

Patient personality predicts postoperative stay after colorectal cancer resection

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Abstract

Objective Postoperative length of stay (LOS) is an important outcome after colorectal cancer surgery. The aim of this study was to evaluate the putative effects of personality, mood, coping and quality of life on LOS.

Method A consecutive series of 110 eligible patients undergoing elective resection for colorectal cancer were invited to participate in the study. A battery of psychometric questionnaires including the Hospital Anxiety and Depression Scale, the Functional Assessment of Cancer Therapy (colorectal), the Courtauld Emotional Control Scale, the Positive and Negative Affectivity Scale and the Eysenck Personality Questionnaire (EPQ) were administered 5–12 days before surgery. Nonparametric correlations were computed for psychometric scores, demographic variables and the LOS. Factors found to be significantly correlated on this analysis were entered into a multiple regression model to determine the independent predictors of LOS.

Results One hundred and four patients with colorectal cancer participated. Seventy were male (67%) and the mean age was 68 years (range 39–86). The median LOS was 10 days (range 4–108). LOS was negatively correlated with pre- and postoperative albumin levels, PANAS +ve affect, Functional Assessment of Cancer Therapy questionnaire with the colorectal module functional well-being score and EPQ extroversion score. LOS was strongly positively correlated with postoperative morbidity. LOS was positively correlated with CECS anger score, age and being male. Postoperative morbidity ($\beta = 0.379$, $P = 0.007$) and extroversion ($\beta = -0.318$, $P = 0.05$) were independent predictors of LOS.

Conclusion Personality as measured by EPQ predicts postoperative LOS in patients with colorectal cancer. Extroverts have a higher pain threshold and this may be part of the explanation.

Keywords QoL, personality, postoperative stay, extroversion

Introduction

Postoperative length of stay (LOS) is an important outcome after colorectal cancer surgery. Patients with longer stay in hospital account for a significant expenditure of hospital resources [1,2]. In the current NHS environment, there is considerable emphasis on reducing postoperative stay and utilizing savings to improve other services [3].

Surgical complications have been linked with increased postoperative stay and hospital expenditure in several studies. Other factors shown to increase LOS are

increasing age, type of operation and ASA grade of patient [4–6].

Research has also shown association between patient personality and quality of life (QoL) with their health status. High psychological stress has been linked to poor outcomes after surgery [7–9]. On the other hand, Extroversion, as measured by the Eysenck personality questionnaire (EPQ) has been shown to be positively related to use of active coping strategies and negatively related to perceived intensity of pain in healthy volunteers [10,11].

It has been shown recently that some aspects of preoperative QoL scores are significantly associated with postoperative complications [12] and may help in predicting postoperative stay after colorectal cancer surgery [13]. However, the effect of personality of patients on their postoperative LOS, after surgery for colorectal cancer has not been previously reported.

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The aim of this study was to test the hypothesis that patients with longer postoperative hospital stay after colorectal cancer surgery would have poorer preoperative QoL scores and lower scores on extroversion scales compared with those with shorter hospital stay.

Method

Permission to carry out the study was obtained from Hull & East Yorkshire Local Research Ethics Committee (LREC/08/03/168, 11/09/2003).

Patient recruitment

This was a prospective study of consecutive patients. All patients with newly diagnosed colorectal cancer scheduled for elective open resection in Hull and East Yorkshire NHS Trust were eligible for the study. Exclusion criteria were Karnofsky performance status <80% (The Karnofsky Performance Scale allows patients to be classified as to their functional impairment; patients with a Karnofsky performance status below 80% are unable to carry on normal activity); being unwilling or unable to give informed consent, or being unable to complete the study questionnaires.

Patients were recruited in the preassessment clinic 5–12 days prior to surgery. Patients gave written, informed consent and then completed various questionnaires (see below). All the questionnaires were administered and analysed by the first author.

Psychosocial measurements

- 1 The Functional Assessment of Cancer Therapy questionnaire with the colorectal module (FACT-C) was used to assess various aspects of QoL. This questionnaire gives separate scores for physical well being, social and family well being, emotional well being, functional well being and QoL relevant specifically to colorectal cancer (additional concerns). Patients rate each item of the questionnaire from 0 to 4, and a higher score denotes better QoL. Validity and reliability have been reported [14].
- 2 The EuroQoL (EQ-5D) questionnaire is a generic, standardized, nondisease-specific instrument for describing and evaluating health-related QoL. It is used to generate a generic cardinal index of health. The EQ-5D assesses five dimensions: mobility, self care, usual activities (work, study, housework, family, or leisure), pain or discomfort and anxiety and depression. The information derived from the EQ is converted to a score using population norms in a given country or region (time trade off method). EQ-5D also incorpo-

ates a visual analogue scale to measure self-perceived overall health. The validity and reliability of EQ-5D have been tested in several European studies [15–17].

- 3 The Hospital Anxiety and Depression Scale (HADS) is a 14-item self report screening scale that was originally developed to screen for clinically significant anxiety and depression in the setting of a medical outpatient clinic [18,19]. The HADS is widely used in cancer research, and its validity and reliability have been studied [18,20–22].
- 4 The Positive and Negative Affect Schedule (PANAS) was developed by Watson *et al.* [23] as a brief measure of both Negative affectivity (NA) and Positive affectivity (PA). Several studies have confirmed the validity and reliability of PANAS and shown its relationship to other measures [24–26].
- 5 The Mood Rating Scale (MRS) was developed by Walker *et al.* [27] as a brief, acceptable, reliable and valid measure of mood. The MRS consists of six visual analogue scales (150 mm) with verbally defined anchor points. The MRS has been shown to correlate well with the corresponding dimensions of the Profile of Mood States (POMS) and it is sensitive to the effects of various interventions [27,28]. Furthermore, in the UK, it has been found to be more acceptable to patients than POMS [27].
- 6 The Eysenck Personality Questionnaire in its most recent form (EPQ-R) is a development of previous questionnaires. The EPQ-R measures three main factor-analytically derived dimensions of personality-neuroticism (emotionality, N) Extraversion (E) and Psychoticism (tough-mindedness, P). The scale also incorporates a Lie scale which can be used to detect dissimulation (falsely presenting oneself in a positive way). However, L also measures conformity [29].
- 7 The Courtauld Emotional Control Scale (CECS) was developed by Watson and Greer to measure emotional control or expressivity [30]. The CECS has three subscales: anger, anxiety and depression. The scores in the three sections are usually significantly positively correlated and can be summated.

Postoperative morbidity was recorded prospectively in this study. Morbidity was further divided into minor and major. For the purpose of this study, presence of any morbidity was recorded as affirmative in the postoperative morbidity section.

Statistical analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS, version 11.5, Chicago, Illinois, USA). Relationships between ordinal variables (for example, psychometric scores, age, LOS) were evaluated

using Spearman's correlation coefficient. The effect of categorical variables (e.g. gender) on LOS was examined using the Mann-Whitney *U*-test.

Factors significant at $P < 0.1$ on univariate analysis were analysed using multiple regression to determine independent predictors of LOS. Simultaneous entry of variables was used.

Results

Patient details

A consecutive series of 110 patients who met the inclusion criteria were invited to participate. Six refused (four did not wish to complete questionnaires or give blood samples, one did not wish to participate as he was already in another study and one gave no reason). The remaining 104 patients gave written informed consent. Seventy (67.3%) were male and the mean age of the group was 67.6 years (standard deviation 10.4, range 39–86). All patients were Caucasian in origin. Sixty-two (59.6%) patients had early stage disease (TNM stage I and II) and 42 had advanced disease (TNM stage III and IV). Twenty-two (21.2%) patients had resection of the right side of the colon, six (5.8%) had a total colectomy and the remaining 76 (73%) had resection of the left side of the colon. There were six deaths in the postoperative period. The median LOS was 10 days (range 4–108, Table 1). There was no significant difference in the postoperative LOS in the right and left sided resections ($U = 699$, $P = 0.241$).

Relationships between LOS, clinical and demographic variables

The presence of postoperative morbidity had a significant effect on prolonging the LOS ($U = 304.5$,

Table 1 Median postoperative length of stay in right and left-sided colorectal cancer resections.

Type of operation	Number of cases	Median postoperative stay	Range of days
Right hemicolectomy	13	9	5–23
Extended right hemicolectomy	9	10	7–21
Left hemicolectomy and sigmoid colectomy	6	8	6–13
Anterior resection	50	10	4–57
Abdominoperineal excision of rectum	14	13	7–55
Total colectomy	6	12	7–32
Hartmann's operation	6	12	6–108

Table 2 Difference in length of stay in individual groups.

Patient related characteristics	Mann-Whitney <i>U</i> -test	Significance (<i>P</i>)
Site of tumour (left/right)	699.0	0.24
Gender	868.5	0.02
Postoperative morbidity	304.5	<0.005

Table 3 Correlation between length of stay and biological variables.

Biological variable	Nonparametric correlation	Significance (two-tailed)
Age	$r = 0.292$	$P = 0.003$
Preoperative haemoglobin	$r = -0.142$	$P = 0.194$
Preoperative albumin	$r = -0.370$	$P < 0.001$
Postoperative haemoglobin	$r = -0.021$	$P = 0.846$
Postoperative albumin	$r = -0.354$	$P = 0.003$

$P < 0.005$). Males had a longer LOS than females (median 11 days *vs* 8 days, $U = 868.5$, $P = 0.02$, Table 2).

Length of stay was positively correlated with age ($r = 0.29$, $P = 0.003$) and negatively correlated with the preoperative and postoperative albumin levels ($r = -0.370$, $P < 0.005$, $r = -0.354$, $P = 0.003$). The correlation with pre- and postoperative haemoglobin did not reach significant level (Table 3).

Relationships between LOS and psychosocial variables

Length of stay was negatively correlated with PANAS +ve affect ($r = -0.214$, $P = 0.05$), FACT-C functional well-being score ($r = -0.198$, $P = 0.05$) and EPQ extroversion ($r = -0.252$, $P = 0.01$). In contrast, LOS was positively correlated with CECS anger score ($r = 0.232$, $P = 0.02$) and the correlation approached significance levels for CECS anxiety score ($r = 0.176$, $P = 0.10$, Table 4).

Multivariate analyses of the above variables showed that postoperative morbidity ($\beta = 0.379$, $P = 0.007$) and extroversion ($\beta = -0.318$, $P = 0.05$) were the only independent predictors of LOS (Table 5).

Discussion

This study set out to investigate *a priori* hypothesized relationships between various psychosocial variables and postoperative stay in patients with colorectal cancer. A number of significant correlations between postoperative stay and psychosocial factors were obtained.

Table 4 Correlation between postoperative length of stay and presurgical psychosocial measurements.

	Correlation coefficient (<i>r</i>)	Significance two-tailed (<i>P</i>)
HADS anxiety	-0.135	0.185
HADS depression	0.151	0.138
PANAS positive affect	-0.214	0.05
PANAS negative affect	-0.160	0.151
Mood Rating Scale	-0.011	0.919
FACT-C physical wellbeing	-0.158	0.123
FACT-C social wellbeing	-0.028	0.787
FACT-C emotional wellbeing	0.141	0.168
FACT-C functional wellbeing	-0.198	0.05
FACT-C additional concerns	-0.103	0.316
CECS anger scale	0.232	0.02
CECS anxious scale	0.176	0.10
CECS unhappy scale	0.140	0.191
EQ-5D score	-0.117	0.247
EQ-5D VAS	-0.165	0.172
EPQ-psychoticism	0.043	0.677
EPQ- extroversion	-0.252	0.01
EPQ- neuroticism/emotionality	-0.033	0.749
EPQ-lie	-0.066	0.526

Length of stay was found to be significantly higher in males; however, gender was not found to be an independent predictor of postoperative stay on multiple regression analysis. Presence of postoperative morbidity was associated with a significantly longer LOS. This has been reported in several previous studies, Khan *et al.* reported the significant association of postoperative stay with hospital costs and LOS in 7457 patients undergoing noncardiac surgery in a tertiary hospital [31]. Complications are known to prolong stay in aortic and gynaecological surgery [32,33]. Efforts to identify high-risk patients, initial optimization of their physiological status with the aim of preventing postoperative

complications may reduce overall LOS and hospital costs.

Length of stay was also found to show significant positive correlation with the age of the patient and negative correlation with the pre- and postoperative albumin levels. Age has been found to predict incidence of postoperative complications and the LOS [32,34] in several studies and is an integral part of risk scoring systems [35]. A low albumin level has also been found to be associated with poor prognosis in GI tract cancers [36,37]. However, neither age nor albumin levels retained significance as independent predictors of LOS on multiple regression analysis in this study.

These data provide partial support for the study hypotheses that patients with longer postoperative hospital stay after colorectal cancer surgery would have poorer preoperative QoL scores and lower scores on extroversion scales.

Length of stay was negatively correlated with scores on the PANAS +ve affect, FACT-C functional wellbeing and the EPQ extroversion scale. Positive correlation was obtained with CECS anger sub-scale; however, no correlation was found with other QoL measures used in the study.

Positive affect assesses the predisposition of the patient to experience positive mood states and reflects one's state of energy, excitement and enthusiasm [23]. Positive affectivity has been found to be associated with the level of social activity and physical exercise in patients [23]. High scores on the functional well-being scale of FACT were also found to be correlated with a shorter postoperative stay. FACT-C FW, PW and AC scores were found to be significantly associated with postoperative study in another study of colorectal cancer patients. Only the FACT-C total score remained a significant predictor of LOS on multivariate analysis [13]. The same group of authors also showed a significant association of pretreatment FACT-C SW,

Independent variable	<i>R</i>	<i>R</i> ²	<i>F</i>	β	<i>P</i> -value
Gender	0.644	0.415	2.903	0.113	0.39
Age	0.644	0.415	2.903	-0.145	0.38
Preoperative albumin	0.644	0.415	2.903	-0.036	0.85
Postoperative albumin	0.644	0.415	2.903	-0.076	0.69
Postoperative morbidity	0.644	0.415	2.903	0.379	0.007
PANAS positive affect	0.644	0.415	2.903	-0.127	0.42
FACTC functional wellbeing	0.644	0.415	2.903	-0.265	0.14
CECS anger score	0.644	0.415	2.903	-0.009	0.95
CECS anxiety score	0.644	0.415	2.903	0.024	0.88
EPQ extroversion score	0.644	0.415	2.903	-0.318	0.05

Dependent variable: postoperative stay.

Table 5 Multiple regression analysis using variables with *P* < 0.1 on univariate analysis.

EW and FW scales and the FACT-C total score with presence of postoperative complications in colorectal cancer patients [12]. However, in our study FACT-C total score did not correlate significantly with the LOS and none of the FACT scores retained significance on multiple regression analysis.

Extroversion score on the EPQ-R was found to predict LOS independently on multiple regression analysis. The exact mechanism behind this finding is not clear. One of the factors that may be responsible is the difference in pain perception among extroverts and introverts. The other difference may arise as extroverts are more likely to have a better social support network [38]. Patients who score higher on the EPQ extroversion scale have been found to show higher tolerance to pain [10,11,39], and to use active coping strategies as a response [11]. This difference is thought to be due to the differences in cognitive processes related to the ways in which people constitute the meaning and implication of pain [40]. A recently published study has shown that extroversion along with life satisfaction show a significant relationship with early postoperative recovery in elective surgical patients [38]. In addition, active coping and use of less analgesia was found to be associated with early recovery.

This study provides evidence for the hypothesis that personality influences the duration of postoperative stay in patients undergoing elective resection for colorectal cancer and accounts for a clinically significant proportion of the variability of LOS. Unfortunately, the measure of extroversion used in this study is probably too lengthy for routine clinical use, and the development of a briefer reliable version would be helpful.

Because extroversion is a stable personality trait with a psychobiological basis, it would not be feasible to attempt to modify this in a short time within the context of the hospital environment. However, further studies to clarify more precisely how extroversion modifies LOS might yield information that could lead to an intervention (psychological, social and/or psychopharmacological) that would significantly and safely reduce LOS following colorectal cancer surgery.

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