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Title:
Impact of hospital geographic remoteness on short-term outcomes after colorectal cancer resection using state-wide administrative data

Date:
2020-07-01

Citation:
Udayasiri, D. K., MacCallum, C., Silva, N. D., Skandarajah, A. & Hayes, I. P. (2020). Impact of hospital geographic remoteness on short-term outcomes after colorectal cancer resection using state-wide administrative data. ANZ Journal of Surgery, 90 (7-8), pp.1328-1334. https://doi.org/10.1111/ans.15992.

Persistent Link:
https://hdl.handle.net/11343/275785

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Title Page

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Impact of hospital geographic remoteness on short-term outcomes after colorectal cancer resection using state-wide administrative data.

Short running head

Outcomes post resection CRC in Victoria

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This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/ans.15992

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Sources of support

Condon Colonic Disorder Scholarship, Medicine, Dentistry and Health Sciences, The University of Melbourne.

Health Technology Assessment Scholarship, The Royal Australian College of Surgeons

Word count abstract: 200

Word count body of text: 2780

Word Count Bibliography: 1037

Word Count tables: 500

Total Word Count: 4517

Number of tables: 2

Number of supplementary Figures: 2

Disclaimers

There are no conflicts of interest in this article.

Abstract

Purpose

This study aimed to use validated coding algorithms, applied to a central repository of administrative data (AD), to report on short-term outcomes following resection for colorectal cancer (CRC) comparing regional to metropolitan Victorian hospitals.

Methodology

A retrospective cohort study using prospectively-gathered AD.

The primary outcome was prolonged length of stay (LOS).

Secondary outcomes were: inpatient mortality, return to theatre (RTT), discharge destination and need for mechanical ventilation/intensive care unit support.

Outcomes were adjusted for potential confounders via multivariable logistic regression analysis.

Results

This study of 18470 patients found strong evidence for lower odds of prolonged LOS (OR 0.53, 95% CI 0.48 – 0.58, p=<0.001) and inpatient mortality (OR 0.67, 95%CI 0.49 – 0.91, p=0.01) in inner regional hospital compared with metropolitan hospitals. For outer regional hospitals, there was strong evidence of decreased odds of prolonged LOS (OR 0.64, 95%CI 0.52 – 0.77, p=<0.001) and RTT (OR 0.67, 95%CI 0.47 – 0.95, p=0.03).

Conclusion

This is the largest and most detailed study concerning short term outcomes following CRC resection in Victorian public hospitals.

Inner and outer regional centres had similar or better short-term outcomes than metropolitan hospitals after CRC resection.

AD with validated algorithms serves as a large accurate database to report on CRC outcomes.

Keywords: Colorectal neoplasm, surgery, administrative data, short-term outcomes

Introduction

Background

Of the studies that examine state-wide outcomes for colorectal cancer (CRC) resection in Australia[1-17] relatively few provide detailed data. This study uses validated algorithms of administrative data (AD) coding to access whole-of-state data and is one of the largest, detailed studies on CRC surgical outcomes in Victoria.

Centralisation of health care for CRC surgery has been advocated due to operative challenges and requirements for specialised supports[18-20]. It might be expected that metropolitan hospitals with higher case and complexity volume could have better outcomes than their regional counterparts, but this has not been proven in Victoria. To study this issue requires detailed data with broad coverage to adjust for multiple confounding variables.

No multi-institutional database is perfect. Clinical databases with prospectively-gathered, detailed clinical data are the most accurate of the surgical databases; the Bi-National Colorectal Cancer Audit (BCCA) and BIOGRID are the largest colorectal surgery databases in Australia and New Zealand. However, BCCA only captures 15-20% of CRC resections, with mostly metropolitan hospital data[21]. BIOGRID only has contributions from 3 public sites in Victoria[13].

Hospital AD, whilst not as accurate as clinical data, has access to all recorded inpatient AD for the state[22]. AD are collected on all patients admitted to Australian Hospitals. Patient demographics, co-morbidities, type of operation, post-operative complications, histopathology and some staging information are recorded. Trained coders review clinical notes and then assign alphanumeric codes to these data based on the International Classification of Diseases Tenth Revision, Australian

Modification (ICD-10-AM). These codes, developed for the purpose of billing, are not focused on reporting data in a clinically relevant fashion. We have previously shown that the use of algorithms of code combinations can increase the accuracy of AD for clinical research[22-24]. These algorithms can be applied to the central repository of AD in Victoria, the Victorian Admitted Episode Dataset (VAED), to create a validated alternative database with broad coverage that is more clinically relevant than unmodified AD.

Objectives

This study's aim was to use validated coding algorithms applied to the VAED to report on short-term outcomes following CRC surgery comparing regional to metropolitan hospitals.

The primary outcome was prolonged length of stay (LOS).

Secondary outcomes were: inpatient mortality, return to theatre (RTT), discharge destination.

A further important objective was to highlight the potential of AD to provide adequately detailed information for clinical outcomes research in CRC at a population level.

Methods

Study Design

This is a retrospective cohort study using prospectively-gathered AD from VAED.

This study was performed in accordance with the STROBE statement[25].

Ethics approval for this study was granted by the Human Research and Ethics Committee, National Health and Medical Research Council of Australia (reference number HREC/52415/MH-2019).

Participants

The algorithms created from a previous study were applied to the VAED to facilitate case finding and improve accuracy[23]. These algorithms were based on comparing clinical notes with AD and using this information to construct combinations of administrative codes to improve the clinical relevance of AD. Right colon was defined as extending to and including the splenic flexure, left colon comprised the descending colon and sigmoid colon and rectum included recto-sigmoid and rectum. The algorithms combined the code for 'tumour location' with the code for 'type of operation' to eradicate illogical combinations thereby increasing accuracy[26]. (An example of an illogical combination is a tumour location code in the ascending colon but with an operative code of a high anterior resection). When compared to clinical notes, the accuracy of validated algorithms of AD was 93%, 89% and 88% for right, left and rectum respectively. To create our study population, these algorithms were applied to the VAED to gather all patients undergoing resection for CRC in Victoria from 2008 to 2018. Data from VAED is de-identified for patient and hospital name. However, data can be requested by categories such as hospital location, case-volume etc. Patients less than 10 years old were excluded.

Variables

Exposure and Control

The principal exposure of interest was geographic location of hospital. Patients having major resection for CRC (adenocarcinoma) in regional public hospitals were compared with similar patients from metropolitan public hospitals (control) in the state of Victoria, Australia.

To define the geographical location of hospitals, the Accessibility/Remoteness Index of Australia (ARIA+) was used. ARIA+ is a nationally recognised index for defining geographical remoteness based on accessibility to services. It divides Australia into five categories (S1)[26]. All Victorian hospitals reside in major cities, inner regional and outer regional zones.

The control group was metropolitan hospitals and was compared separately to inner regional and outer regional hospitals.

Potential Confounders

Patient demographics, comorbidities ((Charlson Comorbidity Index score[27] (CCI) and American Society of Anaesthesiologists (ASA) score)), mode of surgery (open/laparoscopic approach) and pathological details were recorded. Although AD does not record TNM stage, it does report on the presence of lymph node metastases (92% accuracy) and distant metastases (88% accuracy)[23].

Hospital case volume (high volume ≥50 cases per year, low volume < 50 cases per year) and Colorectal Surgical Society of Australia and New Zealand (CSSANZ) status were recorded. Victorian CSSANZ hospitals have been previously defined[26]. Although Peter MacCallum Cancer Centre is not a CSSANZ hospital, it was included in this group because of its case load, surgeon experience and research.

ASA was defined categorically: low for ASA 1-2, high for ASA 3-5. To minimise data restriction in the final multivariable analysis, a further category was assigned 'grade not recorded' if an anaesthetic code had been used without an ASA grade

CCI score was recorded as 0, 1 or 2, with ≥2 conferring higher mortality. The diagnostic categories used to calculated CCI were those validated for use in the ICD-10-AM[27]. This categorisation has been used previously[5,15,27,28].

Surgical mode of access was defined as laparoscopic or open. Laparoscopic was defined by the use of a unique code for a laparoscopic CRC operation or an open code combined with the code for 'diagnostic laparoscopy' or 'laparoscopic division of adhesions.' The overall accuracy of coding for laparoscopic operations was 76% in our institution.

The composite variable HDU+ was a composite variable signifying patients that required more than simple ward care. It represents all patients requiring any period of postoperative mechanical ventilation and/or a monitored bed including ICU, CCU or HDU. HDU+ was also dichotomised as requiring these measures or not.

Outcomes

The primary outcome of interest was prolonged LOS (>14 days). LOS was defined as the discharge date minus the admission date. This outcome was chosen because it was likely to capture most significant types of post-operative morbidity. Secondary outcomes were inpatient mortality, RTT, discharge destination.

Inpatient mortality was defined as death during the index admission.

RTT was defined as an unplanned operation following the initial CRC resection. The algorithm used to extract this information was described previously[23].

Discharge destination was defined as home or other.

Statistical Analysis

Data was analysed using Stata version 15.0 (College Station, Texas, USA). Baseline data were presented as absolute numbers with percentages (Table1).

A univariable logistic regression analysis assessing the odds of the primary outcome (prolonged LOS) was performed for each baseline variable. Multivariable logistic regression analysis was then performed retaining geographical location as the principal exposure of interest. Co-variables from the univariable analysis which were associated with ≥10% change in odds ratio were included in the multivariable logistic regression analysis. The co-variables, CSSANZ-status and Case-volume were not included in the multivariable analysis because CSSANZ hospitals were all metropolitan and there were no high-volume hospitals in the outer regional zone.

A similar analysis was performed for the secondary outcomes.

The sample size was not calculated for this study as the database was a fixed available sample.

A priori, it was determined that rectal cancer, high ASA score and modality of surgery (laparoscopic versus open) were potential effect modifiers. Testing for effect modification was performed on the primary outcome by using likelihood ratio testing to compare the original regression model with a further regression model including the variable of concern as an indicator variable. Effect modification was not tested for the secondary outcomes to minimise the likelihood of type 2 error.

Patients with missing data were identified and excluded from the analysis.

Results

Data extracted from the VAED included 75,460 patients totalling 1,623,753 admissions. Of the 75,460 patients, 60,819 had major colorectal resections (not necessarily for cancer). After applying the algorithms described above to improve the accuracy of the database, 33,275 patients were found who had major colorectal resections for CRC stratified by tumour position. Patients aged less than 10 years were also excluded (5 patients) as were patients operated on in private hospitals leaving 18479. Finally, 9 duplicates were excluded leaving 18470 patients for analysis: 13511 metropolitan patients, 4202 inner regional patients and 766 outer regional patients (S2). Baseline variables were similar across the cohorts (Table 1). This dataset had remarkably little missing data; only 1% of ASA scores and 2% of discharge destination had missing data. The distribution of missing data was similar across cohorts.

Length of Stay

LOS was prolonged in 23% of metropolitan hospitals, 18% inner regional hospitals and 23% outer regional hospitals. The median LOS was: 8 days (interquartile range (IQR) 6 – 14 days) in metropolitan hospitals, 8 days (IQR 6 – 13 days) in inner regional hospitals and 9 days (IQR 7 – 14 days) in outer regional hospitals.

Univariable logistic regression analysis showed that inner regional hospitals had 26% lower odds of prolonged length of stay than metropolitan hospitals (OR 0.74, 95% CI 0.68 – 0.81, p=<0.001). There was no evidence of a difference in incidence of prolonged length of stay in outer regional hospitals compared with metropolitan hospitals. (OR 0.98, 95% CI 0.83 – 1.17, p=0.86). Multivariable regression, adjusted for the effects of age, gender, year, ASA score, CCI score, position of tumour, mode of access, admission type and distant metastasis, decreased the odds of prolonged LOS in inner regional hospitals further to 47% (OR 0.53, 95% CI 0.48 – 0.58, p=<0.001). After adjusting for the same variables outer regional hospitals had 36% lower odds of prolong LOS which was now significant (OR 0.64, 95%CI 0.52 – 0.77. p=<0.001 (Table 2).

No evidence of effect modification was found. This suggests that the subgroups of patients having high ASA score, rectal surgery or laparoscopic surgery in regional centres did not have different odds of prolonged LOS compared with metropolitan centres.

Inpatient Mortality

Inpatient mortality was 1.9% in metropolitan hospitals, 2.1% in inner regional hospitals and 2.2% in outer regional hospitals.

Univariable logistic regression analysis showed that there was no difference in the odds of inpatient morality in inner regional or outer regional hospitals when compared to metropolitan hospitals ((OR 1.06, 95% CI 0.83 – 1.36, p=0.62) and (OR 1.14, 95% CI 0.69 – 1.87, p=0.61) respectively). Multivariable regression, adjusted for the effects of age, year, gender, ASA status, CCI, position of tumour, mode of access, admission type, lymph node metastases, distant metastasis and HDU+ showed that the odds of inpatient mortality were 30% less in inner regional hospitals compared with metropolitan hospitals and this was statistically significant (OR 0.67, 95%CI 0.49 – 0.91, p=0.01). Adjusting for the same variables resulted in outer regional patients having no difference in odds of inpatient mortality when compared to metropolitan hospitals (OR 0.64, 95%CI 0.38 – 1.07, p=0.08).

Return to theatre

Only 5.6% of metropolitan patients had a RTT compared to 6.2% of inner regional patients and 4.7% of outer regional patients.

Univariable logistic regression analysis showed no difference in odds of RTT for inner regional or outer regional hospitals when compared to metropolitan hospitals ((OR 1.11, 95% CI 0.96 – 1.29, p=0.15) and (OR 0.83, 95% CI 0.59 – 1.17, p=0.28) respectively).

Multivariable regression, adjusted for the effects of gender, ASA, CCI, position of tumour, type of admission, distant metastases and HDU+ showed that the odds of RTT were no different in inner regional hospitals compared to metropolitan hospitals (OR 0.94, 95% CI 0.81 – 1.09, p=0.42).

However, adjusting for the same variables resulted in outer regional hospitals having 33% lower odds of RTT, which was statistically significant (OR 0.67, 95%CI 0.47 – 0.95, p=0.03).

Discharge Destination

13% of metropolitan patients were not discharged home compared to 9% of inner regional patients and 20% of outer regional patients.

Univariable logistic regression analysis showed that, compared to metropolitan patients, inner regional patients had 55% higher odds of not being discharged home (OR 1.55, 95% CI 1.41 – 1.70, p=<0.001). Outer regional patients had 65% higher odds of not being discharged home (OR 1.65, 95% CI 1.37 – 1.99, p=<0.001).

After adjusting for the effects of age, gender, year, ASA score, CCI score, position of tumour, mode of access, admission type, distant metastasis and HDU+ there was no difference in discharge destination between inner regional or outer regional hospitals and metropolitan hospitals ((OR 1.11, 95%CI 1.00 – 1.23, p=0.051) and (OR 1.08, 95%CI 0.88 – 1.33, p=0.47) respectively).

CSSANZ status and hospital volume were not included in the multivariable analysis as they were not applicable across all cohorts.

Compared with non-CSSANZ hospitals, CSSANZ hospitals had higher odds of prolonged LOS (OR 1.18, 95%CI 1.10 – 1.26, p=<0.001), decreased odds of inpatient mortality (OR 0.74, 95%CI 0.60 – 0.91, p=0.004), no difference in odds of RTT (OR 0.97, 95%CI 0.86 – 1.10, p=0.67) and decreased odds of a discharge destination other than home (OR 0.63, 95%CI 0.58 – 0.69, p=<0.001).

Compared with low volume hospitals, high volume hospitals had higher odds of prolonged LOS (OR 1.22, 95%CI 1.12 – 133, p=<0.001), no difference in odds of inpatient mortality (OR 1.05, 95%CI 0.82

– 1.35, p=0.70), or odds of RTT (OR 1.12, 95%CI 0.96 – 1.30, p=0.15) but decreased odds of discharge destination other than home (OR 0.60, 95%CI 0.58 – 0.66, p=<0.001).

Discussion

This is the largest and most detailed study concerning short term outcomes of CRC resection involving all Victorian public hospitals. Rather than present the results simply as an audit, we have chosen to subject the data to hypothesis testing to maximise their utility. With 14 exposure variables and 4 outcome variables there were many ways in which this study could have been configured. We felt that an important initial issue was to determine if there were major differences in short-term outcomes by geographical location of hospital. This would determine if future studies utilising this dataset could use the whole state's data unmodified. A study of long-term survival analysis will follow.

Overall this study shows that short-term outcomes of CRC resection in regional hospitals are comparable to and sometimes better than metropolitan hospitals. The odds of all adverse outcomes tend to be lower in regional hospitals. Strong evidence was found for lower odds of prolonged LOS and inpatient mortality in inner regional hospital compared with metropolitan hospitals. For outer regional hospitals, there was strong evidence for a decrease in the odds of prolonged length of stay and RTT. CSSANZ training centres performed worse than other hospitals in terms of LOS but better for inpatient mortality and discharge to home. High volume hospitals compared with low volume hospitals performed worse regarding LOS but better for discharge to home. Overall other co-variables had expected results with patients who were older, more comorbid, emergency cases and those requiring high dependency having worse outcomes.

The methodology of this study does not account for allocation bias in determining which patients chose to have surgery at their regional hospital, patterns of referral to metropolitan hospitals and case selection by regional surgeons. However, we have used the technique of multivariable regression analysis to adjust for co-variables which may confound outcomes. The results of this study support the current practices in surgical treatment of CRC across the state of Victoria. This study used AD rather than the clinical data to report on surgical colorectal cancer outcomes. AD has been used in the past in Australia in this setting[1,6-10,14,29,30] however these studies have used unmodified ICD-10-AM codes. Unmodified coding data does not always match well with data from clinical notes. We have used combinations of codes which we knew to be highly accurate having compared them to clinical notes [23]. With these algorithms, AD approaches the accuracy of clinical databases but with the benefit of much higher numbers and state-wide generalisability[11-13,31,32].

AD cannot record all complications. The most notable example in AD is the absence of a code for anastomotic leak. However, many leaks would have been captured indirectly in our primary and secondary outcomes. It should also be noted that AD does not report on outpatient neoadjuvant treatments.

We excluded private hospital data from this analysis because all our previous validation of AD was performed using public hospital data.

The results of this study are similar to other Australian studies examining LOS but using unmodified AD. A study performed in New South Wales, Australia found comparable incidence of prolonged LOS and inpatient mortality when comparing rural to metropolitan patients[16]. They also found that high CCI, age and emergency admission were associated with prolonged LOS. A South Australian study found increased odds of 30-day mortality in non-metropolitan patients [5] whereas a Queensland study did not[17].

Of the international studies exploring the effects of geographical location on LOS, one of the largest studies was performed in England[33]. This showed increased odds of prolonged LOS in the Central and Southern parts of England when compared to the North. An Irish study showed no difference in prolonged LOS after colorectal resection when case volume and socioeconomic status were used as markers of access to healthcare[34].

Conclusion

After adjustment for confounding variables, Inner and outer regional hospitals have similar or better short-term outcomes after resection for colorectal cancer than metropolitan hospitals in the state of Victoria.

AD with validated algorithms, utilising pre-existing data and requiring minimal additional resources, has demonstrated fitness for purpose as a large and detailed database to report on CRC outcomes.

Acknowledgements

We would like to thank the Centre of Victoria Data Linkage (CVDL) for data curation and data linkage.

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Supplementary Figure Legends

S1: ARIA+ remoteness classification.

S2: Study population selection flow diagram

S3: Algorithms to improve cohort accuracy

		Metropolitan n=13511 (73%)	Inner Regional n=4202(23%)	Outer Regional n=766(4%)
Age, deciles (years) (%total)	**10-19**	11 (0.1%)	1 (0.0%)	0 (0.0%)
	20s	102 (0.8%)	11 (0.3%)	2 (0.3%)
	30s	346 (2.6%)	51 (1.2%)	9 (1.2%)
	40s	908 (6.7%)	186 (4.5%)	25 (3.3%)
	50s	2095 (15.5%)	546 (13.0%)	93 (12.1%)
	60s	3429 (25.4%)	973 (23.2%)	182 (23.8%)
	70s	4118 (30.5%)	1448 (34.5%)	261 (34.1%)
	80s	2492 (18.4%)	975 (23.3%)	194 (25.3%)
	90+	10 (0.1%)	0 (0.0%)	0 (0.0%)
Sex M:F (Male%)		7581:5930 (56%)	2261:1932 (54%)	403:363 (53%)
ASA score	**Grade not recorded**	2390 (17.7%)	645 (15.4%)	172 (22.5%)
	1	700 (5.2%)	225 (5.4%)	47 (6.1%)
	2	4682 (34.7%)	1391 (33.2%)	244 (31.9%)
	3	4679 (34.6%)	1470 (35.1%)	260 (33.9%)
	4	896 (6.6%)	374 (8.9%)	35 (4.6%)
	5	36 (0.3%)	25 (0.6%)	2 (0.3%)
	6	0 (0.0%)	0 (0.0%)	1 (0.1%)
	Missing	128 (1.0%)	62 (1.5%)	5 (0.7%)
CCI score	**0**	12380 (91.6%)	3819 (91.1%)	702 (91.6%)
	1	1020 (7.6%)	337 (8.0%)	60 (7.8%)
	2	63 (0.5%)	27 (0.6%)	3 (0.4%)
	3	20 (0.2%)	8 (0.2%)	1 (0.1%)
	4	18 (0.1%)	1 (0.0%)	0 (0.0%)
	5	1 (0.0%)	1 (0.0%)	0 (0.0%)
	6	9 (0.1%)	0 (0.0%)	0 (0.0%)
Year*	**2007**	765	284	49
	2008	1,056	386	74
	2009	1,118	345	67
	2010	1,157	374	54
	2011	1,159	356	66
	2012	1,102	365	73
	2013	1,119	355	59
	2014	1,101	346	70
	2015	1,172	343	61
	2016	1,117	322	59
	2017	1,207	325	67
	2018	1,240	342	56
	2019	198	50	11

Admission type	**Elective**	11343 (84%)	3465 (83%)	590 (77%)
	Emergency	2168 (16%)	728 (17%)	176 (23%)
Side of operation	**Right**	5740 (42.5%)	2121 (50.6%)	411 (53.7%)
	Left	3209 (23.8%)	902 (21.5%)	184 (24.0%)
	Rectum	4562 (33.8%)	1170 (27.9%)	171 (22.3%)
Mode of access	**Open**	7784 (57.6%)	3160 (75.4%)	700 (91.4%)
	Laparoscopic	5727 (42.4%)	1033 (24.6%)	66 (8.6%)
Lymph node metastases	**Present**	4041 (29.9%)	1323 (31.6%)	206 (26.9%)
	Absent	9470 (70.1%)	2870 (68.5%)	560 (73.1%)
Distant metastases	**Present**	1887 (14.0%)	485 (11.6%)	97 (12.7%)
	Absent	11624 (86.0%)	3708 (88.4%)	669 (87.3%)

Table 1: Baseline characteristics

*2017 & 2019 are included in this table as patients have fallen within this timeframe due to patient dates being moved forward and backwards by fixed amounts by VAED to protect confidentiality.

		Univariable						Multivariable				
		No. total	**prolonged LOS**	**OR**	**95% CI**		**p-value**	**n=**	**OR**	**95%CI**		**p-value**
ARIA	**Inner v Metro**	4193 v 13511	754 v 3088	0.74	0.68	0.81	<0.001	18273	0.53	0.48	0.58	<0.001
	Outer v Metro	766 v 13511	173 v 3088	0.98	0.83	1.17	0.862	18273	0.64	0.52	0.77	<0.001
CSSANZ Hospital	**Yes v No**	9449 v 9021	2183 v 1832	1.18	1.10	1.26	<0.001					
Case Volume	**≥50 cases/year vs <50 cases/year**	14199 v 4271	3195 v 820	1.22	1.12	1.33	<0.001					
Age	**>70 v <70**	9498 v 8972	2440 v 1575	1.62	1.51	1.74	<0.001	18273	1.34	1.24	1.46	<0.001
Sex	**Male v Female**	10245 v 8225	2385 v 1630	1.23	1.14	1.32	<0.001	18273	1.16	1.08	1.26	<0.001
Year	**2008-2013 v 2014 - 2018**	10383 v 8087	2425 v 1590	1.25	1.16	1.34	<0.001	18273	1.13	1.05	1.23	0.002
ASA score	**High vs Low**	7777 v 7289	2292 v 861	3.12	2.86	3.40	<0.001	18273	2.07	1.88	2.28	<0.001
	NR vs Low	3207 v 7289	829 v 861	2.60	2.34	2.89	<0.001	18273	2.17	1.93	2.42	<0.001
CCI score	**1 vs 0**	1417 v 16901	310 v 3644	1.02	0.89	1.16	0.781	18273	0.95	0.83	1.10	0.522
	≥2 vs 0	152 v 16901	61 v 3644	2.44	1.76	3.38	<0.001	18273	1.64	1.14	2.35	0.007
Position	**Left vs Right**	4295 v 8272	877 v 1661	1.02	0.93	1.12	0.653	18273	1.02	0.92	1.12	0.754
	Rectum vs Right	5903 v 8272	1477 v 1661	1.33	1.23	1.44	<0.001	18273	1.63	1.48	1.79	<0.001
Mode of access	**Laparoscopic v Open**	6826 v 11644	859 v 3156	0.39	0.36	0.42	<0.001	18273	0.56	0.51	0.62	<0.001
Admission type	**Emergency/Elective**	3072 v 15398	1266 v 2749	3.23	2.97	3.50	<0.001	18273	2.73	2.48	3.00	<0.001
Lymph node metastases	**Positive v Negative**	5570 v 12900	1228 v 2787	1.03	0.95	1.11	0.504					
Distant metastases	**Positive v Negative**	2469 v 16001	753 v 3262	1.71	1.56	1.88	<0.001	18273	1.27	1.14	1.41	<0.001
HDU+	**Yes v No**	6661 v 11809	2389 v 1626	3.50	3.26	3.77	<0.001	18273	2.80	2.58	3.03	<0.001

Table 2: Univariable and multivariable logistic regression analysis – Prolonged length of stay