

Atlas of Healthcare Variation Methodology | Bowel cancer

General points:

- Data are not presented where the number of people was less than 10. This is to preserve confidentiality.
- People were assigned to their district health board (DHB) or regional cancer network (RCN) of domicile at the time of their first bowel cancer diagnosis unless otherwise noted. This is not always the DHB that provided treatment.
- People who could not be assigned to a DHB were excluded from all analyses.
- Ethnicity data is presented as prioritised ethnic group (Māori, Pacific, Asian, European/Other).
- Cancer incidence rates in this Atlas are both crude rate and age adjusted. All other indicators are not adjusted for age or any other factors.
- Where there was more than one bowel cancer registration for a patient (eg. a registration for colon cancer and a registration for rectal cancer) the first diagnosis date was used for all analyses.
- Treatment indicators include all data for public hospitals. Where data was available from private hospitals this has been included.
- The twenty DHBs in New Zealand are grouped geographically into four Regional Cancer Network (RCN) areas. These RCN areas have a larger population base and provide more stable indicators for comparison.

Standard deviation

DHBs are coloured according to how far their values are from the mean (overall New Zealand rate). We used standard deviations for the colour ranges.

Standard deviation is a statistical measure of variation from a mean. Assuming that recorded instances are normally distributed (ie, they are in the usual 'bell-shaped curve'), 68 percent of all recorded instances would be expected to be within one standard deviation either side of the mean and 95 percent within two standard deviations. The two 'middle' shades will be within one standard deviation of the mean.

Confidence intervals

Data for each DHB or RCN is presented as either rate per 100,000 population or percentage. Ninety-five percent confidence limits were calculated.

Indicator #1:	Bowel cancer crude incidence by sex, age group, ethnic group (Māori, Pacific, Asian, European/Other), 2009–13 diagnosis years and age adjusted rates for 2009–13 and ethnic groups.
Numerator	Number of bowel cancer registrations
Denominator	Estimated resident population from Census data for DHB, RCNs
Data source	New Zealand Cancer Registry
Comments	<p>Bowel cancer ICD10 codes - colorectum (C18–C20) Excludes in situ cancer.</p> <p>Incidence rates were age adjusted using the 2013 Census population as the reference population and six age groups (0-39, 40-49, 50-59, 60-69, 70-79, 80+).</p> <p>See age and ethnic group specific rates in Appendix 1 Table 1.</p>

Indicator #2:	Bowel cancer stage at diagnosis
Numerator	Number of people with bowel cancer for each disease extent at diagnosis i.e. localised (B), adjacent (C), regional (D) and distant extent (E)
Denominator	Number of people with bowel cancer on the New Zealand Cancer Registry
Data source	New Zealand Cancer Registry
Comments	<p>SEER extent codes as follows</p> <p>A In situ (not included in dataset) B Localised to organ of origin C Invasion of adjacent tissue or organ D Regional lymph nodes E Distant F Not known</p> <p>This indicator is also presented in Appendix 1 as</p> <ul style="list-style-type: none"> - a stacked bar graph for each district health board and regional cancer network - national graph by stage and ethnic group

Indicator #3:	Proportion of people diagnosed with bowel cancer following emergency presentation
Numerator	No of people with bowel cancer presenting at ED in the 2 weeks prior to diagnosis
Denominator	No of people with bowel cancer on the New Zealand Cancer Registry
Data source	NZCR, National Minimum Dataset (NMDS), National Non-Admitted Patient Collection (NNPAC)
	<p>Includes 1) People admitted to hospital with health specialty code M05 (Emergency Medicine) and length of stay of 0 or 1 days and the event ended 0–14 days prior to bowel cancer diagnosis</p> <p>2) people who had an outpatient visit (NNPAC record) with a Purchase_Unit code that started with "ED" 0–14 days prior to bowel cancer diagnosis.</p>

Indicator #4:	Proportion of people treated with tumour resection in a public hospital following diagnosis with bowel cancer
Numerator	Number of people with bowel cancer who had curative surgery
Denominator	No of cancer registrations
Data source	Cancer registry, NMDS
Comments	Includes ACHI (7th edition) procedure codes for bowel cancer: (descriptions in Appendix 2 Table 5) 3200000, 3200001, 3200300, 3200301, 3200400, 3200401, 3200500, 3200501, 3200600, 3200601, 3200900, 3201200, 3201500, 3202400, 3202500, 3202600, 3202800, 3203000, 3203900, 3205100, 3205101, 3206000, 3209900, 3211200, 9220800, 9095900 Includes all public hospital surgery and private hospital surgery if it is available.

Indicator #5:	Average length of stay following surgery in a public hospital
Numerator	Length of hospital stay following admission for curative surgery
Denominator	No of people with bowel cancer who undergo curative surgery
Data source	Cancer registry, NMDS
Comments	Includes ACHI (7th edition) procedure codes for bowel cancer: 3200000, 3200001, 3200300, 3200301, 3200400, 3200401, 3200500, 3200501, 3200600, 3200601, 3200900, 3201200, 3201500, 3202400, 3202500, 3202600, 3202800, 3203000, 3203900, 3205100, 3205101, 3206000, 3209900, 3211200, 9220800, 9095900 Includes all public hospital surgery and the first procedure following diagnosis. Includes private hospital surgery if it is available.

Indicator #6:	Overall 90 day mortality after curative surgery in a public hospital
Numerator	Number of people with bowel cancer undergoing curative surgery who died within 90 days
Denominator	Number of people with bowel cancer undergoing curative surgery
Data source	NZCR, NMDS, Mortality
Comments	Includes ACHI (7th edition) procedure codes for bowel cancer: 3200000, 3200001, 3200300, 3200301, 3200400, 3200401, 3200500, 3200501, 3200600, 3200601, 3200900, 3201200, 3201500, 3202400, 3202500, 3202600, 3202800, 3203000, 3203900, 3205100, 3205101, 3206000, 3209900, 3211200, 9220800, 9095900 Includes all public hospital surgery and the first procedure following diagnosis. Includes private hospital surgery if it is available.

Indicator #7:	Proportion of people with bowel cancer who received chemotherapy by disease extent at diagnosis
Numerator	People with bowel cancer with disease extent [D,E] who received chemotherapy
Denominator	People with bowel cancer ¹ with extent [D,E] disease
Data source	New Zealand Cancer Registry, PHARMS
Comments	<p>Chemotherapy drugs include</p> <ul style="list-style-type: none"> - oxaliplatin - capecitabine - 5-Fluorouracil (5FU) - irinotecan <p>Includes chemotherapy received up to two years after diagnosis. Disease extent includes</p> <ul style="list-style-type: none"> B Localised to organ of origin C Invasion of adjacent tissue or organ D Regional lymph nodes E Distant <p>Note: chemotherapy for people with disease extent B & C are shown in Table 3 in Appendix A. ¹The denominator for chemotherapy for extent B (localised) is colon cancer (C18, C19) registrations only.</p>

Indicator #8:	Proportion of people receiving long-course radiotherapy (pre or post-operatively) who also received concurrent chemotherapy in public hospitals
Numerator	Number of people having concurrent chemotherapy
Denominator	Number of people with rectal cancer who had both curative surgery and long course radiotherapy in a public hospital
Data source	New Zealand Cancer Registry, PHARMS, NMDS, NNPAC
Comments	<p>Includes people who have curative surgery up to one year after diagnosis.</p> <p>Radiotherapy identified with NNPAC codes</p> <ul style="list-style-type: none"> M50005 Oncology - Radiotherapy (pre July 2011 code) ¹ M50025 Oncology - Radiotherapy, External Beam Megavoltage (linac) (July 2011 onwards) <p>¹ Note includes attendance where the purpose is to plan for or to receive prescribed radiotherapy treatment</p> <p>Chemotherapy drugs dispensed during, or up to 6 weeks prior to, radiotherapy include</p> <ul style="list-style-type: none"> - oxaliplatin - capecitabine - 5-Fluorouracil (5FU) - irinotecan
	Long-course defined as 20 or more treatments. Includes people treated up to 20 weeks before surgery (to account for post-radiotherapy wait for surgery), and starting radiotherapy up to 12 weeks after surgery.

Indicator #9a:	Proportion of people with rectal cancer receiving pre-operative radiotherapy in public hospitals
Numerator	People receiving pre-operative short or long course radiotherapy
Denominator	Number of people registered with rectal cancer and having curative surgery in a public hospital
Data source	New Zealand Cancer Registry, , NMDS, NNPAC
Comments	<p>Includes people diagnosed with rectal cancer (ICD-10AM code C20) who have curative surgery up to one year after diagnosis.</p> <p>Radiotherapy identified with NNPAC codes¹ M50005 Oncology - Radiotherapy (pre July 2011 code) M50025 Oncology - Radiotherapy, External Beam Megavoltage (linac) (July 2011 onwards)</p> <p>¹ Note includes attendance where the purpose is to plan for or to receive prescribed radiotherapy treatment</p> <p>Includes people treated up to 20 weeks before surgery (to account for post-RT wait for surgery).</p>

Indicator #9b:	Proportion of people with rectal cancer receiving preoperative radiotherapy who received short course pre-operative radiotherapy in public hospitals
Numerator	People with rectal cancer receiving short course radiotherapy prior to curative surgery in a public hospital
Denominator	People with rectal cancer receiving both curative surgery and short or long course radiotherapy in a public hospital
Data source	New Zealand Cancer Registry, NMDS, NNPAC
	<p>Includes people diagnosed with rectal cancer (ICD-10AM code C20) who have curative surgery up to one year after diagnosis.</p> <p>Radiotherapy identified with NNPAC codes M50005 Oncology - Radiotherapy (pre July 2011 code) M50025 Oncology - Radiotherapy, External Beam Megavoltage (linac) (July 2011 onwards)</p> <p>Short course is defined as 5 to 9 treatments. There should not be an overlap between short course and long course, or short course and chemotherapy.</p> <p>Includes people treated up to 20 weeks before surgery to account for post-radiotherapy wait for surgery).</p>

Indicator #10:	People with rectal cancer who had public hospital surgery likely to result in a permanent colostomy
Numerator	Number of people with rectal cancer having an abdominoperineal resection or a Hartmann's procedure
Denominator	Number of people diagnosed with rectal cancer who had major surgery in a public hospital
Data source	New Zealand Cancer Registry, NMDS
Comments	Includes only people diagnosed with rectal cancer (ICD10AM code C20). Includes people diagnosed with rectal cancer (ICD-10AM code C20) with ACHI (7th edition) procedure codes for curative bowel cancer surgery: (see Table 5 in Appendix 2 for descriptions) 3200000, 3200001, 3200300, 3200301, 3200400, 3200401, 3200500, 3200501, 3200600, 3200601, 3200900, 3201200, 3201500, 3202400, 3202500, 3202600, 3202800, 3203000, 3203900, 3205100, 3205101, 3206000, 3209900, 3211200, 9220800, 9095900 and procedure codes for - Abdominoperineal resection (3203900) - Hartmann's procedure (3203000) Includes four people who had rectal surgery in a private hospital.

Indicator #11:	Proportion of people with bowel cancer who died within 2 years of diagnosis
Numerator	Number of people with bowel cancer on the New Zealand Cancer Registry who died in the two years following registration
Denominator	Number of people with bowel cancer on the New Zealand Cancer Registry
Data source	NZCR, NMDS
Comments	See Appendix 1 for survival by disease extent graph.

Appendix 1.

Table 1. Age and ethnic group specific bowel cancer registration rates per 100,000 people, 2009-13

Age group	Māori		Pacific peoples		Asian		European/Other		Unknown
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number
0-39	39	1.6	23	2.3	15	0.9	203	3.0	8
40-49	71	17.5	41	23.4	46	13.2	492	21.9	17
50-59	174	57.6	75	63.4	94	37.2	1305	61.6	46
60-69	241	146.7	89	127.9	95	72.2	2955	170.8	74
70-79	170	227.4	51	158.3	108	173.5	4158	388.0	96
80+	90	407.8	31	286.6	55	295.8	3494	496.6	38

a) Extent at time of diagnosis

Figure 1. Disease extent at time of bowel cancer diagnosis by ethnic group, 2009-13

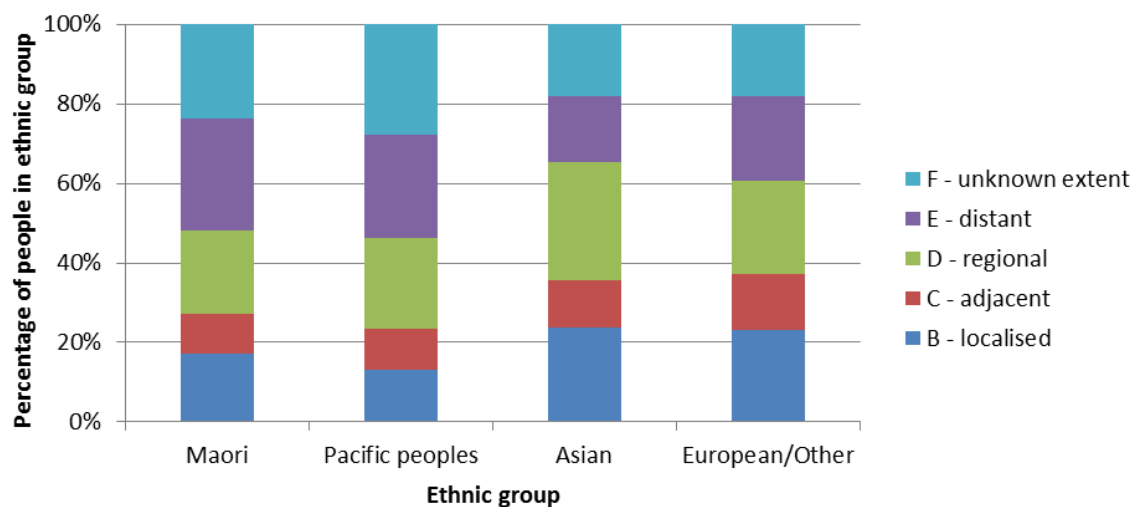


Figure 2. Disease extent at time of bowel cancer diagnosis by regional cancer network, 2009–13

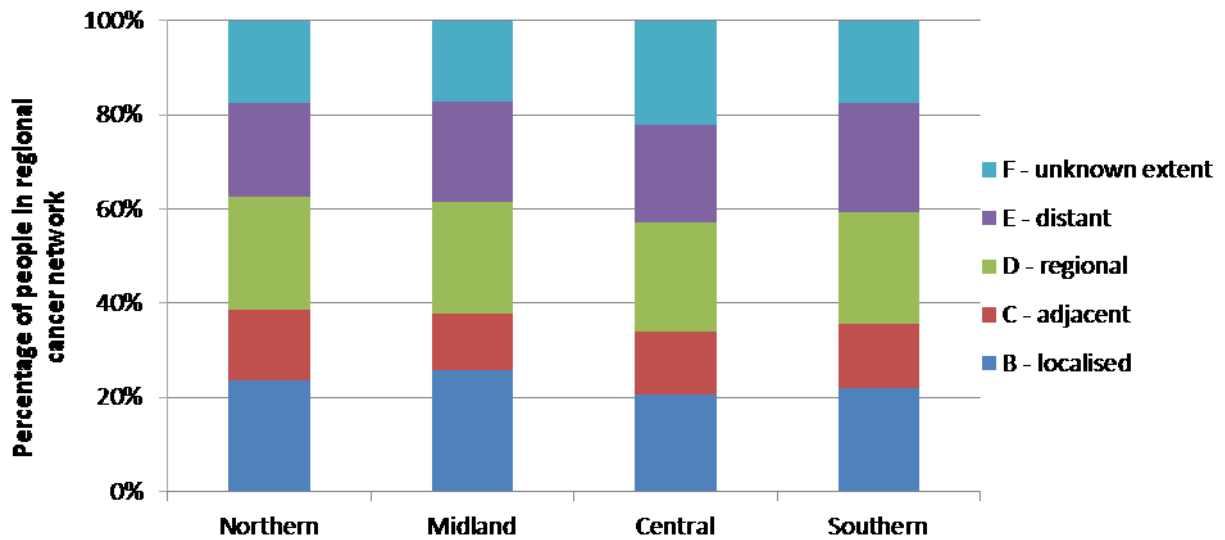
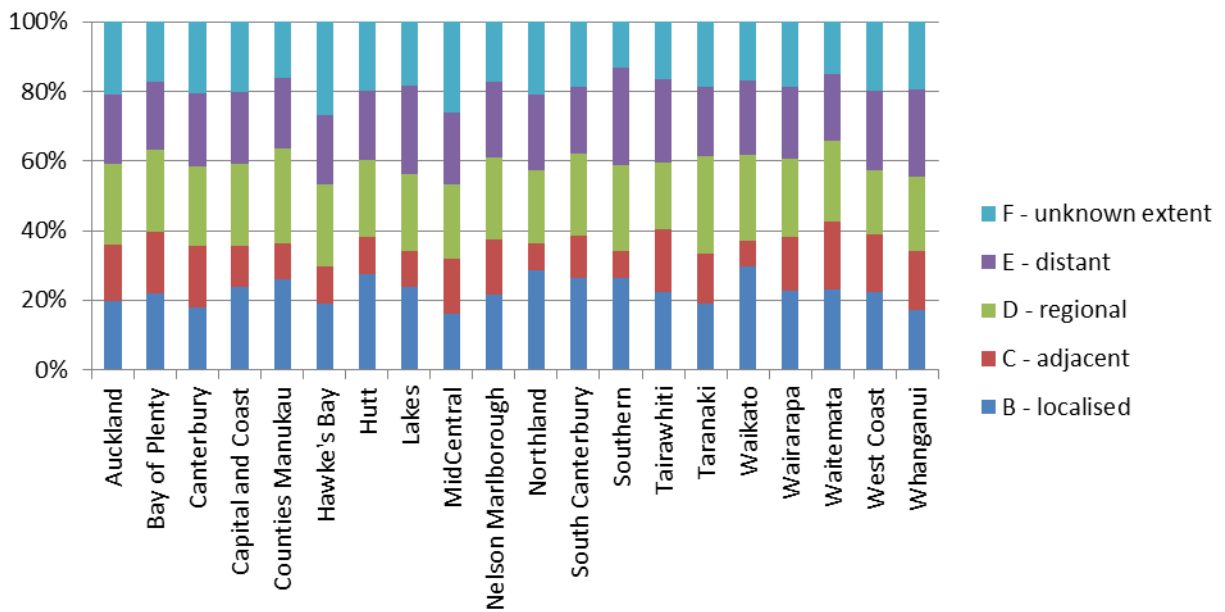


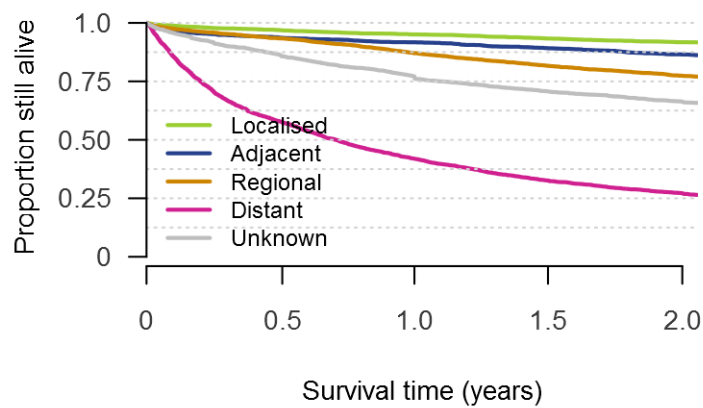
Figure 3. Disease extent at time of bowel cancer diagnosis by district health board, 2009–13



b) Survival

Cancer treatment aims to prolong survival and improve quality of life by reducing the impact of symptoms. The median age at diagnosis for all bowel cancer patients was 72 years (2009–13). People of Māori ethnicity had a lower median age than non-Māori (64 vs 72 years). Median survival (the time taken from the date of diagnosis for 50 percent of patients to die from their cancer) is one way of measuring survival of the whole cohort of patients diagnosed in 2009–13. The graphs below show the survival patterns for this cohort by disease extent (Figure 4).

Figure 4. Survival curve for all people with bowel cancer by disease extent, 2009–2013



- The median survival time was 8.6 months (95% CI 8.0–9.2) for distant disease extent and greater than 5 years for patients with localised, adjacent tissue, regional and unknown disease extent.

c) Length of stay (days) following surgery

Table 2. Mean, median and interquartile range for length of stay (days) following surgery in public hospitals, by DHB and RCN, 2009-13

Area	Mean	Median	Interquartile range
District health boards			
Auckland	11.2	9	8
Bay of Plenty	10.7	9	6.5
Canterbury	8.9	7	5
Capital and Coast	10.0	7	7
Counties Manukau	11.3	8	8
Hawke's Bay	9.9	7	6
Hutt	9.1	7	6
Lakes	10.7	9	6
MidCentral	10.4	8	6.75
Nelson Marlborough	10.3	8	6
Northland	11.9	9	7
South Canterbury	9.9	7	5
Southern	10.6	8	7
Tairāwhiti	8.7	7	6
Taranaki	9.3	7	6
Waikato	10.2	7	6
Wairarapa	7.1	6	4
Waitemata	10.7	8	7
West Coast	9.3	8	5
Whanganui	10.1	8	6
Regional cancer networks			
Central	9.7	7	6
Midland	10.3	8	7
Northern	11.1	8	7
Southern	9.8	8	5
All DHBs/RCNs	10.3	8	6

d) Chemotherapy treatment in public hospitals by extent at time of diagnosis

Note that this only includes chemotherapy treatment in public hospitals.

Table 3. Number and percentage of people receiving chemotherapy treatment by disease extent at time of diagnosis, by DHB and RCN, 2009–13

	Localised		Adjacent		Regional		Distant	
	Number	%	Number	%	Number	%	Number	%
District health boards								
Auckland	13	6.5	21	12.6	141	59.0	89	44.1
Bay of Plenty	5	2.7	23	15.5	120	59.7	88	54.0
Canterbury	10	3.1	57	18.2	253	60.7	187	49.5
Capital and Coast	4	2.4	14	16.3	119	71.3	85	58.2
Counties Manukau	11	3.9	19	16.8	172	59.3	98	45.0
Hawke's Bay	3	2.6	7	10.9	90	62.9	69	57.5
Hutt	4	3.4	8	17.8	66	69.5	39	45.3
Lakes	7	9.2	6	17.6	56	78.9	44	54.3
MidCentral	2	2.0	10	10.3	76	58.9	64	50.0
Nelson Marlborough	3	2.3	7	7.3	90	63.4	68	51.5
Northland	18	10.4	11	24.4	78	61.9	59	44.7
South Canterbury	5	6.0	7	17.9	53	69.7	29	47.5
Southern	14	3.9	19	18.3	195	58.4	181	47.8
Tairāwhiti	1	3.7	4	18.2	12	52.2	15	51.7
Taranaki	3	3.6	5	7.8	67	54.5	40	44.9
Waikato	23	6.2	25	26.0	184	59.9	135	50.2
Wairarapa	2	4.7	4	13.8	33	78.6	18	46.2
Waitemata	11	2.8	50	14.9	249	63.5	150	46.4
West Coast	0	0.0	2	9.5	11	47.8	15	51.7
Whanganui	1	2.5	7	17.5	27	54.0	23	39.0
Regional cancer networks								
Central	19	2.9	55	12.9	478	63.8	338	50.7
Midland	36	5.5	58	19.3	372	61.8	282	52.0
Northern	53	5.1	101	15.3	640	61.1	396	45.3
Southern	32	3.5	92	16.0	602	60.7	480	49.0
All DHBs/RCNs	140	4.3	306	15.6	2092	61.7	1496	48.8

e) Rectal cancer surgery in public hospitals by extent at time of diagnosis

Note that this includes all surgery for rectal cancer in public hospitals and surgery for rectal cancer in private hospitals where this was available (four procedures between 2009-2013).

Table 4. Number and percentage of people with rectal cancer who have surgery in a public hospital by DHB and RCN, 2009-2013

	Number	%
District health boards		
Auckland	120	44.8
Bay of Plenty	134	59.8
Canterbury	245	54.1
Capital and Coast	110	54.2
Counties Manukau	148	51.7
Hawke's Bay	91	58.0
Hutt	68	57.6
Lakes	58	65.9
MidCentral	108	60.7
Nelson Marlborough	100	61.7
Northland	108	61.7
South Canterbury	52	65.0
Southern	216	62.6
Tairāwhiti	19	59.4
Taranaki	78	66.1
Waikato	162	56.1
Wairarapa	43	70.5
Waitemata	235	56.6
West Coast	27	62.8
Whanganui	34	54.8
Regional cancer networks		
Central	532	59.3
Midland	373	58.9
Northern	611	53.4
Southern	640	59.1
All DHBs/RCNs	2156	57.2

Appendix 2

Table 5. Bowel cancer ACHI (7th edition) surgery procedure codes

3200000	Colectomy	Limited excision of large intestine with formation of stoma
3200001	Colectomy	Right hemicolectomy with formation of stoma
3200300	Colectomy	Limited excision of large intestine with anastomosis
3200301	Colectomy	Right hemicolectomy with anastomosis
3200400	Colectomy	Subtotal colectomy with formation of stoma
3200401	Colectomy	Extended right hemicolectomy with formation of stoma
3200500	Colectomy	Subtotal colectomy with anastomosis
3200501	Colectomy	Extended right hemicolectomy with anastomosis
3200600	Colectomy	Left hemicolectomy with anastomosis
3200601	Colectomy	Left hemicolectomy with formation of stoma
3200900	Colectomy	Total colectomy with ileostomy
3201200	Colectomy	Total colectomy with ileorectal anastomosis
3201500	Total proctocolectomy	Total proctocolectomy with ileostomy
3202400	Anterior resection of rectum	High anterior resection of rectum
3202500	Anterior resection of rectum	Low anterior resection of rectum
3202600	Anterior resection of rectum	Ultra low anterior resection of rectum
3202800	Anterior resection of rectum	Ultra low anterior resection of rectum with hand sutured coloanal anastomosis
3203000	Rectosigmoidectomy or proctectomy	Rectosigmoidectomy with formation of stoma
3203900	Rectosigmoidectomy or proctectomy	Abdominoperineal proctectomy
3205100	Total proctocolectomy	Total proctocolectomy with ileo-anal anastomosis
3205101	Total proctocolectomy	Total proctocolectomy with ileo-anal anastomosis and formation of temporary ileostomy
3206000	Rectosigmoidectomy or proctectomy	Restorative proctectomy
3209900	Excision of lesion or tissue of rectum or anus	Per anal submucosal excision of lesion or tissue of rectum
3211200	Rectosigmoidectomy or proctectomy	Perineal rectosigmoidectomy
9220800	Anterior resection of rectum	Anterior resection of rectum, level unspecified
9095900	Excision of other lesion of large intestine	Other excision procedures on large intestine