Colorectal cancer in Victoria

Optimal care pathway data summary report

VICTORIA State Government | Health and Human Services

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Foreword

The data presented in this report summarises the data analyses prepared for the second Colorectal Cancer Summit, held in March 2018.

We were pleased to be able to co-chair the working group that was convened to help guide the analyses of statewide routine datasets that included both private and public services to help inform our understanding of the current patterns of care delivered to Victorians diagnosed with colorectal cancer. This has been particularly instructive as it is the second time we have done this and the first time we have had access to the complete linked Victorian cancer and state-based healthcare utilisation dataset.

The ability to utilise linked data to track individual patients across the care system and to be able to compare activity across geographic regions has highlighted some key areas for further investigation and action that will hopefully improve the care and outcomes for Victorians diagnosed with this disease.

Also, as considerable service improvement work was generated following the first Colorectal Cancer Summit, this meeting was a great opportunity to share the good work that has been undertaken. We would like to acknowledge the importance of this type of work in bringing the clinical community together to share learnings and collectively identify where we can make meaningful change and improvement for our patients.

We are extremely grateful for the time, effort and thoughtful contributions of our colleagues on the working group and to all who attended and actively participated at the summit. Special acknowledgement and thanks for the ongoing support of Dr Luc te Marvelde and Ella Stuart, who expertly undertook the data analyses, and the Tumour Summit Project Team.

We look forward to seeing continued improvement efforts informed by this process and, ultimately, seeing the outcomes of these efforts for our patients from across the state.

Dr Brian Hodgkins
Co-Chair

Dr Geoff Chong
Co-Chair

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Acknowledgements

The data, analysis and commentary provided in this report represent a joint effort by numerous key contributors from the following groups.

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We also gratefully acknowledge the providers of the Victorian Cancer Registry data, Victorian Admitted Episodes Dataset and the Victorian Radiotherapy Minimum Dataset, as well as the Centre for Victorian Data Linkage for performing the linkages between the Victorian Cancer Registry and administrative datasets.

To view the colorectal summit data presentation and related documents, visit the Colorectal Tumour Summit meeting page <www.nemics.org.au/page/Improving_cancer_care/VICS_and_other_ICS/Victorian_tumour_stream_network_summits/CRC_summit_12th_September_2014/>.

Introduction

This report summarises the data analyses prepared for the 2018 Colorectal Cancer Summit. The Colorectal Cancer Summit is part of the Victorian Tumour Summits program, an initiative of the Victorian Integrated Cancer Services (ICS[1]) delivered in collaboration with the Department of Health and Human Services ('the department') and Cancer Council Victoria. The summits support the broader program of work implementing the optimal care pathways (OCP).

The first Colorectal Cancer Summit was held in Melbourne on 12 September 2014. In this summit, recommendations were made regarding multidisciplinary team meetings (MDM), monitoring treatment and the quality of data, as well as screening, colonoscopy and early diagnosis of colorectal cancer. Progress against some of these recommendations were reported at the most recent summit. For example, the proportion of stage III colon cancers receiving adjuvant chemotherapy and the proportion of rectal cancer patients with a documented MDM treatment plan were reported. Progress on all recommendations from the 2014 tumour summit can be found on the NEMICS website (see below).

The second Colorectal Cancer Summit, held in 2018, gathered more than 60 stakeholders from across Victoria to discuss variations in care and to identify opportunities for improvement. Data presented focused on the presentation, diagnosis and treatment steps of the colorectal cancer OCP. Stakeholders prioritised variations based on their potential impact on patient experiences and outcomes. Clinical commentary and recommendations from the summit are included in this report.

More information

- Find out more about the Colorectal Cancer Summit from the NEMICS website <www.nemics.org.au/page/Improving_cancer_care/VICS_and_other_ICS/Victorian_tumour_stream_network_summits/CRC_summit_12th_September_2014/>.
- The colorectal cancer OCP can be viewed and downloaded from the Cancer Council Australia website <www.cancer.org.au/OCP>.

Data sources

The Victorian Cancer Registry (VCR) is a population-based cancer registry that collects demographic and tumour details for all Victorian residents who are diagnosed with cancer. The department's Centre for Victorian Data Linkage performs an annual data linkage between the VCR and administrative datasets including the Victorian Admitted Episodes Dataset (VAED), the Victorian Radiotherapy Minimum Data Set (VRMDS) and the Victorian Death Index. Linking the VCR to the VAED provides information on cancer treatment, including surgery and intravenous chemotherapy (excluding oral chemotherapy), provided in an inpatient setting in Victorian public and private hospitals. Linking the VCR to the VRMDS provides information on admitted and non-admitted radiotherapy courses in Victorian public and private radiotherapy centres.

Additional unlinked data sources include the department's Cancer Services Performance Indicator Audit 2015 and the Rectal Cancer Audit 2015, both of which are medical record audits assessing documented evidence of MDMs for a sample of newly diagnosed actively treated patients. The Rectal Cancer Audit 2015 included all rectal cancer cases diagnosed from July to December 2015 and was initiated after a recommendation from the first Colorectal Tumour Summit.

[1] See the abbreviations list for the naming of the eight Victorian ICS.

Patients

Victorian residents aged 18 years or older with a primary diagnosis of colorectal cancer (ICD-10-AM: colon cancer – C18 and C19; rectal cancer – C20) between 2008 and 2015 were identified using the VCR. Patients whose cancer diagnosis was notified to the VCR by death certificate only were excluded from survival, presentation, treatment and palliative care analyses.

The VCR provided information regarding registry-derived stage (RD-stage). There are multiple classification systems of cancer staging. The VCR derives stage at diagnosis by applying the American Joint Committee on Cancer TNM staging principles. The information to inform the specific T, N and M components for staging is a best estimate derived from summary sources at the time of diagnosis (defined as the four-month period following the first notification of cancer diagnosis). Hence, a combination of clinical and pathological data is used for deriving stage according to established rules. Occasionally, hospital notifications are the only source of information regarding distant metastases, which may result in an underreporting of stage IV. In this analysis, RD-stage was updated to stage IV if metastatic disease codes were present in hospitalisations within four months of diagnosis. Staging information was only available after neoadjuvant therapy for 29 per cent of rectal cancer patients. Due to the uncertainty of the pre-treatment stage for this group, rectal cancer patients with RD-stage I, II and III were analysed together.

At a glance

Key findings

Colorectal cancer demographics

- Between 2011 and 2015, 18,621 Victorians were diagnosed with colorectal cancer.
- The median age at diagnosis was 71 years, and 54 per cent were male.
- More patients in regional ICS lived in areas with greater socioeconomic disadvantage compared with patients living in metropolitan ICS.
- Approximately three-quarters (73 per cent) of patients had no other comorbidity prior to their cancer diagnosis.

Incidence

- The age-standardised incidence rate decreased from 39 per 100,000 in 1982 to 35 per 100,000 in 2015.
- Over the five-year period from 2011 to 2015, incidence was higher in regional than metropolitan ICS (range: 37–42 per 100,000 vs 32–34 per 100,000).

Stage IV at diagnosis

- Twenty-four per cent of colorectal cancer patients had metastatic disease at or within four months of diagnosis.
- Patients in GICS were more likely to present with distant metastases compared with other ICSs.

Survival

- Five-year relative survival increased from 49 per cent in 1986–1990 to 69 per cent in 2011–2015.
- Compared with the Victorian average, survival was poorer for colon cancer patients living in LMICS and rectal cancer patients in SMICS, and better for rectal cancer patients in HRICS.

Presentation

- Over 2011–2015, 14 per cent of first colorectal cancer surgeries occurred during an emergency admission.
- Surgery performed in an emergency admission:
  - increased over time from 13 per cent in 2011 to 15 per cent in 2015
  - was lowest for stage I (three per cent) and highest for stage IV disease (27 per cent).

Multidisciplinary team meeting

- In 2015 the statewide average for documented MDM discussions for colorectal cancer patients was 79 per cent, ranging from 56 to 93 per cent across ICS.
- Thirty-two per cent of rectal cancer patients had a documented MDM after treatment had started.

Treatment

- There was significant variation in overall utilisation of surgery, chemotherapy and radiotherapy in colon and rectal cancer patients across Victoria between 2011 and 2015.

Neoadjuvant and adjuvant treatment for rectal cancer

- Prior to surgery, neoadjuvant therapy for rectal cancer stages I–III varied by ICS of surgery, being lower in BSWRICS and GICS and higher in WCMICS and LMICS compared with the state average.
- Adjuvant intravenous chemotherapy following surgery for rectal cancer stages I–III was also lower in BSWRICS and higher in WCMICS compared with the state average.

Adjuvant chemotherapy for colon cancer

- Adjuvant intravenous chemotherapy following surgery for stage III colon cancer was lower for those having surgery in BSWRICS compared with the state average.
- For stage III colon cancer patients, time from surgery to intravenous chemotherapy was within eight weeks (56 days) for 72 per cent of cases but was lower in public (64 per cent) compared with private hospitals (81 per cent).
- Timeliness of adjuvant intravenous chemotherapy varied by ICS of surgery.

Lymph node resection for colon cancer

- The proportion of colon cancer patients with 12 or more lymph nodes examined following surgery increased over time and in 2015 was 89 per cent.
- For stage II and III colon cancers:
  - HRICS had the lowest proportion of surgeries examining 12 or more lymph nodes: 73 per cent compared with the statewide average of 89 per cent
  - the proportion of patients in whom 12 or more lymph nodes were examined varied between hospitals.

Stage IV colon cancer

- Treatment for stage IV colon cancer varied by ICS. Compared with the state average, surgery was more likely for patients living in BSWRICS and GICS and less likely for patients in WCMICS. Chemotherapy was more likely in NEMICS and SMICS, and radiotherapy was more likely in NEMICS.

Palliative care

- Ten per cent of colorectal cancer patients received chemotherapy within 30 days of their death.
- For sixty-eight per cent of colorectal cancer patients, their place of death was a Victorian hospital.

Key variations for local action identified by ICS

NEMICS	Sixty-three per cent of colorectal cancer (stage III) patients who had surgery are achieving timely adjuvant chemotherapy (within 56 days).
SMICS	Patients with rectal cancer living in the SMICS region have lower survival rates. Sixty-four per cent of rectal cancer patients had an MDM discussion occur after treatment.
WCMICS	Fifty-five per cent of colon cancer (stage III) patients who had surgery are achieving timely adjuvant chemotherapy (within 56 days).
BSWRICS	There is significantly lower utilisation of chemotherapy compared with the state average for colorectal cancer patients (stages I/II/III).
GRICS	Fifteen per cent of colorectal cancer patients living in GRICS have surgery in an emergency admission. Fifty per cent of rectal cancer patients had no MDM discussion.
HRICS	There is a significantly lower proportion of colon cancer surgery (stages II/III) with 12+ lymph nodes examined (Victorian hospitals only) compared to Victorian average.

LMICS	Stage IV colon cancer survival is significantly lower for residents of LMICS compared with the Victorian average.
GICS	Rectal cancer (stages I/II/III) patients are significantly less likely to receive neoadjuvant radiotherapy compared with the Victorian average.

Recommended actions

High-impact, low-effort recommendations

1. **Increase the proportion of newly diagnosed colorectal cancer cases having an MDM discussion regardless of whether they are public or private patients.[2]**
   - MDM use ranged from 56 to 93 per cent.
   - Reducing variation in colorectal MDM treatment planning is important and within the sphere of clinical influence to achieve.
2. **Increase the utilisation of adjuvant chemotherapy for stage III colon cancer patients.**
   - Use of adjuvant chemotherapy for patients aged less than 70 years ranged from 70 to 91 per cent by ICS of surgery.
   - All surgical stage III colon cancer patients should be considered for adjuvant chemotherapy.
   - Reducing variation in the uptake of adjuvant therapy is clinically feasible and could improve survival for those with stage III colon cancer who opt for chemotherapy.

High-impact, greater effort recommendations

3. **Increase the percentage of MDM discussions for newly diagnosed rectal cancer patients prior to commencing treatment regardless of whether they are public or private patients.[2]**
   - Only 50 per cent of patients with rectal cancer had a pre-treatment MDM, varying by ICS of treatment.
   - Timely and appropriate referral of such patients to an MDM may lead to more appropriate treatment.
4. **Reduce variation in the utilisation of neoadjuvant radiotherapy in rectal cancer patients.**
   - Use of neoadjuvant radiotherapy for rectal cancer varied widely by ICS, from 16 to 51 per cent, and use also varied by hospital.
   - All newly diagnosed patients should be assessed for suitability of neoadjuvant radiotherapy given the evidence of better outcomes for selected patients receiving this treatment.
5. **Increase the timeliness of adjuvant chemotherapy for stage III colon cancer patients to within eight weeks (56 days) of surgery.**
   - Timely commencement of adjuvant chemotherapy ranged from 53 to 80 per cent by ICS of surgery (public hospitals only).
6. **Increase the proportion of surgical colon cancer patients who have 12 or more lymph nodes examined.**
   - The proportion of surgeries performed for colon cancer stage II/III disease where 12 or more lymph nodes were examined ranged from 73 to 92 per cent by ICS.
   - Data indicated a reduction in mortality for patients who had 12 or more lymph nodes examined.

[2] As per the colorectal cancer OCP.

Demographics

- Between 2011 and 2015, 18,621 Victorians were diagnosed with colorectal cancer (Table 1).
- The median age at diagnosis was 71 years old, ranging from 69 to 73 years across ICS.
- Slightly more males were diagnosed with colorectal cancer compared with females.
- Overall, a quarter of Victorians with colorectal cancer were in the most disadvantaged socioeconomic status (SES) quintile.
- Patients living in socioeconomically disadvantaged areas were more common in regional than metropolitan ICS.
- Approximately three-quarters of Victorians with colorectal cancer had a Charlson Comorbidity Index (CCI[3]) of zero, suggesting no other comorbidities prior to their cancer diagnosis, with limited variation by ICS.

Table 1: Colorectal cancer patient demographics for Victoria and by ICS of residence (diagnosed 2011–2015)

ICS of residence	Number	Age (median)	Male (%)	SES, most disadvantaged (%)	CCI of zero (%)
NEMICS	4,413	72	54	10	73
SMICS	4,703	72	52	18	72
WCMICS	3,229	69	56	31	71
BSWRICS	1,553	73	52	27	71
GRICS	1,135	71	56	31	76
HRICS	1,202	70	54	34	74*
LMICS	1,379	72	54	38	74
GICS	1,007	72	54	36	71
Victoria	**18,621**	**71**	**54**	**24**	**73**

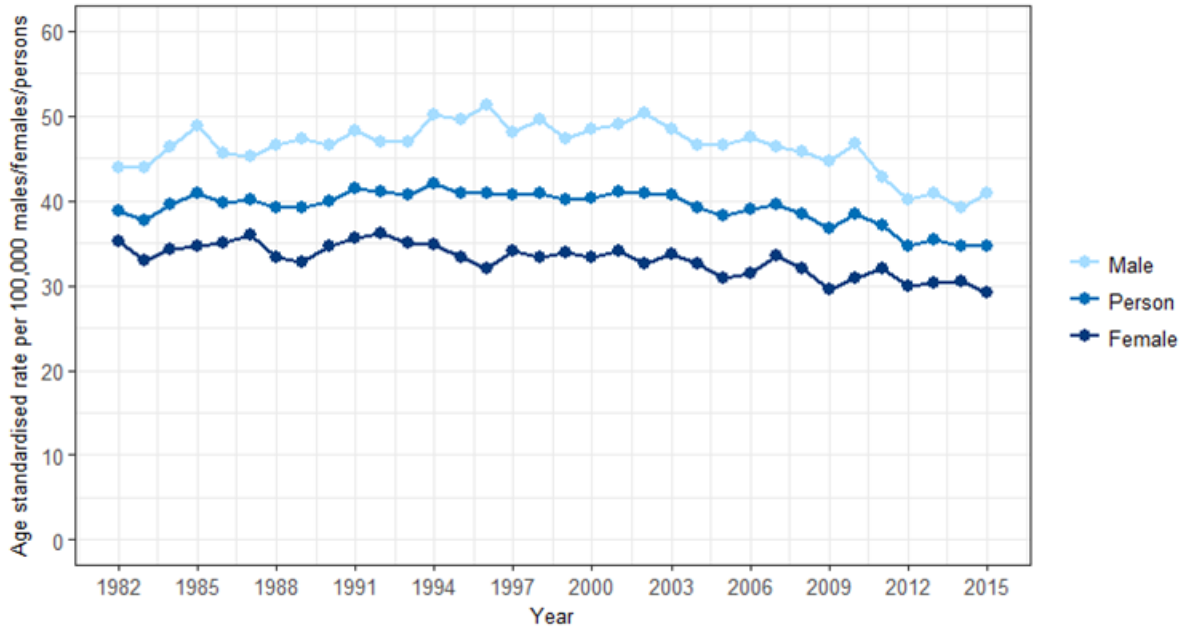
** Patients living in HRICS may attend hospitals in Albury (NSW), and these episodes are not captured in the VAED. Therefore, the CCI may be underestimated for patients living in HRICS.*

[3] See the glossary for the methodology of determining CCI.

Incidence

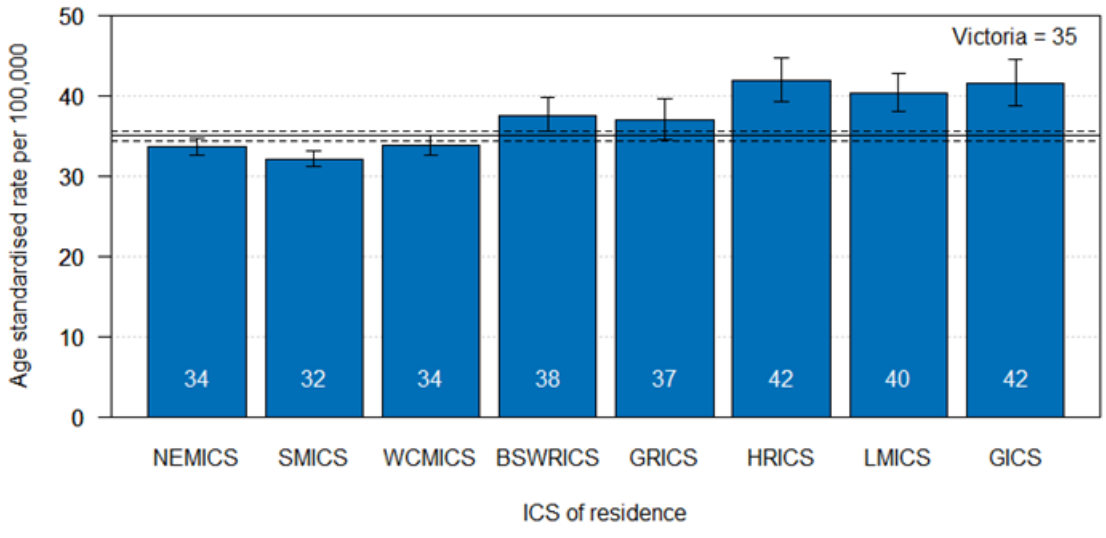
- The Victorian age-standardised incidence rate decreased between 1982 and 2015 from 39 cases to 35 cases per 100,000 (Figure 1).
- Males had the greatest reduction in incidence over time and remain more likely to be diagnosed with colorectal cancer than women.
- The incidence rate in Victoria between 2011 and 2015 was 35 cases per 100,000 (Figure 2).
- Incidence was higher in regional compared with metropolitan ICS.

Figure 1: Colorectal cancer age-standardised incidence rate per 100,000 population for Victoria by sex (diagnosed 1982–2015)



Source: Cancer Council Victoria *<http://vcrdata.cancervic.org.au/vs/>*

Figure 2: Colorectal cancer age-standardised incidence rate per 100,000 for Victoria by ICS of residence (diagnosed 2011–2015)



Stage at diagnosis

Stage IV at diagnosis[4]

- In Victoria, 24 per cent of colorectal cancer tumours were stage IV at diagnosis (Table 2).
- GICS had a significantly higher proportion of stage IV colorectal cancer tumours compared with the other ICS (p = 0.003).

Table 2: Number and percentage of colorectal cancer patients who had stage IV cancer at diagnosis by ICS of residence (diagnosed 2011–2015)

ICS of residence	Colon cancer	Rectal cancer	Colorectal cancer
NEMICS	817 (26%)	215 (18%)	**1,032 (23%)**
SMICS	894 (26%)	254 (20%)	**1,148 (24%)**
WCMICS	635 (27%)	162 (18%)	**797 (25%)**
BSWRICS	297 (25%)	89 (23%)	**386 (25%)**
GRICS	213 (25%)	64 (22%)	**277 (24%)**
HRICS*	220 (25%)	57 (18%)	**277 (23%)**
LMICS	256 (25%)	70 (19%)	**326 (24%)**
GICS	218 (30%)	67 (25%)	**285 (28%)**
Victoria	3,550 (26%)	978 (20%)	**4,528 (24%)**

** Stage IV cancer at diagnosis is determined in part by episodes in the VAED within four months of diagnosis that contain metastatic cancer codes. Patients living in HRICS may attend hospitals in NSW (Albury), and these episodes are not captured in the VAED. Therefore, stage IV rates may be underestimated for patients living in HRICS.*

Clinical commentary

Colorectal cancer patients presenting with stage IV disease at diagnosis varied little by ICS, except for in GICS. Higher rates of stage IV disease in GICS may indicate later patient presentation, problems in availability or delays accessing health providers and services such as cancer diagnostic tests. Participation in the National Bowel Screening Program[5] is not lower in the Grampians region (45.3 per cent in 2015–16) compared with the Victorian average (41.9 per cent in 2015–16).

[4] See the glossary for the methodology of determining stage IV cancer.

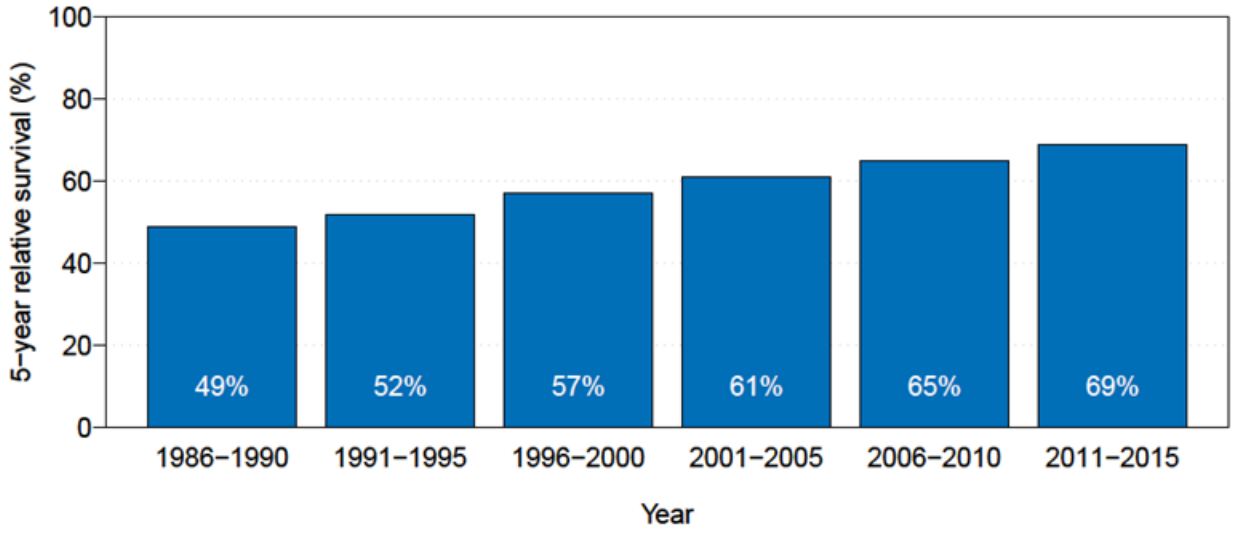
[5] Australian Institute of Health and Welfare <https://www.aihw.gov.au/reports/cancer-screening/cancer-screening-in-australia-by-small-geographic/data>

Survival

Relative survival

- Five-year relative survival for colorectal cancer increased from 49 per cent in 1986–1990 to 69 per cent in 2011–2015 (Figure 3).

Figure 3: Five-year relative survival of Victorians with colorectal cancer over time (diagnosed 1986–2015)



Relative survival is a net survival measure representing the proportion of Victorians who would have survived if cancer was the only cause of death. Relative survival was calculated using the period approach and Ederer II method.

Clinical commentary

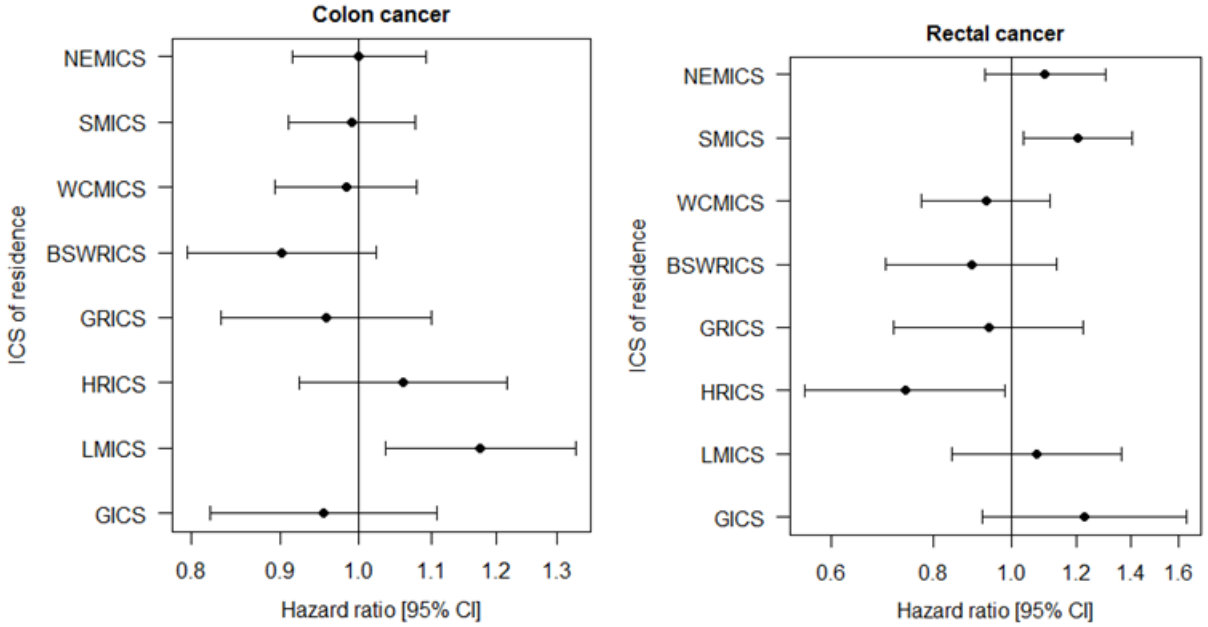
Reasons for improved survival for colorectal cancer are uncertain but most likely include a combination of factors such as better screening, earlier stage at diagnosis, better surgery and better perioperative and oncology care.

Survival by ICS

- Survival varied by ICS of residence after adjusting for case-mix differences between ICS (Figure 4).
- Survival was significantly poorer than the Victorian average for:
  - colon cancer patients in LMICS
  - rectal cancer patients in SMICS.
- Survival was significantly better than the Victorian average for:
  - rectal cancer patients in HRICS.
- When examining survival for colon cancer patients by stage and ICS of residence:
  - there was no statistically significant difference in survival between ICS for stage I and II patients (

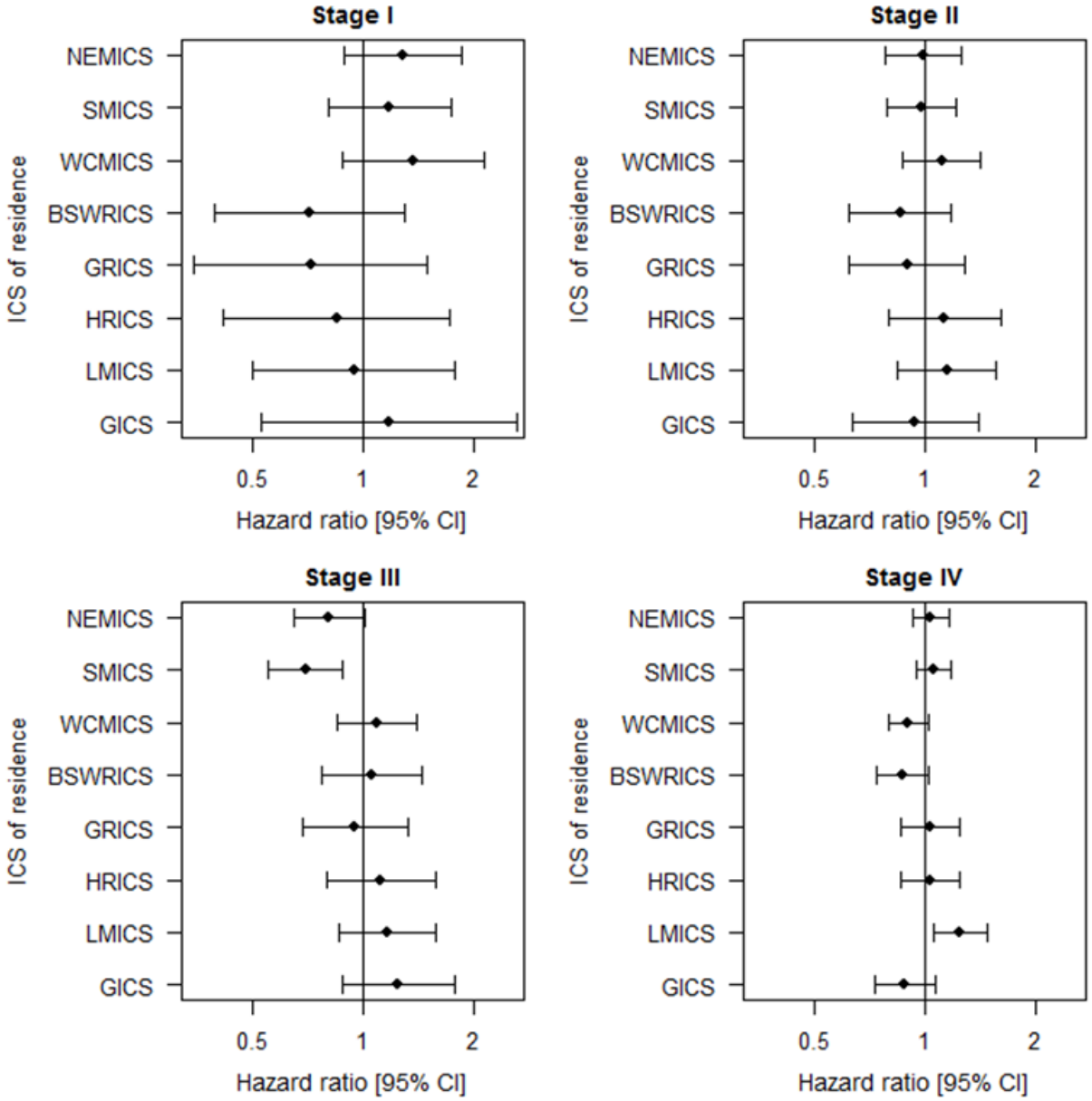
– Figure 5)
– patients with stage III cancer had better survival in SMICS than the Victorian average
– patients with stage IV cancer had poorer survival in LMICS than the Victorian average.

Figure 4: Relative risk of death following colorectal cancer diagnosis by ICS of residence (diagnosed 2011–2015)



Relative risk compared with the Victorian average expressed as hazard ratios from a multivariable Cox proportional hazard model adjusted for age, sex, SES, stage at diagnosis, year of diagnosis and CCI. Bars represent 95 per cent CI. Hazard ratios less than one indicate better survival and greater than one poorer survival.

Figure 5: Relative risk of death following colon cancer diagnosis by stage and ICS of residence (diagnosed 2011–2015)



Relative risk compared with the Victorian average expressed as hazard ratios from a multivariable Cox proportional hazard model adjusted for age, sex, SES, year of diagnosis and CCI. Bars represent 95 per cent CI. Hazard ratios less than one indicate better survival and greater than one poorer survival.

Clinical commentary

Variation in colon cancer survival for LMICS patients appears to be restricted to those with stage IV disease. For rectal cancer, patients in SMICS had poorer outcomes compared with the Victorian average (Figure 4). Differences in case-mix between ICS, such as in age, sex, SES and comorbidity, cannot explain these differences. The reasons for poorer survival in these regions requires further exploration. Areas to explore include timeliness of care, quality of treatment and access to supportive and palliative care services.

Presentation

Colorectal cancer

- Between 2011 and 2015, 14 per cent of colorectal cancer surgeries (first surgery) were emergency surgeries (defined as surgery performed in an emergency hospital admission).
- The proportion of emergency surgeries increased slightly, but significantly, over time (*p* trend < 0.001) (Figure 6).
- Patients living in GICS had the highest proportion of emergency surgeries (17 per cent) (Figure 7).
- The rate of emergency surgery was lower for colorectal cancer patients with stage I (three per cent) compared with all other stages: stage II (15 per cent), III (16 per cent), IV (27 per cent).
- After adjusting for case-mix factors (age, sex, SES, CCI and metastatic disease status), patients whose first surgery was performed in an emergency admission had a twofold increased risk of death compared with patients whose first surgery was planned (HR 2.02 (95% CI, 1.87–2.19)).

Figure 6: Proportion of colorectal cancer surgery performed in an emergency admission by diagnosis year (diagnosed 2011–2015)

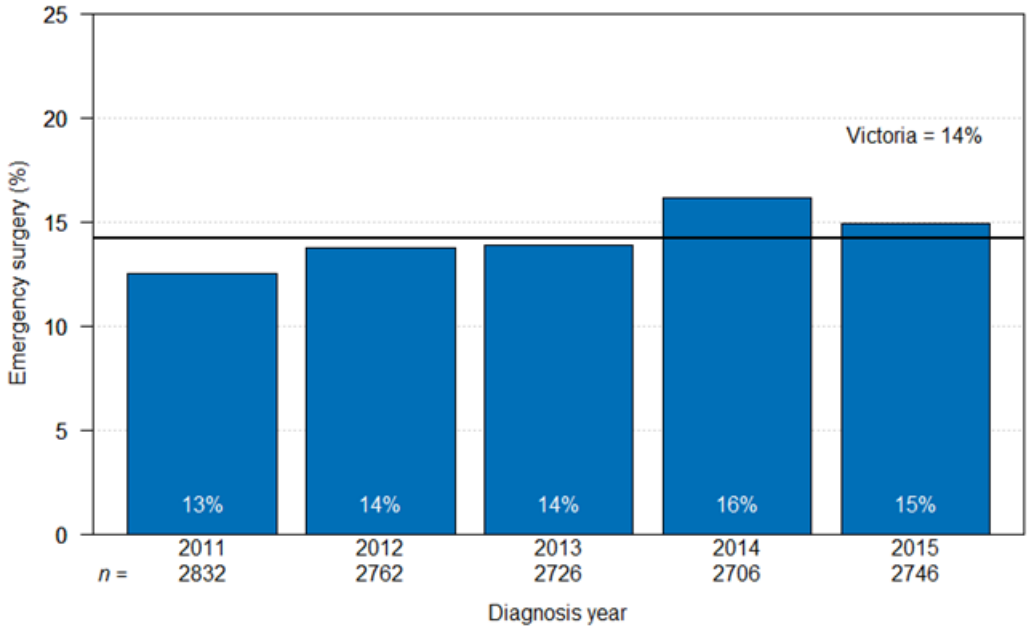
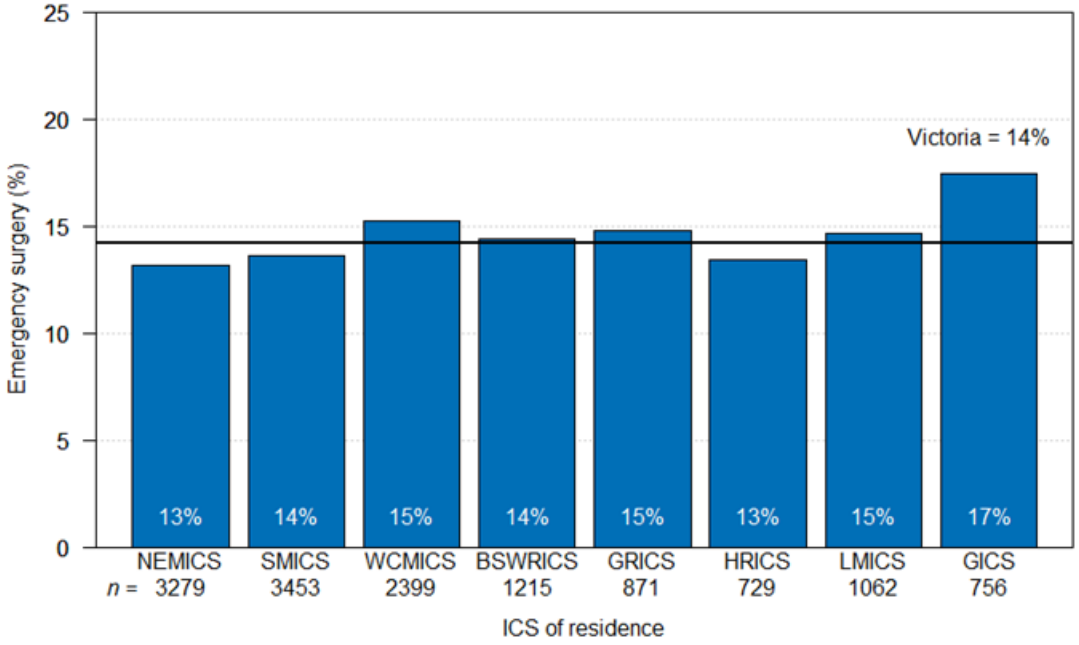


Figure 7: Proportion of colorectal cancer surgery performed in an emergency admission by ICS of residence (diagnosed 2011–2015)



Clinical commentary

Patients have better outcomes if surgery is planned rather than emergency. Surgery performed in an emergency setting may indicate late or missed diagnosis, failure to refer, or distance and delays to access providers and services.

The increasing trend in emergency admissions is worrying, however, may be mitigated by recent initiatives. At the first colorectal summit, data revealed that a high proportion of emergency cases had sought medical consultation in the period before the emergency presentation. Over 2016–2017, many Victorian GPs have been educated in colorectal cancer symptom recognition and referral pathways as part of OCP implementation efforts.[6] We would expect that the rate of emergency surgeries should start trending downwards in Victoria if this has been effective.

[6] Victorian Primary Health Network Alliance. 2017, 'Optimal Care Pathways. State-wide adoption of the lung and colorectal optimal care pathways into primary health. Final Project Report, October 2017' (unpublished).

Multidisciplinary meeting

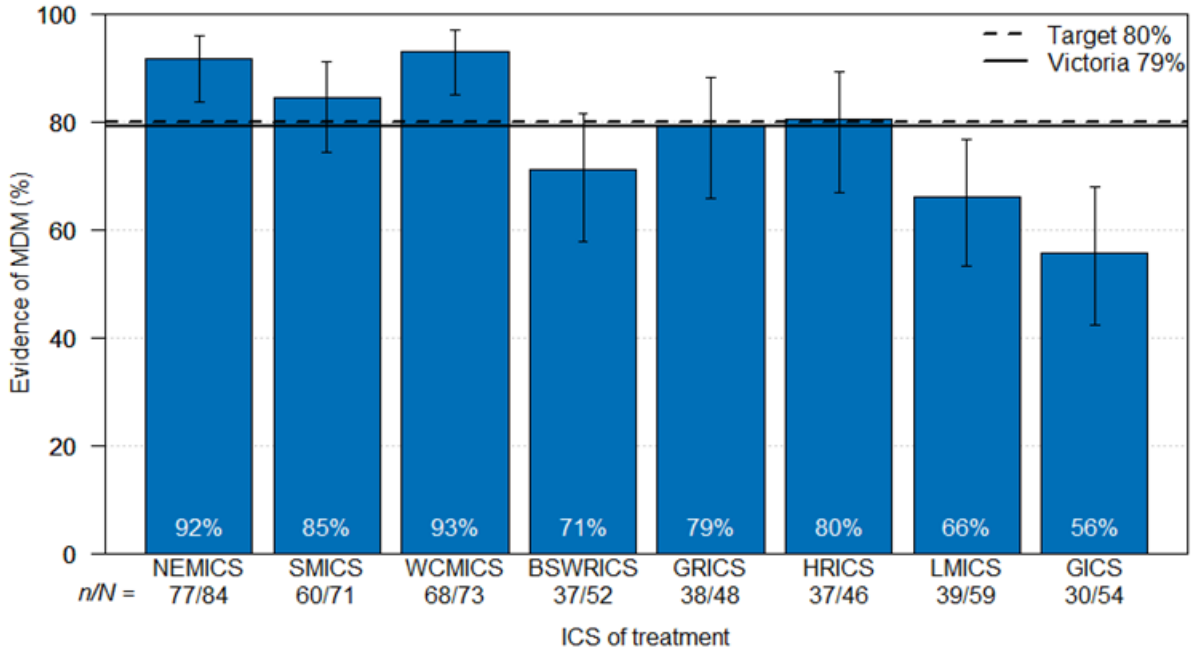
The colorectal cancer OCP states that all newly diagnosed patients should be discussed by a multidisciplinary team regardless of whether public or private patients, and that patients with rectal cancer should be discussed before surgery.

There are currently no systems for routinely monitoring the occurrence of MDMs. For this analysis, a sample of newly diagnosed colorectal cancer patients (who received treatment) were audited within each ICS for the Cancer Services Performance Indicator Audit 2015 and the Rectal Cancer Audit 2015. The presence or absence of MDM treatment recommendations in the patient's medical history was used as a measure of whether an MDM had occurred.

Colorectal cancer

- Seventy-nine per cent of newly diagnosed colorectal cancer patients had a documented MDM in 2015.
- Evidence of an MDM differed significantly by ICS ($p < 0.001$), ranging from 56 to 93 per cent (Figure 8).
- Four out of five regional ICS did not meet the department's target rate of 80 per cent.

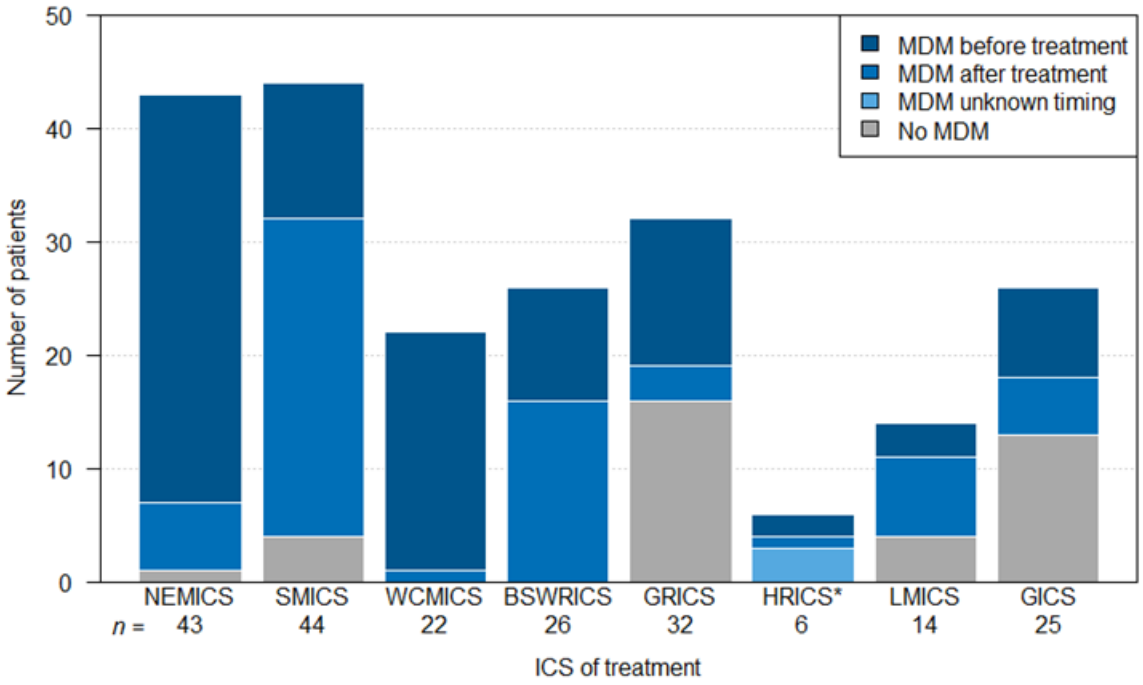
Figure 8: Percentage of newly diagnosed colorectal cancer cases with documented MDM recommendations (2015)



Rectal cancer

- Eighty-two per cent of rectal cancer patients had documented evidence of an MDM, and this varied by ICS of treatment (Figure 9).
- GRICS, LMICS and GICS had MDM rates below the 2014 summit's recommended rectal cancer MDM rate of 90 per cent (50 per cent, 71 per cent and 52 per cent respectively).
- Fifty per cent of patients had documented evidence of an MDM prior to starting treatment, and 32 per cent of patients had documented evidence of an MDM after starting treatment.

Figure 9: Utilisation and timing of MDM for Victorian rectal cancer patients (diagnosed July–December 2015)



** HRICS patients may receive surgery and/or chemotherapy in Albury (NSW) hospitals, and these episodes are not captured in the VAED. Therefore, rates of surgery and chemotherapy are likely to be underestimated for HRICS patients.*

Clinical commentary

In 2015 there was wide variation in the evidence of MDM meetings for newly diagnosed colorectal cancer cases across ICS. For patients with rectal cancer, there were also considerable differences in when this meeting took place. The colorectal cancer OCP recommends MDM discussion of all cases with colorectal cancer. In addition, as identified in the 2014 colorectal tumour summit, MDM discussions should take place before treatment to ensure all treatment options are considered based on the needs of the individual patient, including identifying potential clinical trials. This is particularly important for rectal cancer patients who may benefit from neoadjuvant therapies.

Since this audit data was released, GICS and GRICS have implemented programs focused on increasing rectal cancer MDM discussions. In 2017 the proportion of cases discussed had increased to 74 per cent in GICS and 84 per cent in GRICS. In addition, GICS worked to improve the proportion of cases assessed prospectively from 32 per cent in 2015 to 55 per cent in 2017. This work demonstrates how data on care variation, together with focused, local implementation, can improve service provision.

A further repeat audit would be helpful to determine progress on this aspect of colorectal cancer care across Victoria, particularly regarding prospective MDM for rectal cancer patients.

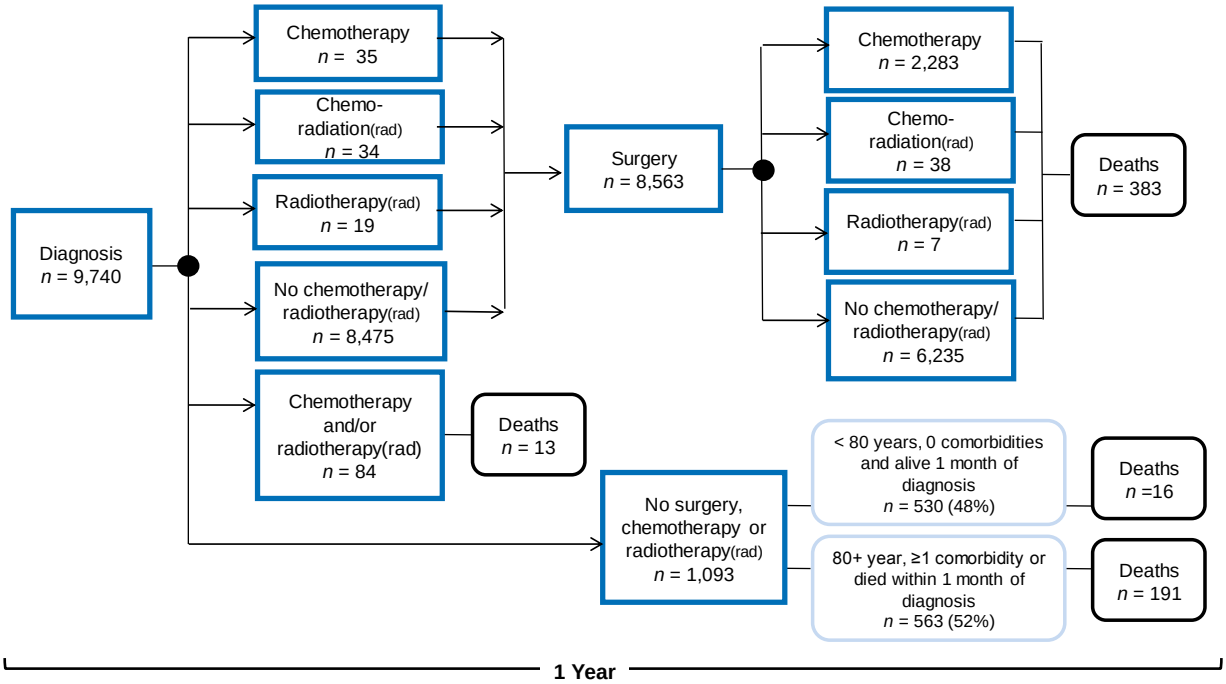
Treatment[7]

Overall for stage I, II and III colon and rectal cancer

For Victorians diagnosed with stage I, II or III colon cancer, within one year of diagnosis, there were:

- Eighty-eight per cent who had surgery (Figure 10).
- Less than one per cent who had chemotherapy and/or radiotherapy but no surgery.

Figure 10: Treatment pathway within one year of stage I, II and III colon cancer diagnosis (diagnosed 2011–2015)



(rad) = radiotherapy with radical intent.

Note: Patients in the 'No surgery, chemotherapy or radiotherapy (rad)' include those who had early-stage disease treated with minor procedures not included in the surgical definition used in this report and those who were unfit for treatment.

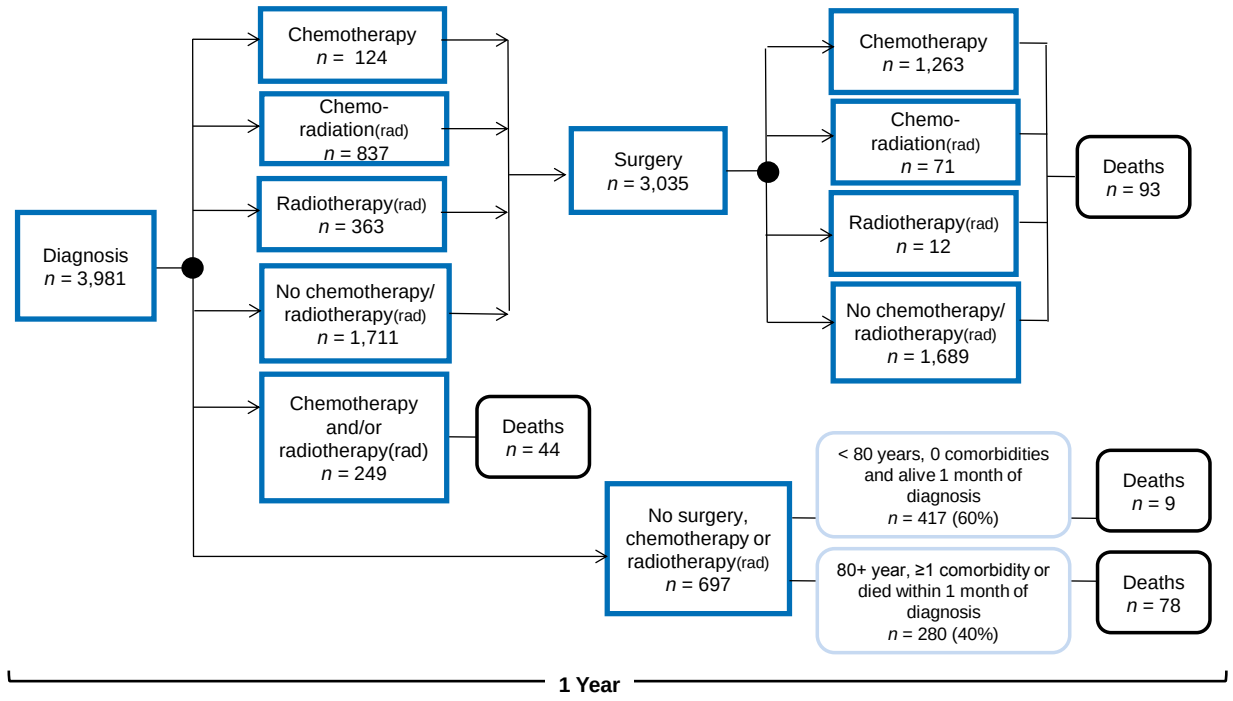
For Victorians diagnosed with stage I, II or III rectal cancer, within one year of diagnosis there were:

- 76 per cent who had surgery (

[7] Chemotherapy refers to intravenous chemotherapy only (excluding oral). Radiotherapy for stage I, II and III colorectal cancer patients refers to radiotherapy with radical intent. Radiotherapy for stage IV colon cancer patients refers to radiotherapy with radical or palliative intent.

- Figure 11)
- six per cent who had chemotherapy and/or radiotherapy but not surgery.

Figure 11: Treatment pathway within one year of stage I, II and III rectal cancer diagnosis (diagnosed 2011–2015)



(rad) = radiotherapy with radical intent.

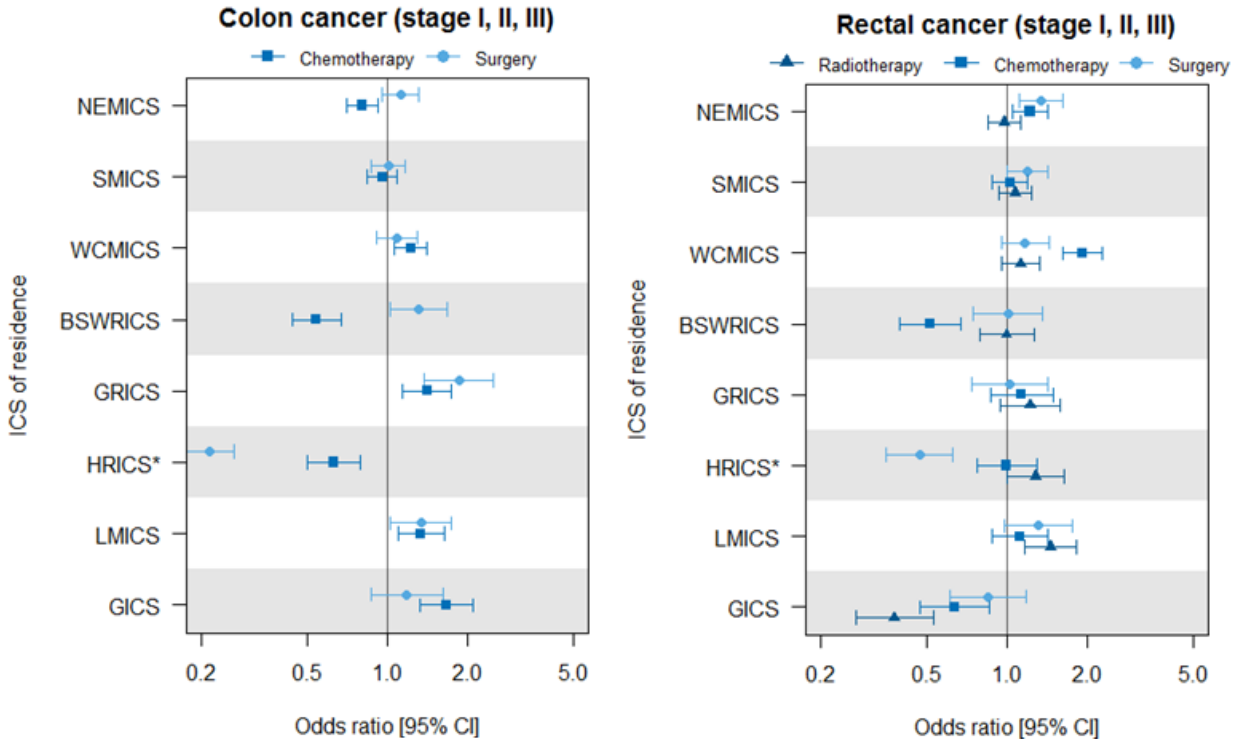
Note: Patients in the 'No surgery, chemotherapy or radiotherapy (rad)' include those who had early stage disease treated with minor procedures not included in the surgical definition used in this report and those who were unfit for treatment.

Treatment by ICS for stage I, II and III colon and rectal cancer

- There were significant differences in treatment received by non-metastatic colon and rectal cancer patients by ICS of residence (

- Figure 12).
- For those with colon cancer stage I, II and III disease:
  - surgery was more likely for Victorians who lived in BSWRICS, GRICS and LMICS, compared with the Victorian average
  - chemotherapy was more likely for Victorians who lived in WCMICS, GRICS, LMICS and GICS, and less likely in NEMICS and BSWRICS.
- For those with rectal cancer stage I, II and III disease:
  - surgery was more likely for Victorians who lived in NEMICS
  - chemotherapy was more likely for Victorians who lived in NEMICS and WCMICS and less likely in BSWRICS and GICS
  - radiotherapy was more likely for Victorians who lived in LMICS and less likely in GICS.

Figure 12: Likelihood of receiving surgery, chemotherapy and radiotherapy within one year of diagnosis for stage I, II and III colon and rectal cancers by ICS of residence (diagnosed 2011–2015)



Likelihood expressed as odds ratios compared with the Victorian average from a logistic regression model adjusting for age and CCI. Bars represent 95 per cent CI. Odds ratios less than one indicate a lower likelihood and greater than one indicate a greater likelihood. Radiotherapy refers to radiotherapy within radical intent.
** HRICS patients may receive surgery and/or chemotherapy in Albury (NSW) hospitals, and these episodes are not captured in the VAED. Therefore, rates of surgery and chemotherapy are underestimated for HRICS patients.*

Clinical commentary

While data limitations may explain HRICS results, reduced likelihood of receiving treatment in other ICS may represent unwarranted variation. The MDM treatment planning process is critical to ensure the full range of treatment options are considered including clinical trials and if referral to another service is necessary to access a treatment not available locally.

Neoadjuvant and adjuvant treatment for stage I, II and III rectal cancer

- The proportion of rectal cancer patients with stage I, II and III disease receiving radiotherapy before surgery was 40 per cent and for chemotherapy was 32 per cent (Table 3).
- Adjuvant radiotherapy was rare (two per cent), while 44 per cent received adjuvant chemotherapy.
- Receipt of adjuvant and neoadjuvant therapies varied by ICS of surgery. Compared with the state average, rectal cancer patients who had surgery at a hospital in:
  - WCMICS had higher use of neoadjuvant treatments and adjuvant chemotherapy
  - BSWRICS or GRICS had higher use of adjuvant radiotherapy
  - LMICS had higher use of neoadjuvant radiotherapy
  - SMICS had lower use of adjuvant radiotherapy
  - BSWRICS had lower use of neoadjuvant treatments and adjuvant chemotherapy
  - GICS had lower use of neoadjuvant treatments.

Table 3: Utilisation of neoadjuvant and adjuvant treatment for rectal cancer (stage I, II and III) patients in the year following diagnosis by ICS of surgery (diagnosed 2011-2015)

ICS of surgery	Neoadjuvant radiotherapy	Neoadjuvant chemotherapy	Adjuvant radiotherapy	Adjuvant chemotherapy
NEMICS (*n* = 724)	39.9%	33.4%	1.2%	43.9%
SMICS (*n* = 932)	39.7%	29.4%	1.1%^	40.9%
WCMICS (*n* = 786)	44.3%#	43.6%##	2.7%	53.6%##
BSWRICS (*n* = 230)	33.0%^	13.9%^^	4.8%#	29.1%^^
GRICS (*n* = 70)	40.0%	25.7%	10.0%##	48.6%
HRICS* (*n* = 62)	33.9%	24.2%	4.8%	35.5%
LMICS (*n* = 127)	51.2%#	33.9%	3.1%	41.7%
GICS (*n* = 141)	15.6%^^	8.5%^^	4.3%	37.6%
Victoria	**39.7%**	**31.9%**	**2.3%**	**43.9%**

Radiotherapy refers to radiotherapy with radical intent.
** HRICS patients may receive surgery and/or chemotherapy in Albury (NSW) hospitals, and these episodes are not captured in the VAED. Therefore, rates of surgery and chemotherapy are likely to be underestimated for HRICS patients.*
 # Above Victorian average, p < 0.05
Above Victorian average, p < 0.001
^ Below Victorian average, p < 0.05
^^ Below Victorian average, p < 0.001

Clinical commentary

Focusing on non-metastatic rectal cancer, it appears that BSWRICS might be giving more short-course radiotherapy and significantly less chemotherapy compared with the rest of Victoria, but it is also worth noting that WCMICS has significantly higher use of chemotherapy. It is difficult to understand whether the variation between ICS is appropriate without data on cancer stage and patient performance.

GICS appears to be an outlier in neoadjuvant treatment as well as having the lowest levels of documented MDM treatment recommendations. Increasing MDM case discussion of rectal patients may improve uptake of adjuvant therapies.

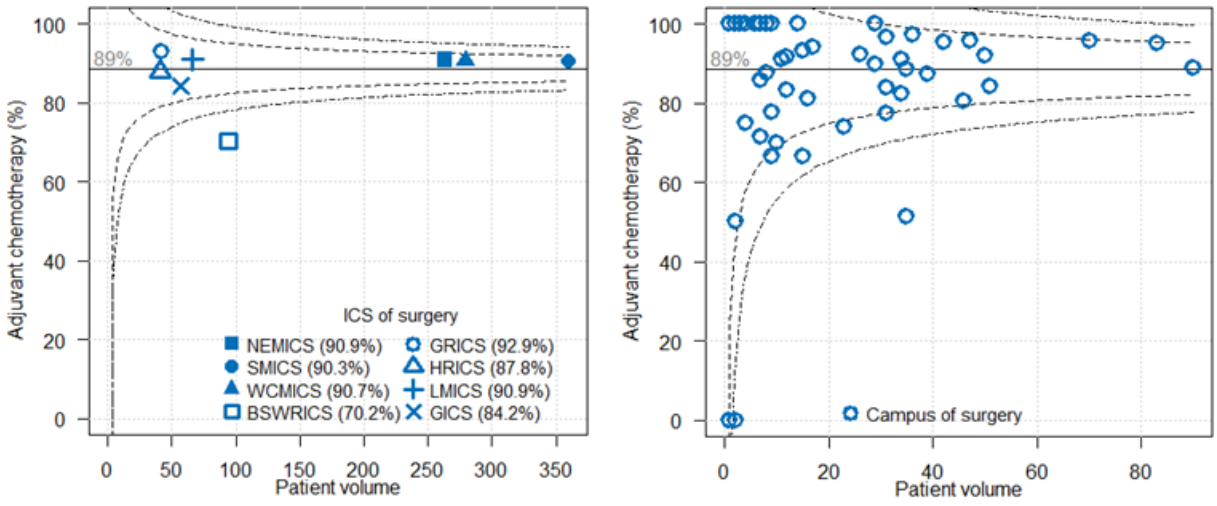
Adjuvant chemotherapy for stage III colon cancer

Utilisation for patients aged under 70 years

- The Victorian average of stage III colon cancer patients aged under 70 years receiving adjuvant intravenous chemotherapy within six months of surgery was 89 per cent (

- Figure 13).
- The proportion of patients receiving adjuvant chemotherapy was lowest for patients who had their surgery in BSWRICS.
- There were a number of campuses that had significantly lower use of adjuvant chemotherapy compared with the state average.

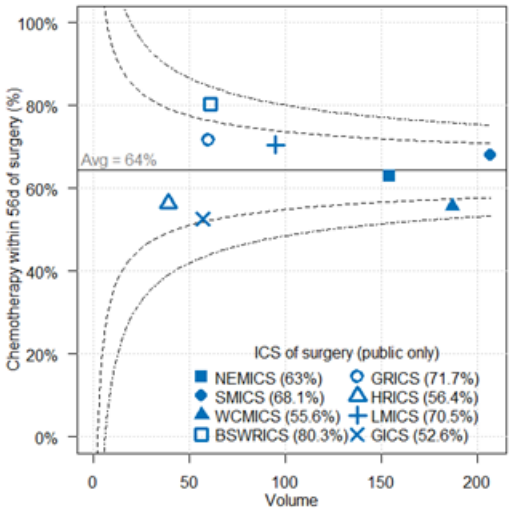
Figure 13: Adjuvant intravenous chemotherapy within six months of surgery by ICS of surgery and by campus of surgery for stage III colon cancer patients aged less than 70 years (diagnosed 2011–2015)



Timeliness

- Time from surgery to chemotherapy was within 56 days for 72 per cent of stage III colon cancer patients.
- Timeliness varied by hospital type, where 64 per cent of patients attending public hospitals and 81 per cent of patients attending private hospitals received their chemotherapy within 56 days.
- Timeliness also varied by ICS of surgery for public campuses (Figure 14).

Figure 14: Timeliness of adjuvant intravenous chemotherapy within six months of surgery in a public hospital by ICS of surgery for stage III colon cancer patients (diagnosed 2011–2015)



Clinical commentary

There is a limitation with the chemotherapy data in that treatment with oral chemotherapy agents is not captured in the routine datasets. There is striking variation in the use of adjuvant chemotherapy provided in an inpatient setting by ICS, and there is a clear hospital outlier for stage III colon cancer. Detailed data has been provided to support local review in clarifying the issue.

Variation in the timeliness of starting adjuvant chemotherapy between public and private providers may indicate resource pressures in the public system. Timeliness also differed by ICS, with almost half of patients in GICS and WCMICS waiting longer than eight weeks to begin adjuvant chemotherapy. Local investigation of potential reasons for delay should be undertaken and novel referral pathways or booking systems considered to ensure patients start adjuvant chemotherapy within the recommended time.

Lymph node resection for stage I, II, III and IV colon cancer

- Statewide, 78 per cent of patients diagnosed with colon cancer between 2008 and 2015 had 12 or more lymph nodes examined.
- The proportion of patients with 12 or more lymph nodes examined:
  - increased over time (Figure 15)
  - was lowest for stage I or unknown stage disease and highest for stage II disease (Figure 15).
- For the 2008–2015 period, risk of death was 14 per cent higher for colon cancer patients with fewer than 12 lymph nodes examined at surgery after adjusting for age, sex, emergency status, comorbidities, American Society of Anaesthesiologists (ASA) Score, stage and year of diagnosis (HR 1.14 (95% CI, 1.04 – 1.26)).
- In 2015 the proportion of surgeries with 12 or more lymph nodes examined for stage II and III colon cancer patients:
  - was lowest for surgeries in HRICS (

– Figure 16)

varied between surgery campus, with some campuses performing significantly fewer surgeries where 12 or more nodes were examined compared with the state average (

– Figure 16).

Figure 15: Proportion of colon cancer patients with 12 or more lymph nodes examined by year of diagnosis and stage at diagnosis (diagnosed 2008–2015)

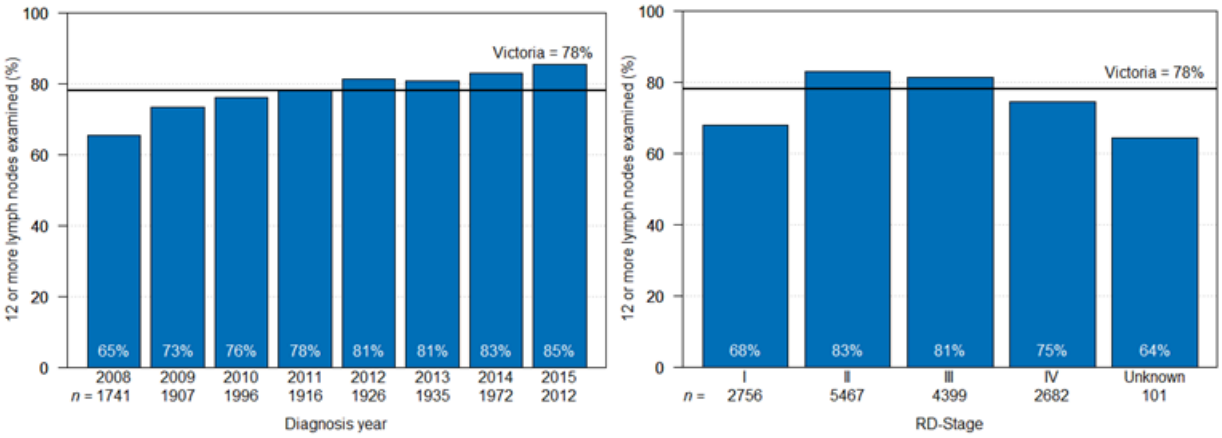
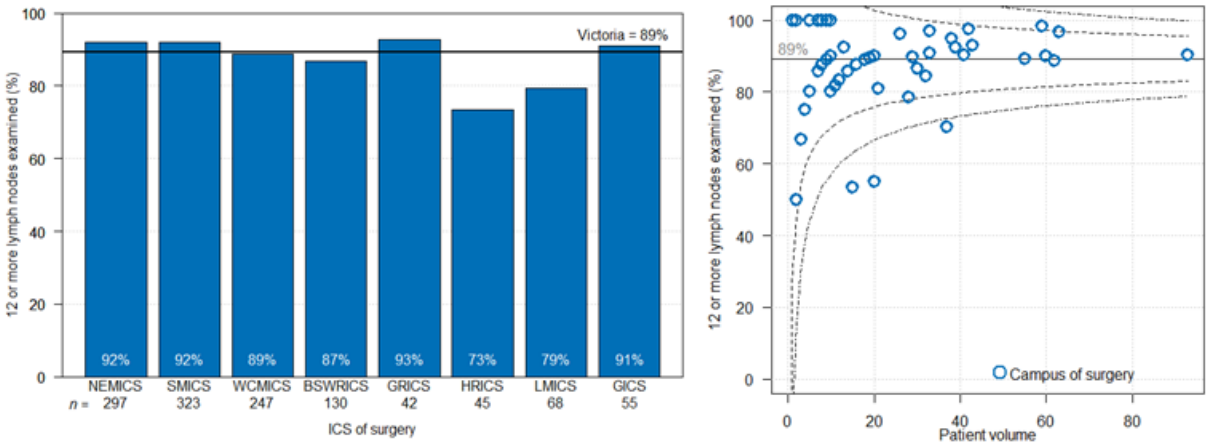


Figure 16: Lymph node resection for stage II and III colon cancer by ICS of surgery and hospital campus within four months of diagnosis (diagnosed 2015)



Clinical commentary

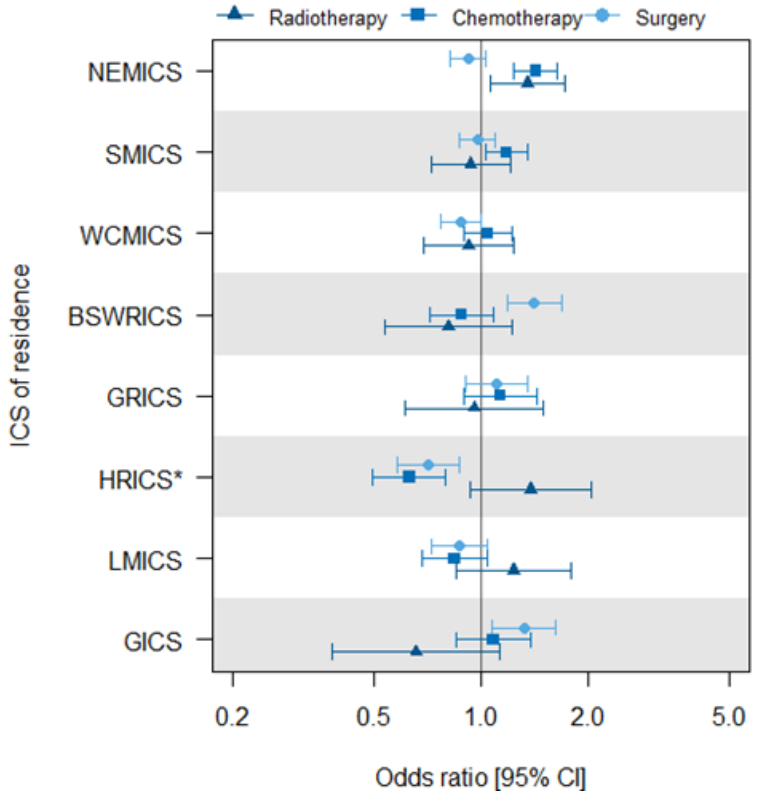
Lymph node count in excess of 12 is considered an indicator of quality of surgery, and possibly pathology. The increasing proportion of surgeries meeting this quality indicator over time is encouraging, but there is significant variation by ICS. In this case there are no limitations on Hume data because this is for resections performed in that ICS. Hume is a significant outlier in this regard.

Treatment for stage IV colon cancer

- Treatment for stage IV colon cancer varied by ICS (

- Figure 17) in that:
  - surgery was more likely for those in BSWRICS and GICS, and less likely in WCMICS
  - chemotherapy was more likely for those in NEMICS and SMICS
  - radiotherapy was more likely for those in NEMICS.

Figure 17: Likelihood of receiving surgery, chemotherapy and radiotherapy within one year of diagnosis for stage IV colon cancer by ICS of residence (diagnosed 2011–2015)



Likelihood expressed as odds ratios compared with the Victorian average from a logistic regression model adjusting for age and CCI. Bars represent 95 per cent CI. Odds ratios less than one indicate a lower likelihood and greater than one indicate a greater likelihood. Radiotherapy refers to radiotherapy with radical or palliative intent.
** HRICS patients may receive surgery and/or chemotherapy in Albury (NSW) hospitals, and these episodes are not captured in the VAED. Therefore, rates of surgery and chemotherapy are likely to be underestimated for HRICS patients.*

Clinical commentary

Survival analyses for colon cancer patients by stage showed LMICS patients with stage IV disease had significantly poorer outcomes compared with the Victorian average. However, this data shows treatment patterns in LMICS are not statistically significantly different from the state average. Understanding the type of chemotherapy used, access to clinical trials and palliative care services may provide more insight into this differential. Other population factors may also be important – LMICS has one of the highest proportion of patients from low SES areas.

Palliative care[8]

- Statewide data on palliative care services was not available at the time of the Colorectal Cancer Summit.
- In Victoria, 10 per cent of colorectal cancer patients received chemotherapy in the last 30 days of life, ranging from six per cent to 11 per cent across ICS (Table 4).
- Sixty-eight per cent of deaths of Victorians with colorectal cancer occurred while in a Victorian hospital, and this ranged from 58 per cent to 73 per cent between ICS (Table 5).

Table 4: Percentage of colorectal cancer patients who received chemotherapy within 30 days of death by ICS of residence (diagnosed 2011–2015)

ICS of residence	Percentage of patients (%)
NEMICS	11
SMICS	10
WCMICS	10
BSWRICS	6
GRICS	11
HRICS*	9
LMICS	8
GICS	10
Victoria	**10**

** Patients living in HRICS may receive chemotherapy at hospitals in Albury (NSW) and these episodes are not captured in the VAED. Therefore, chemotherapy rates may be underestimated for patients living in HRICS.*

Table 5: Percentage of colorectal cancer patients whose place of death was a Victorian hospital (diagnosed 2011–2015)

ICS of residence	Percentage of patients (%)
NEMICS	71
SMICS	69
WCMICS	73
BSWRICS	60
GRICS	58
HRICS	59
LMICS	72
GICS	69
Victoria	**68**

[8] Chemotherapy refers to intravenous chemotherapy only (excluding oral).

Abbreviations

CCI	Charlson Comorbidity Index (see Glossary)
CI	confidence interval
HR	hazard ratio
ICS	Integrated Cancer Service
MDM	multidisciplinary meeting
OCP	optimal care pathway
RD-stage	registry-derived stage
SES	socioeconomic status (see Glossary)
VAED	Victorian Admitted Episodes Dataset
VCR	Victorian Cancer Registry
VRMDS	Victorian Radiotherapy Minimum Data Set

Victorian Integrated Cancer Services

NEMICS	North Eastern Melbourne Integrated Cancer Service
SMICS	Southern Melbourne Integrated Cancer Service
WCMICS	Western and Central Melbourne Integrated Cancer Service
BSWRICS	Barwon South Western Regional Integrated Cancer Service
GRICS	Gippsland Regional Integrated Cancer Services
HRICS	Hume Regional Integrated Cancer Service
LMICS	Loddon Mallee Integrated Cancer Service
GICS	Grampians Integrated Cancer Service

Glossary

Charlson Comorbidity Index (CCI)	An index measuring the number of comorbid conditions a patient has at diagnosis, which may influence their prognosis. Data on patient comorbidities was extracted from diagnosis codes of admitted episodes in the year prior to 30 days after the patient's colorectal cancer diagnosis date. Patients without admitted episodes were assumed to have no comorbidities. The CCI was calculated for each patient according to Quan et al. 2011[9] (excluding cancer and metastases) and grouped into four categories (0, 1, 2 and 3+). Diagnosis codes for comorbidities are assigned in the admitted episode when the comorbidities meet criteria for coding in accordance with the Australian Coding Standards.[10] As a result, the identification of comorbidities is underestimated. Conditions included in the index: • AIDS/HIV • congestive heart failure • chronic pulmonary disease • dementia • diabetes with chronic complications • hemiplegia or paraplegia • mild liver disease • moderate/severe liver disease • renal disease • rheumatic disease.
Country of birth	The Victorian Cancer Registry assigns country of birth to each patient at the time of their cancer diagnosis. Country of birth has been grouped into: 'English speaking' – Australia, New Zealand, United Kingdom, United States, Canada – and 'Non-English speaking' – all other countries.
Death certificate only	A method of cancer notification to the Victorian Cancer Registry whereby the death certificate provides the only notification of a person's cancer to the registry.
Socioeconomic status (SES)	A measure of a person's economic and social position within society, which tends to be positively associated with better health. In this report SES is based on the Index of Relative Socio-Economic Disadvantage (IRSD) included in the Socio-Economic Index of Areas published by the Australian Bureau of Statistics. Victorians were assigned an IRSD score using their residential address at the time of their diagnosis. IRSD scores have been grouped into quintiles (from 1 – most disadvantaged, to 5 – least disadvantaged).
Stage IV	Patients who were classified as having stage IV cancer at the time of their cancer diagnosis. Stage IV cancer was determined by VCR TNM-M (M1) and admitted episodes in the VAED between 30 days prior and four months after the diagnosis date, which contained metastatic cancer diagnosis codes (neoplasm and morphology codes).
VCR diagnosis date	The date of the pathology report or other investigative report where the diagnosis of cancer was first confirmed to the Victorian Cancer Registry.

[9] Quan H, Li B, Couris C, Fushimi K, Graham P, Hider P et al. 2011, 'Updating and validating the Charlson Comorbidity Index and score for risk adjustment in hospital discharge abstracts using data from 6 countries', *American Journal of Epidemiology*, vol. 173, no. 6, pp. 676–682.

[10] Australian Coding Standard ACS 0002 Additional Diagnoses.