

RESEARCH

Open Access



Validation of the health-related quality of life instrument with 8 items for assessing health-related quality of life in patients with oropharyngeal cancer: a comparison with the EQ-5D-5L

Gyeong-U Hong¹ , Bon Seok Koo², Min-Ju Kim¹ , Woo-Jeong Sim¹ , Ah-Yeon Lee¹ , Ji-Eun An³ , Su-Yeon Yu³ , Sei Young Lee^{4*†} and Soo Hyun Lee^{1*†}

Abstract

Background To overcome the limitations of existing health-related quality of life (HRQoL) instruments, the HRQoL Instrument with 8 Items (HINT-8) was developed for the Korean population. We aimed to evaluate the validity, interrater reliability, and agreement of the HINT-8 compared to the EQ-5D-5 L among patients with oropharyngeal cancer (OPC).

Methods A total of 327 patients with OPC aged ≥ 19 years who received treatment at 14 hospitals in South Korea were recruited between August 2023 and February 2024. HRQoL was assessed using the two instruments. The psychometric evaluation included analyses of validity (convergent and known-group validity), agreement (intraclass correlation coefficient and Bland–Altman analysis), and reliability (internal consistency measured by Cronbach's alpha). The ceiling effects and score distributions were also examined.

Results In total, 299 respondents were included in the final analysis. Both instruments demonstrated high internal consistency (HINT-8: $\alpha = 0.872$; EQ-5D-5 L: $\alpha = 0.845$) and good agreement (intraclass correlation coefficient [ICC] = 0.80; 95% confidence interval [CI]: 0.76–0.84). The convergent validity was supported by strong correlations between the HINT-8 index and both the EQ-5D-5 L index ($r = 0.805$) and EQ VAS ($r = 0.715$). The ceiling effect of HINT-8 (12.7%) was substantially lower than the EQ-5D-5 L (32.8%).

[†]Sei Young Lee and Soo Hyun Lee contributed equally to this manuscript as co-corresponding authors.

*Correspondence:

Sei Young Lee
syleemd@cau.ac.kr

Soo Hyun Lee
lsh5027@kongju.ac.kr

Full list of author information is available at the end of the article



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

Conclusions The HINT-8 is a valid, reliable, and responsive instrument for measuring HRQoL in patients with oropharyngeal cancer. These findings suggest that HINT-8 can serve as a valuable complementary instrument to the EQ-5D-5 L.

Keywords Health-Related quality of life, EQ-5D-5L, HINT-8, Oropharyngeal cancer, Validation

Background

Oropharyngeal cancer (OPC) is a type of head and neck cancer (HNC) that begins in the tissues of the oropharynx [1]. Advances in OPC treatment have significantly improved survival rates. However, this cancer profoundly impacts on the quality of life (QoL) of survivors because it impairs essential functions such as swallowing, chewing, salivation, and speech [2]. After OPC treatment, issues related to residual tumors remain, and long-term survivors face challenges in health-related QoL (HRQoL) due to treatment sequelae [3]. Consequently, the QoL of patients with OPC has become an important aspect in clinical decision-making [4, 5]. QoL is a multidimensional concept and is an important focus for research and practice in health and medicine [6]. HRQoL dimensions capture information about an individual's physical, mental, and social health status, as well as overall health [7, 8].

HRQoL instruments are categorized into generic and disease-specific types [9]. Disease-specific instruments, such as the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) and its HNC module (EORTC H&N-35), provide detailed assessments for specific diseases, including OPC [10–12]. However, the combined length of these questionnaires (65 items) can be time-consuming and burdensome, particularly for patients experiencing health challenges during or after treatment [13]. In contrast, generic instruments such as EQ-5D-5 L provide a broad assessment of overall health that is applicable across diverse populations and health conditions [14]. One key advantage of the EQ-5D-5 L is its ability to generate health utility values, which are essential for calculating quality-adjusted life years (QALYs) in health economic evaluations and conducting cost-utility analyses [15, 16].

The EQ-5D-5 L is a short, generic questionnaire introduced by the EuroQol Group in 2009 to improve sensitivity and reduce ceiling effects in the EQ-5D-3 L [17]. The questionnaire has been validated in several cancers, including HNC [18], and shows strong comparability with disease-specific tools such as the EORTC QLQ-C30 [13]. A Korean study further reported moderate correlations between the EQ-5D-5 L and EORTC QLQ-C30, supporting its use as a valid generic measure for assessing HRQoL in patients with OPC [19]. Furthermore, the EQ-5D-5 L is applicable and reliable within the Korean context [20], and can be effectively used to assess the QoL of patients with cancer [21].

However, as the EQ-5D-5 L is a Europe-based generic instrument, it has limitations in fully reflecting the cultural characteristics and linguistic nuances of Korea, and has been criticized for its high ceiling effect [22]. These limitations highlight the need for culturally tailored tools that provide more accurate and sensitive HRQoL assessments.

To address these challenges, an HRQoL Instrument with Eight Items (HINT-8) was developed as a concise yet comprehensive, culturally specific instrument for the Korean population [23]. Although several HRQoL instruments have been introduced in Korea, many were either intended for specific patient groups or contained too many items, limiting their practicality for use in large-scale national surveys such as the Korea National Health and Nutrition Examination Survey (KNHANES). The HINT-8 addresses this gap and, like the EQ-5D-5 L, provides health-utility values derived from a valuation study conducted in a nationally representative sample of the Korean general population [24].

The HINT-8 has been used to assess HRQoL in a nationally representative population and has demonstrated construct validity, internal consistency, and measurement invariance [25]. In addition, it has shown good test-retest reliability, convergent validity, and discriminant validity for patients with breast cancer [26], patients with diabetes [27], and elderly individuals [28].

Despite the clinical importance of HRQoL assessment in patients with OPC, the application of HRQoL instruments in this population in Korea remains under-explored. Patients with OPC often experience persistent functional difficulties and psychosocial challenges, including speech difficulties, dysphagia, anxiety, and body image concerns, which may not be fully captured by conventional generic instruments [29]. The HINT-8, with its inclusion of items addressing psychosocial and emotional domains such as fatigue, depression, anxiety, and happiness, may be better suited to detect these health concerns in Korean OPC patients. Supporting this, a study evaluating oral health promotion and treatment impact on HRQoL revealed statistically significant associations using HINT-8, whereas no significant results were observed with EQ-5D [30]. Given its reduced ceiling effects, the HINT-8 may offer potential advantages over the EQ-5D-5 L in capturing subtle yet meaningful differences in health status [26–28]. Accordingly, we aimed to assess the validity, reliability, and agreement of

the HINT-8 compared to the EQ-5D-5 L in patients with OPC.

Methods

Study population and survey methods

We recruited patients with OPC aged ≥ 19 who received treatment at 14 hospitals in South Korea between August 2023 and February 2024. All participants visited the hospital as outpatients and were undergoing treatment or had completed treatment at the time of the survey. The Institutional Review Board (IRB) of the Kongju National University, as well as IRBs of the 14 participating hospitals [see Additional file 1] approved this study (KNU_IRB_2023-49).

Patient surveys were conducted after providing prior explanations and guidelines for the medical staff. Only participants who completed both instruments in full were included in the analysis; those with incomplete responses to either instrument were excluded [see Additional file 2].

The survey collected (a) demographic characteristics (sex, age, education level, marital status, income, household members, employment status, and religion); (b) clinical characteristics (duration since diagnosis, duration since treatment, disease status, American Joint Committee on Cancer [AJCC] stage, recurrence, outcome status, and human papillomavirus [HPV] status); and (c) HRQoL measured using the EQ-5D-5 L and HINT-8 instruments.

In terms of clinical characteristics, disease status was classified into two categories. Patients who were undergoing treatment or had completed treatment within 6 months prior to survey participation were categorized as being in the treatment phase, while those who had completed treatment more than 6 months prior were considered to be in the follow-up or survivorship phase. Outcome status was defined as follows: no evidence of disease (NED) refers to the absence of any clinically or radiologically detectable signs of OPC at the time of the survey, whereas alive with disease (AWD) indicates that the patient was living with persistent or recurrent OPC at the time of assessment.

HRQoL instruments

The EQ-5D-5 L is a generic, preference-based questionnaire consisting of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression [17], assessed on five levels of severity: no problems, slight problems, moderate problems, severe problems, and extreme problems. Additionally, the EQ-5D-5 L includes a visual analog scale (EQ VAS), which allows patients to rate their overall health on a scale of 0 (worst) to 100 (best). The South Korean EQ-5D-5 L utility value set was developed using the composite time trade-off (cTTO) approach. The utility index is calculated based

on this valuation set and ranges from -0.066 (worst) to 1 (best), with higher values indicating better health [31].

The HINT-8 is a culturally tailored instrument developed for the Korean population [23], comprising eight dimensions: climbing stairs, pain, vitality, work, depression, memory, sleep, and happiness, rated on four levels of severity: no problems, mild, moderate, and severe. The HINT-8 utility index ranges from 0.132 (worst) to 1 (best). A value closer to 1 indicates a better health status, whereas a lower value signifies a poorer health status [24]. In the valuation study, Korean adults evaluated health states using both the visual analogue scale (VAS) and the standard gamble (SG) methods [24]. Detailed information on the model specification, validity evaluation, and utility scoring algorithm is provided [see Additional file 3].

Statistical analysis

Descriptive statistics were used to summarize the demographic and clinical characteristics of respondents. Continuous variables were converted into categorical variables, and all variables are presented as frequencies and percentages. To assess potential non-response bias, we compared characteristics between completers and non-completers using Fisher's exact test.

The EQ-5D-5 L response distribution was calculated for each level of the HINT-8 items, and kernel density estimation was applied to compare the distribution of the indices between the two instruments. To assess the ceiling effect, we calculated the proportion of respondents who reported the best possible health state (1.00) on both the HINT-8 and EQ-5D-5 L indices.

Bland–Altman plots were used to assess the agreement between at the utility score level the two instruments [32]. This plot visualizes agreement and highlights any bias (mean difference) between the two methods, including 95% limits of agreement, to indicate the expected range of differences [32]. The intraclass correlation coefficient (ICC) was calculated at the utility score level to evaluate inter-instrument reliability between the utility scores derived from the HINT-8 and the EQ-5D-5 L [33], with 95% confidence intervals (95% CIs) derived using a two-way mixed effects model based on single measures and absolute agreement [33]. The ICC values were interpreted as follows: $ICC < 0.50$, poor agreement; $0.50 < ICC < 0.75$, moderate agreement; $0.75 < ICC < 0.90$, good agreement; and $ICC > 0.90$, excellent agreement.

Cronbach's alpha coefficients were utilized to assess the internal consistency reliability; for items within each dimension, a value > 0.7 was acceptable [34].

To assess convergent validity, the correlations between each dimension and the index values of the HINT-8, EQ-5D-5 L, and EQ VAS were analyzed using Spearman's rank coefficients (Spearman's rho). We hypothesized

that the correlation coefficients between similar dimensions would be higher than those between dissimilar dimensions. The interpretation of Spearman's rho (r_s) followed a commonly used rule of thumb: $0 < r_s \leq 0.20$, negligible; $0.21 \leq r_s \leq 0.40$, weak; $0.41 \leq r_s \leq 0.60$, moderate; $0.61 \leq r_s \leq 0.80$, strong; and $0.81 \leq r_s \leq 1.00$, very strong correlation [35].

Known-group validity was evaluated by analyzing differences in the HINT-8 and EQ-5D-5 L indices across predefined clinical subgroups, selected based on prior evidence of their associations with HRQoL in cancer populations using the Mann–Whitney U test for comparisons between two groups and the Kruskal–Wallis test for three or more groups. We hypothesized that individuals with more severe clinical characteristics such as a shorter duration since treatment [36], advanced-stage disease [37], recurrence [38], HPV-negative status [39], or being alive with disease (AWD) would report significantly lower HRQoL index compared to their counterparts. Evidence of known-group validity was considered acceptable when statistically significant differences in HRQoL scores were observed in the expected direction.

All statistical analyses were conducted using R software, version 4.4.1 (R Foundation for Statistical Computing, Vienna, Austria).

Results

Characteristics of participants

A total of 299 respondents who completed both the HINT-8 and the EQ-5D-5 L were included (Table 1). The mean age was 63.6 years, with 58.2% of participants aged ≤ 65 . Most of the respondents were male (84.3%), married (71.9%), and lived in two-person households (80.3%).

In terms of socioeconomic characteristics, 43.1% had a college degree or higher and 24.7% had a monthly household income below 2 million KRW (USD \$1,439.86). More than half (52.8%) of respondents were employed or self-employed during the survey.

In total, 77.6% of participants had been diagnosed with cancer within the past 60 months and 33.1% had received treatment within the past 12 months; 74.2% of the patients were in the follow-up or survivorship phase. In addition, 82.3% had no history of recurrence, and 77.6% showed NED. HPV positivity was observed in 69.6% of respondents. Participants who completed both instruments ($n = 299$) and those with missing responses ($n = 28$) showed significant differences in household members, religion, duration since diagnosis, duration since treatment, disease status, AJCC stage, outcome status, and HPV status [see Additional file 4].

Known-groups validity

Both instruments showed significant differences in HRQoL indices based on key variables, including sex, educational level, employment status, duration since treatment, and disease status (Table 1). Duration since diagnosis, outcome status, and HPV status showed significant differences only in HINT-8. Both the HINT-8 and EQ-5D-5 L indices were significantly lower in patients whose duration since treatment was ≤ 12 months compared to those with > 12 months (HINT-8: 0.80 vs. 0.85, $p < 0.001$; EQ-5D-5 L: 0.82 vs. 0.88, $p < 0.001$). In terms of outcome status, Patients with NED reported significantly higher HRQoL compared to those AWD in the HINT-8 index (0.84 vs. 0.80, $p = 0.01$), while the EQ-5D-5 L index showed a similar trend that did not reach statistical significance (0.86 vs. 0.82, $p = 0.13$). The HINT-8 detected a statistically significant difference by HPV status, with HPV-positive individuals reporting higher HRQoL than HPV-negative individuals (0.83 vs. 0.81, $p = 0.04$).

Distribution and correlation of HRQoL indices

The frequency distributions of the HINT-8 index, EQ-5D-5 L index, and EQ VAS were visualized using kernel density functions (Fig. 1a–c), along with the correlation between the HINT-8 and EQ-5D-5 L (Fig. 1d). Kernel density estimation was used to visualize score distributions. The distributions of all indices were right-skewed, with the highest ceiling effect observed for the EQ-5D-5 L. The correlation was concentrated in the upper-right quadrant.

The distributions of the HINT-8 and EQ-5D-5 L indices are shown in Table 2. The Cronbach's alpha results showed high internal consistency values of 0.87 (95%CI: 0.85–0.89) for HINT-8 and 0.84 (95%CI: 0.82–0.87) for EQ-5D-5 L. The ceiling effect was higher in the EQ-5D-5 L (32.8%) than in the HINT-8 (12.7%). When the HINT-8 index reached 1.00, the mean $\pm$ standard deviation EQ-5D-5 L index was also high at 0.99 ± 0.04 , and the mean EQ VAS score was similarly elevated at 92.84 ± 6.06 . When the EQ-5D-5 L index was 1.00, the mean HINT-8 index was 0.93 ± 0.06 , and the mean EQ VAS score was 87.56 ± 9.67 . The mean difference between the HINT-8 and EQ-5D-5 L indices was significantly different at 0.03 ($p < 0.001$).

HINT-8 and EQ-5D-5L agreement

Bland–Altman plots were used to assess agreement between the health utility index derived from the HINT-8 and the EQ-5D-5 L (Fig. 2). The two instruments demonstrated a similar trend 94.6% of the indices fell within the 95% limit of agreement (-0.14 to 0.19). The ICC analysis result was 0.80 (95% CI: 0.76–0.84, $p < 0.001$), indicating good agreement between the two measures. Our results

Table 1 Comparison of HINT-8 and EQ-5D-5 L indices by demographic and clinical characteristics

Characteristics		N (%)	HINT-8 index			EQ-5D-5 L index		
			M	SD	p	M	SD	p
Sex	Male	252 (84.3)	0.84	0.12	0.00	0.86	0.14	0.01
	Female	47 (15.7)	0.79	0.12		0.80	0.16	
Age (years)	≤ 65	174 (58.2)	0.83	0.11	0.73	0.86	0.13	0.88
	> 65	125 (41.8)	0.82	0.14		0.84	0.17	
Marital status ^a	Married	215 (71.9)	0.83	0.12	0.33	0.86	0.15	0.83
	Not Married	82 (27.4)	0.82	0.11		0.85	0.14	
Household member ^a	1	56 (18.7)	0.82	0.12	0.97	0.86	0.14	0.65
	> 2	240 (80.3)	0.83	0.12		0.85	0.15	
Education level ^a	Less than middle school	57 (19.1)	0.77	0.13	0.00	0.79	0.16	0.00
	High school	112 (37.5)	0.84	0.12		0.87	0.14	
	College or more	129 (43.1)	0.84	0.11		0.87	0.14	
Monthly household income ^a (Million KRW)	< 2	74 (24.7)	0.79	0.14	0.11	0.82	0.17	0.31
	2 ~ 5	116 (38.8)	0.83	0.12		0.85	0.15	
	5 ~ 7	37 (12.4)	0.86	0.09		0.89	0.08	
	> 7	67 (22.4)	0.84	0.10		0.87	0.13	
Employment status ^a	Employed	158 (52.8)	0.86	0.10	0.00	0.89	0.11	0.00
	Unemployed	140 (46.8)	0.79	0.13		0.81	0.17	
Religion ^a	Yes	173 (57.9)	0.82	0.11	0.44	0.86	0.14	0.67
	No	124 (41.5)	0.83	0.13		0.85	0.15	
Duration since diagnosis ^a (m)	≤ 60	232 (77.6)	0.82	0.12	0.02	0.85	0.15	0.14
	> 60	66 (22.1)	0.85	0.13		0.88	0.14	
Duration since treatment ^a (m)	≤ 12	99 (33.1)	0.80	0.12	0.00	0.82	0.15	0.00
	> 12	173 (57.9)	0.85	0.12		0.88	0.14	
Disease status	Undergoing or completed treatment within the last 6 months	77 (25.8)	0.78	0.13	0.00	0.81	0.16	0.00
	F/U or live	222 (74.2)	0.84	0.12		0.87	0.14	
AJCC Stage ^a	1	112 (37.5)	0.83	0.10	0.72	0.86	0.12	0.75
	2	93 (31.1)	0.83	0.12		0.85	0.15	
	3	61 (20.4)	0.84	0.13		0.86	0.15	
	4	31 (10.4)	0.81	0.17		0.82	0.21	
Recurrence ^a	Yes	35 (11.7)	0.80	0.14	0.11	0.82	0.17	0.18
	No	246 (82.3)	0.83	0.12		0.86	0.14	
Outcome status ^a	No evidence of disease	232 (77.6)	0.84	0.12	0.01	0.86	0.14	0.13
	Alive with disease	64 (21.4)	0.80	0.12		0.82	0.18	
HPV ^a	Yes	208 (69.6)	0.83	0.12	0.04	0.86	0.15	0.44
	No	57 (19.1)	0.81	0.12		0.84	0.14	

The p-values refer to group differences in the HINT-8 index or EQ-5D-5 L index. The Wilcoxon rank-sum test was used for comparisons between two groups, and the Kruskal–Wallis test was applied for comparisons involving three or more groups

2 M KRW = USD \$1,439.86

HINT-8 Health-related Quality of Life Instrument with 8 Items, EQ-5D-5 L EuroQol 5-Dimension 5-Level, AJCC American Joint Committee on Cancer, KRW Korean Won, HPV Human papillomavirus

^aSum of percentages did not reach 100%, indicating missing values

suggest strong consistency between the indices generated by the two instruments.

Individual item comparisons

To assess the comparability between instruments, the mean EQ-5D-5 L index and EQ VAS scores were analyzed for each level of the HINT-8 items (Table 3). As the severity level of each HINT-8 item increased, both the EQ-5D-5 L index and EQ VAS scores decreased, reflecting lower HRQoL.

Among all HINT-8 items, “Climbing stairs” had the highest proportion of respondents reporting no problems (Level 1) (63.21%), whereas “Happiness” had the lowest (32.78%). Among all HINT-8 items, “Vitality” had the highest proportion of respondents reporting severe problems. (Level 4) (4.01%), indicating that participants were completely lacking energy.

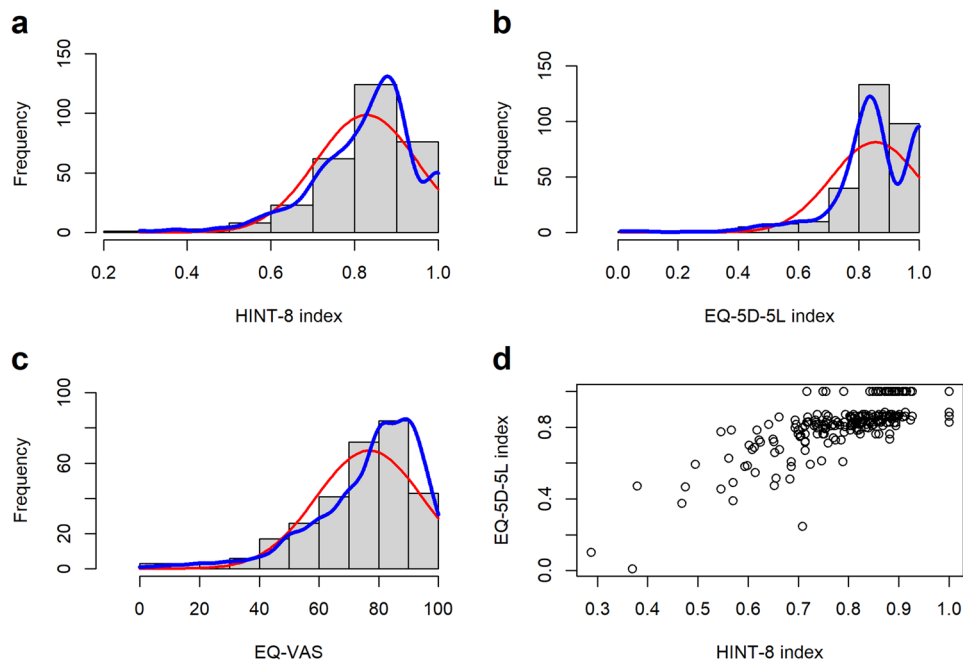


Fig. 1 Distributions of the instruments with correlation analysis (a) Distribution of the HINT-8 index, (b) distribution of the EQ-5D-5 L index, (c) distribution of the EQ VAS index, and (d) scatter plot illustrating the correlation between HINT-8 and EQ-5D-5 L indices. The red line represents the normal distribution curve, while the blue line represents the distribution estimated using the kernel density function

Table 2 Distribution of the HRQoL scores

	HINT-8	EQ-5D-5 L
Item	8	5
Number of health states	65,536	3,125
Theoretical range	0.132, 1	−0.066, 1
Observed range	0.28, 1	0.01, 1
Mean (SD)	0.83 (0.12)	0.85 (0.15)
Difference in paired samples t-test	0.03 ($p < 0.001$)	
Cronbach's alpha (95% CI)	0.872 (0.85–0.89)	0.845 (0.82–0.87)
Ceiling, N (%)	38 (12.7%)	98 (32.8%)
Measure	Score when HINT-8 = 1.00	Score when EQ-5D-5 L = 1.00
	Mean (SD)	Mean (SD)
HINT-8	1.00	0.93 (0.06)
EQ-5D-5 L	0.99 (0.04)	1.00
EQ VAS	92.84 (6.06)	87.56 (9.67)

HINT-8 Health-related Quality of Life Instrument with 8 Items, EQ-5D-5 L EuroQol 5-Dimension 5-Level, EQ VAS EuroQol-visual analog scale, HRQoL Health-related quality of life, SD Standard deviation, CI Confidence interval

HINT-8 and EQ-5D-5L domains

Correlation analyses between the domains and indices of the HINT-8 and EQ-5D-5 L showed significant correlations across all areas (Table 4). Higher correlations were observed between similar domains than dissimilar domains, confirming convergent validity of the hypothesis. The Depression domain of HINT-8 and the Anxiety/Depression domain of EQ-5D-5 L exhibited the highest correlation ($r_s = 0.781, p < 0.001$), and a strong correlation

was found between the Pain domain of HINT-8 and the Pain/Discomfort domain of EQ-5D-5 L ($r_s = 0.722, p < 0.001$). The HINT-8 index had correlation coefficients of 0.805 and 0.715 with the EQ-5D-5 L index and EQ VAS, respectively.

Discussion

The correlation between the HINT-8 and EQ-5D-5 L indices was very strong, while the correlation with the EQ VAS was strong, confirming that the HINT-8 consistently captures HRQoL dimensions with established generic instruments. HINT-8 dimensions such as “Memory” and “Happiness” showed relatively weaker correlations with EQ-5D-5 L, indicating that HINT-8 may assess psychosocial aspects of HRQoL that EQ-5D-5 L does not fully capture. Generic preference-based instruments such as the EQ-5D-5 L primarily emphasize physical functioning and mobility [40]. This highlights the importance of the HINT-8 in capturing cognitive and emotional well-being, which is particularly relevant in long-term cancer survivorship.

The “Happiness” item in the HINT-8 is positively worded and thus conceptually different from the negatively framed items in the EQ-5D-5 L. A psychometric study of the HINT-8 [25] that used Exploratory Graph Analysis reported that “Happiness” was most strongly linked to “Depression” underscoring its contribution to the scale’s psychological dimension. Consistent with that finding, our study showed that “Happiness” had

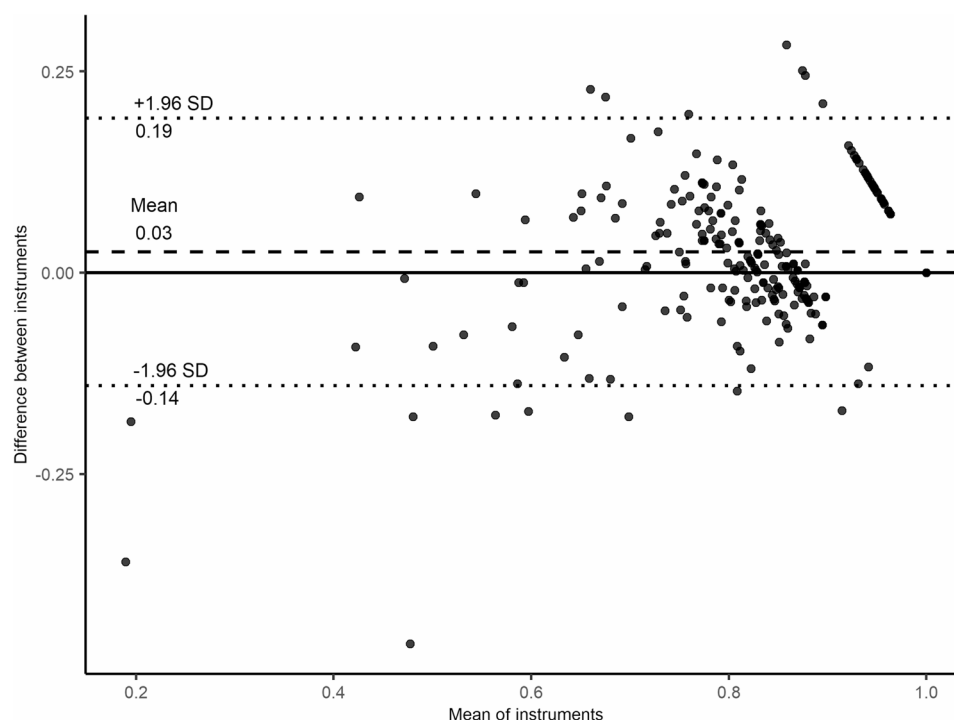


Fig. 2 Bland–Altman plot for agreement analysis between the HINT-8 and EQ-5D-5 L the x-axis represents the mean of the two instrument scores, while the y-axis shows the difference between the scores (HINT-8 minus EQ-5D-5 L). The solid horizontal line indicates the mean difference, while the dashed lines represent the 95% limits of agreement, calculated as the mean difference $\pm$ 1.96 standard deviations

the highest item-level correlation with the EQ-5D-5 L “Anxiety/Depression” domain, confirming its relevance to mental health. However, confirmatory factor analysis from previous validation studies reported that the “Happiness” item had the lowest standardized factor loading among the eight items [25]. Nonetheless, the item was retained to improve content validity and capture emotional well-being, often overlooked in generic HRQoL instruments. In line with this, our results showed that “Happiness” had the lowest rate of “no problems” responses among all HINT-8 items.

Known-group validity was assessed by comparing HRQoL scores across subgroups with clinically distinct characteristics. As hypothesized, both instruments showed lower HRQoL indices in patients assessed within 12 months of treatment. Unlike previous studies reporting significantly lower HRQoL in patients with advanced-stage disease [37] or recurrence [38], our results did not show statistically significant differences in these subgroups, although mean scores were lower. This discrepancy may reflect the limited sensitivity of generic instruments, psychological adaptation over time, or insufficient sample sizes. Notably, patients with AWD and those who were HPV-negative reported significantly lower HRQoL when assessed with the HINT-8, while the EQ-5D-5 L did not detect statistically significant differences, suggesting that the HINT-8 may be more

responsive in capturing HRQoL differences among clinical subgroups of patients with OPC.

While the EQ-5D-5 L is a multidimensional instrument, which limits the interpretability of Cronbach’s alpha, it is widely used in the literature and was included in this analysis for the purpose of comparison. The HINT-8, by contrast, has been psychometrically validated as a unidimensional instrument [24]. Our reliability analysis demonstrated high internal consistency for both instruments, and both provided reliable and consistent assessments of HRQoL, consistent with findings from previous studies [41].

Kernel density estimation illustrated that the EQ-5D-5 L index tended to be clustered at the high end, whereas HINT-8 exhibited a more even distribution. The HINT-8 may be better suited to detect subtle variations in HRQoL, particularly among patients with relatively better health status, allowing a more precise measurement of HRQoL changes over time.

A strong level of agreement was shown between the HINT-8 and EQ-5D-5 L, suggesting that the two instruments produced highly comparable HRQoL scores. However, we found a statistically significant difference in the mean utility index between the two instruments. Our findings are consistent with previous studies showing systematic differences between HRQoL instruments. A head-to-head comparison of the EQ-5D-5 L and AQL-8D also demonstrated discrepancies in mean utility

Table 3 Comparison of EQ-5D-5 L index and EQ VAS according to HINT-8 items

HINT-8 item	Level	N (%)	EQ-5D-5 L index	EQ VAS
			Mean (SD)	Mean (SD)
Climbing stairs	1	189 (63.21)	0.90 (0.10)	82.18 (13.88)
	2	84 (28.09)	0.82 (0.11)	72.27 (16.79)
	3	23 (7.69)	0.64 (0.15)	56.09 (17.71)
	4	3 (1.00)	0.25 (0.33)	25.00 (35.00)
Pain	1	155 (51.84)	0.94 (0.09)	84.27 (13.49)
	2	118 (39.46)	0.81 (0.08)	72.76 (14.80)
	3	24 (8.03)	0.59 (0.20)	52.92 (21.21)
	4	2 (0.67)	0.29 (0.26)	25.00 (21.21)
Vitality	1	126 (42.14)	0.93 (0.09)	86.47 (11.98)
	2	100 (33.44)	0.84 (0.11)	75.02 (14.26)
	3	61 (20.40)	0.78 (0.15)	66.41 (16.66)
	4	12 (4.01)	0.58 (0.28)	43.33 (25.61)
Working	1	159 (53.18)	0.92 (0.09)	83.79 (13.25)
	2	100 (33.44)	0.83 (0.11)	74.56 (15.34)
	3	31 (10.37)	0.68 (0.14)	58.06 (16.36)
	4	9 (3.01)	0.53 (0.30)	43.33 (26.93)
Depression	1	165 (55.18)	0.92 (0.09)	84.32 (13.06)
	2	113 (37.79)	0.8 (0.12)	71.24 (15.01)
	3	17 (5.69)	0.67 (0.14)	54.41 (18.70)
	4	4 (1.34)	0.24 (0.22)	20.00 (18.26)
Memory	1	171 (57.19)	0.89 (0.11)	81.04 (15.21)
	2	112 (37.46)	0.82 (0.15)	73.98 (17.81)
	3	15 (5.02)	0.66 (0.21)	52.33 (19.35)
	4	1 (0.33)	0.47	40.00
Sleep	1	137 (45.82)	0.91 (0.13)	84.32 (14.06)
	2	116 (38.8)	0.84 (0.12)	73.67 (17.19)
	3	45 (15.05)	0.74 (0.18)	62.67 (18.20)
	4	1 (0.33)	0.47	50.00
Happiness	1	98 (32.78)	0.93 (0.09)	87.73 (10.85)
	2	114 (38.13)	0.87 (0.10)	77.96 (14.09)
	3	80 (26.76)	0.76 (0.16)	63.91 (18.38)
	4	7 (2.34)	0.58 (0.28)	52.86 (26.90)

HINT-8 Health-related Quality of Life Instrument with 8 Items, EQ-5D-5 L EuroQol 5-Dimension 5-Level, EQ VAS EuroQol-visual analog scale

index between the two instruments [42]. This difference appears to be associated with the higher ceiling effect of the EQ-5D-5 L.

While the EQ-5D-5 L has been widely used, it has limitations in detecting subtle differences in HRQoL among individuals with a generally good health status, often exhibiting ceiling effects that can lead to a slight overestimation of HRQoL [43]. The EQ-5D-5 L was introduced to improve sensitivity and reduce ceiling effects compared with its predecessor, the EQ-5D-3 L [44]. However, ceiling effects persist, albeit to a lesser extent. For instance, in a population-based sample of adults, the ceiling effect for the EQ-5D-5 L was 31% [45]. A study of patients with prostate cancer revealed that physical well-being and prostate cancer-specific subscale scores were positively related to ceiling effects on the EQ-5D-5 L

[43]. Furthermore, a comparative study between the EQ-5D-5 L and Short Form 6-Dimension version 2 (SF-6Dv2) suggested that the EQ-5D-5 L may overestimate health status, with its ceiling effect being 2.02 times that of the SF-6Dv2 (72.8% vs. 36.1%) [46]. These findings highlight the ongoing challenge of capturing subtle variations in HRQoL, particularly among individuals with better perceived health status, despite improvements in instrument design.

Our findings have several important implications for clinical practice and future research. First, the reduced ceiling effect and improved differentiation of HRQoL scores of HINT-8 suggest that it may be a valuable tool for assessing long-term survivorship outcomes in patients with OPC. Second, HINT-8 has potential applications in health economic evaluations, serving as a culturally adapted HRQoL measure that better reflects patient-reported outcomes in specific populations. Finally, future research should explore the responsiveness and broader applicability of HINT-8. Longitudinal studies and expanding validation studies in multinational settings will be crucial in determining the generalizability of our findings and in assessing HINT-8 beyond the Korean healthcare context.

This study also had some limitations. First, the cross-sectional design limited the ability to assess changes in HRQoL over time. Future longitudinal studies are needed to evaluate the responsiveness of HINT-8 in detecting meaningful clinical changes and test-retest reliability. Second, the study sample was drawn from tertiary hospitals, limiting the generalizability of the findings. Additional studies with more diverse populations are necessary. Third, this study primarily compared HINT-8 with the EQ-5D-5 L, a generic HRQoL instrument. Further research should explore how the HINT-8 compares with disease-specific HRQoL instruments. Fourth, this study may be subject to non-response bias. Patients with more severe clinical conditions were less likely to complete the survey. As a result, individuals in poorer physical health may have been underrepresented in the final sample, potentially limiting the generalizability of the HRQoL results. Finally, while the HINT-8 was developed for the Korean population, its cultural adaptability to other populations remains unclear, and future research should validate HINT-8 in multinational settings.

Conclusions

The HINT-8 demonstrated acceptable validity and reliability in assessing health-related quality of life among patients with oropharyngeal cancer in South Korea, showing strong agreement with the EQ-5D-5 L. The HINT-8 also showed advantages in reducing ceiling effects. However, given the relatively small sample size and the cross-sectional nature of the study, further

Table 4 Correlation analysis between HINT-8 items and EQ-5D-5 L domains

HINT-8 item	EQ-5D-5 L domain						EQ-5D-5 L index	EQ VAS
	Mobility	Self-care	Usual activities	Pain/Discomfort	Anxiety/Depression			
Climbing stairs	0.566*	0.364*	0.425*	0.373*	0.400*	− 0.540*	− 0.435*	
	[Moderate]	[Weak]	[Moderate]	[Weak]	[Weak]	[Moderate]	[Moderate]	
Pain	0.402*	0.395*	0.502*	0.722*	0.483*	− 0.722*	− 0.527*	
	[Weak]	[Weak]	[Moderate]	[Strong]	[Moderate]	[Strong]	[Moderate]	
Vitality	0.387*	0.280*	0.429*	0.427*	0.496*	− 0.555*	− 0.588*	
	[Weak]	[Weak]	[Moderate]	[Moderate]	[Moderate]	[Moderate]	[Moderate]	
Working	0.422*	0.314*	0.557*	0.520*	0.448*	− 0.599*	− 0.515*	
	[Moderate]	[Weak]	[Moderate]	[Moderate]	[Moderate]	[Moderate]	[Moderate]	
Depression	0.251*	0.295*	0.385*	0.466*	0.781*	− 0.593*	− 0.548*	
	[Weak]	[Weak]	[Weak]	[Moderate]	[Strong]	[Moderate]	[Moderate]	
Memory	0.218*	0.228*	0.251*	0.302*	0.386*	− 0.354*	− 0.321*	
	[Weak]	[Weak]	[Weak]	[Weak]	[Weak]	[Weak]	[Weak]	
Sleep	0.252*	0.236*	0.288*	0.386*	0.420*	− 0.460*	− 0.499*	
	[Weak]	[Weak]	[Weak]	[Weak]	[Moderate]	[Moderate]	[Moderate]	
Happiness	0.257*	0.243*	0.393*	0.441*	0.590*	− 0.547*	− 0.598*	
	[Weak]	[Weak]	[Weak]	[Moderate]	[Moderate]	[Moderate]	[Moderate]	
HINT-8 index	− 0.469*	− 0.399*	− 0.569*	− 0.698*	− 0.666*	0.805*	0.715*	
	[Moderate]	[Weak]	[Moderate]	[Strong]	[Strong]	[Very Strong]	[Strong]	

All coefficients were derived by Spearman rank correlation analysis
HINT-8 Health-related Quality of Life Instrument with 8 Items, EQ-5D-5 L EuroQol 5-Dimension 5-Level, EQ VAS EuroQol-visual analog scale
* $p < 0.001$

longitudinal research is warranted to confirm the generalizability of the HINT-8 in the South Korean context.

Abbreviations

AJCC American Joint Committee on Cancer
CI Confidence interval
HNC Head and neck cancer
HRQoL Health-related quality of life
ICC Intraclass correlation coefficient
IRB Institutional Review Board
OPC Oropharyngeal cancer
QoL Quality of life

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12955-025-02425-4>.

- Supplementary Material 1.
- Supplementary Material 2.
- Supplementary Material 3.
- Supplementary Material 4.

Acknowledgements

The authors would like to express their sincere gratitude to the hospital staff and participants who made this study possible. We also thank the research assistants for their support with data collection and entry. Special thanks to those who provided administrative and technical assistance throughout the research process.

Authors' contributions

All authors contributed to the study conception and design. Material preparation and data collection and analysis were performed by G-UH, BSK, M-JK, W-JS, A-YL, J-EA, S-YY, SYL, and SHL. The first draft of the manuscript was written by G-UH, S-YY, SHL, and SYL, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding

This study was supported by the Korea Disease Control and Prevention Agency [#2023-10-012].

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

All participants were informed about the study purpose, procedures, and methods, following which they signed a research consent form for participation. The study was submitted to the central Research Ethics Committee of Kongju National University, Gongju, Korea, and was approved under the protocol number KNU_IRB_2023-49. The institutional review board numbers for each hospital are included [see Additional 1]. Informed consent was obtained from all individual participants included in the study.

Consent for publication

The authors affirm that all individual participants provided informed consent for publication of the results. No identifying information is included in this manuscript.

Competing interests

The authors declare no competing interests.

Author details

- ¹Department of Medical Information, College of Nursing and Health, Kongju National University, Gongju-si 32588, Chungcheongnam-do, Republic of Korea
²Department of Otolaryngology-Head and Neck Surgery, College of Medicine, Chungnam National University, Daejeon 35015, Republic of Korea
³College of pharmacy, Kangwon National University, Chuncheon-si 24341, Gangwon-do, Republic of Korea
⁴Department of Otolaryngology-Head and Neck Surgery, College of Medicine, Chung-Ang University, Seoul 06974, Republic of Korea

Received: 10 May 2025 / Accepted: 26 August 2025
Published online: 16 October 2025

References

- Chhetri D, Dewan K. Dysphagia Evaluation and Management in Otolaryngology. Elsevier; 2019. <https://doi.org/10.1016/C2017-0-01118-7>.
- Núñez-Vera V, García-Perla-García A, González-Cardero E, Esteban F, Infante-Cossio P. Impact of treatment on quality of life in oropharyngeal cancer survivors: a 3-year prospective study. *Cancers*. 2024. <https://doi.org/10.3390/cancers16152724>.
- Oskam IM, Verdonck-de Leeuw IM, Aaronson NK, Witte BJ, de Bree R, Doornaert P, et al. Prospective evaluation of health-related quality of life in long-term oral and oropharyngeal cancer survivors and the perceived need for supportive care. *Oral Oncol*. 2013;49:443–8.
- Pourel N, Peiffert D, Lartigau E, Desandes E, Luporsi E, Conroy T. Quality of life in long-term survivors of oropharynx carcinoma. *Int J Radiat Oncol Biol Phys*. 2002;54:742–51.
- Kim TW, Youm H-Y, Byun H, Son Y-I, Baek C-H. Treatment outcomes and quality of life in oropharyngeal cancer after surgery-based versus radiation-based treatment. *Clin Exp Otorhinolaryngol*. 2010;3:153–60.
- Fayers PM, Machin D. Quality of Life: The Assessment, Analysis and Interpretation of Patient-Reported Outcomes. Wiley; 2013. <https://doi.org/10.1002/9780470024522>.
- Cai T, Verze P, Bjerkklund Johansen TE. The quality of life definition: where are we going? *Uro*. 2021;1:14–22.
- Karimi M, Brazier J. Health, health-related quality of life, and quality of life: what is the difference? *Pharmacoeconomics*. 2016;34:645–9.
- Patrick DL, Deyo RA. Generic and disease-specific measures in assessing health status and quality of life. *Med Care*. 1989;27:S217–32.
- Infante-Cossio P, Torres-Carranza E, Cayuela A, Gutierrez-Perez JL, Gili-Miner M. Quality of life in patients with oral and oropharyngeal cancer. *Int J Oral Maxillofac Surg*. 2009;38:250–5.
- Epstein JB, Emerton S, Kolbinson DA, Le ND, Phillips N, Stevenson-Moore P, et al. Quality of life and oral function following radiotherapy for head and neck cancer. *Head Neck*. 1999;21(1):1–11.
- Niezgoda HE, Pater JL. A validation study of the domains of the core EORTC quality of life questionnaire. *Qual Life Res*. 1993;2(5):319–25.
- Davies A, Waylen A, Leary S, Thomas S, Pring M, Janssen B, et al. Assessing the validity of EQ-5D-5L in people with head & neck cancer: does a generic quality of life measure perform as well as a disease-specific measure in a patient population? *Oral Oncol*. 2020;101:104504.
- Wells GA, Russell AS, Hararoui B, Bissonnette R, Ware CF. Validity of quality of life measurement tools—from generic to disease-specific. *J Rheumatol Suppl*. 2011;88:2–6.
- Devlin NJ, Shah KK, Feng Y, Mulhern B, Van Hout B. Valuing health-related quality of life: an EQ-5D-5L value set for England. *Health Econ*. 2018;27(1):7–22.
- Brazier J, Rowen D. NICE DSU Technical Support Document 11: Alternatives to EQ-5D for Generating Health State Utility Values. 2017. <https://www.ncbi.nlm.nih.gov/books/NBK425861/>.
- Herdman M, Gudex C, Lloyd A, Janssen M, Kind P, Parkin D, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Qual Life Res*. 2011;20:1727–36.
- Pickard AS, Wilke CT, Lin H-W, Lloyd A. Health utilities using the EQ-5D in studies of cancer. *Pharmacoeconomics*. 2007;25:365–84.
- Kim M-J, Koo B-S, Cho K-J, Lee S-H, Lee A-Y, Hong G-U, et al. Health-related quality-of-life assessment in patients with oropharyngeal cancer: a comparison of EQ-5D-5L and EORTC instruments. *Oral Oncol*. 2025;165:107342.
- Kim TH, Jo M-W, Lee SI, Kim SH, Chung SM. Psychometric properties of the EQ-5D-5L in the general population of South Korea. *Qual Life Res*. 2013;22:2245–53.
- Kim SH, Hwang JS, Kim TW, Hong YS, Jo M-W. Validity and reliability of the EQ-5D for cancer patients in Korea. *Support Care Cancer*. 2012;20:3155–60.
- Ock M, Jo M, Lee S. Measuring health related quality of life using EQ-5D in South Korea. *Health Technol Assess*. 2013;1:103–11.
- Lee H, Jo M, Choi S, Kim Y, Oh K. Development and psychometric evaluation of measurement instrument for Korean health-related quality of life. *Public Health Wkly Rep*. 2016;9:447–54.
- Jo M. Valuation of Korean health-related quality of life instrument with 8 items (HINT-8). Cheongju: Korea Centers for Disease Control & Prevention; 2017. p. 20–103.
- Lee E-H. Internal structure of the health-related quality of life instrument with 8-items in a nationally representative population. *J Korean Acad Nurs*. 2023;53(3):359–69.
- Kim J, Jo M-W, Lee H-J, Ahn S-H, Son BH, Lee JW, et al. Validity and reliability of the health-related quality of life instrument with 8 items (HINT-8) in Korean breast cancer patients. *Osong Public Health Res Perspect*. 2021;12(4):254–63.
- Kim J, Lee H-J, Jo M-W. Health-related quality of life instrument with 8 items for use in patients with type 2 diabetes mellitus: a validation study in Korea. *J Prev Med Public Health*. 2022;55:234–42.
- Kim S-H, Kim M. Validity of the health-related quality of life instrument with 8 items (HINT-8) in the Korean elderly: a cross-sectional study. *J Korean Gerontol Nurs*. 2022;24:248–56.
- Sharma Y, Mishra G, Parikh V. Quality of life in head and neck cancer patients. *Indian J Otolaryngol Head Neck Surg*. 2019;71(Suppl 1):927–32.
- Kim YR. Effect of oral health promotion and oral disease treatment on health-related quality of life measurement tools EQ-5D and HINT-8: the 8th Korea National health and nutrition examination survey. *J Korean Soc Dent Hyg*. 2021;21:621–8.
- Kim SH, Ahn J, Ock M, Shin S, Park J, Luo N, et al. The EQ-5D-5L valuation study in Korea. *Qual Life Res*. 2016;25:1845–52.
- Giavarina D. Understanding Bland Altman analysis. *Biochem Med*. 2015;25:141–51.
- Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med*. 2016;15:155–63.
- Tavakol M, Dennick R. Making sense of cronbach's alpha. *Int J Med Educ*. 2011;2:53–5.
- Prion S, Haerling KA. Making sense of methods and measurement: Spearman-rho ranked-order correlation coefficient. *Clin Simul Nurs*. 2014;10:535–6.
- Højbroek Michaelsen S, Grønhoj C, Højbroek Michaelsen J, Friborg J, von Buchwald C. Quality of life in survivors of oropharyngeal cancer: A systematic review and meta-analysis of 1366 patients. *Eur J Cancer*. 2017;78:91–102.
- Oates J, Davies S, Roydhouse JK, Fethney J, White K. The effect of cancer stage and treatment modality on quality of life in oropharyngeal cancer. *Laryngoscope*. 2014;124:151–58.
- Brady G, Roe J, Paleri V, Lagergren P, Wells M. Patient and caregiver experience of diagnosis, treatment, and living with recurrent oropharyngeal cancer. *JAMA Otolaryngol Head Neck Surg*. 2025;151:97–104.
- Korsten LH, Jansen F, Lissenberg-Witte BJ, Vergeer M, Brakenhoff RH, Leemans CR, et al. The course of health-related quality of life from diagnosis to two years follow-up in patients with oropharyngeal cancer: does HPV status matter? *Support Care Cancer*. 2021;29(8):4473–83.
- Devlin NJ, Brooks R. EQ-5D and the EuroQol Group: past, present and future. *Appl Health Econ Health Policy*. 2017;15:127–37.
- Norman GR, Sloan JA, Wyrrich KW. Interpretation of changes in health-related quality of life: the remarkable universality of half a standard deviation. *Med Care*. 2003;41:582–92.
- Campbell JA, Palmer AJ, Venn A, Sharman M, Otahal P, Neil A. A head-to-head comparison of the EQ-5D-5L and AQL-8D multi-attribute utility instruments in patients who have previously undergone bariatric surgery. *Patient*. 2016;9:311–22.
- Murasawa H, Sugiyama T, Matsuoka Y, Okabe T, Wakumoto Y, Tanaka N, et al. Factors contributing to the ceiling effect of the EQ-5D-5L: an analysis of patients with prostate cancer judged 'no-problems'. *Qual Life Res*. 2020;29:755–63.
- Thompson AJ, Turner AJ. A comparison of the EQ-5D-3L and EQ-5D-5L. *Pharmacoeconomics*. 2020;38:575–91.
- Konnopka A, Koenig H-H. The 'no problems'-problem: an empirical analysis of ceiling effects on the EQ-5D 5L. *Qual Life Res*. 2017;26:2079–84.
- Ding N, Zhou H, Chen C, Chen H, Shi Y. Comparison of the measurement properties of EQ-5D-5L and SF-6Dv2 in COVID-19 patients in China. *Appl Health Econ Health Policy*. 2024;22:555–68.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.