01.0007

over time and may not have a common course across individuals regardless of a given category of disease. One area where the multidimensional construct of QOL has been explored is in the clinical literature on patients treated for head and neck cancer [3–4].

The impact of a head and neck cancer diagnosis on the person and the consequences of its treatment cross multiple functional domains that have a clear and direct influence on one's posttreatment well-being and associated QOL. For example, even if successful from the standpoint of eliminating the tumor and increasing one's long-term survival, treatment for many forms of head and neck cancer will result in significant changes that permanently alter the individual's physical, psychological, social, emotional, nutritional, and communicative functioning, with myriad secondary influences on his or her functional status. Several specific concerns have emerged as valuable areas of clinical inquiry. Specifically, the experience of pain, concerns of disfigurement and subsequent posttreatment appearance and its social impact, changes in deglutition and swallowing, and difficulties encountered with voice and speech are all concerns that have a direct bearing on QOL [3,5–8]. When quantifying one's QOL, we must consider the influence of numerous factors and their potential interdependence if accurate representations of QOL status are to be gathered. For this reason, efforts to gather QOL measures in those with head and neck cancer are of particular value in evaluating the efficacy of treatment and the success of rehabilitation, and perhaps more importantly, in identifying the types of healthcare services that may be required to optimize rehabilitation.

In the case of laryngeal cancer, results from the use of QOL scales highlight the fact that although treatment of the cancer is sufficient (i.e., increased survival occurs), individuals continue to experience difficulties in daily activities and social participation, regardless of the type of treatment (i.e., radiation therapy, conservative or radical surgical treatment, chemotherapy, or a combined treatment protocol) [7]. A diagnosis of laryngeal cancer that ultimately requires radical surgical intervention will have devastating effects on the person who experiences the disease. This is particularly true when treatment requires surgical removal of the entire larynx, or what is termed "total laryngectomy" (TL). In particular, TL will result in significant levels of change in the physical, psychological, social, and emotional domains with an ultimate influence on the individual's judgment of his or her own QOL. Functional restrictions in these domains are

further complicated by the fact that TL results in complete loss of normal verbal communication. For example, while voice and speech may be restored through training and use of alternative methods of verbal communication—tracheoesophageal (TE), esophageal, and artificial laryngeal speech—listeners will always identify the quality of this new communication method as nonnormal.

In the past decade, it has become increasingly common for many individuals who are laryngectomized to undergo surgical-prosthetic voice rehabilitation in the form of a TE puncture voice restoration [9–10]. TE voice restoration first involves creation of a midline-TE puncture and use of a one-way valved prosthesis that permits flow of pulmonary air into the esophageal reservoir. This airflow can generate a pulmonary-powered "esophageal" voice through vibration of tissues of the upper esophagus and lower pharynx. TE puncture voice restoration has the advantage of permitting rapid restoration of voice in many individuals who have undergone laryngectomy. When compared to other methods of alaryngeal voice and speech production, TE speakers are among those who exhibit frequency, intensity, and durational values that approximate those of the normal speaker [10]. Although objective values of TE speech often fall within the normal laryngeal range, listeners clearly identify TE speakers as being perceptually less acceptable and less intelligible than normal laryngeal speakers, as well as those who have been treated with radiation but no surgical intervention [11]. These results have direct implications on social acceptance and interaction, functional communication, and the adjustment of individuals who undergo total laryngectomy. Consequently, the psychosocial impact of such concerns cannot be disregarded.

While the restoration of functional verbal communication is arguably a critical factor in recovery and clearly influences rehabilitation success, the acquisition of post-laryngectomy verbal communication does not solely influence one's perception of QOL. In a landmark Department of Veterans Affairs (VA) study, Terrell, Fisher, and Wolf [12] investigated the long-term QOL in surviving patients with advanced laryngeal cancer. Patients were randomized to a radiotherapy treatment (RT) plus chemotherapy (CT) or radiotherapy group and TL group. Ten years posttreatment, Terrell et al. found that individuals who had preserved larynges (RT + CT) had significantly better mental health QOL scores on a general health survey, as well as better pain scores than did those in the TL group. Individuals who had undergone laryngectomy

were more depressed (28%) than those individuals with intact larynges (15%). However, when examining speech and communication scores, Terrell et al. found no differences between the two treatment groups.

Terrell et al. [12] demonstrated that individuals who undergo TL continued to report difficulty even 10 years posttreatment. However, the study by Terrell et al. included individuals who used a variety of communication methods. Since surgical-prosthetic voice restoration (i.e., TE puncture) seems to be increasing [10], information that addresses QOL in a group of laryngectomized men with TE speech as their primary method of postlaryngectomy verbal communication would be a valuable area of investigation. Furthermore, since severity of disease, medical treatment, time since treatment, age, social support, coping strategies, education, etc., may affect one's perception of QOL, it also was important to investigate QOL in a group of patients with varying factors. We investigated patients from a variety of hospitals, and their results were compared with the self-perceptions of individuals who were treated in VA hospitals to ensure that we could generalize previous results. Although this was essentially a study replication [12], a direct statistical comparison was not appropriate since many of these factors were not known in the previous study and could not be controlled. Consequently, the purpose of this investigation was twofold: first, we determined QOL in individuals who use TE speech as their primary mode of communication with the University of Michigan Head and Neck Quality of Life (HNQOL) instrument [13] and second, we descriptively compared these outcomes with those reported previously in the literature.

## METHODS

### Participants

Thirty adult males participated in the present study ( $N = 30$ ). The mean age for the entire group of 30 speakers was 66.1 years (age range 42–82 years). Participants were recruited in one of three ways. First, individuals ( $n = 17$ ) who registered for the International Association of Laryngectomees (IAL) conference were randomly recruited for participation. The IAL is an educational, self-help/support group conducted through the American Cancer Society. Additional participants ( $n = 5$ ) were recruited through professional contacts at a healthcare facility in a larger metropolitan center. Finally, a third set

of participants ( $n = 8$ ) were recruited through one of the author's professional contacts ( $N = 30$ ). All individuals reported TE speech as their primary mode of communication. Participation was voluntary following the general solicitation previously described. Participant TE speakers reported English as their first language, and all were at least 12 months postlaryngectomy, to allow time for postlaryngectomy adjustment and adaptation, as well to adjust to their new mode of communication. None of the participants reported any hearing difficulties. **Table 1** presents the summary of the demographic characteristics of the 30 adult male TE speakers in this study.

### Data Collection

#### General Information Form

This project was approved by the Ethics Review Board, University of Western Ontario (Ethics 8927). Individuals completed a general information form; participants were asked to provide information with regard to age, number of months postlaryngectomy, whether radiation therapy was received and length of treatment, their primary language, education level, proximity to a speech-language pathologist, major occupation and current work status, primary method and length of communication, and whether they had any difficulties with hearing. Participants also were asked to self-rate their education level with a 5-point scale:

1. Elementary school.
2. Some high school.
3. Completed high school.
4. College or university.
5. Postgraduate.

**Table 1.**

Summary of demographic characteristics of 30 participants, including age in years, education, time postlaryngectomy in months, time with TE speech as their primary mode of communication in months, and communication satisfaction. Data are presented as means or medians, standard deviations (SD), and ranges.

Characteristic	Mean/Median $\pm$ SD	Min–Max
Age (yr)	66.13 $\pm$ 9.45	42.0–82.0
Education (yr)	4.0	2.0–5.0
Time Postlaryngectomy (mo)	96.10 $\pm$ 65.11	17.0–252.0
Time with TE Speech (mo)	85.10 $\pm$ 56.29	12.0–214.0
Communication Satisfaction	4.0	3.0–5.0

TE = tracheoesophageal, SD = standard deviation

Participants also were asked to rate their overall satisfaction with verbal communication on a 5-point scale with “1” representing a rating of “Never satisfied,” and 5 representing “Always satisfied.”

### *HNQOL Questionnaire*

Participant TE speakers were asked to complete a QOL index as measured by the HNQOL instrument. The HNQOL is a head and neck cancer-specific QOL instrument that has been developed and validated [13]. It is a self-administered questionnaire that requires completion of 20 questions related to head and neck cancer symptoms that are then used to generate scores for four QOL domains or dimensions:

1. Communication.
2. Eating.
3. Pain.
4. Emotional well-being.

Global symptoms, disability attributable to head and neck cancer, and response to treatment are also assessed. Each scale of the HNQOL has been validated for test-retest reliability and for construct validity [13].

### **Statistical Methods**

We used published scoring algorithms to calculate the HNQOL domain scores (0 = poorest score, 100 = best score). We determined the relationships among HNQOL domains to any demographic variable(s) with Spearman's correlation coefficients with the exception of presence of radiation, which was calculated with a rank order biserial correlation because of its nominal nature. We calculated the relationship between reported communication satisfaction and each of the HNQOL domains with a Spearman's correlation. An a priori statistical significance level of  $p < 0.05$  was employed.

We also descriptively compared present results with those found in a similar previous study [12]. However, parametric statistical comparisons (e.g., analysis of variance [ANOVA]) were not performed because of our inability to control multiple factors (i.e., severity of disease, presence of radiation, education, socioeconomic status, social support, etc.) across the groups. We determined relationship across these studies with a Pearson's correlation coefficient to illustrate directional patterns in the HNQOL domains.

## **RESULTS**

### **Demographics of Participants**

In addition to undergoing TL, 24 of 30 participants in the present study specified they had received radiation therapy. Twenty-eight of thirty participants also indicated they were almost always satisfied with their communication (i.e., corresponding to a level 4 or higher on the 5-point communication satisfaction rating scale).

We found a significant relationship between participant age and time since surgery ( $r = 0.484$ ,  $p < 0.05$ ). No significant relationships were found between any of the demographic variables (e.g., education, age, time postlaryngectomy, presence or absence of radiation, etc.) and HNQOL domain values. To examine the potential interrelationship between an individual's self-rated satisfaction with communication and other factors that possibly contributed to QOL, we calculated Spearman's rank order correlations for the 5-point communication satisfaction scaled scores. We found significant relationships ( $p < 0.05$ ) between communication satisfaction and the HNQOL communication domain ( $r = 0.664$ ), between communication satisfaction and the HNQOL eating domain ( $r = 0.382$ ), as well as to global bother ( $r = 0.574$ ) and overall response to treatment ( $r = 0.418$ ).

### **HNQOL Questionnaire**

The group means and standard deviations for the HNQOL domains are presented in **Table 2**. Thirty responses were gathered for all values except the “global bother” question 7, which was not completed by one TE speaker. The possible range of scores was from “0” to “100” for each of the HNQOL domains, with a higher score indicating better relative QOL for that domain. For the present study, we transformed each of the domain scores with standardized algorithms.

We empirically compared the participants' HNQOL domain values derived in the present study with values reported by those who had undergone total laryngectomy in the study by Terrell et al. [12]. Scores from both studies (Series 1, present study; Series 2, Terrell et al. [12]) are presented in the **Figure** for each of the four HNQOL domains (emotion, eating, pain, and communication). We discovered a significant relationship among HNQOL scores in the two studies ( $r = 0.96$ ;  $p < 0.05$ ).

**Table 2.**Results from HNQOL instrument,  $N = 30$ .

HNQOL Domain	Min	Max	Range	Mean $\pm$ SD
HNQOL—Eating	50.0	100	50.0	91.53 $\pm$ 12.78
HNQOL—Communication	31.25	100	68.75	84.38 $\pm$ 19.54
HNQOL—Emotion	75.0	100	25.0	94.58 $\pm$ 7.59
HNQOL—Pain	56.25	100	43.75	88.54 $\pm$ 13.04
Global Bother	50.0	100	50.0	84.17 $\pm$ 16.72
Treatment Response	0.0	100	100.0	80.00 $\pm$ 25.76

HNQOL = head and neck quality of life, SD = standard deviation

## DISCUSSION

Our purpose for this investigation was twofold. Our first objective was to determine self-perceived QOL with the use of HNQOL instrument in men with TE speech as their primary mode of postlaryngectomy communication. Results revealed that the present group of speakers reported high levels of function for all the HNQOL domains and response to treatment, as well as low levels of overall bother (**Table 2**). The second objective of this study was to descriptively compare the HNQOL domain values found in this group of TE speakers with those reported for a previous group of laryngectomees in a study supported by the VA, since the participants from both studies had undergone total laryngectomy and had lived with this procedure for many years [12]. HNQOL domain

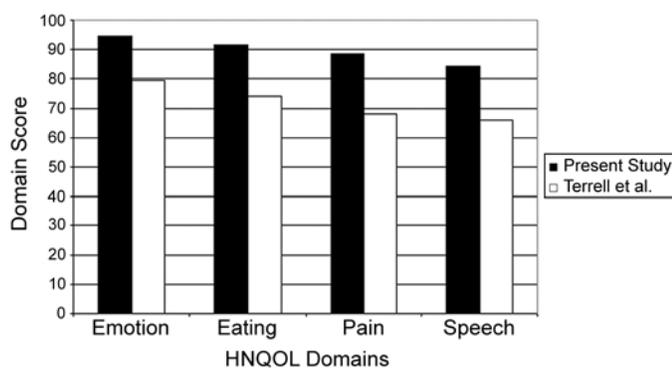
scores for participants in the present study were comparatively higher than those reported for the same domains measured in a group of veterans (**Figure**). Several possible reasons may account for the discrepancy among present HNQOL data and those reported previously, including differences in age, time postlaryngectomy, education, method of postlaryngectomy communication, and coping strategies. The possible contributions of these factors to success postlaryngectomy will be discussed relative to the head and neck cancer literature. This discussion will include factors for consideration by rehabilitation professionals.

### Age of TE Speakers

Demographic characteristics of the present TE speakers (**Table 1**) must be considered relative to comparative populations. The average age (66.1 years) of the present participants is comparable to those reported in other recent studies [14], but slightly older than those reported by Terrell et al. (55.7 years) [12]. These differences alone cannot explain the relatively positive findings in HNQOL domains in the present study. For example, older individuals are often assumed to fare worse after treatment, although few data support this view [1,15]. In the present study, age was not significantly correlated with function and suggests that older individuals reported QOL scores comparable to younger individuals. Present results also showed a positive relationship between age and time since laryngectomy, which is consistent with older individuals having often lived longer after surgery. Age is not a likely contributing factor to the higher scores observed in the present study, so future efforts to predict postlaryngectomy outcomes relative to age should be done with considerable care.

### Time of Postlaryngectomy

The present participants included both those who had recently undergone TL (minimum time postlaryngectomy

**Figure.**

Descriptive comparison of health status for laryngectomees in present study ( $n = 30$ , Series 1) vs. laryngectomees in Terrell et al.'s study ( $n = 33$ , Series 2) for four domains of head and neck quality of life (HNQOL) instrument: emotion, eating, pain, and speech. *Source:* Terrell JE, Fisher SG, Wolf GT. Long-term quality of life after treatment of laryngeal cancer. Department of Veterans Affairs Laryngeal Cancer Study Group. *Arch Otolaryngol Head Neck Surg.* 1998;124(9):964–71.

= 17 months) and those who had lived with the procedure for many years (maximum time postlaryngectomy = 252 months) with a mean of 96 months (8 years). Results of the present study indicated no significant interaction between time postlaryngectomy and QOL as measured by the HNQOL instrument. Based on previous research, it was expected that this factor would correlate with function as measured on the HNQOL questionnaire, in that individuals who had lived longer with TL might do better than those who had recently undergone TL [12,16]. However, this finding did not emerge. One possible explanation is that the bulk of the current participants were those who were many years postlaryngectomy (mean = 8 years), which may have skewed these findings. With regard to communication, Blood et al. [16] found that perception of performance increases as time passes, with 31 percent of recent laryngectomy survivors indicating they were communicating "just fine," 38 percent indicating they were communicating poorly, and 38 percent uncertain about communicative performance. In contrast, 76 percent of distant survivors thought they were communicating "just fine," 12 percent thought they were communicating poorly, and 12 percent were uncertain. Although this effect may bolster scores, it does not explain better HNQOL performance by participants in the present study when compared to participants studied by Terrell et al. [12], who were on average 10 years postlaryngectomy. Other factors may contribute more strongly to the success observed in the present study.

### **Education and Socioeconomic Status**

Another possible reason for the increased function among the current participants based on the HNQOL and relative domains is the high level of education and socioeconomic status reported by our TE speakers. For example, more than half of all participants reported a college/university education (53.3%). Education and socioeconomic status may affect an individual's knowledge of the healthcare system, access to services, and potential level of involvement in care. As a result, individuals who are more educated may have more positive outcomes because of increased and perhaps more active involvement in treatment decisions. Educational level also may influence one's level of compliance with the recommendations of healthcare providers because questions may be raised and answers provided. Additionally, level of social support among better educated, and perhaps more economically stable, individuals may play a role in one's

rehabilitation success. This suggestion is supported by the work of Blood et al. [17], who found a significant difference in education reported among laryngeal cancer survivors who were well-adjusted and "good copers" (12.3 years education) versus those who were "bad copers" (7.1 years education). Although not specifically evaluated here, factors such as third-party reimbursement and insurance also could have played a role in access to medical care and choice of postlaryngectomy communication. This may permit individuals to access their care with greater flexibility than those reported in the earlier work. However, since the VA provides strong support for its patients, this would not appear to fully account for the present results where QOL domains were empirically higher than those reported by Terrell et al. [12].

Seventeen participants in the present study also were able to travel to an international conference to participate in a meeting. This would potentially require good general health and financial status. Blood et al. [16] observed that demographic characteristics of IAL members may misrepresent characteristics of laryngeal cancer patients at large, since education and socioeconomic status are on average higher and ethnicity is primarily Caucasian. Because education and socioeconomic factors were not reported in the study by Terrell et al. [12], results are not directly comparable. However, other researchers have not found a relationship between education and QOL among those receiving TL [14]. Instead, they found a small positive relationship with income (i.e., accounting for 6 percent of the variability in QOL). Interestingly, Palmer and Graham's [14] study also included individuals who were members of the IAL. The demographics of this group might suggest that these individuals are mostly well-adjusted with higher levels of education and may contrast with the typical demographic characteristics of those treated for head and neck cancer, which has historically been plagued by substance abuse, lower socioeconomic status and levels of education, and a generally poor social network [18]. While these factors may all have played a potential role in the more positive QOL outcomes in the present study, they remain a rich area for future study.

### **Role of Communication**

A further reason why participants in the present study exhibited higher HNQOL scores than those reported previously potentially may relate to the mode of alaryngeal speech assessed (i.e., TE puncture voice restoration). Although TE speech is not uniformly successful, it

typically involves rapid restoration of voice after laryngectomy with resultant functional verbal communication. This certainly can positively impact psychosocial adjustment, which impacts rehabilitative success [11,16,19]. For example, Palmer and Graham [14] found that TE speakers consistently rated themselves more successful with familiar and unfamiliar listeners than those individuals with an electrolarynx. Finizia et al. [11] investigated QOL for two groups of individuals with laryngeal cancer, those who were laryngectomized and used TE speech and those treated by radiotherapy and who retained a laryngeal system, and found no significant differences in QOL between groups. In a separate study, Finizia and Bergman [20] reported that laryngectomized individuals who used TE speech ( $n = 14$ ) did not show any reduced psychosocial function from those treated with radiotherapy ( $n = 70$ ). Furthermore, Finizia and Bergman found that a small group of speakers with electrolarynxes ( $n = 5$ ) showed higher levels of dysfunction and emotional distress when compared to the TE group and those treated with radiotherapy. However, because of the small number of participants with electrolarynxes, Finizia and Bergman were unable to conclude definitively about how TE speakers perform relative to electrolaryngeal users [20]. Nevertheless, Finizia and Bergman suggested that successful speech rehabilitation with a TE prosthesis after laryngectomy may be as effective as conservative treatment with radiotherapy for laryngeal cancer, which retains laryngeal structures relative to psychosocial adjustment and function ability.

Based on the data available for comparison, one might postulate that inclusion of solely TE speakers in the present study, particularly those who are better educated and of relatively improved socioeconomic status, would potentially result in better QOL outcomes. In the study by Terrell et al. [12], 30 of 33 individuals had some type of artificial voice that “allowed them to communicate reasonably well.” Terrell et al.’s [12] comparison group included three nonvocal communicators, as well as others who were potentially not as successful with their primary mode of communication as the speakers in the present study. Nonvocal communicators usually report lower functional scores on everyday activities and lower levels of coping and adjustment, as well as a poorer QOL [10]. Thus, the inclusion of nonvocal communicators in Terrell et al.’s study may have lowered their overall group scores [12]. In addition, some individuals in the present study used hands-free speaking valves that may

have led to the improvement of the voice signal and reduced the frustration with communication. Any individuals who used humidifier moisture exchange (HME) devices in these hands-free valves might also have experienced ease of breathing and speaking, thereby positively influencing QOL scores. In this regard, use of HMEs might also be seen to offer unique advantages that cross specific domains of functional performance that influence QOL. For example, the ability to optimize breathing has direct pulmonary consequences that fall within the physical and perhaps psychological domains. More efficient breathing may increase general levels of activity and associated independence and reduce fatigue [21–23]. Similarly, decreased coughing and reduced concerns specific to stoma hygiene also would be likely to have an influence on one’s social functioning and associated comfort in such situations. Finally, the ability to communicate in a “hands-free” fashion might be seen to normalize communicative interactions with requisite interpersonal benefits. Although these details are not known from the Terrell et al. [12] study, these factors are important considerations in the success of postlaryngectomy rehabilitation and may have contributed to elevated QOL scores in the present study.

Finally, significant relationships were found between self-rated communication satisfaction and several HNQOL domains (communication,  $r = 0.664$ ; eating,  $r = 0.382$ ; global bother,  $r = 0.574$ ; overall response to treatment,  $r = 0.418$ ). These associations highlight the importance of the relationship between one’s communication ability and overall well-being. For example, Palmer and Graham [14] investigated the relationships between demographic variables as well as functional abilities with overall QOL in a group of individuals who had undergone TL. They found the ability to communicate exhibited the strongest relationship with QOL ( $r = 0.52$ ,  $p < 0.001$ ). 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 to us that social interactions and interpersonal activities strongly and positively affect the QOL for those who are laryngectomized. Communication is an important segue to social activity and is an extremely important component influencing postlaryngectomy outcomes.

### **Coping, Adjustment, and Social Support**

Coping strategies, adjustment, social support, and psychological factors also impact postlaryngectomy QOL and success [1,17]. The present study included many individuals who were actively involved in support groups. Inclusion of these individuals could have positively skewed results because these individuals may have been in better general health, been less depressed, reported less pain, and were generally better adjusted socially than the "average" laryngeal speaker. These individuals appeared to be actively involved in positive relationships and interpersonal activities with others. DeSanto et al. [24] suggested that individuals who underwent TL are more concerned with the presence of the tracheostoma and interference with social activities than impaired communication. Previous results also indicate that good coping and adjustment skills are positive predictors of successful postlaryngectomy outcomes [16,19,25]. In this regard, Gritz et al. [26] noted that variables often not considered in typical QOL instruments, such as self-perceived disfigurement, self-image, and coping style, may contribute to health functioning of individuals who are treated for head and neck cancer. The inclusion of these factors as components of more comprehensive QOL assessments and using interviews to identify these factors would supplement measures of QOL that may be narrow in construct.

An interesting note to our empirical comparison of the present data to those of Terrell et al. [12] is that the relative ordering across the four HNQOL domains remains intact. Communication function is rated lowest (poorest QOL score), and emotion is rated highest (best QOL score). Although absolute transformed values are greater than those reported by Terrell et al. [12], the relationship between these domains remains strong ( $r = 0.96$ ). Factors that are believed to have positively influenced the outcomes in the present study appear to have influenced each QOL domain equally. Identification of these factors, as well as their relative contribution to postlaryngectomy success, should be the focus of future studies related to head and neck cancer in general, and laryngeal cancer specifically. It may be advantageous to identify what made the present group of participants highly satisfied with their lives, in anticipatory efforts to positively influence outcomes of others who are undergoing the same treatment for laryngeal cancer. When we compare each individual's function over time, it is clearly necessary to prospectively measure domains that contribute to QOL, including prelaryngectomy, and at several

intervals postlaryngectomy. This would include standard and validated measures of multiple factors, such as severity of disease, type of treatment, social support, coping styles, socioeconomic status, and satisfaction with voice. Results from this type of investigation would help clarify the role of these contributing factors to the rehabilitation success of the individual, which were limitations of the present descriptive and exploratory replication study. These suggestions must be considered when we measure changes in QOL and when we describe and compare all treatment protocols for laryngeal cancer and programs of rehabilitation.

### **CONCLUSIONS**

Our objectives in the present study were first to determine QOL in individuals who had undergone TL and who used TE speech and second to descriptively compare the present results with those found in a previously published extension of the VA's Laryngeal Cancer Study [12]. Positive outcomes with self-rated QOL in the present study suggest that most of our TE speakers were satisfied with their lives. These outcomes were comparatively better relative to the group of individuals previously studied. Factors that affected present outcomes need to be identified more specifically to implement any changes in rehabilitation that may contribute to this success. For example, rehabilitation efforts might include differential methods for promoting communication interaction and social support.

In the future, the present findings and issues must be considered in the context of gender. Specifically, the number of women who are diagnosed with laryngeal cancer continues to rise [27], and their needs and QOL outcomes may indeed differ from those of men. Further prospective studies involving medical, speech/swallowing, psychological, and social team members are needed to increase understanding of those factors that are most meaningful to the QOL of those treated for laryngeal cancer. These results have implications for all rehabilitation professionals involved in the care of individuals to whom we provide clinical service.

### **ACKNOWLEDGMENTS**

Special thanks to Jeffrey E. Terrell, MD, University of Michigan, Ann Arbor, MI, the International Association

of Laryngotomees (IAL); Marlene Jacobson, PhD, Sunnybrook and Women's College Health Sciences Centre, Toronto, ON; Jeffrey Searl, PhD, University of Kansas Medical Center, Lawrence, KS; and Paul Evitts, MSc, of Bowling Green State University, Bowling Green, OH.

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Submitted for publication January 14, 2004. Accepted in revised form June 8, 2004.