ORIGINAL ARTICLE

Predictors of patient satisfaction with anaesthesia and surgery care: a cohort study using the Postoperative Quality of Recovery Scale

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Context Previous research has shown that most patients are satisfied with their anaesthetic care. For those who are not the causes may be multifactorial including dissatisfaction with surgical outcomes.

Objectives We aimed to identify whether quality of recovery after anaesthesia and surgery measured in multiple domains affects patient satisfaction.

Design Sub-group analysis of previously published observational cohort study of quality of recovery after surgery (using the Postoperative Quality of Recovery Scale) was used to identify predictors of incomplete satisfaction 3 days after surgery.

Setting Multicentre perioperative surgery.

Patients Patients ≥ 6 years old, undergoing a variety of operation types and all receiving general anaesthesia.

Observations Of 701 patients, 573 completed the satisfaction question on day 3. Satisfaction was rated by a single five-point rating question. Patients were divided into two groups: 477 (83%) were completely satisfied and 96 (17%) were not completely satisfied. Multivariable logistic regression analysis

was performed on preoperative and patient characteristics and recovery in five domains as follows: physiological, nociceptive (pain and nausea), emotive (anxiety and depression), activities of daily living and cognition. Recovery was defined as return to baseline values or better for all questions within each domain.

Results Incomplete satisfaction was predicted by persistent pain or nausea at day 3 [OR 8.2 (95% CI 2.5 to 27), $P < 0.01$] and incomplete satisfaction at day 1 [OR 28 (95% CI 10 to 77), $P < 0.01$]. Paradoxically, incomplete satisfaction was less likely to occur if pain or nausea was present 15 min after surgery [OR 0.34 (95% CI 0.11 to 0.99), $P < 0.05$] or at day 1 [OR 0.30 (95% CI 0.10 to 0.91), $P = 0.03$]. Incomplete recovery in the other domains did not influence satisfaction.

Conclusion Of the recovery domains measured using the Postoperative Quality of Recovery Scale, only nociception (pain or nausea) contributed to incomplete satisfaction.

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Introduction

Patient-reported outcomes have become one of the most important measures for assessing medical and surgical treatments. Patient satisfaction is an important tool for prompting improvements in clinical care.[1,2] Patient satisfaction with anaesthesia care is usually reported as very high. Myles *et al.*[3] reported an observational study of over 10 000 patients, 96.8% of whom indicated high satisfaction on the first day after operation. Royse *et al.*[4] reported a mixed cohort observational study of 701 patients as part of the initial feasibility and validation of the Postoperative Quality of Recovery Scale (PQRS) and found 95.8% of patients were 'completely satisfied' or 'satisfied' 3 days after surgery. Other studies have shown similar high levels of satisfaction in different patient populations.[5–8] In common with many other attempts

to assess satisfaction, the very high level of satisfaction found in anaesthesia produces a 'ceiling effect' on the ability of satisfaction to discriminate between levels of quality of care.[9] Identification of factors that are associated with incomplete satisfaction provide an opportunity for practice improvement.

The PQRS is a tool for evaluating recovery that objectively measures patient recovery in multiple domains [physiological, nociceptive, emotive, cognitive and activities of daily living (ADL)] over time with comparison to baseline values acquired prior to surgery.[4] A further domain assesses the patients overall (subjective) perspective. This domain includes satisfaction with anaesthesia care which is assessed by a single question with a five-point response. This was included to allow cross-correlation with other recovery domains and to enable an empirical investigation of influences on patient satisfaction following anaesthesia and surgery.

We hypothesised that the recovery domains have an impact on patient satisfaction following anaesthesia and surgery. The aim of this study was to identify predictors of satisfaction 3 days after surgery from domains of recovery recorded using the PQRS, from the previously published dataset of 701 patients.

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Methods

The dataset of 701 patients comprised the initial feasibility and validation study for the PQRS and details of methods and ethics statements have been previously published.[4] That prospective observational study was conducted to measure recovery with the PQRS over repeated periods and to provide the initial feasibility and validation data on its use. This research comprises a detailed analysis of the impact of recovery domains on patient satisfaction at 3 days following anaesthesia and surgery. The original method of patient selection was by convenience sampling and included patients aged at least 6 years, although the number of very young children was few.

The PQRS objectively measures recovery in five domains (physiological, nociceptive, emotive, ADL and cognitive) and assessed the patient's overall perspective as the sixth domain of recovery. Baseline testing in all domains (other than overall patient perspective) is performed on a single occasion 1 to 14 days preoperatively. The immediate postoperative assessment is performed 15 min (T_{15}) after anaesthesia is terminated (T_0) and is principally designed to assess physiological recovery and patient safety. An early measurement is performed 40 min (T_{40}) after anaesthesia and is principally designed to assess recovery at about the point of discharge from the postoperative anaesthesia care unit. Late recovery refers to measurements performed 1 and 3 days after anaesthesia. Long-term recovery is assessed 3 months after anaesthesia (M_3). The 3-month data are not reported in this article, as a large proportion of the cohort did not complete 3-month testing. In late and long-term measurements, the focus changes from physiological and home-readiness recovery to cognitive recovery and functional normality. The definition of 'recovery' is return to baseline values or better in each of the questions or assessments. Recovery can be assessed in a global fashion (recovery in all domains), or specifically looking for recovery within each domain.

In the overall patient perspective domain, the patient is asked to rate their satisfaction with anaesthetic care from day 1 onwards. A five-point scale was used with responses: totally satisfied; satisfied; moderately satisfied; somewhat satisfied; or not at all satisfied. Due to the high level of complete satisfaction ('totally satisfied' response) within the study cohort, the results were split into two groups: those completely satisfied, and those not completely satisfied (in which all four responses other than 'totally satisfied' were grouped). Univariable and multivariable analyses were then performed against preoperative demographic, intraoperative variables and recovery domains for day 1 and day 3 time points.

Statistical methods

Data were collected and verified at each participating centre prior to submission to the data manager for analysis. Patients were included for analysis if they had answered the satisfaction question on day 3. Data are presented as mean (SD) or number (proportion). Univariable analyses were conducted using χ^2-analysis or Fisher's exact test where appropriate. Significant univariable predictors, identified as P value <0.05, were then entered into a multivariable logistic regression analysis to identify independent predictors. The P value <0.05 defined significance for multivariable logistic regression analyses. Continuous data was not dichotomised, and categorical recovery data were assigned to the score in the PQRS test or as 'recovered' or not if the data related to a recovery score. Data were analysed using SPSS version 14.0 for Windows (SPSS Inc., Chicago, Illinois, USA).

Results

Patient characteristics are shown in Table 1 and the operative and anaesthetic details are shown in Table 2.[10] The satisfaction ratings for days 1 and 3 are shown in Table 3. Of the 701 patients, 573 answered the satisfaction question on day 3. These responses were grouped into two groups: 477 (83%) were completely satisfied and 96 (17%) were not completely satisfied.

Univariable predictors of incomplete satisfaction on day 3 were: lower alcohol consumption units per week ($P = 0 0.001$); current or ex-smoker ($P = 0.022$); longer anaesthetic duration ($P < 0.001$); inpatient surgery ($P < 0.001$); major surgery ($P = 0.011$); use of premedication ($P < 0.001$); higher baseline depression score ($P = 0.01$); higher baseline anxiety score ($P = 0.004$); lower score in baseline digit backwards test ($P = 0.019$); higher or lower than normal baseline heart rate ($P = 0.037$); lower oxygen saturation ($P = 0.034$); reduced ability to walk at baseline ($P = 0.03$); and reduced ability to dress at baseline ($P = 0.01$).

Table 1 Characteristics of patients responding to satisfaction question survey on day 3 postoperatively ($n = 573$)

Age (years)	47.7 ($\pm$18.8)
Education (years)	12.9 ($\pm$3.7)
Body mass index (kg m^{-2})	26.5 ($\pm$5.5)
Alcohol consumption (units/week)	1.6 ($\pm$3.7)
Sex (male)	289 (50%)
Non-smoker	336 (61%)
Employment status:	
Not employed	246 (44%)
Not employed due to ill health − plan to return	31 (6%)
Not employed due to ill health − do not plan to return	10 (2%)
Currently employed − plan to return	230 (41%)
Currently employed − do not plan to return	40 (7%)
ASA physical status:	
1	238 (42%)
2	221 (39%)
3	111 (19%)
4	1 (0.2%)
Inpatient[a]	398 (69%)

Data are mean ($\pm$ SD) or number (proportion). ASA, American Society of Anesthesiologists. [a] Inpatient means at least one overnight stay in hospital.

Table 2 Intraoperative data of patients responding to satisfaction question on day 3 ($n = 573$)

Surgical grade	
Minor	366 (64%)
Moderate	176 (31%)
Major	30 (5%)
Received premedication	364 (63%)
Inhalational induction	62 (11%)
Intravenous induction	509 (89%)
Inhalational maintenance	523 (92%))
Intravenous maintenance	47 (8%)
Duration of anaesthesia (min)	116 ± 92

Data are number (proportion) or mean (±SD). Surgical grade was classified as minor, moderate or major according to the modified Johns Hopkins surgical criteria.[10] Premedication included any sedative agent prior to surgery. Anaesthetic induction and maintenance describes the primary anaesthetic technique.

The recovery data for each time point and domain are shown in Table 4. Univariable predictors of incomplete satisfaction were recovery at T_{15} in the nociceptive domain ($P = 0.01$); failure of physiological domain recovery at T_{40} ($P = 0.031$); failure of emotive domain recovery ($P = 0.005$); failure of nociceptive recovery at day 1 ($P = 0.029$); and failure of nociceptive ($P = 0.001$), emotive ($P = 0.005$) and ADL domains ($P = 0.037$) at day 3.

Multivariable logistic regression analysis was conducted using the above input parameters. The full model containing all predictors was statistically significant ($P = 0.001$), indicating that the model was able to distinguish between participants who reported being totally satisfied with anaesthetic care and those who were not. The model as a whole explained 51.7% of the variance in satisfaction (Nagelkerke R^2), and correctly classified 87.9% of the cases [sensitivity (participants completely satisfied) = 95.4%; specificity (participants incompletely satisfied) = 43.8%].

Only four of the variables were independent predictors of incomplete satisfaction. Persistent pain or nausea at day 3 [odds ratio (OR) 8.2 (95% CI 2.5 to 27), $P < 0.01$] and incomplete satisfaction at day 1 [OR 28 (95% CI 10 to 77), $P < 0.01$] were predictors of incomplete satisfaction. Paradoxically, persistent pain or nausea at T_{15} [OR 0.34 (95% CI 0.11 to 0.99), $P < 0.05$] and at day 1 [OR 0.30 (95% CI 0.10 to 0.91), $P = 0.03$] reduced the risk of incomplete satisfaction.

Table 3 Patient satisfaction rating on days 1 and 3 after surgery

	Day 1	Day 3
Totally satisfied	493 (79%)	477 (83%)
Satisfied	98 (16%)	72 (13%)
Moderately satisfied	21 (3%)	20 (3%)
Somewhat satisfied	6 (1%)	4 (0.7%)
Not at all satisfied	3 (0.5)	0
Total responses	621	573

Data are number (proportion).

Discussion

This sub-group analysis of previously reported data has shown that persistent nociception (pain or nausea) and early dissatisfaction are important predictors of incomplete satisfaction 3 days after surgery. The novelty of this analysis was to use the PQRS tool to relate overall patient satisfaction to multiple other domains of recovery. It was surprising to the authors that only the nociceptive domain influenced satisfaction.

Our findings suggest that satisfaction is a poor discriminator of the quality of recovery. Satisfaction is a subjective assessment rather than objective measurement. Furthermore, it is not compared with pre-surgery values and, therefore, is not adjusted to baseline expectation. A common finding from satisfaction surveys is that the incidence of complete or near complete satisfaction is high, and few patients report marked dissatisfaction.[3,4,6–8,11–13] This produces a 'ceiling effect' which further reduces the ability of the measurement to identify the cause or measure improvement.

Multiple factors can influence the assessment of satisfaction such as preoperative expectation,[14] the way patients are handled by staff,[11] the information given and retained by them,[6,11] preference for inpatient rather than ambulatory care[10] and surgical outcome,[3,6] independent of the actual anaesthesia delivery. Minor perioperative complaints such as nausea, sore throat or hoarseness will reduce satisfaction, whereas regional rather than general anaesthesia may improve satisfaction.[8] In our study, all patients had general anaesthesia as a component of their anaesthetic care. Many studies are susceptible to improved outcomes because patients receive more than standard care. Capuzzo et al.[7] identified that dedicated anaesthetic nursing care and more than two postoperative visits by an anaesthesiologist were independent predictors of satisfaction. It is possible that the repeated PQRS assessments by face-to-face and telephone interviews may have also increased satisfaction.

Paradoxically, pain or nausea at 15 min and 1 day after anaesthesia were independent predictors of 'improved' satisfaction (OR < 1). This finding is counter-intuitive, and caution should be exercised in its interpretation. Other factors, including those listed above, as well as the low incidence of cognitive recovery in the early period after surgery, may influence satisfaction more than the impact of nociception at these time periods.

The timing of the satisfaction survey may also influence results. Many surveys are conducted early after surgery or before discharge from hospital. This may produce different findings from surveys conducted several days or weeks later. Such assessments are less likely to reflect immediate recovery and are more likely to be influenced by aspects of clinical recovery and the success of the procedure. For example, Lemos et al.[6] surveyed patient

Table 4   Univariable analyses of recovery within domains for satisfaction over four periods of assessment

PQRS domain	Recovery status	T_{15} satisfaction			T_{40} satisfaction			Day$_1$ satisfaction			Day$_3$ satisfaction		
		Complete	Not	P value	Complete	Not	P value	Complete	Not	P value	Complete	Not	P value
Physiological	Yes	84	13		187	25		163	22		253	29	
	No	362	72	NS	264	61	0.031	284	68	0.029	224	67	0.001
Nociceptive	Yes	90	25		124	24		379	65		379	65	
	No	263	35	0.010	321	55	NS	69	25	0.005	69	25	0.005
Emotive	Yes	258	33		361	58		237	42		332	56	
	No	60	13	NS	68	18	NS	189	40	0.462	139	38	0.037
Cognitive	Yes	10	3		36	3		134	19		164	23	
	366	5	8	NS	389	72	NS	305	69	0.092	305	67	NS

The data are the number of patients responding to the satisfaction question and responded to the postoperative quality of recovery scale (PQRS) domain at each period. Recovery status means achieving the same score (or better) on individual tests compared with baseline values. T_{15}, T_{40}, day$_1$ and day$_3$ refer to the PQRS survey conducted at 15 and 40 min, 1 and 3 days after the end of anaesthesia. 'Complete' means 'totally satisfied' and 'Not' is any satisfaction score other than 'totally satisfied'. NS, non-significant. P value is the χ^2-statistic.

satisfaction after ambulatory surgery at discharge and at 30 days after surgery. Complete satisfaction was reported in 75% of patients at discharge. This decreased to 62% at 30 days. It was postulated that clinical outcome was strongly related to patient satisfaction at the later time.

When combined with other measures satisfaction surveys can be used to identify predictors of inadequate satisfaction. Consistent with the findings of our study, others have also reported that pain and nausea are consistent and strong predictors of incomplete satisfactions.[3,6,8,13] Other researchers have found that awareness,[3] preoperative anxiety,[12,13] younger age, sedation rather than general anaesthesia,[12] information delivery[11] and postoperative complications[3] adversely affect satisfaction.

There are limitations to our study. The survey of satisfaction is a single question with a five-point Likert rating scale, and this approach has been criticised as too simplistic to fully evaluate satisfaction.[15–17] Furthermore, we collapsed the output to two categories, as the incidence of complete satisfaction was so high and this could have the effect of reducing our ability to discriminate more subtle degrees of incomplete satisfaction. Although the PQRS assesses many variables of recovery, it is not designed to assess surgical outcomes, nor will it capture all variables associated with satisfaction. Highly co-linear variables affecting satisfaction such as surgical expectation and outcomes, which were not captured, may in part account for why the model as a whole explained only 51.7% of the variance. In our mixed cohort of patients selected by convenience, we determined multiple univariable predictors of incomplete satisfaction. However, caution should be exercised in the application of these univariable predictors to specific postoperative surgical populations. Rather, they may be valuable to generate hypotheses for future research. The dataset included in this sub-group analysis comprises a wide variety of operations, and patients from multiple cultures and languages. It is possible that in different cohorts of patients, other predictors of satisfaction would be important. A wide age range is also a potential confounder as determinants of satisfaction may be different across wide age ranges. The numbers of very young children were few, and caution should be exercised in extrapolating our findings to young children. The size of the study, although relatively large, is potentially too small for the number of co-variables assessed, and further research in this area using discrete populations and fewer variables would address this. A number of patients did not answer satisfaction questions on day 3 and were excluded. The most common reason was unavailability of the researcher to conduct the questionnaire at that time point.

In conclusion, of the recovery domains measured using the PQRS, only nociception (pain or nausea) contributed to incomplete satisfaction.

Acknowledgements

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