ORIGINAL ARTICLE

Assessment for the Quality of Recovery from general anaesthesia in patients undergoing laparoscopic surgery: An observational study

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Abstract

Background: Quality of recovery following major surgery is directly related to patient satisfaction. Out of numerous patient-based measures, a '40-item-quality of recovery (QoR-40)' has proved to be a valid and reliable scale which assesses five dimensions of post-surgical recovery: physical-comfort, emotional-state, physical-independence, psychological support, and pain. *Aim and Objectives:* To evaluate the quality of recovery and to study different factors influencing recovery after major laparoscopic surgery & anaesthesia using QoR-40 questionnaire. *Material and Methods:* This prospective observational study included 215 adult patients who were posted for laparoscopic surgery. Quality of recovery was assessed after 12 hours, using patient based QoR-40 questionnaire. Total score of QoR-40 questionnaire ranges from 40 to 200. Higher scores indicate better quality of recovery. *Results:* Out of total 215 patients, 142 (66%) had mean QoR-40 score of > 150. Mean QoR-40 score was higher after lower abdominal laparoscopy (159.00 ± 14.11) than after upper abdominal laparoscopy (155.32 ± 14.80) ($p = 0.139$). Shorter duration of surgery (< 120 minutes) had significantly higher QoR-40 scores (161.84 ± 13.92) than with longer duration (> 120 minutes) of surgery (152.28 ± 14.38) ($p < 0.001$). Mean QoR-40 scores were lower (148.07 ± 11.25) in patients who had post-operative complications. *Conclusion:* Quality of recovery following laparoscopic surgeries as predicted by QoR-40 questionnaire was influenced by duration of surgery, upper or lower abdominal laparoscopic surgery and post-operative complications. Type of anaesthetic drugs used had no significant effect on quality of recovery. However, since QoR is multifactorial, many co-variables need to be studied in a wider study population.

Keywords: Quality of Recovery, Laparoscopic, Surgery, Questionnaire

Introduction

With the advancements in the modern surgical and anaesthesia techniques, the minimal access laparoscopic surgeries have become a common practice. These minimally invasive procedures are associated with advantages of reduced length of hospital stay, reduction in the incidence of readmission and perioperative complications [1]. Traditionally, in the context of postoperative recovery, researchers have mainly focused on recovery indices, such as pain, nausea, time to awakening, arrival in the recovery room, and thereafter, to discharge [2-4]. All these measurements do not contribute much to the patients' notion of recovery, which embraces other attributes too such as the development of chronic pain, cognitive issues, and the return of their activities to baseline equivalent to that before surgery [5-6]. Evaluation of functional outcome and Quality of Recovery (QoR) following anaesthesia and surgery is multifactorial and a complex process depending on patient, surgical and anaesthetic characteristics and involves multiple domains, including physical, psychological, and social aspects

[7-9]. Of numerous patient-based measures to evaluate the QoR, a '40-item-Quality of Recovery (QoR-40)' has proved to be valid and reliable [2]. This study was designed to evaluate the QoR in patients after laparoscopic surgery using the QoR-40 questionnaire which assesses five dimensions of post operative recovery: physical comfort, emotional state, physical independence, psychological support, and pain. The primary objective was to evaluate QoR after surgery and anaesthesia in patients undergoing laparoscopic surgery using QoR-40 questionnaire. The secondary objective was to identify various factors affecting the general QoR following laparoscopic surgery.

Material and Methods

This prospective observational study was conducted following approval of institutional ethics committee. Patients of either sex of age group 18 to 60 years undergoing laparoscopic procedures under general anaesthesia and willing to participate in the study were included. The patients who were unable to communicate due to language barrier, intellectual disability, dementia, or an altered conscious state; patients who refused to cooperate or be available for postoperative interviews were excluded from the study.

The anaesthesiologist in charge was blinded to patient involvement in the study. All patients in the Operating Room (OR) received general anaesthesia with endotracheal tube. The type of intravenous or inhalational anaesthetic agents, muscle relaxant and analgesia used were at the discretion of the attending anaesthesiologist who was blinded to the study. All patients received standard American Society of Anesthesiologists (ASA) monitoring for laparoscopic procedure. Post-operatively, all patients were extubated and shifted to post- anaesthesia care unit where further monitoring of hemodynamics was done. The following data was collected from the OR and recovery room records: age, sex, ASA physical status, duration of surgery, duration of anaesthesia, anaesthetic agent(s) and neuromuscular blocking agent used, anti-emetics and analgesics used, duration of post anaesthesia care unit stay and immediate post operative complications if any.

Twelve hours after surgery, all the patients fulfilling the inclusion criteria were counselled and the QoR-40 questionnaire for QoR was explained to them. Patients were requested to fill the questionnaire in the presence of the investigator. Assistance in completing the questionnaire was provided if requested by the patient or offered if deemed necessary by the investigators. The investigator asked the patient to rate each of the items on the QoR-40 by reading each item, asking the patient to provide a rating and then proceeding on to the next item until all 40 items had been addressed. Completed questionnaire data were coded and entered in a database. This questionnaire was based on QoR-40 and was prepared beforehand, after translation to the local language.

QoR-40 structure and scoring rules: The QoR-40 is a self-rated 40-item questionnaire used to assess the recovery of the quality of life. The questionnaire consists of five dimensions: emotional status (9 items), physical comfort (12 items), psychological support (7 items), physical independence (5 items), and pain (7 items). All the items are rated on a five-point scale ranging from 1 to 5. The initial point and conversion score of each item are calculated. Depending on the question, 5 points or 1 point may be the best answer. The best answers to positive questions are scored 5, while the best answers to negative questions are assigned the score of 1. The total score of the QoR-40 is the sum of the scores of

all items. The score of each dimension is the sum of the total scores of the items in the corresponding dimension. The total score ranges from 40 to 200. The higher the score, the better is the quality of life. Poor Quality of Recovery (PQR) was defined for patients with a QoR-40 score lower than minus one standard deviation (-1SD) of the mean QoR score.

Sample size and sampling method: We planned to include approximately 200 patients who were admitted for elective surgery under general anaesthesia during the period of 12 months. Convenient sampling method was used since it was an observational study. The sample size of the study was guided by the previous studies [2-4] and Sousa and colleagues [6]. Assuming a 10% dropout rate we recruited 220 patients in our study of which 5 patients refused to participate. Total sample size was 215 patients. Descriptive and inferential statistical analyses were carried out in the present study. Results on continuous measurements was presented as mean ± standard deviation and of categorical measurements presented in frequencies (%). Significance was assessed at 5% level of significance.

Differences between QoR-40 scores for men and women, and for patients with good or bad recovery were tested using the Wilcoxon rank-sum test. Correlations between QoR-40 scores at 12 hours post-surgery and duration of hospital stay, duration of post-anesthesia care unit stay, and the need for assistance to complete the questionnaire were tested using Spearman rank correlation (p: construct validity). Fisher's exact test was used when cell samples were very small. Value of $p < 0.01$ was considered as strongly significant. The Statistical Package for the Social Sciences (SPSS) version 18.0, and R environment version 3.2.2 were used for the analysis of the data and Microsoft Word and Excel were used to generate graphs, tables etc**.**

Results

The demographic parameters of the patients and distribution of type of surgery is given in Table 1. As seen in Table 2, the mean total QoR-40 score of all the patients was found to be 156 ± 14.71. Around 66% of patients had QoR-40 score above 150 whereas 34% of patients had QoR-40 score below 150 (Figure 1). There was no statistically significant difference in QoR-40 with respect to age and gender (Table 3). The mean QoR-40 score was higher after lower abdominal surgeries than upper abdominal surgeries but the difference was not statistically significant ($p = 0.139$). In components' score analysis of QoR-40, psychological support was significantly higher after the lower abdominal surgeries than after upper abdominal laparoscopy ($p < 0.05$) indicating that recovery after lower abdominal laparoscopy was better than upper abdominal laparoscopy (Table 4). QoR-40 scores after using desflurane (n = 16), sevoflurane (n = 176) and propofol (n = 26) were 158.54, 156.65 and 150.92 respectively indicating that desflurane was a better maintenance agent followed by sevoflurane and propofol as far as post operative recovery is concerned, although the difference was not statistically significant ($p = 0.148$) (Table 5). There was no significant difference in total QoR-40 score with either atracurium (n = 46) or vecuronium (n = 169) However, pain and emotional component of QoR-40 was significantly high with vecuronium than atracurium ($p = 0.006$) (Table 6). Statistically significant difference in mean QoR-40 scores was observed (161 vs 152) with surgical and anaesthesia duration of <120 minutes compared to > 120 minutes (Figure 2). All the components of QoR-40 were affected especially physical comfort and physical independence, followed by emotional and psychological support and pain showed statistical

significance. This indicates that QoR after 12 hours is better with shorter duration of surgery and anaesthesia. Total QoR-40 score was significantly affected (p = 0.002) in patients who had complications after surgery, especially the emotional component of QoR-40 score was found to be affected the most, followed by physical independence (Figure 3). This suggests that QoR after 12 hours is better when there are no post operative complications such as nausea, vomiting. Also, we observed that there was no statistical significance on total QoR-40 score with patients' duration of stay in post anaesthesia care unit.

Table 1: Demographic parameters

Age (years) (mean ± SD)	38.09 ± 13.26
Weight (kg) (mean ± SD)	55.41 ± 7.20
Sex	
Male (n, percentage)	60 (27.95)
Female (n, percentage)	155 (72.09)
ASA physical status class	
Class I (n, percentage)	133 (61.9)
Class II (n, percentage)	82 (38.1)
Type of Surgery	
Upper abdominal laparoscopy (n, percentage)	172 (80)
Lower abdominal laparoscopy (n, percentage)	43 (20)

Table 2: Mean QoR-40 and QoR for each dimension (n = 215)

Dimension of QoR-40	**Mean QoR ± SD (for each dimension)**
Pain (7 items)	28.21 ± 3.52
Emotional status (9 items)	34.60 ± 5.28
Physical comfort (12 items)	47.08 ± 5.34
Psychological support (7 items)	31.17 ± 3.07
Physical independence (5 items)	14.83 ± 4.58
Total QoR-40 Score	**156.07 ± 14.71**

QoR: Quality of Recovery

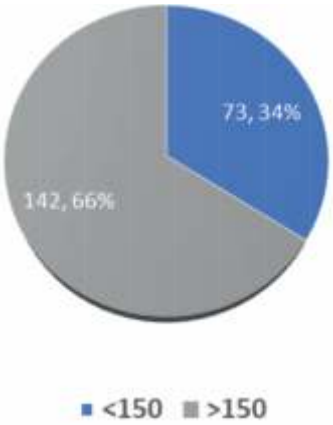

Figure 1: Mean QoR-40

Table 3: Comparison of QoR-40 and its component according to age

Parameters	Age		*p*
	⩽ 40 yrs (n=132)	> 40 yrs (n=83)	
Pain (7 items)	28.51 ± 3.41	27.74 ± 3.66	0.123
Emotional (9 items)	34.71 ± 5.37	34.42 ± 5.15	0.696
Physical comfort (12 items)	47.66 ± 5.44	46.15 ± 5.06	0.044
Psychological support (7 items)	31.48 ± 3.01	30.66 ± 3.09	0.055
Physical independence (5 items)	15.42 ± 4.75	13.89 ± 4.14	0.017
Total QoR-40 Score	**157.96±14.35**	**153.06±14.84**	**0.017**

QoR: Quality of Recovery

Table 4: Comparison of QoR-40 and its component according to type of surgery

Parameters	Type of Surgery		*p*
	Upper Abdominal (80%)	Lower Abdominal (20%)	
Pain (7 items)	28.13 ± 3.57	28.55 ± 3.34	0.485
Emotional (9 items)	34.70 ± 5.17	34.20 ± 5.73	0.579
Physical comfort (12 items)	46.91 ± 5.41	47.75 ± 5.04	0.351
Psychological support (7 items)	30.87 ± 3.13	32.32 ± 2.52	0.005
Physical independence (5 items)	14.64 ± 4.58	15.57 ± 4.56	0.233
Total QoR-40 Score	**155.32 ± 14.80**	**159.00 ± 14.11**	**0.139**

QoR: Quality of Recovery

Table 5: Comparison of QoR-40 according to maintenance agent

Parameters	Maintenance Agent			*p*
	Desflurane (n= 13)	Propofol (n= 26)	Sevoflurane (n=176)	
Total QoR-40 Score	**158.54 ± 14.48**	**150.92 ± 13.88**	**156.65 ± 14.76**	**0.148**
Pain (7 items)	27.92 ± 4.27	26.81 ± 3.58	28.44 ± 3.43	0.082
Emotional (9 items)	37.38 ± 3.95	32.62 ± 4.78	34.69 ± 5.35	0.025
Physical comfort (12 items)	46.85 ± 6.24	46.35 ± 5.08	47.20 ± 5.33	0.738
Psychological support (7 items)	31.08 ± 2.25	30.62 ± 3.02	31.26 ± 3.13	0.609
Physical independence (5 items)	15.31 ± 3.45	14.15 ± 5.81	14.9 ± 4.46	0.690

QoR: Quality of Recovery

Table 6: Comparison of QoR-40 and its component according to NMBA

Parameters	Neuromuscular blockade agents		*p*
	Atracurium	Vecuronium	
Total QoR-40 Score	**154.07 ± 14.80**	**156.62 ± 14.68**	**0.298**
Pain (7 items)	26.96 ± 3.70	28.56 ± 3.40	0.006
Emotional (9 items)	32.72 ± 5.39	35.11 ± 5.15	0.006
Physical comfort (12 items)	47.20 ± 4.73	47.05 ± 5.5	0.868
Psychological support (7 items)	31.85 ± 2.90	30.98 ± 3.09	0.090
Physical independence (5 items)	15.09 ± 5.63	14.76 ± 4.27	0.672

QoR: Quality of Recovery; NMBA: Neuromuscular blocking agent

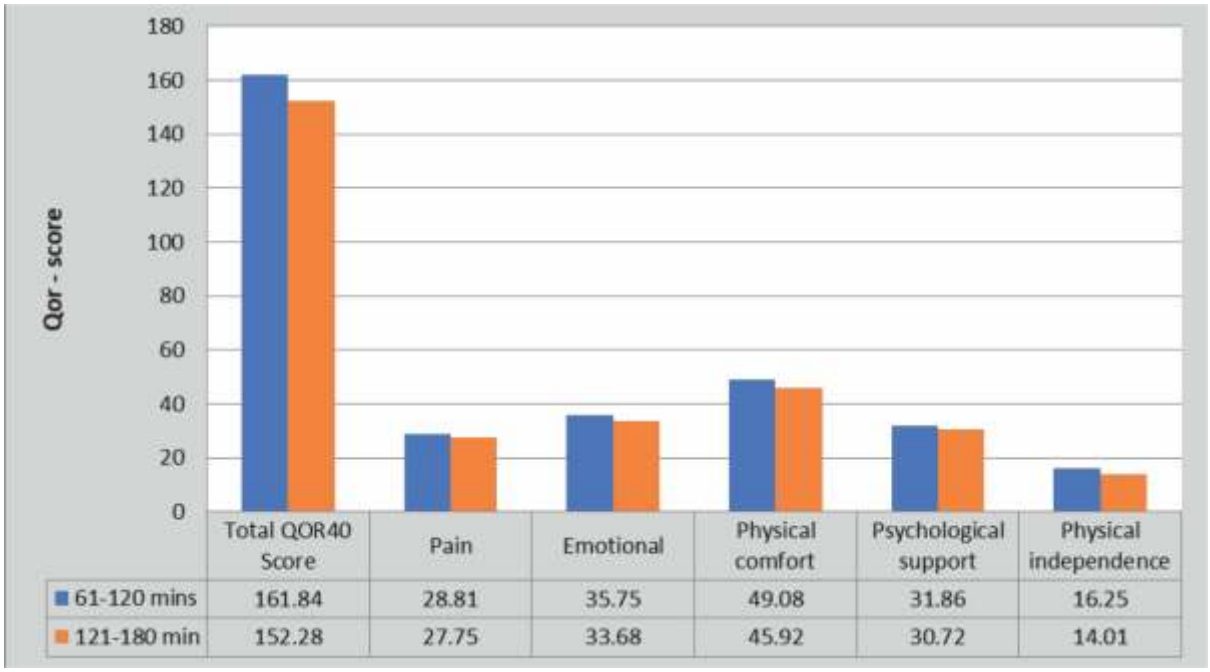

Figure 2: QoR-40 and its components and duration of anaesthesia

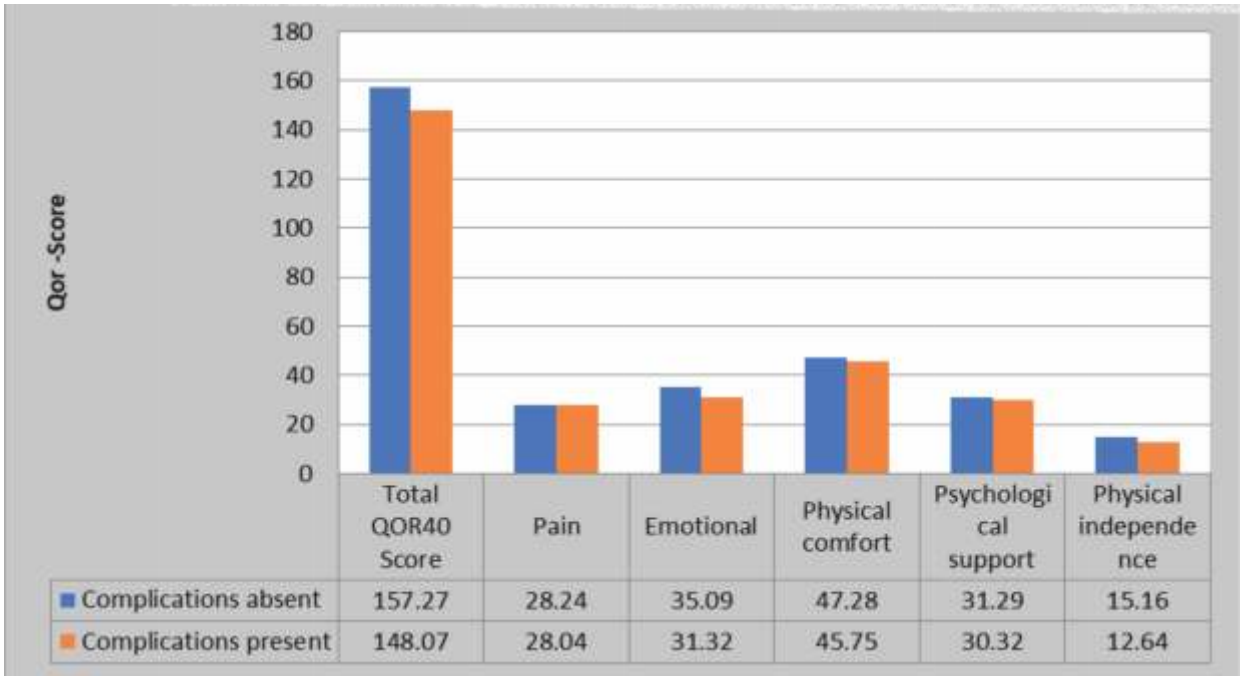

Figure 3: QoR-40 and its components and complications

Discussion

The advantages of laparoscopic surgery in reducing postoperative pain, better cosmetic results, quicker return to normal activities, decrease in hospital stay make it a safe and simple procedure that may be performed on an outpatient basis. In recent years, advanced laparoscopic surgery has targeted older and sicker patients, rendering anaesthesia during laparoscopy more technically demanding [10-12]. Recovery following anaesthesia and surgery is multifactorial and a complex process dependent on patient, surgical, and anaesthetic characteristics, and involves multiple domains, including physical, psychological, and social aspects [13]. The natural trajectory of recovery after major surgery is characterized by a period of immediate deterioration post-surgery, followed by a gradual rehabilitation to baseline level [8]. This rehabilitation period can last much longer than healthcare providers expect. Various scoring systems have been developed to measure QoR and can provide an extensive yet efficient evaluation of postoperative recovery from the patient's perspective [14].

QoR following surgery is an important dimension of the patient's experience and may be related to the quality of anaesthesia care. Satisfaction with anaesthesia is a vital component of quality care but difficult to measure. Any dimension of the QoR-40 can be targeted at specific assessment as particularly important to them [15, 16]. For example, a patient may wish to regain their usual physical functioning as soon as possible or may want to avoid pain and physical discomfort, whereas others may require specific emotional and psychological support. With increased interest in quality of care, contemporary hospital practice focuses more strongly on individual patient requirements and thus should place greater emphasis on patient-rated assessment of care [17, 18]. Construct validity of the QoR score was supported by the finding that patients expected to have a poorer quality of recovery had lower scores [2]. The QoR score has been shown to have good validity and reliability, simple to use in routine practice, can be targeted at specific assessment as particularly important to them. The questionnaire is easy for the patient to understand and within 10 minutes most of the patients can complete the survey without any assistance [2]. Hence, this study was designed which included 215 patients who underwent laparoscopic surgery under general anaesthesia were assessed for quality of recovery using QoR-40 score. Consenting patients were given QoR-40 Questionnaire after 12 hours post-operatively, which they filled themselves or with assistance if required.

The average age of the study cases was 38.09 ± 13.26 years, 60 cases were male and 155 cases were females, mean weight of the cases was 55.41 ± 7.20 kg. Of the total 215 patients, 133 patients were of ASA grade I and 82 patients of ASA grade II. Majority of patients underwent laparoscopic cholecystectomy (n = 160; 74.4%) and laparoscopic appendicectomy (n = 23; 10.7%).

Mean QoR-40 score in our study was 156 (± 14.71 SD). Only 142 (66%) patients had QoR 40 score ≥ 150 and 73 (34%) patients had QoR 40 score < 150. Hong *et al*. [19] in their study observed mean QoR-40 score of 140 following gynaecologic surgery which was lower than our study (i.e. 156). Our study included both male and female patients which could be the reason for this discrepancy. Also, they had included non-laparoscopic surgeries in their study. On the contrary, higher QoR-40 score of 167 was observed by Myles *et al*. [2] which may be due to greater proportion of males included in their study. Gornall *et al*. [20] in their systematic review reported that men had slightly higher QoR-

40 scores than women. It may be due to different factors such as developing anaesthetic and surgical techniques, dedicated caretakers, dedicated surveyors, survey time, awareness of patients, type of hospital.

We observed mean QoR-40 score to be higher in males (n = 60; 158.05 ± 12.71) compared to females (n = 155; 155.30 ± 15.38) but was statistically insignificant (p = 0.22). Similar were the findings in the study by Myles *et al*. [2] but their result showed statistical significance between the score of both genders. This statistical significance may be because of greater proportion of males included in their study. Stark *et al*. [13] observed a negative correlation of QoR to female gender in QoR-15 score. Similarly, our QoR-40 scores for females were less but not significant statistically. This may be due to smaller sample size of males compared to females in our study.

Higher mean QoR-40 scores were observed in our study in patients of less than 40 years (n = 132) (157.96 ± 14.35) than those > 40 years (n = 83) (153.06 ± 14.84) but was statistically insignificant (p = 0.017). The difference was predominantly in the physical independence domain of QoR-40 (p = 0.017). Hong *et al*. [19] observed a positive correlation between age and QoR-40 score i.e. older age group had better QoR. Their study included both open and laparoscopic lower abdominal gynaecological surgeries. Huppe *et al*. [21] observed that younger patients (18-49 years old) described more postoperative complaints than older patients. Older age patients were generally more satisfied with surgery. However, their study was done following open surgery, whereas our study was after laparoscopic surgery. We can say that probably the physiological changes of laparoscopic surgery are well tolerated in the younger patients thereby leading to better recovery with adequate pain control and early return to normal activity suggesting better QoR. Significant negative relationship between QoR score and older age were observed in study done by Myles *et al*. [22] and Carolina *et al*. [23] which were similar to findings in our study. Stark *et al*. [13] observed no correlation of QoR with age in QoR-15 post-operative recovery scores.

Total mean QoR-40 score in upper abdominal surgeries was 155 ± 14.80 which was lower than in lower abdominal surgeries 159 ± 14.11 but this difference was statistically insignificant in our study. Component of QoR-40 score which was found statistically significant in our study was psychological support (p < 0.005) depicting that lower abdominal surgeries had better QoR then upper abdominal surgeries.

With respect to maintenance agent i.e. propofol vs sevoflurane vs desflurane, the mean QoR-40 scores were 150.92, 156.65, 158.54 respectively which was not statistically significant in our study. This statistical insignificance may be due to smaller sample of study where propofol (6%) and desflurane (12%) were used as their maintenance agent whereas in majority of cases, sevoflurane (82%) was used as maintenance agent.

Mikuni *et al*. [24] observed that after using sevoflurane for induction of anaesthesia, change over to desflurane intra-operatively led to faster emergence and recovery thus giving advantages of both the inhalational agents i.e. smooth induction and rapid recovery, achieving high patient satisfaction. The finding in our study were in concordance with this study as QoR-40 score of desflurane was more than sevoflurane in our study. Bailey *et al*. [25] reported that desflurane was marginally a better anaesthetic agent in terms of recovery to sevoflurane, whereas sevoflurane was slightly better than the former in terms of cognitive recognition.

Therefore, both the drugs are equally good anaesthetic agents. These results also are in concordance with our study. Vipin *et al*. [26] observed that the intra-operative use of desflurane and sevoflurane for maintenance of general anaesthesia resulted in a higher percentage of patients being judged fast-track eligible after ambulatory surgical procedures compared to propofol. The results in our study are also similar having QoR-40 scores less for propofol and more for desflurane and sevoflurane.

Regarding the use of neuro-muscular blocking agent (atracurium or vecuronium), there was no statistical significance on total QoR-40 score when either was used. However, pain and emotional component were significantly affected ($p = 0.006$) showing higher scores in vecuronium than atracurium depicting that vecuronium may be better than atracurium in terms of QoR. This may be as vecuronium neither releases histamine nor has any cardiovascular effects. Zuurmond *et al*. [27] in their study observed that atracurium and vecuronium provide satisfactory relaxation and rapid recovery in outpatient arthroscopy of the knee. There were no significant differences in the results obtained from the recovery tests. This result is in concordance with our study as total mean QoR-40 score with atracurium and vecuronium was not significant. Specific components of QoR have not been studied until now for neuromuscular blocking agents.

Patients whose surgery was of shorter duration (< 120 minutes) had significantly higher QoR-40 scores (n = 194; 161.84 ± 13.92) compared to those with longer duration of surgery (n = 21; 152.28 ± 14.38). All the components of QoR-40 scores were affected especially physical comfort > physical independence > emotional > psychological support and pain which were statistically significant. This depicts that QoR after 12 hours is better with shorter duration of surgery and anaesthesia. Shorter duration of anaesthesia and surgery indicates less surgical manipulation, lesser exposure to anaesthetic agents, sedative drugs, and lesser post-surgical pain. All these leading to early recovery and mobilization, early discharge from hospital giving better patient overall satisfaction. This justifies the significant difference in the total mean and component QoR scores with shorter duration of surgery. Hong *et al*. [19] reported similar results in non-laparoscopic surgeries in their study. Our findings were similar to study done by Stark *et al*. [13] and Myles *et al*. [2, 22] who showed a negative correlation of QoR to duration of surgery. Royse *et al*. [28] observed poor patient satisfaction with longer duration of surgery and anaesthesia. We noted few complications (nausea, vomiting, headache, soft tissue injury, sore throat, chills and pain) during the perioperative period of laparoscopic surgeries. Out of the total 215 patients, 28 had some or the other complications in the post operative period. Total mean QoR-40 score was significantly lower ($p = 0.002$) in patients who had complications after surgery, especially emotional component ($p < 0.001$) and physical independence ($p = 0.006$). Other components were not significant statistically. This suggests that QoR after 12 hours is better when there are no post operative complications such as nausea, vomiting. Similar findings were reported by Stark *et al*. [13] and Myles *et al*. [21, 29-30] in their studies.

Patients with duration of stay in post-anaesthesia care unit (PACU) less than 120 minutes, mean QoR-40 scores was higher compared to longer duration of PACU stay (> 120 minutes) but there was no statistical difference depicting that it has no significant influence over QoR. Hong *et al*. [19] observed similar findings. Our study included ASA I and II patients undergoing laparoscopic surgeries in which there were minimum complications

whereas the study by Stark *et al*. [13] included patients from ASA I-IV and major surgeries such as cardiothoracic surgeries which have relatively higher post operative morbidity requiring longer stay in intensive care unit. This may be the reason for the discrepancy noted in findings.

Limitations of study

Although the QoR-40 assesses many variables of recovery, it is not designed to assess surgical outcomes, nor will it capture all variables associated with satisfaction such as highly co-linear variables affecting satisfaction such as surgical expectation and outcomes. We also did not evaluate preoperative QoR-40 scores, which could have helped identify patients at risk of poor postoperative recovery based on their baseline scores and responses in various QoR assessment domains.

Conclusion

Good QoR following laparoscopic surgeries can be predicted with QoR-40 questionnaire. Multiple factors influence the QoR. Duration of surgery and anaesthesia, and post-operative complications are inversely proportional to QoR and its components. QoR component of psychological support was better in lower abdominal surgeries compared to upper abdominal surgeries, physical independence was better in younger age groups than in older age. Since, QoR is multifactorial and requires many co-variables to be assessed, the results obtained in our study cannot be extrapolated to a wider population and different health care setups. Further research in this area using discrete populations and fewer variables would be suggested.

Acknowledgements

General Surgical Operation Theatre of Lokmanya Tilak Municipal Medical College and General Hospital, for providing surgical patients, materials and data for the research.

References

1. Buia A, Stockhausen F, Hanisch E. Laparoscopic surgery: A qualified systematic review. *World J Methodol* 2015; 5(4): 238-254.
2. Myles PS, Weitkamp B, Jones K, Melick J, Hensen S. Validity and reliability of a postoperative quality of recovery score: the QoR-40. *Br J Anaesth* 2000;84(1):11-15.
3. Fang L, Wang Q, Xu Y. Postoperative discharge scoring criteria after outpatient anesthesia: A review of the literature. *J Perianesth Nurs* 2023; 38(4):642-649.
4. Ferraz SM, Moreira JP, Mendes LC, Amaral TM, Andrade AR, Santos AR, *et al*. Evaluation of the quality of recovery and the postoperative health status after elective surgery. *Braz J Anesthesiol* 2018;68(6): 577-583.
5. Bakshi SG, Rathod A, Salunkhe S. Influence of interpretation of pain scores on patients' perception of pain: A prospective study. *Indian J Anaesth* 2021; 65: 216-220.
6. Sharma R, Moied S, Raikwar S, Gupta V. Functional outcomes and quality of recovery after anaesthesia and surgery - Outreaching towards protracted goals. *Indian J Anaesth* 2022; 66(Suppl 3):S133-S136.
7. Bowyer A, Royse C. The importance of postoperative quality of recovery: influences, assessment, and clinical and prognostic implications. *Can J Anaesth*. 2016; 63: 176–183.
8. Ghosh S, Sarker G, *et al.* Quality of Life in Geriatric Population in a Community Development Block of Kishanganj, Bihar, India. *J Krishna Inst Med Sci Univ.* 2017; 6(1), 33-41.
9. Neville A., Lee L., Antonescu I., *et al.* Systematic review of outcomes used to evaluate enhanced recovery after surgery. *Br J Surg*. 2014;101:159–170.
10. Sauerland S., Jaschinski T., Neugebauer E.A. Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database Syst. Rev. 2010
11. Perrin M, Fletcher A. Laparoscopic abdominal surgery. *Cont Educ Anaesth Crit Care Pain* 2004; 4(4):107–110.
12. Weber DM. Laparoscopic surgery: an excellent approach in elderly patients. *Langenbecks Arch Surg* 2004; 389(3):204-208.

13. Stark PA, Myles PS, Burke JA. Development and psychometric evaluation of a postoperative quality of recovery score: the QoR-15. *Anesthesiology* 2013; 118: 1332-1340.
14. Nadia R, Reddy D, Kruthi N. Validation of translated Quality of Recovery-15 questionnaire in a south Indian population. *J Krishna Inst Med Sci Univ* 2024; 13(4): 55-64.
15. Guimarães-Pereira L, Costa M, Sousa G, Abelha F. Quality of recovery after anaesthesia measured with QoR-40: a prospective observational study. *Braz J Anesthesiol* 2016; 66(4):369-375.
16. Eberhart LH, Greiner S, Geldner G, Wulf H. Patient evaluation of postoperative recovery. An evaluation of the QoR scores in 577 patients. *Anaesthesist* 2002;51(6): 463-466
17. Brusco NK, Atkinson V, Woods J, Myles PS, Hodge A, Jones C, *et al*. Implementing PROMS for elective surgery patients: feasibility, response rate, degree of recovery and patient acceptability. *J Patient Rep Outcomes* 2022; 6(1):73.
18. Myles PS. Quality in anesthesia. *Minerva Anestesiol* 2001; 67(4):279-283.
19. Hong S, Lee J, Park C, Park H, Jeon J, Yu M, *et al*. Assessment for the quality of recovery from general anesthesia in patients with gynecologic surgery. *Korean J Anesthesiol* 2008; 54(5):531.
20. Gornall BF, Myles PS, Smith CL, Burke JA, Leslie K, Pereira MJ, *et al*. Measurement of quality of recovery using the QoR-40: a quantitative systematic review. *Br J Anaesth* 2013; 111(2):161-9.
21. Hüppe M, Beckhoff M, Klotz KF, Heinzinger M, Prüssmann M, Gerlach K, Ocker H, Schmucker P. Reliability and validity of the Anaesthesiological Questionnaire for electively operated patients. *Anaesthesist* 2003; 52(4):311-20.
22. Myles PS. Measuring quality of recovery in peri-operative clinical trials. *Curr Opin Anaesthesiol* 2018; 31(4):396-401.
23. Carolina A, Sousa G, Santos A, Abelha F. Quality of recovery after anesthesia: Validation of the Portuguese version of the "Quality of Recovery 15" Questionnaire. *Acta Medica Portuguesa* 2015; 28: 567-574.
24. Mikuni I, Harada S, Yakushiji R. Effects of changing from sevoflurane to desflurane on the recovery profile after sevoflurane induction: a randomized controlled study. *Can J Anaesth* 2016; 63(3): 290-297.
25. Bailey C. The recovery of cognitive function after general anesthesia in elderly patients: A comparison of Desflurane and Sevoflurane. *Survey Anesthesiol* 2002; 46(4): 211.
26. Vipin Kumar, Trivedi P, Singh S. A comparative study of propofol vs. Sevoflurane for maintenance of anesthesia in pediatric patients undergoing short surgical procedures. *Int J Med Pub Health* 2025; 15(1); 128-134.
27. Rady Saada, El-deeb Hoda. Effect of progressive muscle relaxation technique on post-operative pain and quality of recovery among patients with abdominal surgeries. *Egypt J Health Care* 2020; 11(4): 566-581.
28. Royse C, Chung F, Newman S, Stygall J, Wilkinson D. Predictors of patient satisfaction with anaesthesia and surgery care. *Eur J Anaesthesiol* 2013; 30(3):106-110.
29. Myles PS, Reeves MD, Anderson H, Weeks AM. Measurement of quality of recovery in 5672 patients after anaesthesia and surgery. *Anaesth Intensive Care* 2000; 28(3):276-280.
30. Myles PS, Williams DL, Hendrata M, Anderson H, Weeks AM. Patient satisfaction after anaesthesia and surgery: results of a prospective survey of 10,811 patients. *Br J Anaesth* 2000; 84(1):6-10.

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How to cite this article:

Kotwani D, Kotwani MB, Agrawal P. Assessment for the Quality of Recovery from general anaesthesia in patients undergoing laparoscopic surgery: An observational study. *J Krishna Inst Med Sci Univ* 2025; 14(1):128-139.

***Submitted:** 30-Sep-2024 **Accepted:** 08-Dec-2024 **Published:** 01-Jan-2025*