Pourliaka *et al.*
Health and Quality of Life Outcomes (2025) 23:6
https://doi.org/10.1186/s12955-025-02334-6

Health and Quality
of Life Outcomes

REVIEW **Open Access**

Voice-related quality of life after total laryngectomy: a scoping review of recent evidence

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Abstract

Background Laryngeal cancer often leads to total laryngectomy (TL), which results in the loss of natural voice, necessitates voice rehabilitation and affects the individuals Quality of Life (QoL). Despite advancements in treatment, Voice-Related QoL (VRQoL) post TL remains a neglected area in the field of rehabilitation. This study seeks to fill this gap by evaluating though a scoping review the impacts of TL on patients' voice-related QoL.

Methods A scoping review was conducted to assess the impact of total laryngectomy (TL) on voice-related quality of life (VRQoL). The search was performed across various electronic databases—PubMed, Scopus, Embase, Cohrane Library, Google scholar and Web of Science— using a broad set of keywords to capture studies addressing total laryngectomy and voice-related quality of life (VRQoL). Articles were screened using predefined inclusion and exclusion criteria, focusing on studies that directly addressed TL and VRQoL outcomes.

Results A total of eleven papers were finally selected to respond to the research question. The review indicates that TL significantly impacts VRQoL. Common issues included difficulties with communication in noisy environments, social interactions, anxiety about being understood, and physical challenges related to voice production. These difficulties were reflected in lower scores on various assessment tools. Patients reported declines in socio-emotional functioning and faced challenges in physical activities requiring voice use.

Conclusions This scoping review highlights the profound impact of TL on patients' voice-related QoL. Despite advances in surgical techniques and rehabilitation methods, patients continue to experience significant challenges in communication and social integration, which are crucial components of overall well-being. The persistent lower scores across various QoL assessment tools underscore the necessity for enhanced supportive care and innovative rehabilitation strategies tailored to the specific needs of this population.

Keywords Total laryngectomy, Voice-related Quality of Life, Laryngeal cancer, Hypopharyngeal cancer, Head and neck cancer, Tracheal-esophageal speech

Introduction

Laryngeal cancer currently affects approximately 2.76 individuals annually per 100,000 people [1]. The primary objective of treatment is to enhance patient survival while striving for the best possible functional outcomes. This may involve either a single treatment method or a combination of surgery, radiation therapy, and/or chemoradiotherapy [2, 3]. The main treatment approach for patients with advanced stage laryngeal cancer who are

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not candidates for chemotherapy is usually total laryngectomy (TL) [4]. Furthermore, is often required as a salvage procedure for recurrent or persistent disease following chemoradiotherapy [5]. Total laryngectomy is also performed for functional reasons, such as severe airway obstruction or chronic aspiration, when other treatments fail to provide relief. These functional causes present their own set of rehabilitation challenges, particularly in terms of restoring airway protection and improving quality of life.

Total laryngectomy requires removal of the larynx, which leads to the loss of natural voice due to the anatomical change. Absence of voice and presence of a permanent stoma interferes with fundamental life functions such as breathing, swallowing and communication, which can impact emotional well being and quality of life [6, 7], making the restoration of speech using an alternative sound source a primary objective of their rehabilitation. Total laryngectomy not only impacts voice production but also results in a loss of the sense of smell due to the disruption of airflow through the nasal cavity. This anosmia can significantly affect a patient's quality of life by impairing their ability to enjoy food, detect hazardous odors, and engage in social activities [8]. The success of voice rehabilitation greatly affects a patient's quality of life (QoL), with those achieving better vocal scores experiencing improved psycho-emotional well-being [9, 10].

In today's medical discourse, assessing the success of a surgical procedure's oncological outcomes goes beyond instrumental measures; it must also encompass the patient's subjective perception of treatment efficacy. This holistic approach aligns with the World Health Organization's (1971) definition of health as a multidimensional concept [11]. Despite this recognition, there remains a significant gap in the literature regarding the voice-related quality of life (VRQoL) of patients' post-total laryngectomy. QoL, as defined by the World Health Organization (2004), reflects " *an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns*" [12]. However, quantifying QoL poses challenges due to its dynamic nature and the multitude of subjective and objective factors involved. Initial work in this field focused primarily on the general QoL of patients following TL [6, 13, 14]. Although it is crucial to evaluate the QoL in these patients, it has been shown that is also important to use more specific questionnaires for the assessment of voice-related quality of life [15] as voice appears to play a crucial role. In the research of Vilaseca et al., (2006) patients identified speech, appearance, and activity as the most significant issues post-laryngectomy although there was no correlation between speech difficulties and overall QoL [16]. Research suggests that quality of life (QoL) often declines initially after laryngectomy. While some aspects gradually improve during the year following surgery, others, such as physical functioning, social functioning, speech, and social contact, tend to remain significantly worse compared to pre-surgery levels [17–19]. More recent evidence shows that QoL is poorer in patients after TL compared with general population [19, 20].

A recent systematic review and meta-analysis of 15 studies focused on voice rehabilitation-related quality of life comparing the impact of two types of voice rehabilitation interventions [10]. The findings revealed that the tracheoesophageal voice (TEV) group had significantly better Voice Handicap Index (VHI) scores compared to the esophageal voice (EV) group. However, when Voice-related Quality of Life (VrQoL) was assessed using the Voice-Related Quality of Life (V-RQOL) questionnaire, no significant difference was observed between the two groups.

This scoping review aims to provide a comprehensive exploration of the literature on voice rehabilitation in total laryngectomy (TL) patients, extending beyond the scope of previous systematic reviews by including emerging research and broader topics not previously covered. The choice of a scoping review methodology allows for a broad examination of the available literature, making it an ideal approach for synthesizing diverse findings in VRQoL post-laryngectomy. This methodology is particularly well-suited for identifying gaps and emerging trends in clinical practice and provides a structured overview of this complex and multifaceted topic, highlighting areas for future research. By synthesizing the most current research, this study seeks to offer current insights into the lived experiences of TL patients, enhancing the understanding of their post-surgical journey and to serve as a resource for clinicians and researchers aiming to improve patient outcomes in this field.

Methods

Study design

A scoping review was conducted as outlined by Armstrong et al. [21] and reported following the PRISMA Extension for Scoping Reviews (PRISMA-ScR) guidelines. The study selection process is summarized in Fig. 1 (PRISMA flow diagram). This method was chosen over a more systematic approach because it accommodates broader and less specific research questions. The present study followed the framework proposed by Arksey and O'Malley [22] and in alignment with the PRISMA Extension for Scoping Reviews (PRISMA-ScR) checklist to ensure transparency and rigor in reporting. This process involved: which provided a transparent, yet

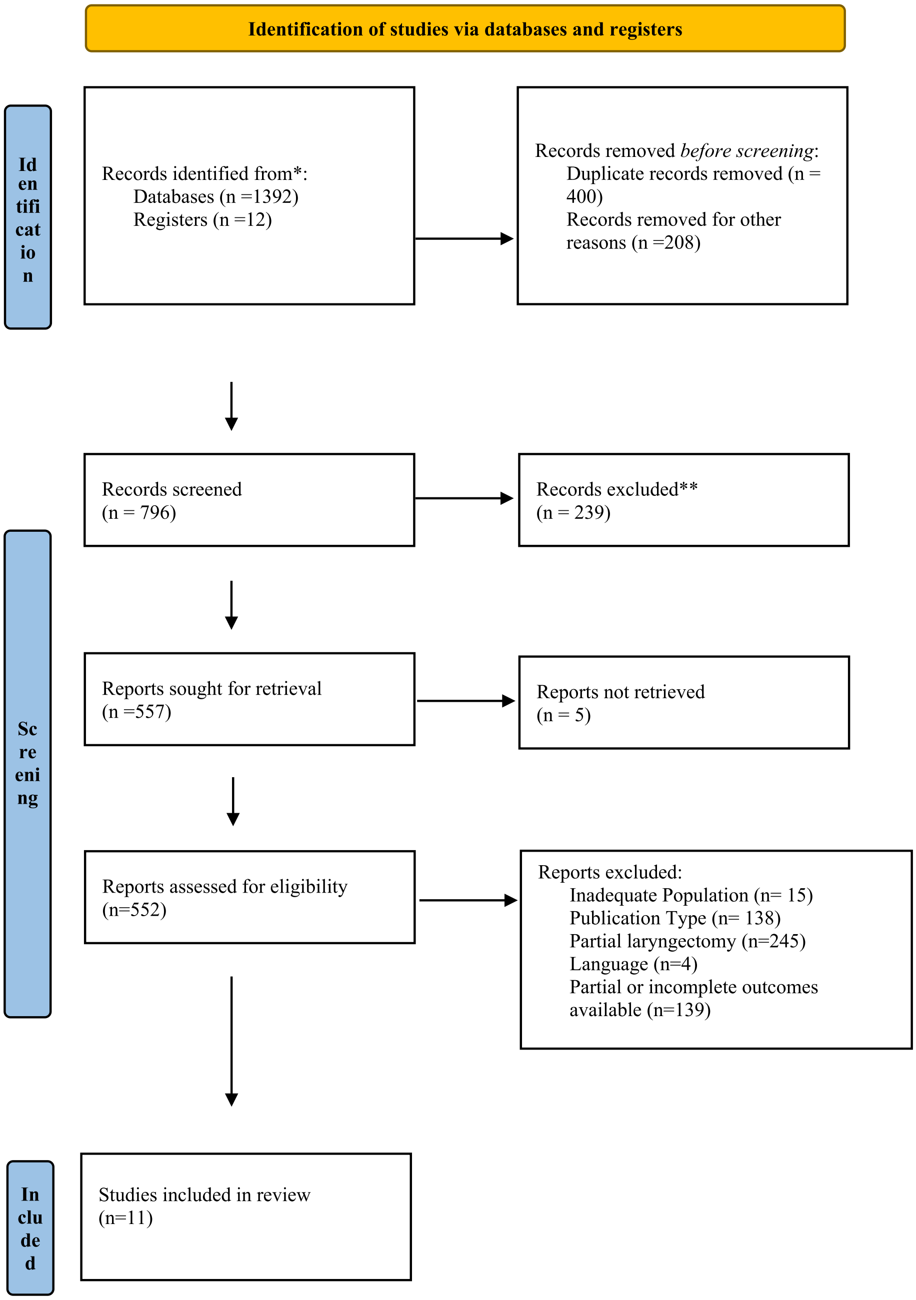

Fig. 1 PRISMA 2020 flow diagram for systematic reviews

flexible methodology for gathering and reporting evidence through a scoping review that involves a. identifying relevant studies through comprehensive searches in databases and registries, b. selecting studies based on specific criteria, c. extracting data from these studies, and d. synthesizing and presenting the findings.

This scoping review focused on adult patients who underwent total laryngectomy and subsequent voice rehabilitation, examining voice-related quality of life (VRQoL) as the primary outcome.

A Population, Intervention, Comparator, and Outcome (PICO) framework was employed to define the research question:

- Population: Adult patients who have undergone total laryngectomy;

- Intervention: Various voice rehabilitation methods (e.g., tracheoesophageal speech, esophageal speech, electrolarynx, pneumatic larynx);
- Comparator: None (broad scoping approach);
- Outcome: Changes in VRQoL and secondary outcomes such as vocal performance and overall well-being.

Because the most recent literature review on this topic covered the period from Dec 1, 2001, to Jun 1, 2021 [10], the research was restricted to studies published between Jan 1, 2020 and Jun 1, 2024. Restrictions based on language (English) and publication status (only peer-reviewed articles) were imposed. For this scoping review, adult patients who have undergone total laryngectomy and various voice rehabilitation methods were considered, focusing on changes in voice-related quality of life as the primary outcome. Original research articles, observational studies, clinical trials, and case studies were included reporting changes in voice-related quality of life measured by post-treatment questionnaires. Secondary outcomes included other parameters related to vocal performance and overall patient well-being. Studies were limited to English-language, peer-reviewed articles to ensure accessibility and quality, and pediatric populations were excluded to focus specifically on the adult population most affected by laryngeal cancer and voice rehabilitation needs (Table 1). Data on the publication, the study design, the basic characteristics of the participants (age and gender), the tool for the assessment of VRQoL used and the main findings were collected.

Search strategy

A comprehensive search of the PubMed, Scopus, Embase, Cohrane Library, Google scholar and Web of Science electronic databases was conducted for studies focusing on voice and quality of life outcomes in patients who have undergone total laryngectomy and subsequent speech rehabilitation. To detect clinical trials a search of clinical trials (https://clinicaltrials.gov/) and EU Clinical Trials Register (https://www.clinicaltrialsregister.eu/) was included. The search strategy employed Medical Subject Headings (MeSH) terms, entry terms, and related keywords such as "total laryngectomy," "Laryngeal cancer" "tracheoesophageal speech/ voice", "esophangeal voice", "laryngectomized patients", "voice problems", "voice rehabilitation," and "voice-related quality of life." Boolean operators (AND/OR) and filters were applied to refine the results.

The "Related articles" feature on the PubMed homepage was also utilized to identify additional relevant studies. References were collected and duplicates were removed using reference manager software (EndNote X7). Titles and abstracts of papers available in English were examined by the investigators. Full texts of the identified studies were screened for original data, and references within these articles were reviewed manually to identify other relevant studies. Data were charted using a standardized extraction form to capture study design,

Table 1 Criteria setails of the scoping review

Inclusion Criteria

- Original research articles.
- Published in English.
- Sample consisted of patients who underwent total laryngectomy and subsequent voice rehabilitation.
- Provision of detailed information on post-treatment vocal and quality of life outcomes

Exclusion Criteria

- Studies focused on pediatric populations.
- Non-peer-reviewed articles, including letters, editorials, and commentaries.
- Articles not published in English.
- Studies focusing on partial laryngectomy or other unrelated surgical procedures.

participant demographics, VRQoL assessment tools, and primary findings related to voice-related quality of life post-laryngectomy.

Study selection

A PRISMA flow diagram (Fig. 1) illustrates the process of study selection and inclusion. In this scoping review, one thousand four hundred four (1,404) records were identified initially through comprehensive searches of databases (1,392 records) and registers (12 records). Before screening, four hundred (400) duplicate records via EndNote and two hundred eight (208) records published before 2020 were removed, resulting in seven hundred ninety-six (796) records to be screened. Following the screening process, two hundred thirty-nine (239) records were excluded for being systematic reviews, and five hundred fifty-seven (557) reports were sought for retrieval. Of these, five (5) reports could not be retrieved, as access was requested through ResearchGate. Five hundred fifty-two (552) full-text reports were assessed for eligibility, with five hundred forty-one (541) papers excluded for the following reasons: fifteen (15) focused on children's populations, one hundred thirty-eight (138) were excluded due to publication type (one hundred twenty-seven (127) were not peer-reviewed, and eleven (11) were letters to the editor), two hundred forty-five (245) focused on partial laryngectomy, and four (4) were not published in English. One hundred thirty-nine (139) papers were excluded due to the absence or incomplete data. Ultimately, eleven (11) studies met the inclusion criteria and were included in the review.

To depict the flow of information through the different phases of the present scoping review the Preferred Reporting Items for Systematic reviews and Meta-Analyses was used (PRISMA-2020).

Data extraction

Data extraction was performed using a standardized charting form. Extracted data included publication details, study design, participant demographics (age and gender), tools used to assess VRQoL, and primary findings related to post-treatment VRQoL and secondary outcomes.

Data analysis

Findings were synthesized narratively, focusing on VRQoL outcomes and secondary measures such as vocal performance, psychological well-being, and social participation.

Framework adherence

This review adhered to PRISMA-ScR [23] reporting guidelines to ensure reproducibility and comprehensiveness. All phases of the review process were conducted systematically to maintain transparency and rigor.

Results

Characteristics of included studies

This review encompasses studies carried out in the following countries including Taiwan, Portugal, Denmark, Sweden, Brazil, Italy, Australia, the Netherlands, USA, and Greece (Table 2). The participants in these studies were individuals who have had their larynx removed, primarily due to laryngeal or hypopharyngeal cancer in various stages, including salvage surgeries following failed prior treatments. In one study, a small group of participants underwent laryngectomy for functional reasons. The patients of the studies were undergoing various forms of speech rehabilitation, including pneumatic artificial laryngeal speech, esophageal speech, tracheoesophageal speech, and electrolarynx usage. In three papers, salvage laryngectomy is mentioned as the reason for surgery in a significant portion of participants. The time since total laryngectomy ranged from 6 months to 25 years.

The studies were conducted across a variety of settings. Seven studies were completed in acute hospital settings, recruiting patients from national and international hospitals in countries such as Portugal, Greece, Brazil, Australia, Italy and the Netherlands. Three studies utilized retrospective medical records, including databases from the Danish Health Data Authority and hospital databases in Denmark, Sweden, and Brazil. One study relied on an international online questionnaire distributed by a medical device company to collect data from laryngectomy patients. National associations, such as Taiwan's Association of Laryngectomees, were used for participant recruitment in some studies (Table 2).

The review observed a variety of study designs that provide a comprehensive view of the VRQoL post-total laryngectomy. Wang et al. [24] and Wulff et al. [25] and Cocuzza et al. [26] employed cross-sectional studies to assess the current state and health-related quality of life among laryngectomy patients in Taiwan, the Nordic countries and in Italy, respectively. Ana Rodrigues et al. (2023) conducted a comprehensive cohort study over a 12-year period to evaluate long-term outcomes of different speech rehabilitation methods in Portugal [27]. Sluis et al. (2020) utilized a prospective multicenter cohort study design, tracking voice outcomes from pre-surgery up to one-year post-surgery across Australia and The Netherlands [28]. Raquel et al. (2020) in Brazil, Mesolella et al. (2023) in Italy, and Vlachtsis et al. (2021) in Greece also opted for cross-sectional observational studies to explore the correlation between various evaluation

Table 2 Main features and findings of papers included in the scoping review on voice-related quality of life in post-laryngectomy patients

Study	Aim	Participants	Time post Laryngectomy	Main Findings	Other QoL Findings	Additional Instruments/ Findings
Wang et al. 2023 (Taiwan) [24]	Compare voice-related quality of life (V-RQOL) between PA and ES speakers using the V-RQOL questionnaire	100 males and 4 females (79 PA, 25 ES)	0 to over 72 months	No significant difference between PA and ES; both reported lower quality of life compared to healthy controls. Challenges in communication, social interactions, and noisy environments were noted		
Rodrigues et al. 2023 (Portugal) [27]	Assess the impact of different speech rehabilitation methods on QoL	124 male patients post-laryngectomy	48 months	Esophageal speech was less effective than other methods. Longer follow-up correlated with better vocal function		
Wulff et al. 2021 (Denmark & Sweden) [25]	Investigate HRQoL post-laryngectomy, including voice and swallowing issues	147 male, 25 female patients post-laryngectomy	19.2 to 217.2 months	Lower HRQoL compared to normative data; significant voice and swallowing issues, with depression and anxiety also prevalent	Lower scores on EORTC QLQ-C30; 16% depression, 20% anxiety	EORTC QLQ-C30 scores correlated with comorbidities, voice problems, dysphagia
Raquel et al. 2020 (Brazil) [29]	Correlate QoL assessment tools in post-laryngectomy patients	36 male,2 female patients divided into speakers and non-speakers	27.6 months for one group and 14.5 months for another	Strong correlation between different QoL instruments. Any of the evaluated tools could effectively assess QoL, irrespective of esophageal voice development	Strong correlation with QLQ-C30 and QLQ-H&N35	FACT-H&N: Significant correlations with QoL outcomes
Mesolella et al. 2023 (Italy) [30]	Analyze the impact of phonatory function on QoL using the INFVo scale	77 males and 12 female total laryngectomees	24 to 36 months	No significant QoL differences among voice groups. The INFVo scale effectively classified psychoacoustic vocal characteristics		INFVo scale useful for analyzing psychoacoustic characteristics
Sluis et al. 2020 (Australia & Netherlands) [28]	Assess voice outcomes from pre- to post-laryngectomy over 12 months	33 male and 10 female participants	3 months, 6 months, and 12 months	Deterioration in voice quality post-surgery; most achieved successful tracheoesophageal speech. Patient's acceptance of condition despite poor voice quality	Significant deterioration in voice quality post-surgery (VHI); AVQI showed significant worsening	EQ-5D-5L indicated improvement over time

Table 2 (continued)

Study	Aim	Participants	Time post Laryngectomy	Main Findings	Other QoL Findings	Additional Instruments/ Findings
Vlachtsis et al. 2021 (Greece) [31]	Evaluate QoL in post-laryngectomy patients and correlate with demographic/clinical characteristics	50 male patients	6 to 300 months	QoL similar to other cancer patients but with more specific issues like voice and dyspnea. Better functional status in several areas compared to reference group	Comparable QoL to reference group, but voice senses and dyspnea were more problematic	
Souza et al. 2020 (Brazil) [32]	Describe QoL post-laryngectomy and factors associated with reduced QoL	86 male and 9 females patients	5 to 89 months	Higher QoL with tracheoesophageal prosthesis; absence of vocal emission linked to lower QoL		UW-QOL used to assess outcomes
Cocuzza et al. 2020 (Italy) [26]	Assess voice-related quality of life in post-laryngectomy patients with tracheoesophageal prosthesis (TEP) compared to esophageal voice (EV)	54 patients (47 male, 7 female)	9.55 to 12.85 years	TEP patients showed significantly better socio-emotional and functional outcomes in V-RQOL than EV group ($p = 0.01$). No significant difference in Voice Handicap Index scores ($p = 0.33$)	Patients with TEP prosthesis had better overall QoL scores, but frequent complications (e.g., leakage, granulomas) were linked to reduced device longevity and increased intervention needs	V-RQOL, VHI; TEP group further divided by prosthetic and fistula-related disorders with different QoL impacts
Longobardi et al. 2021 (Italy) [34]	Examine effects of pre-operative speech-language pathology (SLP) counseling on post-TL psychological well-being and voice adaptation	26 male, 1 female	0 to 3 months	Pre-operative SLP counseling reduced distress, anxiety, and depression levels, enhancing adaptation to TE speech ($p < 0.05$) in experimental group	Patients who received counseling showed significantly lower distress, post-traumatic stress, and better acceptance of new voice in daily life	IES-R, PDI, HADS, I-SECEL; counseling group displayed greater satisfaction with post-operative information and functional changes
Leemans et al. 2020 (Netherlands) [33]	Assess the impact of functional and participation issues on QoL post-laryngectomy	1361 males, 263 females	2 to 10 years	Younger patients (< 60 years) and those < 2 years post-TL reported more functional and social participation issues, leading to lower QoL scores	Pulmonary issues were highly prevalent and strongly correlated with other QoL impacts like social participation and daily activity limitations	Custom survey, assessing themes such as pulmonary, communication, esthetic issues; self-reported QoL scale (r-QoL)

Abbreviations: *QoL* Quality of Life, *V-RQOL* Voice-Related Quality of Life, *HRQoL* Health- Related Quality of Life, *PA* Pneumatic Artificial Laryngeal (PA), *ES* Esophagealspeakers, *INFVo* Impression Noise Fluency Voicing, *EORTC QLQ-C30 EORTC QLQ-H&N35,* The European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire, Core and Head and Neck module, *VHI* Voice Handicap Index, *AVQI* Acoustic Voice Quality Index, *FACT-H&N* Functional Assessment of Cancer Therapy – Head & Neck, *EQ-5D-5L EuroQol—5 Dimensions-5 Levels UW-QOL* Quality of Life Assessment Questionnaire from Washington University, *r-QoL* reported-quality of life,*TEP* tracheoesophagealprosthesis, *SLP* speech-language pathology) counseling, *IES-R* Impact of Event Scale– Revised, *PDI* Psychological Distress Inventory and Hospital, *HADS* Anxiety and Depression Scale instruments and the perceived quality of life post-laryngectomy [29–31]. Lastly, Souza et al. (2020) conducted an observational cross-sectional study to analyze factors influencing quality of life among Brazilian patients post-total laryngectomy [32]. Leemans et al. (2020) used a large-scale international online survey distributed by a medical device company to gather data from over 1,700 laryngectomy patients across nine countries, including the United States, France, and Germany. Longobardi et al. (2021) conducted a pilot randomized controlled trial in Italy to evaluate the effects of pre-operative speech-language pathology counseling on psychological well-being and adaptation to tracheoesophageal speech [33, 34].

Patients' characteristics

A total of 2.501 laryngectomized patients was included in the eight studies that were included in the review [24–34]. The sample sizes of the studies ranged from 38 to 1.705 participants. The ages of the participants across the studies ranged from 30 to 91 years (mean age is approximately 64.7 years). The gender distribution was heavily skewed towards males, with percentages ranging from 85.0% to 100.0% male participants in individual studies. Among the 2.501 participants in the review, there were 2,068 male and 333 female participants (88.7% male, 8.7% female). Notably, the highest representation of females in any study was 15%, reflecting the fact that Head and Neck Cancer is more frequent in men than in women, with an incidence ratio approximately equal to 3:1 [35], whereas two of the studies included only male subjects [27, 31].

The duration since total laryngectomy varies significantly across the studies, providing insights into both short-term and long-term post-surgical adaptations. Wang et al. (2023) segmented participants into four groups, ranging from 0 to over 72 months post-laryngectomy, allowing for a nuanced comparison of recovery phases [24]. Rodrigues et al. (2023) reported a follow-up time with an average of 48 months, illustrating mid-term adaptation to various speech rehabilitation techniques [27]. Wulff et al. (2021) included participants who had undergone laryngectomy between 19.2 to 217.2 months prior, highlighting long-term quality of life issues [25]. Sluis et al. (2020) conducted assessments at multiple post-surgery intervals—pre-surgery, 3 months, 6 months, and 12 months to capture the evolving outcomes over the first year [28]. Raquel et al. (2020) noted a mean post-surgery period of 27.6 months for one group and 14.5 months for another, focusing on the development of esophageal speech [29]. Mesolella et al. (2023) examined patients within a 24 to 36-month postoperative window, evaluating voice quality and psychoacoustic parameters [30]. Vlachtsis et al. (2021) had a broad range, with participants 6 to 300 months post-surgery, providing a comprehensive view of long-standing issues [31]. Souza et al. (2020) studied patients with a mean time of 47.5 months post-laryngectomy, assessing long-term quality of life factors [32].

Leemans et al. (2020) included participants at varying durations post-laryngectomy, with a median of 5 years (60 months) and a range extending beyond 10 years, providing a comprehensive view of long-term adaptations across nine countries [33]. Longobardi et al. (2021) examined patients within a short-term postoperative window, conducting assessments up to 3 months after surgery to evaluate the impact of pre-operative counseling on adaptation to tracheoesophageal speech [34]. Cocuzza et al. (2020) reported a mean follow-up of 11.2 years (134 months), offering insights into very long-term outcomes and quality of life comparisons between tracheoesophageal and esophageal speech users [26].

Instruments used for assessing the VRQoL

The studies utilized various validated instruments to assess Voice-Related Quality of Life (VRQoL) in patients who had undergone total laryngectomy (Table 2). Commonly used tools included the Voice-Related Quality of Life (V-RQOL) questionnaire [24, 29, 30] which specifically measures the impact of voice disorders on a patient's quality of life. Other instruments employed were the Self-Evaluation of Communication Experiences After Laryngectomy (SECEL) questionnaire, designed to evaluate communication dysfunction in laryngectomized patients [27, 30] and the Voice Handicap Index (VHI) [29], which assesses the psychological and social effects of voice problems. In one study, voice quality was meticulously measured using tools like the Acoustic Voice Quality Index (AVQI), Voice Handicap Index 10 (VHI-10), and the EuroQol 5-Dimension 5-level (EQ-5D-5L), a patient-reported measure of health-related quality of life [28]. University of Washington Quality of Life Questionnaire (UW-QOL) a self-reported assessment of QoL for head and neck cancer patients was used in two studies to evaluate the quality of life of post total laryngectomy patients [29, 32]. Some studies incorporated broader health-related quality of life measures such as the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core (EORTC QLQ-C30) and its Head and Neck module (EORTC QLQ-H&N35) [28] and the M.D. Anderson Dysphagia Inventory (MDADI) [25, 29].

Leemans et al. (2020) utilized a custom survey distributed internationally to assess long-term functional outcomes, including social participation, pulmonary health, and communication challenges. The survey also included tailored questions about the use and effectiveness of voice prostheses. Longobardi et al. (2021) employed the Italian version of the Self-Evaluation of Communication Experiences After Laryngeal Cancer (I-SECEL) to measure voice adaptation and psychological distress post-surgery, alongside other tools such as the Impact of Event Scale-Revised (IES-R), Psychological Distress Inventory (PDI), and Hospital Anxiety and Depression Scale (HADS). Cocuzza et al. (2020) used the V-RQOL and the Voice Handicap Index (VHI) to compare the functional and socio-emotional impacts of tracheoesophageal and esophageal speech on quality of life [33, 34].

VRQoL in patients with total larygectomy

In general, the studies indicate that total laryngectomy significantly impacts the Voice-Related Quality of Life (VRQoL) of patients. Despite the varied rehabilitation methods used, including pneumatic artificial laryngeal speech, esophageal speech (ES), tracheoesophageal speech (TES), and electronic larynx (EL), all patients experienced notable challenges in their VRQoL.

Common issues affecting VRQoL included difficulties with communication in noisy environments, anxiety about being understood, and physical challenges related to voice production. These issues were reflected in lower scores on validated assessment tools such as the Voice-Related Quality of Life (V-RQOL) questionnaire, the Self-Evaluation of Communication Experiences After Laryngectomy (SECEL), and the Voice Handicap Index (VHI). Patients reported a decline in socio-emotional functioning and faced significant challenges in physical activities requiring voice use, such as speaking loudly, using the telephone, and performing job duties [24, 25].

Wang et al. [24] assessed the voice-related performance of pneumatic artificial laryngeal (PA) and esophageal (ES) speakers using the V-RQOL questionnaire. Both PA and ES participants reported moderate difficulties with communication, which led to avoidance of social interactions and feelings of frustration and isolation. Compared to healthy laryngeal speakers (LA), PA and ES speakers had lower scores in the social-emotional domain, indicating a greater impact on their quality of life.

Rodrigues et al. (2023) highlighted the impact of voice loss on emotional well-being, noting that patients with TES showed improvements over time in physical functioning and VRQoL. Time was a significant factor in predicting VRQoL, with patients reporting an ability to adapt and cope in the long term [27, 28].

Leemans et al. (2020) revealed that patients frequently experienced limitations in social participation and daily activities due to persistent voice-related difficulties, particularly in environments requiring consistent or loud communication. These findings emphasize the long-term impact of laryngectomy on social and professional aspects of life. Longobardi et al. (2021) highlighted that pre-operative speech-language pathology counseling reduced emotional distress and facilitated better adaptation to tracheoesophageal speech (TES), underscoring the role of psychological preparation in improving post-surgical QoL. Cocuzza et al. (2020) found that patients using TES had significantly better socio-emotional and functional outcomes than those using ES, though complications related to prosthetic maintenance occasionally impacted their VRQoL [33, 34].

Patients with tracheoesophageal prosthesis (TES) consistently reported a better quality of life compared to those using an electrolarynx or esophageal voice, while the absence of vocal emission was strongly associated with lower VRQoL scores [32].

Other social and physical challenges

Some studies also highlighted broader challenges not directly related to VRQoL, such as difficulties with social eating and maintaining social contact, which affected patients' quality of life post-surgery. Wulff et al. (2021) noted that these issues were prevalent, particularly in the long-term [25]. Mesolella et al. (2023) also discussed the social isolation many patients face due to voice loss, emphasizing the need for post-operative care that addresses these social challenges [30]. Leemans et al. (2020) identified significant long-term challenges in social participation and daily activities, with many patients reporting dependence on caregivers and limited engagement in social settings due to persistent functional limitations [33]. Longobardi et al. (2021) noted that inadequate pre-operative counseling could exacerbate these challenges by leaving patients unprepared for the psychological and social impact of the surgery, emphasizing the importance of tailored interventions to mitigate social isolation [34]. Cocuzza et al. (2020) also highlighted the socio-emotional burden faced by patients with esophageal speech, who reported more social withdrawal compared to tracheoesophageal speech users [26].

Key outcomes of the studies

The findings consistently show that patients using tracheoesophageal speech (TES) reported better outcomes in terms of Voice-Related Quality of Life (VRQoL) compared to those using esophageal speech (ES) or an electrolarynx (EL). Souza et al. (2020) found that TES users experienced fewer communication difficulties and had higher VRQoL scores than patients using other rehabilitation methods [32].

Longobardi et al. (2021) emphasized that pre-operative counseling significantly improved adaptation to TES, which positively impacted VRQoL and reduced emotional distress in the early postoperative period [34].

Wang et al. (2023) found no significant differences in the quality of life between different speech rehabilitation methods, yet noted that all patients reported worse outcomes compared to healthy controls [24]. Similarly, Rodrigues et al. (2023) observed that TES patients reported improvements in both physical and emotional functioning over time [28].

The absence of a laryngeal voice (i.e., reliance on nonlaryngeal speech methods) was significantly associated with lower VRQoL scores, particularly in the social-emotional domains [32].

Discussion

This scoping review paper has investigated the current landscape of voice-related Quality of Life (VrQoL) following total laryngectomy. The results from the included studies demonstrate that despite advances in surgical and rehabilitation techniques, patients post-laryngectomy continue to experience substantial challenges in voice-related QoL. These findings are consistent with previous evidence. Giordano et al. (2011), found that physical limitations on activities, social functioning and the influence of emotional problems on activities at work were significantly better in healthy controls than in patients who had previously undergone a total laryngectomy and their voice rehabilitation was obtained with a voice prosthesis device [36]. In the research of Deshpande et al., (2008) 30.0% of the patients reported trouble speaking loudly or being heard in noisy situations highlighting the challenges faced by patients in everyday communication and their impact on social interactions and overall QoL [37]. Leemans et al. (2020) identified substantial long-term challenges in social participation, particularly in environments requiring consistent or loud communication for patients with TL [33].

In the study conducted by Sluis et al., (2020) the results indicated that despite the physical challenges and significant deterioration in voice quality post-surgery, patient-reported outcomes demonstrated an acceptance of their condition and an adaptation to life post-surgery [28]. This adaptation might suggest an underlying resilience and adjustment on a social and emotional level, as participants reported a sense of coping effectively over the long term. The study also noted that while acoustic voice quality remained abnormal at all post-surgery timepoints, the improvement in patient-reported quality of life scores towards normative values by 12 months post-surgery could reflect a positive adjustment in their social and emotional lives. These findings imply that patients may experience a shift in how they perceive and value their social interactions and emotional well-being, gradually adapting to the new normal after their surgical procedures. The wide range of time since total laryngectomy, spanning from 6 months to 25 years, highlights the varied stages of post-surgical adaptation among participants. Patients who are in the earlier stages of recovery may experience more acute challenges with voice rehabilitation, emotional adjustment, and social reintegration. Conversely, those further out from surgery may have had more time to adapt to their new communication methods, potentially achieving greater stability in their quality of life.

These improvements in social and emotional functions underscore the resilience and adaptability of individuals facing profound life changes associated with total laryngectomy is also reported in the research of Vlachtsis et al. [31]. The results indicated improved functional status in the social and emotional domains compared to the reference group of cancer patients, suggesting that despite the severity of their physical condition, patients who underwent total laryngectomy managed to maintain relatively higher social engagement and emotional well-being. The study highlights the critical importance of social support and psychological care in enhancing the quality of life for patients post-laryngectomy, pointing to the need for comprehensive care strategies that address not only the physical but also the emotional and social challenges faced by these individuals.

This is in good agreement with the findings highlighted that a substantial percentage of participants reported an improved perception of their quality of life compared to the period before their diagnosis and the absence of vocal emission was the only variable associated with a lower quality of life in the research of Souza et al. [32]. Specifically, 38.9% of patients felt much better about their health-related quality of life at the time of the survey compared to just before their cancer diagnosis, suggesting a positive shift in their social and emotional well-being. The overall quality of life, considering factors like personal well-being, was rated as good to excellent by 83.2% of the patients. This indicates a notable resilience and adaptation to their new life circumstances, despite the profound changes brought about by total laryngectomy. Such insights underscore the complex interplay between physical health and social-emotional recovery in cancer survivors.

This review suggests that tracheoesophageal speech (TES) may lead to better socio-emotional and functional outcomes compared to esophageal speech (ES), indicating a potential preference in rehabilitation choices. Studies such as Rodrigues et al. (2023) and Souza et al. (2020) reported higher satisfaction with TES, as it appears to be more effective in addressing patients' communicative needs, whereas ES users tended to experience more challenges in communication and a lower overall quality of life [27, 32]. These findings point to the potential limitations of ES as a rehabilitation option and suggest that TES might provide advantages in terms of social interaction and emotional well-being. The study of Leemans et al. (2020) highlighted that TES users generally reported better outcomes than those relying on alternative methods of voice rehabilitation, underscoring the long-term advantages of voice prostheses for maintaining social integration [33]. Cocuzza et al. (2020) research reported that patients with TES consistently reported higher socio-emotional and functional VRQoL scores compared to ES users [26].

However, as Sparks et al. (2023) point out, while tracheoesophageal voice is considered the optimal modality for surgical voice restoration, there is limited clinical evidence regarding the effectiveness of therapeutic interventions to improve the perceptual quality of tracheoesophageal voice. This highlights the need for further research and the development of more robust TE voice therapy interventions [38]. Longobardi et al. (2021) highlighted that pre-operative counseling played a critical role in preparing patients for these challenges, reducing emotional distress, and improving adaptation to TES post-surgery [34]. This emphasizes the need for a holistic approach to care, incorporating psychological support alongside physical rehabilitation.

This scoping review has synthesized evidence from multiple studies, identifying a variety of factors associated with diminished quality of life following total laryngectomy. These studies underscore the complex relationships between physical, emotional, social, and economic factors that contribute to QoL outcomes. Key predictors identified include dyspnea, voice and sensory issues, financial difficulties, the type and effectiveness of vocal rehabilitation, the extent of social and emotional impacts, and patient demographics such as age and gender [24–34]. Studies such as those by Souza et al., (2020) and Wang et al., (2023) emphasize the critical role of vocal emission and the type of speech rehabilitation in influencing patient outcomes [24, 32]. The ability to communicate effectively post-surgery is crucial, with various forms of speech rehabilitation showing differing impacts on quality of life [24, 27]. Furthermore, the length of time since surgery and the patient's adaptation process are repeatedly highlighted as significant, with longer adjustment periods generally associated with improved quality of life metrics [28, 31, 32]. The economic strain was also identified as a critical factor contributing to a lower quality of life [28, 33].

One of the limitations of this review is the wide range of time since total laryngectomy among the participants, spanning from 6 months to 25 years. This large time interval introduces variability in the stages of post-surgical adaptation, making it difficult to compare the data consistently across studies. Patients in the early stages of recovery may face more acute challenges, such as adjusting to new communication methods and managing post-surgical symptoms, while those further out from surgery may have adapted better but could experience new, long-term complications such as prosthesis failure or psychological distress. This variability means that outcomes can differ substantially depending on when the patient underwent surgery, making it challenging to generalize results. Future research could benefit from stratifying patients based on the time since surgery to provide a clearer understanding of how long-term and short-term recovery processes impact quality of life and rehabilitation outcomes. Another potential limitation of the studies included in this review is the possibility of survivor bias. Many studies may primarily include patients who have successfully adapted to post-laryngectomy life, potentially excluding those who experienced more significant difficulties with speech rehabilitation or poorer post-surgical outcomes. This could skew the data toward more favorable results, overestimating the adaptability or resilience of the broader laryngectomy patient population.

The studies included in this review showed a predominant male participation. While head and neck cancer have a well-documented male-to-female incidence ratio of approximately 3:1 [35], the studies in this review demonstrate an even greater skew towards male participants, with some studies reporting as few as 15% female participants. This may be explained by a number of factors. Recruitment bias may have played a role, as men may have been more likely to access care in the specific hospitals or settings where the studies were conducted. The distribution of lifestyle-related risk factors, such as smoking and alcohol use [39, 40] may be more heavily weighted toward men in certain populations, contributing to a higher proportion of male patients. Gender-based biases in medical decision-making may have influenced the inclusion of women, as women with laryngeal cancer might face delays in diagnosis or less aggressive treatment recommendations compared to men [41] Social stigma and societal expectations could discourage women from participating in such studies or seeking care. Women might feel more stigmatized by the loss of their voice and the physical changes caused by total laryngectomy, as these violate social norms about femininity, appearance, and communication [41–43]. The majority of the studies have not provided a detailed analysis or comparison between male and female subjects, potentially due to the disproportionately small number of female participants. This demographic imbalance likely precludes performing detailed statistical analyses aimed at comparing outcomes between genders. However, an exception is found in the study by Souza et al. (2020), that highlighted gender-specific outcomes, revealing that female subjects reported significantly lower mood scores compared to their male counterparts [29]. This finding underscores the importance of considering gender differences in future studies to tailor more effective post-operative interventions and support mechanisms.

Another limitation of the studies included in this review is that not all of the assessment tools used to measure outcomes such as quality of life and voice-related impairments were validated specifically for laryngectomy patients. While these tools are widely used in head and neck cancer research, their applicability to the unique challenges faced by individuals who have undergone total laryngectomy may be limited. This could affect the accuracy or sensitivity of the findings, as the tools may not fully capture the specific issues relevant to this cohort. Instruments such as the Voice Handicap Index (VHI), though commonly used, may not fully capture the experience of laryngectomy patients, as it was originally designed for natural voice users and may lack sensitivity to the specific challenges faced by those using alternative speech methods. This could affect the accuracy or sensitivity of the findings, as the tools may not fully capture the specific issues relevant to this cohort. To facilitate better comparison of results across studies, there is a need to advocate for the use of standardized and validated assessment instruments tailored to laryngectomy patients. Unified tools would ensure consistency in data collection and allow for more reliable comparisons of patient outcomes in future research.

The importance of this work lies in the inclusion of studies from various international contexts, offering a broad perspective on the issues faced by laryngectomized patients globally. However, this research also encounters limitations inherent to the studies it comprises. The variability in assessment tools across studies does not allow a complete comparison of the findings and highlights the importance of using more consistent measurement tools in future research to allow for more direct comparisons of outcomes. Despite these limitations the insights gleaned from this review have significant implications for clinical practice. They emphasize the necessity for a patient-centered approach in selecting voice rehabilitation methods. Clinicians should give detailed information on all voice rehabilitation choices, making sure patients understand how these choices might affect their quality of life. In addition, this approach should consider not just the physical outcomes but also the patient's preferences and emotional needs. In reviewing the studies, no significant geographical differences in outcomes were noted. However, it is worth considering that differences in healthcare systems, access to rehabilitation services, and cultural factors may affect how patients experience and respond to rehabilitation across different regions. Future research could explore these aspects in more detail.

Further work needs to be done to follow patients over extended periods to better understand the long-term outcomes of different rehabilitation methods and their lasting effects on quality of life. Long-term follow-up would provide valuable insights into how VRQoL evolves at different stages of recovery and adaptation, helping clinicians tailor interventions more effectively as patients' needs change throughout their recovery. On a wider level, research focusing on the development and validation of unified, sensitive instruments for assessing voice-related QoL could enhance the comparability of future studies.

In conclusion, this scoping review provides valuable insights into the voice-related QoL of patients' post-total laryngectomy, highlighting the critical role of tailored rehabilitation strategies. While it is crucial to support patients during the acute phase of treatment, the real challenge often begins afterwards, as they strive to reclaim their lives. Therefore, it is essential to closely monitor patients' long-term quality of life and provide support to help them achieve the best possible outcomes. Clinicians can support this by regularly assessing voice-related QoL using validated tools, offering individualized rehabilitation plans, and involving multidisciplinary teams (including speech therapists, psychologists, and social workers) to address both physical and emotional challenges that arise throughout recovery. The use and further validation of existing assessment tools, are vital in ensuring accurate evaluation of patient progress and in guiding the development of more effective rehabilitation strategies.

To implement these recommendations in clinical clinicians should administer validated tools, such as the Voice Handicap Index (VHI) or Voice-Related Quality of Life (V-RQOL), at key milestones (e.g., 3, 6, and 12 months post-surgery) to adjust rehabilitation plans based on patient progress. Early intervention addressing both physical and emotional needs, with support from a multidisciplinary team (speech therapists, psychologists, social workers), is essential. Integrating patient preferences into the rehabilitation process can also improve adherence and satisfaction.

Authors' contributions

Conceptualization: Tatiana Pourliaka, Vassiliki Siafaka; Methodology: Tatiana Pourliaka, Vassiliki Siafaka; Data collection: Tatiana Pourliaka; Writing - original draft preparation: Tatiana Pourliaka, Vassiliki Siafaka; Writing - review and editing: Tatiana Pourliaka, Efcharis Panagopoulou, Vassiliki Siafaka; All authors read and approved the final manuscript.

Funding
This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
The ethical permission is in accordance with the 1964 Declaration of Helsinki. All methods were carried out in accordance with relevant guidelines and regulations. This study did not require approval from an Ethics Committee as it did not involve human participants.

Competing interests
The authors declare no competing interests.

Received: 31 August 2024 Accepted: 8 January 2025

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