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Original Research

Validation of the Turkish Version of the Quality of Recovery-15 Questionnaire

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Abstract

Objectives: The aim of this study was to perform a cross-cultural adaptation and psychometric evaluation of the Quality of Recovery-15 (QoR-15) questionnaire in Türkiye.
Methods: The QoR-15 was translated into Turkish through a rigorous process involving independent translations, consensus, forward–backward translation, and review. The questionnaire was administered to patients undergoing major abdominal surgery preoperatively and on postoperative days 1, 7, and 30. Reliability was assessed using Cronbach's α, McDonald's Omega, and the inter-item correlation coefficient. Construct validity was evaluated using confirmatory factor analysis (CFA), and responsiveness was analyzed using Cohen's effect size and the standardized response mean (SRM).
Results: A total of 510 patients participated in the study; 335 (65.69%) were <65 years old, and 279 (54.71%) were male. The Turkish version of QoR-15 (QoR-15T) demonstrated good internal consistency, with Cronbach's α values of 0.896 and 0.888 for preoperative and postoperative administrations, respectively, and McDonald's Omega coefficients of 0.894 and 0.878. Confirmatory factor analysis confirmed the two-factor (two-dimensional) structure of the QoR-15T. The comparative fit indices for Models 1 and 2 were 0.970 and 0.991, respectively. QoR-15T showed responsiveness to changes in health status, with Cohen's effect size (1.22) and the standardized response mean (1.18) indicating its ability to detect clinically important changes.
Conclusion: The QoR-15T is a reliable, valid, and responsive questionnaire for assessing the quality of recovery in patients undergoing major abdominal surgery. Its ability to capture patients' perspectives and multidimensional aspects of recovery makes it a valuable tool for clinical and research purposes.
Keywords: Major abdominal surgery, patient-reported outcome, QoR-15, quality of recovery, validation

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Postoperative recovery is increasingly recognized as an important and multidimensional outcome. Although there is no perfect definition of recovery, the general consensus is the return to daily life after surgery according to the patient's baseline or social norms.[1,2] In addition to quantitative outcomes such as morbidity, mortality, and readmission, the patient's ability to return to normal daily activities after surgery is a valuable qualitative measure of recovery. Patients' perceptions of recovery encompass not only individual symptoms but also the return to daily activities, social relationships, independence, and the management of psychological and mental challenges. Therefore, it is essential to explore how these various dimensions of recovery are represented. Any assessment tool should incorporate these critical components when evaluating the recovery process. Among the tools that meet these criteria are the QoR-40, its derived questionnaires, and the Surgical Recovery Score.[3]

The most commonly used instrument is the QoR-40, which was developed by Myles et al.[4] in 2000 to evaluate the early postoperative period. The QoR-40 is a patient-reported outcome measure consisting of 40 items across five dimensions and has been used across multiple surgical specialties.[5–7] Stark et al.[8] developed and validated a short-form questionnaire derived from QoR-40, a 15-item short form termed the QoR-15. A systematic review reported that QoR-15 and QoR-40 are equivalent in terms of psychometric properties, but QoR-15 is more feasible.[9]

Validation is crucial when a measurement instrument is utilized in a foreign language or cultural context to confirm its suitability for the target population and to minimize potential cultural variances and linguistic discrepancies. The QoR-15 has been translated and validated for French, Korean, Portuguese, Danish, and German-speaking populations.[9–13] These validation studies frequently included alterations in translation and cultural adaptations to correspond with the particular contexts of each population.[10,12] Moreover, each validation study often emphasizes specific quantitative dimensions, including construct and convergent validity, reliability, responsiveness, acceptability, and feasibility. This project aims to perform a cross-cultural adaptation and psychometric assessment of the QoR-15 scale for application in Türkiye.

Methods

The QoR-15 Instrument

Two co-authors (MAK, MAKuzu) independently translated the original English version of the QoR-15 into Turkish. Another co-author (İCE) evaluated these two preliminary translated versions and produced a final consensus form. The final form was retranslated into English by a fourth translator (YS) and compared with the original form. Accordingly, a structured forward–backward translation approach was applied in line with the World Health Organization's instrument translation and adaptation guidance.[14] All four translators had advanced English proficiency. Lastly, the clarity of the final form was discussed by the authors, and consensus was reached. After obtaining ethical approval, the final translated version of the questionnaire was tested on 10 participants from the target population to evaluate its comprehensibility. Based on feedback from the pilot testing, minor wording adjustments were made to improve clarity and cultural appropriateness. No substantive changes to item content or scoring were required.

The QoR-15 comprises two domains assessing physical (items 1–10) and mental well-being (items 11–15). Each item is scored on a 0–10 Likert scale, yielding a total score ranging from 0 to 150, with higher scores indicating better recovery.[8] The average time to complete the QoR-15 questionnaire was typically 2–3 minutes.

Participants

After approval by the This study was approved by the Ankara University Medical School Ethics Committee (Date: 14.11.2019, Decision no: İ5-208-19) and registration on ClinicalTrials.gov (NCT06456918), patients were informed about the study, and written informed consent for participation was obtained. All methods were performed in accordance with the relevant guidelines and regulations. The study was conducted in accordance with the Declaration of Helsinki.

Patients were recruited from the general surgery departments of five centers between September 2019 and September 2022. Eligible participants were adults (≥18 years) scheduled for elective major abdominal surgery. A total of 535 patients met the inclusion criteria; 25 were excluded due to missing data or withdrawal. The reduction in sample size at later follow-up time points, particularly at postoperative day 30, was mainly due to loss to follow-up after discharge and the inability to contact some patients. Informed consent was obtained from all patients prior to their participation. Exclusion criteria were age <18 years, emergency surgery, alcohol or substance use disorder, refusal to participate, prior major abdominal surgery, and non-cooperation.

Guidelines for the respondent-to-item ratio ranged from 5:1 (i.e., fifty respondents for a 10-item questionnaire) to 30:1.[15–17] In this study, the respondent-to-item ratio was 34:1; therefore, it can be considered very good.

Procedure

To validate the QoR-15, the survey was conducted on the day before surgery (Pre) and on postoperative days 1 (P1),

7–10 (P7), and 30 (P30). Patient characteristics, including age, sex, height, weight, American Society of Anesthesiologists (ASA) score.[18] morbidity, and operation type, were also recorded. The QoR-15 form was given to the patients, and they were requested to answer the questions themselves. While the patients completed the questionnaire, a health professional was present in the room to provide assistance if needed, with the patients' consent.

Statistical Analysis

Descriptive statistics were summarized as counts and percentages for categorical variables; mean and standard deviations for continuous variables; and median (interquartile range) for ordinal and non-normally distributed variables. The Mann–Whitney U test was used to test the difference between two groups in terms of ordinal or non-normally distributed continuous variables. Differences among three or more groups for non-normally distributed or ordinal variables were evaluated using the Kruskal–Wallis analysis of variance. When the p value from the Kruskal–Wallis test statistics was statistically significant, the Dunn test was used to determine which groups differed from others. Degrees of association between variables were calculated using Spearman's correlation coefficient. $p<0.05$ was considered statistically significant. MPlus (Demo Version 8.11) and the R Programming Language (4.3.3) were used to analyze the data.

Reliability

Reliability of the QoR-15 was tested by internal consistency, which is an estimate of the degree to which its constituent items are interrelated and is assessed by Cronbach's α coefficient.[19,20] Usually, a reliability of 0.70 is required for analysis at the group level, and values ≥0.85 are recommended for individual-level use.[21] In addition, McDonald's Omega and the inter-item correlation coefficient were calculated.

Validity

Construct validity was assessed through CFA to evaluate model fit. The number of factors was defined a priori based on the original instrument structure. Weighted Least Squares Mean and Variance Adjusted (WLSMV) estimation was used due to the ordinal structure of the QoR-15 items and its robustness to violations of multivariate normality. Model fit was evaluated using multiple goodness-of-fit indices, including the chi-square statistic (χ^2) and degrees of freedom (df), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), and Akaike Information Criterion (AIC). Acceptable model fit was defined as TLI and CFI values >0.90 (excellent >0.95), RMSEA <0.08 (excellent <0.05), and a chi-square-to-degrees-of-freedom ratio <3.[22] Items with factor loadings below 0.40 were eliminated.[23] Error covariances were specified only for items within the same construct. If the correlation between error terms was greater than 1, one of the two redundant items was deleted. Discriminant validity was also assessed using Spearman's rho coefficients.

Modification indices were examined to identify potential localized areas of model misfit. Error covariances were allowed only between items within the same latent factor and only when a clear conceptual or semantic overlap between item contents was present. No error correlations were specified between items belonging to different factors. Concurrent validity (a form of criterion-related validity) was assessed by examining associations between QoR-15T scores and ASA scores.

Responsiveness

Responsiveness describes an instrument's ability to detect clinically important change. Cohen's effect size was calculated for the responsiveness of QoR-15 as the average change scores (from pre-test to post-test) divided by the SD at baseline. Calculations were performed for Pre and P1, P7, and P30. Cohen effect sizes of 0.2, 0.5, and ≥0.8 correspond to small, medium, and large changes in QoR-15 scores. SRM was also calculated as the change scores divided by the SD of the change scores.[24]

Floor and Ceiling Effects

In order to examine the floor and ceiling effects, box-plot graphs were drawn for repeated measurements, and distributions were analyzed.

Results

Construct and Convergent Validity

510 patients completed the survey, 231 (45.3%) of the respondents were female, 279 (54.7%) were male. 63.5% of the responders were less than 65 years old, 26.3% were between 65-74 years old and 6.3% were between 75-84 years old, and 2% were greater than 84 years old. Clinical characteristics of patients were given in Table 1. The mean (SD) QoR-15 score was 127.2 (22.9), ranging from 4 to 150. Boxplots of QoR-15 scores at each time point were presented in Figure 1. The percentage of patients achieving the highest possible QoR-15 score at the different time points were: Pre (12.9%, n=66), P1 (0.6%, n=3). Figures 2 and 3 indicate no clinically relevant floor or ceiling effects. Floor or ceiling effects were considered present if >15% of respondents achieved the lowest or highest possible score, respectively.[25] The mean time taken to complete the P1 QoR-15 score in a subset of patients (n=15) was 2.7 (1–7) min.

Table 1. Clinical characteristics of patients for categorical variables

	n (%)
Groups	
Colorectal surgery	246 (50.72)
Hepatopancreaticobiliary surgery	89 (18.35)
Upper GI surgery	83 (17.11)
Bariatric surgery	63 (12.99)
Gender	
Male	279 (54.71)
Female	231 (45.29)
Age	
<65	335 (65.69)
65-74	134 (26.27)
75-84	31 (6.08)
>85	10 (1.96)
ASA	
1	177 (36.72)
2	218 (45.23)
3	85 (17.63)
4	2 (0.41)

Upper GI surgery: Upper gastrointestinal surgery; ASA: American Society of Anesthesiologists score.

The distribution of our patients in terms of categorical variables is also summarized in Table 1. The comparison results of QoR-15 scores for all time points in terms of patient clinical parameters are given in Table 2. No difference was observed in gender distribution of the patients. However, differences were observed according to ASA score and type of surgery.

Spearman's correlation coefficient was used to examine the relationships of variables such as age, height, weight, ASA score, operation time, and length of stay with the QoR-15 score (Table 3).

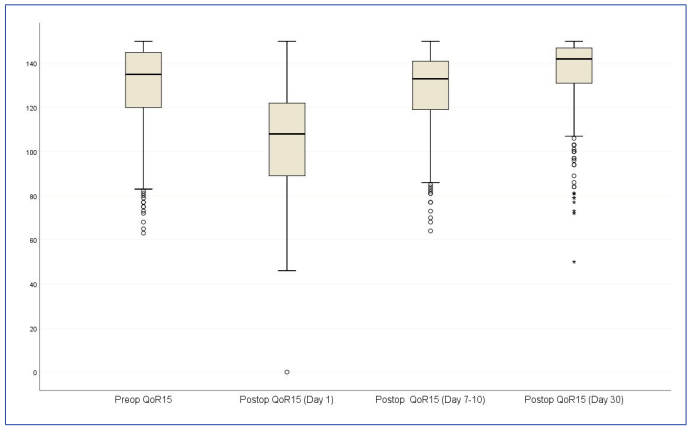

Figure 1. Boxplots for each time point of Quality of Recovery-15 (QoR-15) scores.

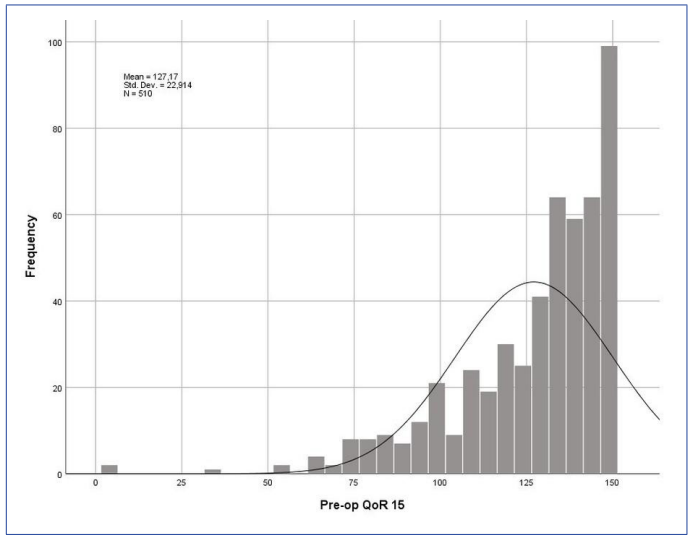

Figure 2. Scale characteristics of the preoperative Quality of Recovery-15 (pre-op QoR-15) scores, illustrating spread of scores and lack of a ceiling effect. A normal distribution curve is interposed.

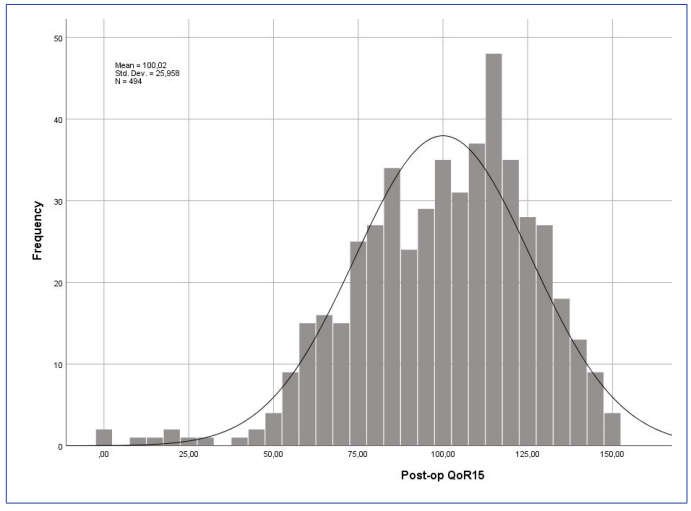

Figure 3. Scale characteristics of the postoperative Quality of Recovery-15 (post-op QoR-15) scores, illustrating spread of scores and lack of a ceiling effect. A normal distribution curve is interposed.

A negative correlation was found with postoperative length of stay and ASA scores. Although statistically significant, this relationship was expressed with a small correlation coefficient. Similarly, a low but significant correlation was calculated between weight and QoR-15 scores. Concurrent validity has been shown with the association between ASA scores and QoR-15.

Figure 1 shows the change in QoR-15 scores taken at 4 different time points. Accordingly, the change over time was found to be significant and Post-hoc multiple comparison

Table 2. Clinical characteristics of patients regarding QoR-15 scores

	QoR-Pre	QoR-P1	QoR-P7	QoR-P30
Groups				
Colorectal	127.27±22.74[b]	99.47±27.56[a]	125.8±19.32[a]	135.72±14.98[a]
Hepatopancreaticobiliary	131.15±17[bc]	99.25±21.19[a]	122.14±19.57[a]	133.42±17.66[a]
Upper GI	119.06±29.71[a]	93.04±27.61[a]	122.35±20.23[a]	133.09±19.61[a]
Bariatric	136.79±14.02[c]	114.83±17.87[b]	137.29±9.99[b]	144.61±7.12[b]
p	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Gender				
Male	127.07±25.31	99.51±27.67	125.3±20.64	137.05±15.81
Female	127.28±19.69	100.63±23.82	126.44±17.27	134.65±17.43
p	0.979	0.843	0.705	0.181
ASA				
1	128.65±22.24[a]	103.47±25.39[a]	128.77±17.03[a]	138.84±12.95[a]
2	130.67±19[a]	102.01±24.45[a]	126.93±19.64[a]	135.92±16.51[ab]
3	118.67±29.78[ab]	88.29±28.51[b]	117.71±20.28[b]	131.79±19.94[b]
4	99±50.91[b]	86±NA	106±NA	NA
p	**<0.001**	**<0.001**	**<0.001**	**0.014**
Age				
<65	127.42±22.11	99.74±26.15	127.33±17.42[a]	136.64±16.62[a]
65-74	127.9±23.52	102.39±24.51	124.84±21.34[a]	135.48±14.78[a]
75-84	124.97±26.61	96.93±28.4	117.93±21.23[ab]	134.96±18.58[a]
>85	115.6±29.08	85.5±29.79	110.67±29.26[b]	117±27.86[b]
p	0.390	0.261	**0.004**	**0.020**

[a,b,c and ab]: The means shown with the same index are statistically the same with each other, while the others are statistically different (p<0.005). QoR-Pre, P1, P7, P10: Quality of recovery-15 scores on the day before the surgery (Pre), and on postoperative days 1 (P1), 7 (P7), and 30 (P30). Upper GI: Upper gastrointestinal surgery, ASA: American Society of Anesthesiologists score.

tests showed that; the difference between all possible paired time point comparisons is statistically significant (p<0.001). Also, the results indicate that the median score of the post-operative QoR-15 (day 1) was lower than all the others.

The CFA conducted on the model with two factors and 15 items showed acceptable CFI and TLI values, but a marginal RMSEA (Model 1). To enhance the model's goodness of fit, we identified the following item pairs for modification based on the Modification Indices: item 3 and item 4, item 5 and item 8, item 12 and item 15, item 11 and item 12, item 10 and item 9, and item 14 and item 15. These modifications were theory-driven and reflected conceptual similarities between certain items assessing closely related aspects of physical or mental well-being. After implementing these modifications, the model demonstrated significant improvement, achieving acceptable CFI, TLI, and RMSEA values (Model 2) (Table 4). The factor loadings for each item across both models are presented in Table 5.

Reliability

The Cronbach's α coefficient of the pre-operative QoR-15 and postoperative QoR-15 were 0.896 and 0.888, respectively. Corrected item-total correlation coefficients ranged from 0.46 to 0.75 for pre-operative QoR-15 and from 0.171 to 0.895 for postoperative QoR-15. The inter-item correlation coefficients for the first and second dimensions ranged from 0.28 to 0.81 and 0.32 to 0.78, respectively. These values indicate a moderate to strong correlation among the items within each dimension, suggesting that the items are related and effectively measure the underlying constructs (Table 6).

Responsiveness

Cohen's effect size and SRM were calculated to measure degree of responsiveness for Pre and P7 points (Table 7). In this population, the total QoR-15 score also demonstrated a Cohen's effect size of 1.22, which is considered large and

Table 3. Relationships of variables versus to QoR-15

	Age groups	Surgery duration	Postop length of stay	ASA	Size	Weight
QoR-Pre						
r	-0.016	0.036	-0.157	-0.080	0.084	0.222
p	0.724	0.483	**0.002**	0.078	0.066	**<0.001**
n	510	377	402	482	481	481
QoR-P1						
r	0.004	-0.064	-0.16	-0.153	0.012	0.17
p	0.933	0.221	**0.001**	**0.001**	0.804	**<0.001**
n	494	366	391	468	467	466
QoR-P7						
r	-0.105	-0.116	-0.254	-0.179	0.063	0.187
p	**0.019**	**0.025**	**<0.001**	**<0.001**	0.170	**<0.001**
n	502	375	400	476	475	474
QoR-P30						
r	-0.091	-0.171	-0.245	-0.102	0.071	0.255
p	0.061	**0.003**	**<0.001**	**0.042**	0.162	**<0.001**
n	419	297	321	396	393	392

r: r value; p: p value; n: number of patients. QoR-Pre, P1, P7, P10: Quality of recovery-15 scores on the day before the surgery (Pre), and on postoperative days 1 (P1), 7 (P7), and 30 (P30). Postop: postoperative, ASA: American Society of Anesthesiologists score.

Table 4. Interitem Correlation Matrix for the QoR-15

QoR-15 item number	Total QoR-15 score	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	0.47	-													
2	0.65	0.35	-												
3	0.74	0.42	0.57	-											
4	0.69	0.37	0.50	0.69	-										
5	0.47	0.34	0.36	0.35	0.29	-									
6	0.47	0.35	0.33	0.32	0.28	0.59	-								
7	0.45	0.37	0.33	0.36	0.31	0.54	0.61	-							
8	0.57	0.39	0.42	0.43	0.36	0.63	0.50	0.47	-						
9	0.71	0.41	0.56	0.61	0.50	0.46	0.44	0.43	0.57	-					
10	0.75	0.43	0.59	0.62	0.48	0.43	0.40	0.41	0.52	0.81	-				
11	0.56	0.17	0.29	0.30	0.23	0.30	0.29	0.26	0.31	0.34	0.36	-			
12	0.64	0.29	0.34	0.41	0.36	0.37	0.36	0.35	0.37	0.42	0.41	0.67	-		
13	0.60	0.23	0.36	0.33	0.30	0.29	0.30	0.25	0.33	0.38	0.43	0.46	0.61	-	
14	0.65	0.18	0.28	0.36	0.34	0.21	0.24	0.24	0.25	0.29	0.37	0.32	0.38	0.35	-
15	0.71	0.21	0.33	0.43	0.37	0.24	0.25	0.28	0.31	0.39	0.46	0.36	0.43	0.38	0.78

Quality of Recovery-15 (QoR-15) items: 1: able to breathe easily; 2: been able to enjoy food; 3: feeling rested; 4: have had a good sleep; 5: able to look after personal toilet and hygiene unaided; 6: able to communicate with family or friends; 7: getting support from hospital doctors and nurses; 8: able to return to work or usual home activities; 9: feeling comfortable and in control; 10: having a feeling of general well-being; 11: moderate pain; 12: severe pain; 13: nausea or vomiting; 14: feeling worried or anxious; 15: feeling sad or depressed.

Table 5. Cohen's effect size and standardized response means

QoR-15 item number	Pre-op mean score	Post-op mean score	Mean change	% Change	Cohen's effect size	SRM
1	8.88±1.82	7.25±2.69	-1.63 (-1.88 to -1.4)	18.33	0.89	0.60
2	8.22±2.56	4.3±3.71	-3.92 (-4.23 to -3.39)	47.72	1.53	0.90
3	8.16±2.38	6.32±2.93	-1.85 (-2.16 to -1.58)	22.64	0.78	0.57
4	7.93±2.5	6.23±3.03	-1.7 (-2.03 to -1.41)	21.44	0.68	0.49
5	9.36±1.78	5.31±3.39	-4.05 (-4.39 to -3.75)	43.27	2.28	1.13
6	9.33±1.71	8.63±2.35	-0.7 (-0.94 to -0.51)	7.54	0.41	0.29
7	9.62±0.99	9.17±1.56	-0.45 (-0.58 to -0.34)	4.69	0.46	0.33
8	9.05±1.93	4.63±3.31	-4.42 (-4.78 to -4.11)	48.81	2.29	1.19
9	8.52±2.16	6.61±2.63	-1.9 (-2.18 to -1.65)	22.33	0.88	0.64
10	8.54±2.08	6.85±2.64	-1.69 (-1.96 to -1.45)	19.81	0.81	0.59
11	7.99±2.95	6.33±2.82	-1.67 (-2 to -1.33)	20.86	0.57	0.44
12	8.54±3.06	7.48±3.06	-1.05 (-1.37 to -0.72)	12.31	0.34	0.28
13	8.22±3.09	7.41±3.17	-0.81 (-1.15 to -0.43)	9.82	0.26	0.20
14	7.35±2.87	7.4±2.84	0.05 (-0.24 to 0.36)	0.63	0.02	0.02
15	7.45±2.91	7.48±2.95	0.04 (-0.27 to 0.34)	0.52	0.01	0.01
Total	127.17±22.91	100.02±25.96	-27.15 (-29.2 to -25.1)	21.34	1.22	1.18

* Mean change was calculated as preoperative (pre-op) score minus postoperative (post-op) score; negative values indicate postoperative deterioration. Quality of Recovery-15 (QoR-15) items:1 : able to breathe easily; 2 : been able to enjoy food; 3 : feeling rested; 4 : have had a good sleep; 5 : able to look after personal toilet and hygiene unaided; 6 : able to communicate with family or friends; 7 : getting support from hospital doctors and nurses; 8 : able to return to work or usual home activities; 9 : feeling comfortable and in control; 10 : having a feeling of general well-being; 11 : moderate pain; 12 : severe pain; 13 : nausea or vomiting; 14 : feeling worried or anxious; 15 : feeling sad or depressed. SRM: Standardized response mean.

Table 6. Confirmatory Factor Analysis (CFA): Goodness of Fit of the QoR-15.

	n of items	χ^2 (df)	p	CFI	TLI	RMSEA (95%CI)
Model 1	15	χ^2 (105) 5.01	**<0.001**	0.970	0.965	0.092 (0.081-0.104)
Model 2	15	χ^2 (105) 2.42	**<0.001**	0.991	0.989	0.051 (0.039-0.063)

n of items: number of items, χ^2: chi-square statistic, df: degrees of freedom, CFI: Comparative Fit Index, TLI: Tucker–Lewis Index, RMSEA: Root Mean Square Error of Approximation, 95% CI: 95% confidence interval.

indicates a meaningful improvement in the overall QoR-15 from Pre to P7. Standardized response means of the total QoR-15 score were 1.18 from Pre to P7. The results presented in the Table 7 indicate significant mean changes across several items of the QoR-15, with notable effect sizes. These results suggest that these items reflect substantial changes in patient recovery experiences. Also changes in health status and responsiveness are summarized in Table 7.

Discussion

Recovery after surgery is a complex process including not only physical well-being but also psychosocial status. Traditionally, postoperative success has been evaluated based on hospital stay, complication rates, and survival.[26] However, this approach overlooks the patient's perspective, resulting in limited information for researchers and medical professionals. Therefore, a multidimensional recovery questionnaire, such as the QoR-15, has been developed and is now considered to have higher clinical value.

The QoR-15 is a questionnaire that provides a more comprehensive assessment of the quality of the recovery period for postoperative patients. It focuses on five different areas that are crucial to a successful recovery: pain, physical comfort, physical independence, psychological support, and emotional state. By questioning patients in each of these areas, the QoR-15 provides a more complete picture of their recovery experience. Unlike traditional methods, its most significant strength lies in offering a multifaceted integration instead of evaluating the patient based on a limited set of outcomes.[27] By incorporating this questionnaire

Table 7. Weighted least squares mean and variance adjusted (WLSMV) factor loadings after modifications

QoR-15 item number		Factor loadings	S.E.	p
1	Physical well being	0.694	0.031	**<0.001**
2	Physical well being	0.743	0.026	**<0.001**
3	Physical well being	0.817	0.021	**<0.001**
4	Physical well being	0.707	0.029	**<0.001**
5	Physical well being	0.817	0.031	**<0.001**
6	Physical well being	0.746	0.036	**<0.001**
7	Physical well being	0.797	0.035	**<0.001**
8	Physical well being	0.803	0.025	**<0.001**
9	Physical well being	0.887	0.019	**<0.001**
10	Physical well being	0.874	0.020	**<0.001**
11	Mental well being	0.823	0.030	**<0.001**
12	Mental well being	0.994	0.021	**<0.001**
13	Mental well being	0.899	0.023	**<0.001**
14	Mental well being	0.742	0.031	**<0.001**
15	Mental well being	0.788	0.037	**<0.001**

Quality of Recovery-15 (QoR-15) items:1: able to breathe easily; 2: been able to enjoy food; 3: feeling rested; 4: have had a good sleep; 5: able to look after personal toilet and hygiene unaided; 6: able to communicate with family or friends; 7: getting support from hospital doctors and nurses; 8: able to return to work or usual home activities; 9: feeling comfortable and in control; 10: having a feeling of general well-being; 11: moderate pain; 12 : severe pain; 13: nausea or vomiting; 14: feeling worried or anxious; 15: feeling sad or depressed. S.E.: standard error.

into clinical studies, researchers and medical professionals can gain a deeper understanding of the factors that contribute to a successful recovery and use this information to improve patient care.

This study was conducted to assess the Turkish version of the QoR-15 questionnaire. We found that QoR-15T has good levels of validity, reliability, responsiveness, and feasibility.

CFA showed excellent goodness of fit and construct validity of QoR-15T. The ability of QoR-15T to discriminate known determinants such as the negative correlation with ASA score and length of stay, and the positive correlation with weight supported the construct validity.[8] Previous validation studies have similarly reported a negative correlation between the postoperative QoR-15 score and the length of postoperative hospital stay, indicating that higher QoR-15 scores are associated with shorter recovery periods.[10,12] In addition, the significant difference between types of surgery, which means that the QoR-15T scores varied according to the extent of surgery, also confirmed the validity.[8,13] The literature also indicates that patients undergoing major surgery report higher postoperative QoR-15 scores compared to those who undergo intermediate or minor surgical procedures.[8,11–13] While the inclusion of correlated error terms may raise concerns regarding overfitting, this risk was mitigated by applying modifications only when theoretically justified, limiting them to items within the same factor, and maintaining the predefined two-factor structure of the original instrument.

The Cronbach's α coefficients of the preoperative and postoperative QoR-15T were good and similar to those reported in the literature.[8,10–13] Specifically, we observed a Cronbach's α of 0.896 preoperatively and 0.888 postoperatively, closely mirroring the original validation study, which reported a coefficient of 0.85.[8] Internal consistency reliability was calculated not only using Cronbach's α but also with inter-item correlation. Preoperative and postoperative item-total correlation coefficients showed that the questions are relevant.

The assessment of responsiveness utilized Cohen's effect size and the standardized response mean, both regarded as highly appropriate. The total Cohen's effect size and standardized response mean for the global QoR-15T score were 1.22 and 1.18, respectively. Stark and colleagues also reported a Cohen's effect size of 1.35 and a standardized response mean of 1.04.[8] These findings highlight the noteworthy sensitivity of the QoR-15T, confirming its ability to detect even minor clinical changes while maintaining the quality of the original version.[8]

To our knowledge, the only other questionnaires that measure quality of recovery, aside from the QoR-15, are the QoR-40, from which the QoR-15 is derived, and the Surgical Recovery Score. Both questionnaires have undergone cross-cultural adaptation and validation in several countries, with studies demonstrating their reliability, validity, and feasibility.[8,10–13,28] Furthermore, the QoR-15 is recognized as an effective tool for measuring recovery due to its sensitivity in detecting even minor changes in clinical trials.[9]

A previous Turkish validation of the QoR-15 has been published and demonstrated satisfactory reliability and feasibility in an elective surgery population assessed preoperatively and on postoperative day 1.[29] However, our study was conducted independently and within a distinct clinical and methodological framework. Specifically, our cohort consisted exclusively of patients undergoing major abdominal surgery within general surgery, included a larger sample size, and evaluated recovery at four predefined time points, allowing assessment beyond the immediate postoperative period. In addition, we applied confirmatory factor analysis to examine the underlying factor structure of the QoR-15T in this major abdominal surgery population. These differences reflect alternative clinical use scenarios and study de-

signs and provide additional evidence supporting the use of QoR-15T in major abdominal surgery.

Concerning construct validity, we employed WLSMV for the calculation of factor loadings, thereby ensuring a robust and widely accepted estimation methodology. Additionally, our study presents an extensive examination of model fit through the provision of critical indices, namely CFA, RMSEA, CFI, TLI, and AIC. These indices collectively serve to gauge the extent to which our proposed measurement model aligns with the observed data.

One of the limitations of this study is the selection of patients only undergoing major abdominal surgery. There were no patients who underwent minor surgery or any operation from another specialty other than general surgery included in the study. Although the sample size is more than adequate, the low variability due to this selection should be considered. Therefore, there is a need for assessment of the QoR-15T in several patient populations and in different settings. Another limitation is that concurrent validity in the present study was assessed using the ASA score classification. While ASA is a well-established perioperative risk indicator, it primarily reflects global physical status and does not directly capture functional recovery or psychosocial well-being. The absence of additional patient-reported or functional measures (e.g., pain scores, general health status, or generic quality-of-life instruments) represents a limitation of this study. Future studies incorporating complementary outcome measures may further strengthen the assessment of criterion validity for QoR-15T. Lastly, the decreasing sample size at later follow-up points may have introduced attrition-related bias, although this is a common limitation of longitudinal postoperative studies. On the other hand, this was a multicentric study involving numerous hospitals in several cities across Türkiye, which may indicate good generalizability.

Conclusion

In conclusion, measurement of the quality of a patient's recovery period is an important and current subject. QoR-15T, which is a unique tool designed specifically for this measurement, is a reliable, valid, and feasible questionnaire for the assessment of recovery, especially in patients undergoing major abdominal surgery.

Disclosures

Ethics Committee Approval: This study was approved by the Ankara University Medical School Ethics Committee (Date: 14.11.2019, Decision no: İ5-208-19).

Informed Consent: Written informed consent was obtained.

Conflict of Interest: None declared.

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