

Validation and cross-cultural adaptation of the postoperative quality of recovery 15 (QoR-15) questionnaire for Spanish-speaking patients: A prospective cohort study

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Abstract

Background: The postoperative QoR-15 questionnaire may improve the detection of postoperative complications on an early basis and contribute to optimize treatment and recovery. No validated Spanish QoR-15 questionnaire has been available to date. **Methods:** The Spanish QoR-15 questionnaire (QoR-15E), carried out by official bilingual translators, was administered to 242 adult patients undergoing elective surgery before and 24 h after surgery. Patients were asked about their perceived quality of general recovery using a visual analogue scale (VAS). A random subgroup of 36 patients completed a third questionnaire 30 – 60 min after having completed the first one, and under the same conditions. **Results:** The Pearson correlation

coefficient between QoR-15E and the VAS score was 0.759. Cronbach's alpha was 0.856 in the postoperative period. Reliability by the split-half method was 0.781. Test-retest correlation coefficient was 0.998. Cohen's d was 0.94. The mean time to complete the preoperative questionnaire was 2.9 ± 0.5 min.

Conclusions: The QoR-15E is valid and reliable for assessing postoperative quality of recovery in Spanish-speaking patients, with psychometric and interpretative features similar to those of the original instrument.

1. Introduction

During 2019, more than 3.72 million surgical procedures were performed in hospitals of the Spanish public healthcare system. Of these procedures, over 35% were due to diseases related to the specialties of gastrointestinal surgery, urology and gynaecological surgery.¹ One of the main challenges facing excellence in the quality of medical care is improving postoperative patient health and comfort, with a reduction of morbidity-mortality, hospital stay and readmissions.²⁻⁴ Enhanced Recovery After Surgery (ERAS) processes and Multimodal Rehabilitation Programmes (MRP) have been designed with this objective in mind, contributing to improve and accelerate patient recovery after surgery.⁴

In routine clinical practice, it is increasingly important to assess quality of recovery and degree of comfort from the patient perspective. By integrating postoperative physiological parameters and complementary tests, together with active assessment by the patients of their emotional state, comfort, pain sensations and performance of daily basic activities, a more precise understanding of their general condition can be gained. At the same time, this may improve the detection of postoperative complications on an early basis and contribute to optimize treatment and recovery in accordance with the Patient-Reported Outcomes Measures (PROM).⁵⁻⁷

The Quality of Recovery 15 (QoR-15) questionnaire has been validated and transculturally adapted to several languages.⁸⁻¹³ It is applicable in clinical practice and measures the quality of postoperative recovery based on 15 questions, each scored from 0 to 10 points to yield a total score of 0 – 150, with higher scores indicating greater quality of recovery.

Our study hypothesis was that the Spanish version of the QoR-15 (QoR-15E) would have psychometric, interpretation and applicability characteristics consistent with those of the original QoR-15.⁸ Our primary outcome was to adapt and validate the questionnaire in Spanish and assess its validity, reliability, and sensitivity, as well as its applicability and viability in routine clinical practice for Spanish-speaking patients.

2. Material and methods

2.1. Ethics

After obtaining permission from the author of the original questionnaire, the study protocol was approved by the Ethics Committee of our centre (PR-AG-620-2020, Chairperson Prof S. Gallego) on 2 December 2020, and was subsequently registered in [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT04699500) (NCT04699500). All included patients gave written informed consent.

2.2. Translation and trans-cultural adaptation of the questionnaire

Translation from English to Spanish of the entire original instrument was carried out by two independent official bilingual translators with expertise in healthcare translations and familiarised with both cultures. A consensus-based version was then prepared and back-translated into English by two new independent official bilingual translators blinded to the original version of the questionnaire. This produced two documents from which another consensus-based version was generated for comparison against the original and for identifying inconsistencies or errors of concept in translation into the Spanish language and culture.¹⁴ Once the final Spanish questionnaire was obtained, it was consolidated by an expert committee composed of a specialist in scientific methodology, two senior anaesthetists with expertise in postoperative care, and two postanesthesia care unit (PACU) nurses. All members of the expert committee were native Spanish speakers. Finally, a pilot test of the pre-final version of the instrument was carried out with 35 patients that met the inclusion criteria, to evaluate the quality of translation, trans-cultural adaptation and applicability of the QoR-15E in our particular work setting.

2.3. Study design and settings

A prospective cohort study was carried out in a single tertiary care university hospital during the period between January and July 2021. The study took place preoperatively in the preadmission area and 24 h after surgery in the ward. Written informed consent was obtained from the patients that met the inclusion criteria.

Inclusion criteria included the obtainment of written informed consent, adequate understanding of the Spanish language with fluid conversation during the interview, operations in the fields of gastrointestinal surgery, urology or gynaecological surgery, and an expected immediate postoperative course in the PACU. Exclusion criteria were failure to obtain written informed consent, a Mini-Mental State Examination (MMSE) score of under 27, urgent surgery, and an immediate postoperative course in some unit other than the PACU.

Preoperatively in the preadmission area and 24 h after surgery in the ward, the QoR-15E questionnaire was delivered individually to the patients for reading and completion. Prior to completion of the questionnaire, an investigator explained the

characteristics of the latter to the patient base don a previously established protocol, and remained available to clarify any possible doubts during the process. On both occasions, the time (in minutes) taken to complete the questionnaire was recorded. During the postoperative interview, and before completing the questionnaire, the patients were asked about their perceived quality of general recovery scored by means of a 0 – 100 mm visual analogue scale (VAS). A random subgroup of 36 patients completed a third QoR-15E questionnaire 30 – 60 min after having completed the first one, and under the same conditions.

2.4. Data collection

Demographic data and perioperative parameters were collected from the electronic medical records of the hospital. Patient age and gender, weight, height, body mass index (BMI), educational level, comorbidities (smoking, alcohol consumption, arterial hypertension, diabetes mellitus, dyslipidaemia, asthma, chronic obstructive pulmonary disease [COPD], ischaemic heart disease, peripheral vascular disease, anxiety syndrome and depressive syndrome), regular treatment with benzodiazepines and/or antidepressants, physical condition according to the ASA (American Society of Anesthesiologists) score, and patient inclusion in MRP were recorded.

Intraoperative parameters registered were the type of anaesthesia (general, regional, combined or sedation), surgical technique (open, laparoscopic, robot-assisted laparoscopic or endoscopic surgery), surgery time and extent according to the National Institute for Health and Care Excellence (NICE) guidelines (minor, intermediate or major),¹⁷ and whether oncological disease was involved. Postoperative parameters included length of PACU stay, pain VAS score upon admission and at PACU discharge, type and dosage of opioids and antiemetic medication in the first 24 postoperative hours, time to oral tolerance, length of hospital stay (LOS), and in-hospital mortality.

2.5. Statistical analysis

Based on the recommendations of Sousa et al. for the validation of instruments and scales in the medical setting,¹⁴ where at least 10 patients per item are required, and in line with the original study of Stark et al.⁸ and validations in other languages,^{9–13} we established a minimum sample size of 240 patients (16 patients per instrument item). Assuming a dropout rate of 20%, a total sample of 288 subjects was planned.

Continuous data were expressed as mean $\pm$ standard deviation (SD), or median and interquartile range [IQR] as appropriate, with frequencies and percentages (%) for categorical data. Student's t-test for independent samples was used to compare two groups, with analysis of variance (ANOVA) in the case of the comparison of more than two groups, after confirming normal data distribution with the Shapiro-Wilk or Kolmogorov-Smirnov test, and homogeneity of variance with the Levene

test. In those cases where ANOVA proved significant, post hoc comparisons were made based on the Bonferroni correction. Before-after comparisons were made using Student's t-test for dependent samples. Correlations were established based on the Pearson correlation coefficient, depending on whether data exhibited a normal distribution or not. Test-retest reliability was assessed by means of the intraclass correlation coefficient (ICC), and repeatability was calculated from the withinsubject standard deviation, based on the Bland-Altman method.

Evaluation of the psychometric properties of the QoR-15E was carried out taking the published literature as reference.¹⁸⁻² Validity of the construct and convergent validity were analysed. The former was established by comparing the score of the scale before and after surgery, in correlation with the clinical characteristics of the patients, responding to the hypothesis that there is a negative association between the postoperative QoR-15E score and patient age, the duration of surgery, the extent of surgery (minor, intermediate or major), the duration of PACU stay, the duration of hospital stay, and the time taken to complete the questionnaire. Regarding gender, we postulated the hypothesis that women obtain poorer quality of recovery scores than men.^{23,24} We also considered the hypothesis that there is a positive correlation between educational level and the postoperative QoR-15E score. On the other hand, convergent validity was contrasted with the hypothesis that there is a positive correlation between the QoR-15E questionnaire and perceived general recovery as assessed by the VAS.

Reliability was evaluated by the statistical analysis of internal consistency based on Cronbach's alpha, where a score of 0.9 indicates excellent internal consistency, 0.8-0.89 indicates good internal consistency, 0.7 – 0.79 indicates acceptable internal consistency, and < 0.7 indicates poor internal consistency. Reliability was also analysed using the split-half method, and test-retest concordance was examined based on the intraclass correlation coefficient (ICC). Responsiveness was evaluated using Cohen's d, with a value of 0.2 being taken to indicate a small effect size, 0.5 an average effect size, and ≥ 0.8 a large effect size. Evaluation also was carried out based on the standardised response mean (SRM).

Finally, feasibility and acceptability were assessed by analysing the time taken by the patients to complete the questionnaire and the percentage of correctly completed questionnaires.

Statistical significance was considered for $p < 0.05$. The SPSS® version 25.0 statistical package (SPSS Inc., Chicago, IL, USA) was used throughout.

Encuesta QoR-15E para pacientes

Fecha: ____/____/____

Estudio n.º: _____

Preoperatorio ☐

Postoperatorio ☐

PARTE A

¿Cómo se ha sentido en las últimas 24 horas?

(De 0 a 10, donde 0 significa "en ningún momento" [mal] y 10 "todo el tiempo" [excelente])

- | | | | |
|--|-------------------|------------------------|----------------|
| 1. He podido respirar con facilidad | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |
| 2. He podido disfrutar de la comida | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |
| 3. Me he sentido descansado/a | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |
| 4. He podido dormir bien | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |
| 5. He podido ir al baño y asearme sin ayuda externa | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |
| 6. He podido comunicarme con mi familia o amigos | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |
| 7. He recibido apoyo del personal médico y de enfermería del hospital | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |
| 8. He podido volver al trabajo o a las actividades domésticas habituales | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |
| 9. Me he sentido cómodo/a y con control de la situación | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |
| 10. He tenido una sensación de bienestar general | En ningún momento | 0 1 2 3 4 5 6 7 8 9 10 | Todo el tiempo |

PARTE B

¿Ha experimentado alguno de los siguientes síntomas en las últimas 24 horas?

(De 10 a 0, donde 10 significa "en ningún momento" [excelente] y 0 "todo el tiempo" [mal])

- | | | | |
|-----------------------------|-------------------|------------------------|----------------|
| 11. Dolor moderado | En ningún momento | 10 9 8 7 6 5 4 3 2 1 0 | Todo el tiempo |
| 12. Dolor severo | En ningún momento | 10 9 8 7 6 5 4 3 2 1 0 | Todo el tiempo |
| 13. Náuseas o vómitos | En ningún momento | 10 9 8 7 6 5 4 3 2 1 0 | Todo el tiempo |
| 14. Preocupación o ansiedad | En ningún momento | 10 9 8 7 6 5 4 3 2 1 0 | Todo el tiempo |
| 15. Tristeza o depresión | En ningún momento | 10 9 8 7 6 5 4 3 2 1 0 | Todo el tiempo |

Fig. 1. The Spanish version of the postoperative Quality of Recovery 15 questionnaire: the QoR-15E questionnaire.

3. Results

3.1. Translation and cross-cultural adaptation

Minor changes were made in the translation process to improve readability and understanding of the questionnaire, adapting the explanations of the assessment methods, and using personal verbal forms for greater consistency of the expressions in Spanish. First, the decision was made to use formal instead of informal expressions in addressing the reader of the questionnaire. Second, we decided to use the perfect tense instead of the simple present tense with the items from one to ten in order to improve readability and understanding - avoiding the synthetic verbal forms we would obtain with a literal translation of the original document. Lastly, we avoided the literal translation of the term "poor", as it has a negative connotation in Spanish - thereby ensuring inclusive language. The definitive QoR-15E questionnaire was established after checking for inconsistencies or errors of concept in the translation and adequate cultural adaptation to Spanish by both the expert committee and based on the absence of negative registries during the pilot test performed (Fig. 1).

3.2. Patient recruitment and characteristics

During the study period, a total of 319 patients were screened. Of these, 23 failed to meet the inclusion criteria established in the working protocol, 11 declined to participate, and 19 were excluded due to lack of availability of the research team. This left a total of 266 patients included in the study. Of these subjects, 24 failed to follow the circuit established by the study protocol and were likewise excluded - leaving a final sample for analysis of 242 patients (Fig. 2).

Patient characteristics and type of surgery are shown in Table 1. A total of 240 patients (99.2%) received benzodiazepines as premedication before surgery, and 227 patients (93.8%) started progressive oral intake during the first 24 h after surgery.

According to surgical techniques, the mean $\pm$ SD surgery time in minutes was 101 ± 55.13 , 129.18 ± 87.3 , 223.93 ± 105.29 and 58.62 ± 39.33 for open surgery, laparoscopic surgery (LS), robot-assisted laparoscopic surgery (RLS) and endoscopic surgery, respectively ($p < 0.001$).

Regarding MRP according to the established protocol at our centre, 99 patients (40.9%) received rehabilitation measures. Of those who were rehabilitated, 71.7% were scheduled for major surgery, 28.3% for intermediate surgery and none for minor surgery ($p = 0.048$).

3.3. Convergent and construct validity

Prior to surgery, no statistically significant associations were observed between the preoperative QoR-15E score and each of the variables reported in Table 1. A significant correlation was found between postoperative QoR-15E and the VAS

scores ($r = 0.759, p < 0.001$). Patients with VAS < 70 mm obtained a mean score of 90.8 ± 11.9 in the QoR-15E versus a score of 119.3 ± 11.8 among patients with VAS ≥ 70 mm ($p < 0.001$). In contrast, no significant correlation was observed between postoperative QoR-15E and patient age ($r = -0.03, p = 0.684$). There were no differences between the postoperative QoR-15E score and patient educational level ($p = 0.105$). Regarding gender, the mean postoperative QoR-15E score was 115.4 ± 15.5 in men versus 108 ± 18.3 in women ($p = 0.001$).

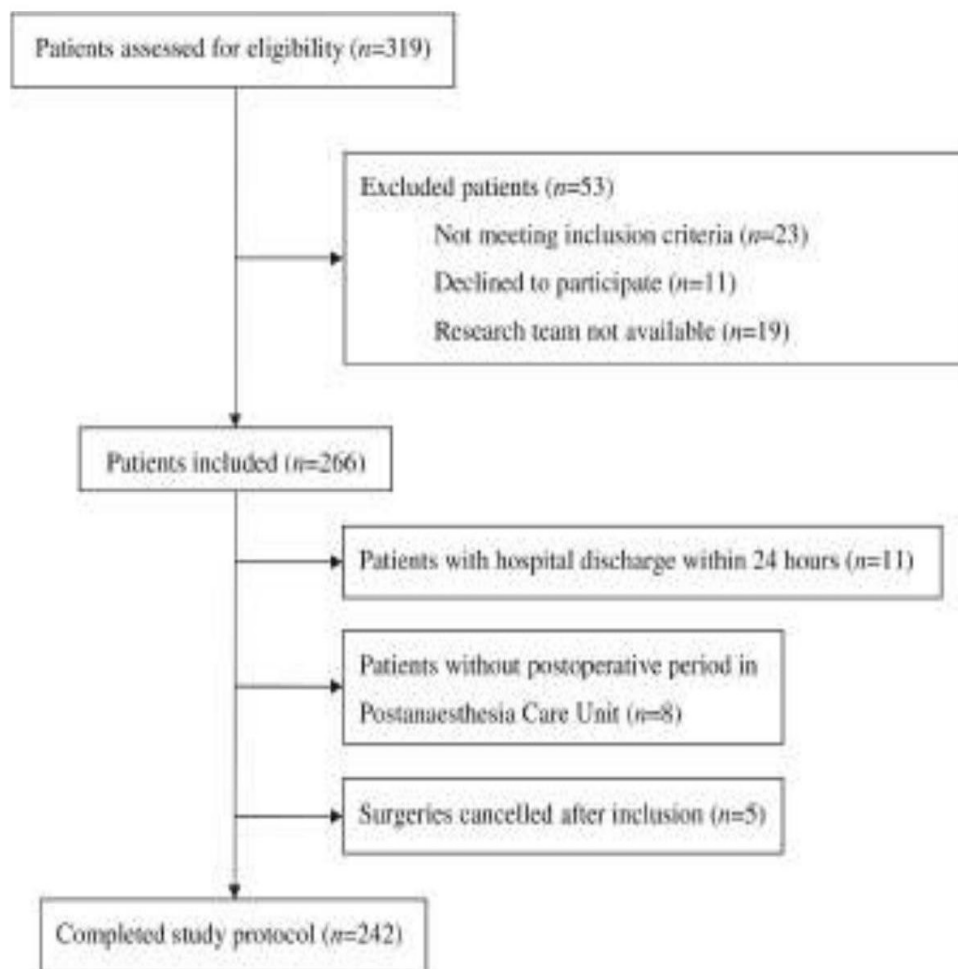


Fig. 2. Patient recruitment flow chart.

Table 1 Patient demographic and surgical characteristics ($n = 242$).

Variable	
Age, years (mean, range)	61.37 (18-87)
Male/female	144/98 (59.5/40.5)
Educational level	
Primary	70 (28.9)
Secondary	77 (31.8)
Higher	95 (39.3)
Comorbidities	
Arterial hypertension	133 (55)
Dyslipidaemia	109 (45)
Diabetes	56 (23.1)
Current smoker	47 (19.4)
Alcohol	39 (16.1)
Depressive disorder	36 (14.9)
Anxiety disorder	35 (14.5)
COPD	29 (12)
Ischaemic cardiomyopathy	29 (12)
Peripheral vascular disease	23 (9.5)
Asthma	18 (7.4)
ASA score	
I	37 (15.3)
II	135 (55.8)
III	68 (28.1)
IV	2 (0.8)
Type of surgery	
Gastrointestinal	124 (51.2)
Colorectal	32 (13.2)
Cholecystectomy	24 (9.9)
Abdominal wall	23 (9.5)
Bariatric	20 (8.3)
Thyroidectomy	14 (5.8)
Gastrointestinal	11 (4.5)
Urological	109 (45.1)

Prostatectomy	34 (14)
Bladder	34 (14)
Urolithiasis	22 (9.1)
Urethral reconstruction	10 (4.1)
Pelvic floor reconstruction	6 (2.5)
Radical nephrectomy	3 (1.2)
Gynaecological	9 (3.7)
Hysterectomy	9 (3.7)
Surgery extent	
Minor	4 (1.7)
Intermediate	83 (34.3)
Major	155 (64)
Surgical techniques	
Open	55 (22.7)
Laparoscopic	67 (27.7)
Robot-assisted laparoscopic	44 (18.2)
Endoscopic	76 (31.4)
Type of anaesthesia	
General	134 (55.4)
Regional	70 (28.9)
Combined	33 (13.6)
Sedation	5 (2.1)
Surgery time, minutes	117.84 (92.14)
PACU stay, minutes	218.6 (110.66)
Hospital stay, days	2.78 (5.52)

Data are presented as number (%) or mean (SD) unless otherwise stated; COPD: chronic obstructive pulmonary disease. PACU: Postanaesthesia Care Unit. Surgery extent: based on the National Institute for Health and Care Excellence (NICE) guidelines.

In contrast, a significant negative correlation was found between the postoperative QoR-15E score and surgery time ($r = -0.3, p < 0.001$), length of PACU stay ($r = -0.39, p < 0.001$), LOS ($r = -0.2, p = 0.004$) and the time taken to complete the questionnaire ($r = -0.21, p = 0.005$). Lastly, regarding the extent of surgery, the mean postoperative QoR-15E score was 131.3 ± 9.6 in the case of minor surgery,

118.5 $\pm$ 13.7 in the case of intermediate surgery, and 108.7 $\pm$ 17.6 in the case of major surgery ($p < 0.001$) (Table 2).

3.4. Reliability

Cronbach's alpha of the scale was 0.856 in the postoperative period. Reliability as assessed by the split-half method was 0.781. Globally, the test-retest concordance coefficient ($n = 36$) obtained with the intraclass correlation coefficient was 0.998 (95% CI 0.996 to 0.999). Table 3 shows the inter-items correlation matrix for QoR-15E.

3.5. Responsiveness

The mean QoR-15E score after surgery was lower than preoperatively (112.4 $\pm$ 17.1 versus 128.4 $\pm$ 14.3)($p < 0.001$). The effect size (Cohen's d) was 0.94, with a standardised response mean (SRM) of 0.92 (Table 4).

3.6. Feasibility and acceptability

All QoR-15E questionnaires were completed (100%). The mean time taken to complete the questionnaire was 2.9 $\pm$ 0.5 min before surgery, versus 2.3 $\pm$ 0.4 min 24 h after surgery ($p < 0.001$).

4. Discussion

The aim of the present study was to adapt and validate the postoperative Quality of Recovery 15 (QoR-15) questionnaire in its Spanish version (QoR-15E). As also reflected in other publications,^{9–13} the instrument had to be adapted to our everyday expressions to ensure improved readability and understanding. We did this by means of official translators, in the same way as the authors that validated the QoR-15swe¹² - though in contrast to the authors of the QoR-15F,¹³ who completed the entire translation process themselves.

Table 2 Comparison of the preoperative and postoperative QoR-15E questionnaire scores in relation to different study variables.

	Preoperative	p -value	Postoperative	p -value
	QoR-15E		QoR-15E	
Educational level		0.278		0.105
Primary	126.09 (14.25)		108.96 (14.68)	
Secondary	129.35 (13.35)		112.81 (18.22)	
Higher	129.34 (15.1)		114.63 (17.53)	
ASA score		0.7		0.271
I/II	128.02 (14.77)		112.9 (18.01)	

III/IV	129.33 (13.24)	111.2 (14.58)	
Type of anaesthesia	0.438	<0.001	
General	127.74 (15.36)	110.39 (16.79)a	
Regional	131.07 (10.76)	118.21 (14.79)b	
Combined	125.03 (15.44)	106 (19.33)a	
Sedation	131 (19.47)	127.6 (9.56)b	
Oncological surgery	0.154	0.646	
No	129.21 (14.42)	112.69 (17.28)	
Yes	127.1 (14.17)	111.96 (16.85)	
Surgery extent	0.388	<0.001	
Minor	127 (18.67)	131.25 (9.64)b	
Intermediate	131.12 (10.13)	118.52 (13.74)b	
Major	126.98 (15.94)	108.65 (17.63)a	

QoR-15E: Spanish version of the Quality of Recovery 15 (QoR-15) questionnaire. Surgery extent: based on the National Institute for Health and Care Excellence (NICE) guidelines. a-b: post hoc. Between two categories, different letters indicate statistically significant differences (Bonferroni correction).

Table 3 The QoR-15E inter-item correlation matrix. Boldface values correspond to $p < 0.05$.

QoR-15E Item	Total QoR-15E Score	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	0.44	1													
2	0.62	0.23	1												
3	0.69	0.30	0.38	1											
4	0.53	0.27	0.27	0.65	1										
5	0.46	0.03	0.21	0.22	0.17	1									
6	0.44	0.21	0.25	0.17	0.08	0.21	1								
7	0.22	0.17	0.12	0.19	0.12	0.03	0.23	1							
8	0.55	0.13	0.29	0.31	0.22	0.28	0.24	0.08	1						
9	0.48	0.20	0.29	0.40	0.27	0.12	0.07	0.32	0.23	1					
10	0.61	0.24	0.45	0.45	0.34	0.19	0.14	0.16	0.23	0.60	1				
11	0.45	0.20	0.17	0.25	0.27	0.07	0.01	-0.01	0.07	0.08	0.21	1			
12	0.48	0.23	0.30	0.31	0.27	0.11	0.09	0.04	0.14	0.14	0.24	0.56	1		
13	0.32	0.14	0.35	0.23	0.13	0.03	0.02	0.12	0.16	0.18	0.21	0.08	0.20	1	
14	0.50	0.31	0.17	0.31	0.21	0.15	0.03	0.09	0.16	0.17	0.28	0.24	0.20	0.21	1
15	0.47	0.22	0.17	0.29	0.16	0.19	0.13	0.11	0.18	0.28	0.31	0.14	0.15	0.14	0.56

QoR-15E: Spanish version of the Quality of Recovery 15 (QoR-15) questionnaire.

Table 4 Mean preoperative, postoperative, change, responsiveness, test-retest reliability and corrected total item correlation values, with the p -value of the QoR-15E questionnaire.

	QoR-15E Pre (n = 242)	QoR-15E Post (n = 242)	Mean change (95% CI) (n = 242)	p-value	Effect size (n = 242)	SRM	Test-retest (n = 36)	Item-test
QoR-15E_1	9.3 (1.29)	9.26 (1.36)	0.04 (-0.15; 0.23)	0.662	0.03	0.03	0.92 (0.85-0.96)	0.44
QoR-15E_2	8.68 (2.09)	6.5 (3.17)	2.19 (1.78; 2.59)	<0.001	1.04	0.69	0.95 (0.91-0.98)	0.64
QoR-15E_3	7.75 (2.03)	7.44 (2.12)	0.31 (-0.03; 0.64)	0.076	0.15	0.11	0.99 (0.97-0.99)	0.67
QoR-15E_4	7.12 (2.61)	6.9 (2.33)	0.22 (-0.19; 0.62)	0.295	0.08	0.07	0.97 (0.95-0.99)	0.54
QoR-15E_5	9.75 (0.79)	4.2 (4.04)	5.55 (5.03; 6.07)	<0.001	7.01	1.36	0.93 (0.86-0.96)	0.5
QoR-15E_6	9.84 (0.58)	8.45 (3.13)	1.40 (1.00; 1.79)	<0.001	2.42	0.45	0.82 (0.67-0.90)	0.41
QoR-15E_7	9.66 (0.99)	9.67 (0.75)	-0.01 (-0.16; 0.15)	0.916	-0.01	-0.01	1	0.23
QoR-15E_8	9.03 (1.69)	4.17 (2.90)	4.86 (4.45; 5.27)	<0.001	2.88	1.50	0.97 (0.94-0.99)	0.54
QoR-15E_9	8.45 (1.79)	8 (1.77)	0.46 (0.18; 0.73)	0.001	0.25	0.21	0.98 (0.95-0.99)	0.46
QoR-15E_10	8.3 (1.71)	7.57 (1.79)	0.73 (0.46; 1.00)	<0.001	0.43	0.34	0.98 (0.96-0.99)	0.59
QoR-15E_11	7.83 (2.56)	5.9 (2.28)	1.92 (1.50; 2.35)	<0.001	0.75	0.57	1.00 (1.00-1.00)	0.42
QoR-15E_12	9.72 (1.03)	9.07 (1.59)	0.65 (0.43; 0.86)	<0.001	0.63	0.37	1	0.46
QoR-15E_13	9.66 (1.28)	9.19 (1.82)	0.48 (0.20; 0.75)	0.001	0.37	0.22	1	0.38
QoR-15E_14	5.78 (2.82)	7.6 (2.42)	-1.83 (-2.18; -1.47)	<0.001	-0.65	-0.66	0.99 (0.99-1.00)	0.49
QoR-15E_15	7.54 (2.88)	8.41 (2.26)	-0.87 (-1.20; -0.54)	<0.001	-0.30	-0.33	1	0.49
QoR-15E_TOTAL	128.4 (14.33)	112.41 (17.08)	15.99 (13.78; 18.20)	<0.001	0.94	0.92	1.00 (1.00-1.00)	

QoR-15E: Spanish version of the Quality of Recovery 15 (QoR-15) questionnaire. Pre: preoperative. Post: postoperative. 95% CI: 95% confidence interval. SRM: standardised response mean.

Regarding the demographic data of our patients, the mean age was 61.4 ± 15 years, with a predominance of males (59.5%). This is consistent with the study published by Stark et al.,⁸ in which males represented 68% of the sample. In contrast, other validations of the QoR-15 have included a larger percentage of women.⁹⁻¹³ With regard to the ASA score, patients corresponding to scores II and III accounted for 83.9% of the sample, which is in line with the other validations of the instrument,^{8,10-13} except the Danish version,⁹ where patients with ASA score I represented 59% of the sample.

With regard to the surgical specialties and the types of surgery involved in the study sample, we chose gastrointestinal surgery, urology and gynaecological surgery, entering a total of 13 different types of surgeries. In this way adaptation was made to the surgical distribution by areas of our hospital, taking into account that the mentioned three specialties represent over one-third of the operations performed annually in the Spanish public healthcare system.¹ This is similar to the situation found among the French¹³ and Danish⁹ colleagues, who included the specialties of gastrointestinal, orthopaedic and gynaecological surgery. In contrast, the authors of the original questionnaire⁸ and the authors of the Chinese validation¹¹ respectively used eight and seven surgical specialties, without including gynaecological surgery in either case. With the exception of the Portuguese authors,¹⁰ who included eight types of surgery in their sample, the rest of the validations did not present the included variety of surgeries.

In relation to the psychometric characteristics, we confirmed the hypothesis that the construct is valid for all the studied variables except patient age - in coincidence with the initial validation published by Stark et al.⁸ and the French¹³ and Swedish¹² versions - and educational level. This latter parameter was only contemplated in the validation of the QoR-15C,¹¹ though no analysis was made in relation to the score obtained. With regard to gender, the QoR-15E yielded poorer postoperative quality of recovery scores in women than in men. This observation is consistent with

the data of the authors of the original questionnaire and of the Danish colleagues.^{8,9} In this regard, different studies have shown such poorer quality of recovery in women to be attributable to biological-psychosocial mechanisms,²⁵ a greater sensitivity to pain,²⁵ a higher risk of postoperative headache,²³ and a greater probability of postoperative nausea and vomiting.^{26,27}

With regard to convergent validity, and in agreement with other validations^{8,13} our results indicate a good correlation between the postoperative QoR-15E and VAS scores (> 0.6). Although correlations are commonly established with this scale, it presents some limitations in assessing quality of recovery, but no other instruments have yet been established as the reference with which to compare the QoR-15E.^{28–32}

Cronbach's alpha showed good internal consistency. Test-retest analysis evidenced excellent reproducibility, and as previously reported,^{8–10,12,13} Cohen's d for assessing the magnitude of effect showed great capacity to detect clinically important changes. Nevertheless, our recorded value was greater than in other validations that reported a moderate capacity to detect changes.^{12,33} Our study also evidenced good feasibility and acceptability.³⁴

Previous efforts yielded the Spanish version of the SF-36 healthrelated quality of life questionnaire,³⁵ which has been widely validated for measuring health condition³⁶ and has also been used to evaluate postoperative quality of recovery.³⁷ On comparing the psychometric properties of the QoR-15E and Spanish SF-36, both tools are seen to offer similar reliability, sensitivity and internal validity when analysed on the basis of the principal purpose for which they were designed.³⁵ In contrast, on only focusing upon quality of recovery, it must be taken into account that the QoR-15E was specifically developed to assess postoperative quality of recovery, while the Spanish SF-36 was designed to evaluate health-related quality of life. This circumstance could affect sensitivity in detecting changes³⁶ and the external validity of the Spanish SF-36 on applying it to postoperative patients for assessing their quality of recovery.³⁷

The results obtained in this study on the validation and adaptation of the postoperative QoR-15 questionnaire to Spanish afford a tool not available to date for assessing the quality of recovery in patients from a subjective perspective based on PROM.⁶ The healthcare organizations have adopted ERAS processes as a key element in the management of patients subjected to surgery in order to reduce morbidity-mortality, LOS and readmissions.^{2,4} In these interdisciplinary processes, clinical trials are being carried out that use quality of recovery questionnaires such as the QoR-15 to determine and contribute to the development of patient-centred outcomes.⁵ Likewise, monitoring of the quality of recovery following surgery has also been recommended by the American Society for Enhanced Recovery.⁷

4.1. Limitations

Our study has several limitations. First, this is a single-centre study carried out at a tertiary care hospital, and we cannot affirm that the results may be extrapolated to other centres in our setting. Second, the QoR-15E has been adapted and validated for Spanish-speaking patients in Spain. Due to the many countries in which Spanish is the spoken language, there may be specific cultural and terminological differences. In this regard, it would be necessary to establish the suitability of the application of the QoR-15E in these scenarios. Third, we acknowledge that our study protocol excludes urgent surgeries, ambulatory surgeries without hospital admission, and surgeries in which the postoperative interval takes place in a location other than the PACU. Validation of the QoR-15E would be needed in these other settings, among others. Finally, due to the organisational structure of the surgical area at our centre, we chose three specialties that consequently reduced the heterogeneity of the study sample. However, we have taken into account that the mentioned three specialties represent over one-third of the operations performed annually in the Spanish public healthcare system.

5. Conclusions

The postoperative QoR-15 questionnaire translated and adapted to Spanish (QoR-15E) has been obtained, with a favourable assessment of its psychometric properties, demonstrating validity, reliability, responsiveness, feasibility and acceptability. The QoR-15E questionnaire allows us to assess the quality of recovery from the subjective perspective of the patients, making it possible to target measures and decisions to cover the needs of the patient, contribute to faster and more effective recovery in routine clinical practice, and reinforcing ERAS and MRP processes.

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Author contributions

All authors attest that they meet the current International Committee of Medical Journal Editors (ICMJE) criteria for Authorship.

Conceptualization: VM-A, MdM and MdN; Data curation: VM-A, YLA and MdM; Formal analysis: VM-A, YL-A, MdM; Investigation: VM-A, YL-A, MP-N and OM-S; Methodology: VM-A, YL-A, MP-N and OM-S; Project administration: AG-T, SM-M and MdN; Resources: AG-T, SM-M and MdN; Software: VM-A and YL-A; Supervision: AG-T, SM-M and MdN; Validation: MdM, AG-T, SM-M and MdN; Visualization: VM-A, AG-T and SM-M; Writing - original draft: VM-A; Writing - review & editing: VM-A, YL-A, MdM and MdN.

All authors provided critical feedback and helped shape the research, analysis, and manuscript. All authors discussed the results, commented on the manuscript, and contributed extensively to the work presented in this paper.

Human and animal rights

The authors declare that the work described has been carried out in accordance with the Declaration of Helsinki of the World Medical Association revised in 2013 for experiments involving humans as well as in accordance with the EU Directive 2010/63/EU for animal experiments.

Informed consent and patient details

The authors declare that this report does not contain any personal information that could lead to the identification of the patient(s).

The authors declare that they obtained a written informed consent from the patients and/or volunteers included in the article. The authors also confirm that the personal details of the patients and/or volunteers have been removed.

Declaration of competing interest

The authors declare that they have no competing interests.

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