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Original Scientific Paper



# VALIDATION OF THE QUALITY OF RECOVERY-40 QUESTIONNAIRE ADAPTED FOR CROATIAN POPULATION

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SUMMARY – Quality of recovery after anesthesia is an important indicator of patient postoperative outcomes. Quality of Recovery-40 (QoR-40) is a validated and widely used multidimensional 40-item questionnaire that measures postoperative quality of recovery. The aim of this study was to perform translation and psychometric validation of the Croatian version of QoR-40, which included validity, reliability, responsiveness, and clinical acceptability. The QoR-40 and Short Form-36 (SF-36) questionnaires were administered to patients undergoing general anesthesia for elective surgery on the day before surgery and on postoperative day 3. The quality of recovery was also assessed with visual analog scale (VAS) 0-100. Of 192 enrolled patients, 162 completed the study protocol. Convergent validity assessed by Pearson correlation (r) between the QoR-40 and VAS scores was 0.68 ($p<0.001$). There were moderate correlations of QoR-40 with SF-36 Physical component scale ($r=0.521$; $p<0.001$) and with SF-36 Mental component scale ($r=0.580$; $p<0.001$). Construct validity was supported by negative correlation with the length of hospital stay ($r=-0.21$; $p=0.007$) and significant difference in total postoperative QoR-40 scores between patients with and without postoperative complications ($p<0.001$). Internal consistency of the global QoR-40 was high (Cronbach's $\alpha=0.93$) and of the QoR-40 dimensions it was moderate to high ($\geq 0.714$). Split-half coefficient was 0.87, Cohen's effect size was 0.81, and standardized response mean was 0.762. Our translated QoR-40 is a valid, reliable and comprehensive questionnaire for measuring quality of postoperative recovery across surgery spectrum in Croatian population with psychometric properties similar to the original version.

Key words: *Patient reported outcome measures; Quality of recovery; Validation study; Perioperative medicine*

## Introduction

In the rapidly evolving field of perioperative medicine, numerous interventions have been designed and implemented before and during surgery to improve postoperative outcomes[1]. Quality of postoperative re-

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covery represents an important determinant of postoperative outcome relevant not only to clinicians but also to patients. Therefore, it should be measured for quality control, as well as in outcome studies to assess the impact of various interventions and implement further improvements. Besides usual measures that include postoperative morbidity and mortality, complication rates, and length of hospital stay, it is prudent to assess also patient perspective on recovery. Furthermore, patient experience and satisfaction has gained a central role in the evaluation of health care quality.

To assess the quality of postoperative recovery, different questionnaires that are included in patient reported outcome measures (PROMs) have been developed[2,3]. Quality of Recovery-40 (QoR-40) is a patient rated questionnaire for evaluation of postoperative recovery developed by Myles *et al.*[4]. The QoR-40 has been validated in several languages and cultures and extensively used as an outcome measure in clinical trials. The translated QoR-40 versions have acceptable validity and reliability for evaluating the quality of postoperative recovery[5-9].

The aim of this study was to translate the English version of QoR-40 to the Croatian language and perform psychometric validation of the Croatian QoR-40 version.

## Patients and Methods

Upon approval obtained from the Zadar General Hospital Ethics Committee (approval no.: 01-4288-2/15), we conducted a prospective observational cohort study in adult patients (age >18 years) undergoing elective surgery under general anesthesia and scheduled to be admitted to the hospital a day before the planned surgery with expected hospitalization of at least three days. The study was conducted from November 2015 to August 2018.

Patients with cognitive impairment, psychiatric disorder and/or severe medical condition precluding objective assessment, patients not fluent in Croatian, and patients with a history of allergy to medication administered in the study protocol were excluded. A written informed consent was obtained from all patients included in the study.

The QoR-40 questionnaire consists of 40 questions that cover five key dimensions of postoperative recovery: physical comfort (12 items), emotional state (9 items), psychological support (7 items), physical independence (5 items), and pain (7 items). The items are scored on a five-point Likert scale from 1 (worst) to 5 (best)[4]. Total score is obtained by summing all items with the range from minimum score 40 (worst possible recovery) to maximum score 200 (best possible recovery). The possible answers are: none of the time, some of the time, usually, most of the time, all of the time[4].

Short Form-36 (SF-36) is an internationally used multi-purpose questionnaire for assessing health related quality of life. It consists of 36 items covering eight dimensions: physical functioning, physical role limitations, general health perceptions, bodily pain, vitality, emotional role limitations, mental health, and social functioning. The first four dimensions were combined to form Physical Component Scale (PCS), and the last four to form Mental Component Scale (MCS). The scores for dimensions and total score range from 0 to 100, with higher score indicating better health status. Validation of the Croatian version of SF-36 was previously published and found the instrument to be valid and reliable[10].

### *Translation and cultural adaptation of the QoR-40 questionnaire*

Approval was obtained from the authors of the original QoR-40 to perform translation and validation of the QoR-40 questionnaire. Forward translation of the original version to Croatian language was independently performed by two bilingual translators who were native Croatian speakers. Disparities in translation were discussed with project manager until consensus was achieved. In the next step, backward translation to English language was done by native English speaker without medical background. Project manager reviewed all versions and after resolving all disparities with translators, the final version was completed. Final version was tested on a pilot group of 20 patients who found the questionnaire to be comprehensible, easy to use, and not time consuming.

### *Protocol*

Patient demographic and perioperative data were obtained including the following: age, gender, body mass index (BMI), American Society of Anesthesiologists (ASA) physical status score, duration of anesthesia and surgery, type of surgery, length of hospital stay, comorbidities, and postoperative complications. Surgeries were classified as intermediate or major based on the expected stress response and duration of the surgery.

Patients were approached by a research team member and were concisely informed about study goals on the day before surgery, all their questions were answered, and baseline QoR-40 and SF-36 were completed. On postoperative day 3, both questionnaires were repeated. The quality of postoperative recovery was assessed on visual analog scale (VAS) 0-100 mm with 0 meaning "worst possible recovery" and 100 "best possible recovery". Self-rated method was used for filling out the questionnaires. Patients completed the questionnaires by themselves but a research team member was available to provide additional clarification and assistance.

***Statistical analysis***

The sample size was guided by the original validation study of QoR-40[4]. To perform psychometric validation of the Croatian version of the QoR-40 questionnaire, we investigated validity, reliability, and responsiveness.

Validity assesses the extent to which the instrument measures what it purports to measure[11]. Convergent validity was assessed with correlation of global QoR-40 score with quality of recovery estimated with recovery VAS and with correlation of QoR-40 with Physical Component Scale (PC SF-36) and Mental Component (MC SF-36) of SF-36 questionnaire.

To examine construct validity, testing of hypotheses based on correlation of QoR-40 with previously established constructs was performed. The following hypotheses were tested: QoR-40 score would be lower in patients with complications, women would have lower QoR-40 score than man, and negative correlation of QoR-40 score with length of stay (LoS) in a hospital.

Reliability is the ability of an instrument to measure without error. To assess reliability of our Croatian version of QoR-40, we calculated internal consistency using Cronbach's alpha coefficient (α), split-half reliability, and item to own dimension correlation coefficients.

To assess responsiveness to change that represents the capacity of questionnaire to detect changes in health status, standardized response mean (SRM) and Cohen's effect size were calculated.

Clinical acceptability was assessed with patient recruitment and completion rate.

Normality of data distribution was confirmed with Kolmogorov-Smirnov test and appropriate parametric statistical analyses were applied (t-test for independent samples and Pearson correlation coefficients). Continuous data were analyzed with mean and standard deviation (SD).

Internal consistency for global QoR-40 and dimensions was assessed using Cronbach's alpha coefficient (α). Values of 0.70 to 0.95 were considered acceptable[12]. SRM was calculated as the mean change in QoR-40 score from preoperative to postoperative divided by SD of the change. Cohen's effect size was calculated as the mean change in QoR-40 score from preoperative to postoperative divided by SD at baseline. Values 0.20, 0.50 and 0.80 or greater were considered small, moderate and large effect sizes, respectively[13]. The values of $p<0.05$ were considered significant.

Data analysis software system IBM SPSS Statistics, version 25.0 was used in all statistical procedures.

## Results

Of the 200 eligible patients, eight patients refused to participate in the study (96% recruitment rate). Two patients were excluded because they needed reoperations due to postoperative complications, and one patient had surgery cancelled after additional diagnostic workup. Another 27 patients were discharged from the hospital before postoperative day 3, making them unavailable to complete the questionnaires (84% completion rate). A total of 162 patients completed the questionnaires. Patient characteristics and perioperative data are presented in Table 1.

Patients found the questionnaire to be comprehensible and easy to use. Most patients completed QoR-40 within 6 minutes without any assistance, indicating good clinical utility. A minority of patients asked research staff to read the questions and mark the answers. Some patients were reminded to fill out the questions they skipped.

Of 103 (64%) male patients included in the study, four had intermediate surgery and 99 major surgery. Of 59 (36%) female patients, 32 had intermediate surgery and 27 major surgery.

Twenty patients had postoperative complications (cardiovascular 6, respiratory 5, neurological 4, sepsis 3, and other 2).

***Validity***

Pearson (r) correlation between postoperative QoR-40 and quality of recovery assessed with recovery VAS (0-100 mm) was 0.68 ($p<0.001$).

Correlations between the global score and dimensions of QoR-40 and SF-36 Physical and Mental

*Table 1. Patient characteristics and perioperative data (N=162)*

| | |
|---|---|
| General data | |
| Age (years): mean ± SD | 60.5±10.7 |
| Male gender: n (%) | 103 (63.6) |
| BMI (kg/m$^2$): mean ± SD | 26.9±4.4 |
| ASA Physical Status | |
| I: n (%) | 18 (11.1) |
| II: n (%) | 114 (70.4) |
| III: n (%) | 30 (18.5) |
| Type of surgery | |
| Thoracic: n (%) | 16 (9.9) |
| Neurosurgical: n (%) | 4 (2.5) |
| Vascular: n (%) | 1 (0.6) |
| Abdominal: n (%) | 25 (15.4) |
| ENT or faciomaxillary: n (%) | 4 (2.5) |
| Urologic: n (%) | 86 (53.1) |
| Gynecologic: n (%) | 24 (14.8) |
| Trauma: n (%) | 1 (0.6) |
| General: n (%) | 1 (0.6) |
| Comorbidity | |
| Cardiovascular: n (%) | 77 (47.5) |
| Respiratory: n (%) | 21 (13.0) |
| Renal: n (%) | 11 (6.8) |
| Gastrointestinal: n (%) | 24 (14.8) |
| Neurological: n (%) | 8 (4.9) |
| Endocrinological: n (%) | 32 (19.8) |
| Other: n (%) | 27 (16.7) |
| Clinical data | |
| Duration of operation (min): mean ± SD | 135.3±56.0 |
| Duration of anesthesia (min): mean ± SD | 164.7±56.9 |
| Length of hospital stay (days): mean ± SD | 7.2±2.5 |
| Major extent of surgery: n (%) | 126 (77.8) |
| Without complications: n (%) | 142 (88.2) |
| VAS recovery score (0-100 mm): mean ± SD | 65.5±16.9 |

ASA = American Society of Anesthesiologists; BMI = body mass index; VAS = visual analog scale; ENT = ear, nose, throat; SD = standard deviation

*Table 2. Pearson correlation coefficients (r) between QoR-40 dimensions and global score with SF-36 component scales*

| | | SF-36 Physical Component Scale | SF-36 Mental Component Scale |
|---|---|---|---|
| QoR-40 Emotional state | r | 0.498 | 0.624 |
| | p | <0.001 | <0.001 |
| QoR-40 Physical comfort | r | 0.441 | 0.441 |
| | p | <0.001 | <0.001 |
| QoR-40 Psychological support | r | 0.357 | 0.484 |
| | p | <0.001 | <0.001 |
| QoR-40 Physical independence | r | 0.396 | 0.383 |
| | p | <0.001 | <0.001 |
| QoR-40 Pain | r | 0.358 | 0.338 |
| | p | <0.001 | <0.001 |
| Global QoR-40 | r | 0.521 | 0.580 |
| | p | <0.001 | <0.001 |

QoR-40 = Quality of Recovery-40; SF-36 = Short Form Health Survey is a 36-item, patient-reported survey of patient health

Component scales were medium to high (r≥0.338) (Table 2).

Patients with postoperative complications had a significantly lower global QoR-40 score than patients without complications (155.7±23.4 *vs*. 179.9±12.0, p<0.001).

There was no difference in the global postoperative QoR-40 score between men and women (178±16.0 *vs*. 174±16.0, p=0.157). However, when global QoR-40 was compared between men and women who had major surgery, the difference was significant (178±16.0 *vs*. 169±20.0, p=0.006).

There was a negative correlation between total QoR-40 score and length of hospital stay (r=-0.21; p=0.007).

***Reliability***

Internal consistency measured using Cronbach's alpha (α) was high for total preoperative QoR-40 score (α=0.91) and total postoperative QoR-40 score (α=0.93). Cronbach's alpha values for QoR-40 dimensions were acceptable (α≥0.714). Split half coefficient was 0.867. Internal consistency of the QoR-40 and item to-own-dimension correlation coefficients are shown in Table 3.

***Responsiveness***

The mean (SD) preoperative QoR-40 was 188.48 (11.80) and postoperative QoR-40 score was 177.02 (15.73). Changes in the total QoR-40 and dimension scores before surgery and on postoperative day 3 are presented in Table 4. Standardized response mean was 0.76 and Cohen's effect size 0.812.

## Discussion

In this study, we demonstrated our Croatian version of QoR-40 to have acceptable validity, reliability, and responsiveness. The results of psychometric validation are similar to those obtained by Myles *et al*. in the original validation of QoR-40[4]. The two original studies have well established content validity of QoR-40 questionnaire[4,14].

Convergent validity was demonstrated with high correlation of QoR-40 with VAS recovery score. Although recovery VAS does not represent standard measure of postoperative recovery, it reflects patient personal perception of the quality of recovery after surgery and anesthesia as does QoR-40 score. Convergent validity of QoR-40 was also demonstrated by all dimensions (emotional state, physical comfort, psychological support, psychical independence, pain) and global QoR-40 having medium to high correlations with SF-36 Physical and Mental Component scale.

Construct validity was supported with confirming our hypotheses that patients who had postoperative complications would have lower QoR-40 score than patients without postoperative complications. Global

*Table 3. Internal consistency (α) of QoR-40 and item to-own-dimension correlation coefficients*

| QoR-40 questions | Mean ± SD | Item-to-own dimension correlation coefficients |
|---|---|---|
| Emotional state, α=0.884 | | |
| Feeling of general wellbeing | 3.74±0.99 | 0.722 |
| Feeling in control | 4.35±0.95 | 0.696 |
| Feeling comfortable | 3.67±1.03 | 0.756 |
| Had bad dreams | 4.68±0.66 | 0.520 |
| Feeling anxious | 4.46±0.76 | 0.768 |
| Feeling angry | 4.83±0.45 | 0.525 |
| Feeling depressed | 4.48±0.73 | 0.736 |
| Feeling alone | 4.58±0.79 | 0.609 |
| Difficulty falling asleep | 3.51±1.09 | 0.512 |
| Physical comfort, α=0.804 | | |
| Able to breathe easy | 4.71±0.64 | 0.388 |
| Able to sleep well | 3.46±1.05 | 0.579 |
| Able to enjoy food | 4.02±1.1 | 0.531 |
| Feeling rested | 3.57±0.98 | 0.584 |
| Nausea | 4.71±0.64 | 0.486 |
| Vomiting | 4.94±0.35 | 0.289 |
| Dry-retching | 4.88±0.45 | 0.352 |
| Feeling restless | 4.37±0.78 | 0.537 |
| Shaking or twitching | 4.78±0.53 | 0.517 |
| Feeling too cold | 4.85±0.43 | 0.419 |
| Shivering | 4.95±0.22 | 0.205 |
| Feeling dizzy | 4.67±0.63 | 0.618 |
| Psychological support, α=0.784 | | |
| Communication with hospital staff | 4.86±0.44 | 0.673 |
| Communication with family and/or friends | 4.74±0.6 | 0.520 |
| Getting support from doctors | 4.78±0.47 | 0.558 |
| Getting support from nurses | 4.83±0.4 | 0.660 |
| Getting support from family and friends | 4.87±0.39 | 0.529 |
| Understanding instructions and advice | 4.91±0.35 | 0.489 |
| Feeling confused | 4.76±0.6 | 0.306 |
| Physical independence, α=0.749 | | |
| Normal speech | 4.9±0.37 | 0.343 |
| Able to wash and brush | 4.13±1.16 | 0.743 |
| Look after appearance | 4.1±1.11 | 0.809 |
| Able to write | 4.8±0.54 | 0.508 |
| Able to return to work or to home activities | 2.33±1.16 | 0.380 |
| Pain, α=0.719 | | |
| Moderate pain | 3.52±0.91 | 0.562 |
| Severe pain | 4.46±0.79 | 0.540 |
| Headache | 4.77±0.55 | 0.392 |
| Muscle pain | 4.49±0.84 | 0.459 |
| Backache | 4.17±0.93 | 0.395 |
| Sore throat | 4.75±0.5 | 0.336 |
| Sore mouth | 4.86±0.4 | 0.424 |
| Global QoR-40 score, α=0.933 | 177.02±15.73 | |

QoR-40 = Quality of Recovery-40; SD = standard deviation

*Table 4. Mean postoperative scores, change and responsiveness of the Croatian version of QoR-40*

| QoR-40 scores (n=162) | Max score | Mean postop score ± SD | Mean change from preop values (95% CI) | % Change from preop values | Cohen effect size d | SRM |
|---|---|---|---|---|---|---|
| Global QoR-40 | 200 | 177.02±15.73 | 11.33 (9.02-13.63) | 6.02% | 0.812 | 0.76 |
| Emotional state | 45 | 38.30±5.51 | 1.78 (0.99-2.57) | 4.45% | 0.340 | 0.35 |
| Physical comfort | 60 | 53.91±4.74 | 2.54 (1.83-3.24) | 4.49% | 0.059 | 0.56 |
| Psychological support | 35 | 33.75±2.18 | 0.54 (0.21-0.87) | 1.58% | 0.279 | 0.26 |
| Physical independence | 25 | 20.27±3.30 | 4.20 (3.68-4.72) | 17.18% | 1.668 | 1.25 |
| Pain | 35 | 31.02±3.11 | 2.16 (1.58-2.74) | 6.51% | 0.740 | 0.58 |

QoR-40 = Quality of Recovery-40; 95% CI = 95% confidence interval; SRM = standardized response mean

QoR-40 showed the expected low negative correlation with the length of hospital stay comparable to that obtained in systematic review performed by Gornall *et al*.[15], although the length of hospital stay could be influenced by many different factors. In the Croatian health care system, some of these factors are not directly related to patient health status but depend on organizational and social issues.

Previous studies have reported on lower quality of recovery measured with QoR-40 in women when compared to men[16]. But in our study, although women had lower total QoR-40 score than men, it did not reach statistical significance. Women in our study were subjected mostly to intermediate surgery (54.2%), whereas almost all men had major surgery (96%). We therefore performed subgroup analysis for major surgery, which demonstrated significant difference in QoR-40 scores between men and women. A difference in QoR-40 scores between women and men was not established in systematic review on QoR-40 performed by Gornall *et al*. either[15]. Other factors that could influence the quality of recovery, such as age, comorbidities, and extent and type of surgery, were not balanced either in this or in other studies included in systematic review, which presumably contributed to these results.

Reliability indices for global QoR-40 were excellent with Cronbach's alpha 0.93 and split half coefficient 0.87. Our results are comparable to the values obtained in the original validation study[4].

Item-to-own dimension correlation coefficients ranged from 0.20 to 0.80. The items "vomiting" and "shivering" had correlation coefficients below 0.3 (0.29 and 0.20, respectively), but still above the recommended threshold[11]. We measured quality of recovery on postoperative day 3, when the incidence of these symptoms is usually low.

Responsiveness measured with Cohen's effect size was high 0.81. The value of SRM was 0.76, which exceeded the value of 0.65 in the original study[4]. Psychological support was the QoR-40 dimension with expectedly low Cohen's effect size and SRM. Patients rate psychological support as a very important factor that influences the perceived quality of recovery; therefore, it should not be omitted from measurements. Measurement of the quality of recovery on postoperative day 3, when most of the patients achieved significant levels of postoperative recovery probably influenced assessment of responsiveness.

Our recruitment and completion rates were high indicating feasibility of our Croatian version of QoR-40. We used investigator-assisted method for data collection with checking for missed items and assisting a minority of patients to complete the questionnaire. Gower *et al*.[17] compared patient self-administered and

investigator-administered measurement of quality of recovery using QoR-40. Results of the study support the preferential use of investigator-administered method since it requires less time to complete surveys and produces more complete data[17]. The Swedish version of QoR-40 was adapted for use in a mobile application. Design of app prevented completion of questionnaire with missing items and included daily reminders with a high response rate. Use of mobile apps is expected to reduce working load on research staff on collecting patient data[18].

Stark *et al.*[19] developed a shorter Quality of Recovery-15 (QoR-15) questionnaire derived from QoR-40, which demonstrated excellent psychometric properties and since then has been extensively used. In a recent systematic review, QoR-15 was found to be essentially unidimensional[20]. On the other hand, QoR-40 is comprehensive and multidimensional, which provides an opportunity to detect dimensions with lower quality of recovery and to direct interventions to improve them.

Results of psychometric validation of the alterna-

Appendix 1

UPITNIK QoR-40

Ime i prezime:_____ Datum i vrijeme: _____

PRVI DIO

Kako ste se osjećali u posljednja 24 sata?

| | Uopće ne | Manji dio vremena | Dio vremena | Veći dio vremena | Cijelo vrijeme |
|---|---|---|---|---|---|
| Mogli ste disati bez poteškoća | 1 | 2 | 3 | 4 | 5 |
| Dobro ste spavali | 1 | 2 | 3 | 4 | 5 |
| Hrana Vam je bila ukusna | 1 | 2 | 3 | 4 | 5 |
| Osjećali ste se odmorno | 1 | 2 | 3 | 4 | 5 |
| Općenito ste se dobro osjećali | 1 | 2 | 3 | 4 | 5 |
| Osjećali ste da stvari držite pod kontrolom | 1 | 2 | 3 | 4 | 5 |
| Osjećali ste se ugodno | 1 | 2 | 3 | 4 | 5 |
| Mogli ste normalno govoriti | 1 | 2 | 3 | 4 | 5 |
| Mogli ste se oprati, oprati zube ili se obrijati | 1 | 2 | 3 | 4 | 5 |
| Mogli ste se brinuti o vlastitom izgledu | 1 | 2 | 3 | 4 | 5 |
| Mogli ste pisati | 1 | 2 | 3 | 4 | 5 |
| Mogli ste se vratiti na posao ili uobičajenim kućnim aktivnostima | 1 | 2 | 3 | 4 | 5 |
| Mogli ste komunicirati s bolničkim osobljem (kada ste u bolnici) | 1 | 2 | 3 | 4 | 5 |
| Mogli ste komunicirati s obitelji ili prijateljima | 1 | 2 | 3 | 4 | 5 |
| Imali ste potporu bolničkih liječnika (kada ste u bolnici) | 1 | 2 | 3 | 4 | 5 |
| Imali ste potporu bolničkih sestara (kada ste u bolnici) | 1 | 2 | 3 | 4 | 5 |
| Imali ste potporu obitelji ili prijatelja | 1 | 2 | 3 | 4 | 5 |
| Mogli ste razumjeti upute i savjete | 1 | 2 | 3 | 4 | 5 |

DRUGI DIO

Jeste li imali ili osjetili nešto od navedenog u posljednja 24 sata?

| | Uopće ne | Manji dio vremena | Dio vremena | Veći dio vremena | Cijelo vrijeme |
|---|---|---|---|---|---|
| Mučnina | 5 | 4 | 3 | 2 | 1 |
| Povraćanje | 5 | 4 | 3 | 2 | 1 |
| Napinjanje na povraćanje (bez da ste povratili) | 5 | 4 | 3 | 2 | 1 |
| Osjećaj nemira | 5 | 4 | 3 | 2 | 1 |
| Drhtanje dijela tijela ili trzajevi mišića | 5 | 4 | 3 | 2 | 1 |
| Drhtavica | 5 | 4 | 3 | 2 | 1 |
| Osjećaj hladnoće | 5 | 4 | 3 | 2 | 1 |
| Vrtoglavica | 5 | 4 | 3 | 2 | 1 |
| Loši snovi | 5 | 4 | 3 | 2 | 1 |
| Osjećaj tjeskobe | 5 | 4 | 3 | 2 | 1 |
| Osjećaj ljutnje | 5 | 4 | 3 | 2 | 1 |
| Osjećaj potištenosti | 5 | 4 | 3 | 2 | 1 |
| Osjećaj usamljenosti | 5 | 4 | 3 | 2 | 1 |
| Bilo Vam je teško zaspati | 5 | 4 | 3 | 2 | 1 |
| Osjećaj zbunjenosti | 5 | 4 | 3 | 2 | 1 |
| Umjerena bol | 5 | 4 | 3 | 2 | 1 |
| Jaka bol | 5 | 4 | 3 | 2 | 1 |
| Glavobolja | 5 | 4 | 3 | 2 | 1 |
| Bolovi u mišićima | 5 | 4 | 3 | 2 | 1 |
| Bol u leđima | 5 | 4 | 3 | 2 | 1 |
| Grlobolja | 5 | 4 | 3 | 2 | 1 |
| Bol ili rane u ustima | 5 | 4 | 3 | 2 | 1 |

Hvala Vam što ste popunili upitnik.

tive Croatian version of QoR-40 questionnaire have been published recently. The study included patients submitted to spine surgery. The psychometric properties evaluated were internal consistency and construct validity assessed by correlation between the QoR-40 and hand grip strength[21]. Patients in our study were submitted to different types of surgery, which aids to generalizability of our results.

Our study had several limitations. It was a single center study. Study protocol necessitated hospital admission a day before surgery and length of hospital stay of minimum 3 postoperative days, so we did not include patients who had minor and emergency surgery. We did not include patients who had surgery performed under regional anesthesia either.

In conclusion, our Croatian version of QoR 40 (QoR40-CRO) showed excellent reliability, validity, responsiveness, and clinical utility for assessment of changes in patient health status during recovery after general anesthesia. Moreover, assessment of patient baseline health status on the day before surgery may help identify high-risk patients for poor quality of recovery. QoR40-CRO (Appendix 1) may be a useful tool for quality of recovery improvement.

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Sažetak

## VALJANOST UPITNIKA *QUALITY OF RECOVERY-40* PRILAGOĐENOG HRVATSKOJ POPULACIJI

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Kvaliteta oporavka nakon anestezije je važan pokazatelj poslijeoperacijskog ishoda. *Quality of Recovery-40* (QoR-40) je validiran i široko korišten multidimenzionalni upitnik za mjerenje kvalitete poslijeoperacijskog oporavka koji se sastoji od 40 pitanja. Cilj ovog rada bio je prijevod i psihometrijska validacija hrvatske verzije upitnika QoR-40 koja uključuje ispitivanje valjanosti, pouzdanosti i kliničke prihvatljivosti. Bolesnici podvrgnuti planiranim kirurškim zahvatima u općoj anesteziji ispunili su upitnike QoR-40 i *Short Form-36* (SF-36) dan prije operacije i trećeg poslijeoperacijskog dana. Kvaliteta oporavka je procijenjena vizualnom analognom ljestvicom (VAS) 0-100. Od 192 uključena bolesnika njih 162 je završilo protokol studije. Konvergentna valjanost je ispitana Pearsonovim korelacijskim koeficijentom (r) između QoR-40 i VAS (r=0,68; p<0,001), između QoR-40 i fizičke komponente SF-36 (r=0,521; p<0,001) te između QoR-40 i mentalne komponente SF-36 (r=0,580; p<0,001). Konstruktnu valjanost podupire negativna korelacija QoR-40 s duljinom hospitalizacije (r=-0,21; p=0,007) i značajna razlika ukupnog bodovnog zbroja QoR-40 između bolesnika s poslijeoperacijskim komplikacijama i bez njih (p<0,001). Unutarnja konzistencija ukupnog QoR-40 je visoka (Cronbach α=0,93), a dimenzija QoR-40 umjerena do visoka (≥0,714). Koeficijent *split-half* je 0,87, Cohenova veličina učinka je 0,81 i standardizirani *response mean* 0,762. Naš prevedeni QoR-40 je valjan, pouzdan i obuhvatan upitnik za mjerenje kvalitete poslijeoperacijskog oporavka sa sličnim psihometrijskim značajkama kao i izvorna verzija.

Ključne riječi: *Mjere ishoda koje opisuje bolesnik; Kvaliteta oporavka; Validacijska studija; Perioperacijska medicina*