Original Article

Outcomes in octogenarians following elective colorectal cancer surgery

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Background: Colorectal surgery in octogenarians is increasing in prevalence and good surgical outcomes have been demonstrated. However, functional status and independence remain the main patient consideration with limited data on the long-term functional outcomes.

Methods: A retrospective analysis was conducted for all patients aged above 80 undergoing surgery for colorectal cancer (CRC) from January 2018 to December 2019. Functional status assessment was made as part of pre- and post-operative allied health clinic appointments. Eastern Cooperative Oncology Group (ECOG) performance scores were recorded. Loss of independence (LOI) was defined as the reduced capacity to perform pre-morbid activities of daily living (ADL) and requiring increased supports.

Results: Forty-one patients aged 80 years or older had elective CRC resections with a median follow-up of 15 months [interquartile range (IQR): 8–20]. The median American Society of Anesthesiology (ASA) score was 3 and 90.2% (37/41) of patients had an ECOG score of 0 or 1. There was no 30-day mortality and 2 (4.9%) deaths occurred within 1 year. The median Clavien-Dindo score was 1, and 2 patients (4.9%) required unplanned intensive care unit (ICU) admissions. Twelve re-hospitalizations occurred with falls being the most common reason. LOI occurred in only 2 patients (4.9%) and on multivariate regression analysis, age and pre-morbid requirement of gait aids were predictive of LOI (P=0.042 and P=0.003, respectively). Gait aids were also associated with higher Clavien-Dindo scores (P=0.057) and increased length of stay (LOS) (P=0.009).

Conclusions: Patients with advanced age undergoing surgery for CRC surgery can still have good post-operative outcomes and adequate functional recovery with pre-operative optimization and appropriate post-operative supports.

Keywords: Colorectal cancer (CRC); surgery; loss of independence (LOI); octogenarians

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Introduction

Australia has an ageing population, with approximately 7% of the population over the age of 75. This demographic is expected to increasingly contribute to disease in the upcoming years (1). Increased age is an independent risk factor for developing colorectal cancer (CRC) (2). Elderly patients are frailer, with greater co-morbidities, and therefore at higher risk of peri-operative morbidity and mortality (3). Due to these concerns, patients >80 years with CRC have traditionally been managed less aggressively than younger patients, regardless of their performance status (4,5). Prior retrospective analyses of octogenarian patients have demonstrated early peri-operative mortality (30-day) following CRC surgery of 10–20% (6). However, more recent studies have demonstrated that CRC surgery can be safe in this age group, with good outcomes and long-term survival, in those deemed fit for surgery (7,8). However, these studies only had a follow up period of 30 days post-operatively.

In recent times, loss of independence (LOI) has gained recognition as the preferred patient outcome in elderly patients with CRC (9,10); LOI can be more significant than their oncological prognosis for this patient cohort (11). Whilst the definition of LOI has been variously described in the literature, we have defined it as a decline in an individual's ability to carry out pre-morbid functional activities of daily living (ADL) necessitating placement in an aged care facility (9,12,13). Additionally, LOI has also been adversely associated with longer length of stay (LOS) and major post-operative complications at 30-day (12,13). However, longer term post-operative functional outcomes and maintenance of independence in this cohort have not been well described.

We hypothesise that elective CRC surgery can be relatively safe in the cohort of patients aged over 80 years over long-term follow-up, with acceptably low levels of surgery-related mortality or LOI in both the short term (30 days) and long term (1 year), as well as low rates of functional decline. We present this article in accordance with the STROBE reporting checklist (available at https://jgo.amegroups.com/article/view/10.21037/jgo-22-1151/rc).

Highlight box

Key findings

- There was no 30-day mortality, 2 (4.9%) deaths occurred within 1 year. The rate of major post-operative complications was low and median Clavien-Dindo score was 1.
- Loss of independence (LOI) occurred in two patients (4.9%) and on multivariate regression analysis, age and pre-morbid requirement of gait aids were predictive of LOI (P=0.042 and P=0.003 respectively). Gait aids were associated with higher Clavien-Dindo scores (P=0.057) and increased length of stay (LOS) (P=0.009).

What is known and what is new?

- Elective colorectal resections in the elderly aged over 80 years are feasible with acceptable outcomes, both medically and functionally.
- After a median follow-up of 15 months, we demonstrate acceptably low levels of surgery-related mortality or LOI in both the short term (30 days), long term (1 year) and low rates of functional decline.

What is the implication, and what should change now?

- Patient quality of life is of paramount importance in this cohort and further studies need to corroborate this evidence to help determine factors to optimise outcomes.

Methods

Patients

A retrospective study was conducted for a total of 41 patients aged 80 or above who underwent elective surgery for CRC across the Eastern Health network (Melbourne, VIC, Australia) between January 2018 to December 2019. Data was collected from hospital records of outpatient surgical, allied health and oncology clinics as part of routine pre-operative and post-operative assessment, as well as ongoing long-term follow-up. Primary outcomes measured included mortality (30-day and 1 year), post-operative complications [unplanned intensive care unit (ICU) admission, Clavien-Dindo grade complications, readmissions and total parenteral nutrition (TPN) requirement] and LOI.

Change in functional status was measured pre- and post-operatively as part of allied health assessments from clinical documentation using the Eastern Cooperative Oncology Group (ECOG) performance status score (14). A change in ECOG was recorded as a decrease in post-operative scores from ECOG scores recorded at baseline. Pre- and post-operative gait aid requirements were documented.

The level of independence was defined as a change in the ability to perform pre-morbid ADL (measured using ADL scores). LOI was defined as a decrease in post-operative ADLs requiring permanent placement in an aged care centre. Determination of LOI was made as part of routine pre- and post-operative allied health clinic assessments.

The study was conducted in accordance with the

Table 1 Patient characteristics

Factor	Values
Age (years)	85
Gender	
Male	18 (43.9)
Female	23 (56.1)
BMI, kg/m^2	25
ASA	3
Co-morbidities	
PVD	4 (9.8)
CVA	5 (12.2)
IHD	6 (14.6)
Previous MI	3 (7.3)
Stents	4 (9.8)
Arrhythmia	12 (29.3)
HTN	31 (75.6)
Antiplatelets	13 (31.7)
Anticoagulation	7 (17.1)
Diabetes	12 (29.3)
Respiratory disease	5 (12.2)
Smoker	
Current smoker	2 (4.9)
Past smoker	5 (12.2)
Recent steroid use	3 (7.3)
Gait aids	
SPS	2 (4.9)
4WW	7 (17.1)
N/A	32 (78.0)

Data are shown as median or n (%). BMI, body mass index; ASA, American Society of Anesthesiology; PVD, peripheral vascular disease; CVA, cerebrovascular accident; IHD, ischemic heart disease; MI, myocardial infarction; HTN, hypertension; SPS, single point stick; 4WW, 4 wheel walker; N/A, not applicable.

Declaration of Helsinki (as revised in 2013). This study was approved by The Eastern Health Human Research Ethics Committee (HREC No. QA21-049) and because of the retrospective nature of the study, the requirement for individual informed consent was waived.

Statistical analysis

Data was imported into IBM SPSS Statistics, Version 27.0 (IBM Corp, Armonk, NY, YSA). Continuous variables were reported as a median with an accompanying interquartile range (IQR). Categorical variables were presented as frequencies and percentages. One-way analysis of variance (ANOVA) was used to assess differences across continuous variables, while Chi-square tests were performed on the categorical factors and Fisher's exact was used to assess significance between groups. The outcomes including LOS, intensive care unit LOS (ICU LOS) and Clavien-Dindo score were analysed using multiple regression. Kaplan-Meier survival function was used to display freedom from rehospitalisation. A P value of less than 0.05 was considered statistically significant.

Results

Demographics and operative characteristics

A total of 118 elective CRC resections were performed. Of these, 41 (34.7%) patients were aged 80 years or older with a median age of 86 years. Median post-operative follow-up was 15 months (IQR: 8–20).

Patient baseline characteristics are described in *Table 1*. The median American Society of Anesthesiology (ASA) score was 3. Hypertension was the most common comorbidity (31/41, 75.6%). Nine patients (22.0%) required gait aids pre-operatively. At baseline, 90.2% (37/41) had an ECOG score of 0 or 1.

Tumor stage was determined as per the American Joint Committee on Cancer (AJCC) classification. Almost half the cohort had stage 2 disease (20/41 patients, 48.8%) while only one patient (2.4%) had stage 4 cancer. All patients underwent resection with curative intent except for one patient, who underwent an elective palliative resection following stenting for an obstructing tumor. No patients received neo-adjuvant chemo-radiotherapy prior to resection. Laparoscopic resection was performed in the majority of patients (38/41, 92.7%) (*Table 2*). Right sided resections (68.3%) were more common than left sided resections (31.7%). Amongst those with left-sided resections, two (2/13, 15.4%) required a stoma; one of whom required a diverting loop ileostomy while the other underwent an end colostomy.

Table 2 Clinical characteristics

Factor	Values
Surgical approach	
Laparoscopic	38 (92.7)
Open	3 (7.3)
T stage	
1	3
2	5
3	22
4	8
0	3
N stage	
0	28
1	11
2	2
M stage	
0	40
1	1
Tumour overall stage	
1	7 (17.1)
2	20 (48.8)
3	10 (24.4)
4	1 (2.4)
N/A	3 (7.3)
Tumour location	
Left side	
Descending colon	1 (2.4)
Sigmoid colon	7 (17.1)
Rectum	5 (12.2)
Right side	
Ascending colon	5 (12.2)
Caecum	7 (17.1)
Hepatic flexure	7 (17.1)
Transverse colon	7 (17.1)
Synchronous lesion	2 (4.9)
TPN	8 (19.5)
LOS (days)	8.49 (4.31)
ICU admission	11 (26.8)
ICU LOS (days)	2 (1.27)
30-day mortality	0 (0.0)
1-year mortality	2 (4.9)
Discharge destination	
Home	34 (82.9)
Rehabilitation	4 (9.8)
Residential facility	3 (7.3)

Data are shown as n, mean (SD), or n (%). T, tumor; N, node; M, metastasis; N/A, not applicable; TPN, total parenteral nutrition; LOS, length of stay; ICU, intensive care unit.

Table 3 Post-operative complications

Complication	No. (%)
Surgical	
Ileus	9 (22.0)
Urinary retention	1 (2.4)
TPN	8 (19.5)
Medical	
UTI	4 (9.8)
Hospital-acquired pneumonia	2 (4.9)
Delirium	2 (4.9)
AKI	1 (2.4)
Atrial Fibrillation	3 (7.3)

TPN, total parenteral nutrition; UTI, urinary tract infection; AKI, acute kidney injury.

Post-operative complications

Post-operative complications occurred in a total of 14 (34.1%) patients with a median Clavien-Dindo classification score of 1 (IQR: 1–2). Ileus was the most common post-operative complication occurring in nine patients (22.0%) and was associated with a longer LOS (P=0.001). Surgical and medical complications are listed in *Table 3*.

Mortality

There was no mortality within a 30-day period. There

Table 4 Rehospitalisations

Cause of rehospitalisation	No.	Time to rehospitalisation (median)
Early		
Frailty/deconditioning	3	24 days
Urinary retention	1	29 days
Late		
Falls	3	2 months
Frailty/deconditioning	2	19 months
TIA	1	6 months
Decompensated CCF	2	6 months
Operative		
Ventral hernia	1	4 months
Incisional hernia	2	7 months
Small bowel obstruction	1	16 months
Colonoscopy	1	6 months

TIA, transient ischemic attack; CCF, congestive cardiac failure.

Table 5 Functional status

ECOG score	Pre-operative, n (%)	Post-operative, n (%)
0	29 (70.7)	16 (39.0)
1	8 (19.5)	16 (39.0)
2	3 (7.3)	7 (17.1)
3	1 (2.4)	2 (4.9)

ECOG, Eastern Cooperative Oncology Group.

were 2 (4.9%) deaths occurring within 1 year. One patient underwent a palliative extended right hemi-colectomy for an obstructing tumor and diffuse peritoneal carcinomatosis. Following transition to palliative care, the patient died 2 months later. A second patient underwent an uncomplicated laparoscopic right-hemicolectomy but died from ischemic bowel following surgery for gastric outlet obstruction 5 months later.

ICU admissions

Eleven patients had ICU admissions (26.8%) and two patients required unplanned admission (4.9%) with a median LOS of 1 day in ICU. There was no significant difference in ICU admission when factoring LOI and ECOG change.

Rehospitalizations

A total of 4 (9.8%) re-hospitalizations occurred within 30 days of discharge (*Table 4*). Two patients were readmitted requiring further rehabilitation with one of these patients also presenting with an ileus (managed conservatively). One patient with diffuse peritoneal metastatic disease at the time of initial surgery represented with worsening frailty and reduced oral intake and was transitioned to palliative care.

There were eight (19.5%) re-hospitalizations after 30 days. Falls were the most common reason for re-presentation, occurring in three patients (7.3%) at a median of 2 months (*Table 4*). Two patients presented with worsening frailty, at an average of 19 months from index admission. Four patients (9.8%) underwent further surgery at a median of 7 months with three patients having had an obstructed incisional hernia and one with adhesional small bowel obstruction. All four patients were discharged home following an uncomplicated post-operative course.

Functional decline and LOI

Post-operative decline from baseline ECOG scores occurred in 46.3% (19/41) of patients (*Table 5*). Patients experiencing ECOG changes were older compared to those not experiencing ECOG changes (87.3 *vs.* 84.8 years, P=0.042). Patients who experienced ECOG changes were more likely to have a history of ischemic heart disease requiring coronary stents compared to those in the non-ECOG change group (22.2% *vs.* 0%, P=0.03).

A logistic regression (*Table 6*) showed a correlation between increasing age and ECOG changes [odds ratio (OR) =1.31, P=0.026]. Females were also less likely to present with ECOG changes (OR =0.14, P=0.043).

On discharge, 82.9% of patients were transitioned home. Sixteen patients (39%) required increased carer support from family and or community physiotherapy and four patients (9.8%) required inpatient rehabilitation. Two patients (4.9%) had LOI and required permanent aged care placement.

On multivariate regression analysis, age and pre-morbid requirement of gait aids were predictive of LOI (P=0.042 and P=0.003 respectively). Gait aids were also associated with higher Clavien-Dindo scores (P=0.057) and increased LOS (P=0.009) (Tables S1,S2). Furthermore, post-operative TPN requirement was predictive of LOI (OR: 4.5, 95% CI: 0.25–82.2) and was associated with a longer LOS (median 14.5 days, IQR: 9.8–19.3).

Table 6 Multivariate logistic regression results for change in ECOG

Factor	ECOG change			
	No (N=23)[§]	Yes (N=18)	OR (95% CI)	P value
Age[†], years	84.78 (3.79)	87.28 (3.74)	1.31 (1.03, 1.65)	0.026*
Gender[‡]				
Female	15 (65.2)	8 (44.4)	1.00 (Ref)[¶]	
Male	8 (34.8)	10 (55.6)	0.14 (0.02, 0.94)	0.043*
BMI[†], kg/m^2	25.52 (3.58)	25.83 (4.55)	0.84 (0.62, 1.14)	0.274
Surgical approach[‡]				
Lap	22 (95.7)	16 (88.9)	1.00 (Ref)[¶]	
Open	1 (4.3)	2 (11.1)	1.48 (0.06, 35.51)	0.807
TPN[‡]				
Negative	20 (87.0)	13 (72.2)	1.00 (Ref)[¶]	
Positive	3 (13.0)	5 (27.8)	0.21 (0.01, 4.30)	0.313
Clavien-Dindo[†]	1.35 (0.57)	1.39 (0.50)	0.60 (0.08, 4.54)	0.623
ICU admission[‡]				
Negative	19 (82.6)	11 (61.1)	1.00 (Ref)[¶]	
Positive	4 (17.4)	7 (38.9)	0.24 (0.03, 1.85)	0.173

[†], continuous variable: mean (SD); [‡], categorical variable: frequency (with row %). Chi-square test was applied; [§], reference outcome level; [¶], 1.00 (Ref) = reference category; *, significant at 0.05. ECOG, Eastern Cooperative Oncology Group; OR, odds ratio; CI, confidence interval; BMI, body mass index; TPN, total parenteral nutrition; ICU, intensive care unit.

Discussion

Our study has shown that elective CRC surgery in patients older than 80 years of age can be offered with low rates of major post-operative complications and achieve acceptable outcomes in terms of disease control and longer-term functional status. To our knowledge, this is the first study in the Australasian population to analyze the longer-term functional changes of this patient group after colorectal surgery with a mean follow up period of 15 months (range, 1–39).

Whilst historically there has been a reluctance in treating CRC in those of advanced age due to the greater co-morbidity profile and risk of peri-operative complications (15,16), this has improved in recent times (17-20). Yap *et al.* demonstrated in patients over 90 years low 30-day and 180-day mortality rates of 2.1%, and 10.4% respectively in a cohort where 20% were non-elective operations (8). Moreover, Pirrera *et al.* found that octogenarians' age alone was not a predictor of 30-day and 90-day post-operative mortality (21). Similar findings were echoed by Tan *et al.*, who supported the notion that age should not preclude surgery, with demonstrated mortality as low as 1.6% (22). However, this was tempered by a risk of morbidity up to 30.7%. Furthermore, whilst Mothes *et al.* reported a significant trend of increasing mortality with increasing age, there was no difference in disease specific survival between the groups and a greater proportion of those in the >80 years category underwent emergency surgery (23).

A recent bi-national Australia and New Zealand audit of CRC surgery outcomes, including data contributed by our institution, showed that in 4,600 patients over 80 years undergoing colorectal resection, there was a 30-day mortality of 3%, compared to 1% in those <80 years. However, age alone was not found to be an independent predictor of morbidity or mortality (24). 20% of these patients had emergency surgery which was found to be a significant risk factor for mortality. Interestingly, the overall tumor stage was less advanced in octogenarians. This was also demonstrated by Sell *et al.*, who found that whilst octogenarians presented with larger tumours, they appear to have less aggressive disease (25). In comparison to younger

patients with similarly sized tumours, octogenarians had a lower pathologic stage, less extramural venous invasion, and lymph nodes yet similar three-year disease-free rates. This is in keeping with our findings, with 66% of our cohort having stage 1–2 disease, and only 2% having stage 4.

Only 10% of our patients received adjuvant chemotherapy. Cross *et al.* found that patients over 80 were much less likely to be offered adjuvant chemotherapy compared to younger populations (24), a finding also supported by Goldvaser *et al.*, who suggested that octogenarians were more likely to receive less aggressive treatment regardless of their functional performance scores (5). Although this may be due to more favorable histology in older patients (24), it should be noted that a further 10% of our patients were offered adjuvant therapy but refused, highlighting the importance of quality of life to this population.

Elective patients have been shown to experience lower post-operative mortality and morbidity (26), which may explain our more favorable outcomes compared to the literature (7,8,27). It also potentially highlights the importance of pre-operative assessment, selection, and optimization in this age group (28).

One-year mortality in our cohort was 5%. This was significantly lower compared to several other retrospective analyses of similar patients undergoing elective colorectal resection, which found an overall 1-year mortality of 20% (7,27). This discrepancy could be accounted for by the predominance of a minimally invasive approach in our cohort (92% laparoscopic). Faiz *et al.* demonstrated that laparoscopic resection was a significant predictor of reduced 1-year mortality compared to open (27). Several other studies have demonstrated that laparoscopic colorectal surgery in elderly patients can be safe, with similar rates of mortality and complications compared with younger patients (29,30). Our study adds to the body of evidence in the literature showing good outcomes with laparoscopic colorectal surgery.

Functional decline after major surgery is frequent (29) and is associated with adverse effects on post-operative morbidity and mortality (13,30). In our cohort, over 90% of patients were living at home pre-operatively. Only 3 patients were unable to return home following surgery, but 39% of our cohort required increased support and community allied health, and 10% required rehabilitation prior to discharge. Furthermore, almost half of our cohort (46%) experienced a decline in functional status post-operatively. Markers of frailty, such as need for pre-morbid gait aids, were predictive of LOI. This reinforces the increased importance of rehabilitation programs and allied health in this patient population, as functional status and independence have a significant impact on the quality of life in this demographic compared to younger populations (31).

This study has several limitations. It is a retrospective study with a limited sample size from a single center. No comparison with a younger age group undergoing elective surgery was made, however it can be surmised from recent Australasian audit data on CRC surgery that although a younger patient cohort may have lower mortality, age would not be an independent risk factor for poorer outcomes (24). As the aim of the study was to assess the outcomes of octogenarians undergoing elective surgery, we recognize that our patient cohort will not be representative of all patients in this age group requiring CRC surgery, whereby they have been assessed pre-operatively and optimised for surgery. Additionally, the assessment of LOI from allied health clinic may be underestimated due to variable or incomplete follow-up. Whilst the use of ECOG scores through longitudinal follow-up was used as a measure of functional changes, it has limitations including that it can be observer dependent, unidimensional and may be subject to observer bias.

Conclusions

Elective colorectal resections in the elderly cohort aged over 80 years are feasible with acceptable outcomes, both medically and functionally. After a median follow-up of 15 months, we demonstrate low levels of surgery-related mortality and LOI in both the short term (30 days) and long term (1 year). Patient quality of life is of paramount importance in this cohort of patients and further studies may help identify models to predict LOI and post-operative outcomes such that targeted optimisation and counselling through comprehensive geriatric assessments can be offered for this population.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://jgo.amegroups.com/article/view/10.21037/jgo-22-1151/rc

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jgo.amegroups.com/article/view/10.21037/jgo-22-1151/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This study was approved by The Eastern Health Human Research Ethics Committee (HREC No. QA21-049) and because of the retrospective nature of the study, the requirement for individual informed consent was waived.

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Supplementary

Table S1 Summary of multiple regression analysis for variables predicating LOS

Factors	B	SE B	β	P	sr^2
Age	0.02	0.01	0.31	0.165	0.15
Gender	−0.03	0.08	−0.07	0.728	−0.04
Tumour location	−0.03	0.02	−0.36	0.140	−0.16
Tumour stage	−0.02	0.05	−0.11	0.619	−0.05
ASA score	−0.12	0.06	−0.34	0.056	−0.22
BMI	0.01	0.01	0.19	0.442	0.08
PVD	−0.15	0.12	−0.23	0.211	−0.14
CVA	0.01	0.05	0.04	0.792	0.03
IHD	0.26	0.15	0.47	0.108	0.18
Previous MI	−0.05	0.20	−0.06	0.818	−0.02
Stents	−0.18	0.20	−0.27	0.388	−0.09
Arrhythmia	0.00	0.08	−0.01	0.970	0.00
HTN	0.18	0.08	0.39	0.039*	0.24
Antiplt use	−0.04	0.10	−0.09	0.704	−0.04
Anticoag use	0.16	0.10	0.30	0.164	0.15
Diabetes	−0.06	0.08	−0.14	0.444	−0.08
Resp Dz	0.15	0.07	0.55	0.059	0.21
Smoker	0.04	0.07	0.15	0.527	0.07
Recent steroid use	0.05	0.36	0.07	0.884	0.02
Surgical approach	−0.36	0.20	−0.47	0.108	−0.18
Tumour recurrence	0.29	0.14	0.38	0.057	0.22
Support location	−0.36	0.20	−1.07	0.100	−0.18
Discharge destination	0.45	0.14	1.52	0.006**	0.34
Pre-op functional status (ECOG)	0.21	0.11	0.79	0.072	0.20
Post-op functional status (ECOG)	0.06	0.08	0.26	0.446	0.08
Gait aids	−0.44	0.14	−1.69	0.009**	−0.32

$F(28, 12) = 2.971$, $P<0.05$, $R^2=0.874$. B = unstandardized coefficients; SE B = standard error; β = standardized coefficient; sr^2 = semi-partial correlation. *, significant at 0.05; **, significant at 0.01.

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Table S2 Summary of Multiple Regression Analysis for Variables predicating Clavien-Dindo classification

Factors	B	SE B	β	P	sr^2
Age	0.01	0.04	0.07	0.824	0.04
Gender	–0.14	0.34	–0.13	0.677	–0.07
Tumour location	–0.03	0.07	–0.15	0.671	–0.07
Tumour stage	0.23	0.19	0.39	0.243	0.19
ASA score	–0.05	0.24	–0.05	0.848	–0.03
BMI	0.04	0.05	0.27	0.473	0.11
PVD	0.19	0.47	0.11	0.693	0.06
CVA	0.25	0.22	0.26	0.284	0.17
IHD	0.30	0.61	0.20	0.634	0.08
Previous MI	–0.05	0.82	–0.02	0.955	–0.01
Stents	0.09	0.80	0.05	0.912	0.02
Arrhythmia	0.03	0.31	0.03	0.920	0.02
HTN	0.30	0.32	0.25	0.354	0.15
Antiplt use	–0.73	0.41	–0.64	0.099	–0.28
Anticoag use	0.03	0.42	0.02	0.951	0.01
Diabetes	0.22	0.31	0.19	0.501	0.11
Resp Dz	–0.05	0.29	–0.06	0.876	–0.02
Smoker	0.20	0.28	0.26	0.483	0.11
Recent steroid use	0.73	1.45	0.36	0.624	0.08
Surgical approach	–0.92	0.83	–0.45	0.290	–0.17
Tumour recurrence	0.58	0.55	0.29	0.313	0.16
Support location	–0.20	0.83	–0.22	0.816	–0.04
Discharge destination	0.15	0.55	0.19	0.792	0.04
Pre-op functional status (ECOG)	0.85	0.44	1.17	0.078	0.30
Post-op functional status (ECOG)	0.26	0.33	0.40	0.446	0.12
Gait aids	–1.22	0.58	–1.75	0.057	–0.33

$F(28, 12) = 1.067$, $P=0.474$, $R^2=0.713$. B = unstandardized coefficients; SE B = standard error; β = standardized coefficient; sr^2= semi-partial correlation.

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