PRACTICE CASE STUDY

TIMELY COLORECTAL CANCER DIAGNOSIS IN ALBERTA: Evidence from Four Population-Based Studies

THEMES

- **Timely follow-up**
- **Patient navigation**
- **Supporting primary care**
- **Care disparities**

INTRODUCTION

Colorectal cancer is the second most common cancer among males and the third among females.[1]

Despite universal healthcare and organized screening, significant disparities in diagnostic pathways, healthcare utilization, and access persist.[2]

Colorectal cancer (CRC) is a pressing public health concern. As a major cause of morbidity and mortality in Canada, it ranks as the second most common cancer among males and the third among females.[1] Despite a universal healthcare system and organized screening programs, **significant disparities in diagnostic pathways, healthcare utilization, and access persists** across provinces, leading to unequal access to timely care and outcomes. Evidence suggests that if these inequities are to be effectively addressed "profound health inequities experienced by Indigenous populations and some vulnerable groups require coordinated action on the social determinants of health".[2]

STUDYING COLORECTAL CANCER DIAGNOSIS IN ALBERTA

Alberta has comprehensive administrative databases and centralized healthcare registries that are well-suited for analyzing colorectal cancer (CRC) presentation patterns.[3] These resources provide an exceptional foundation for studying the disparities and challenges in CRC diagnosis and care, particularly concerning **emergency department (ED) visits preceding diagnosis** and the subsequent impact on patient outcomes. The diagnosis phase of colorectal cancer (CRC) is critical for determining the appropriate treatment and improving patient outcomes.

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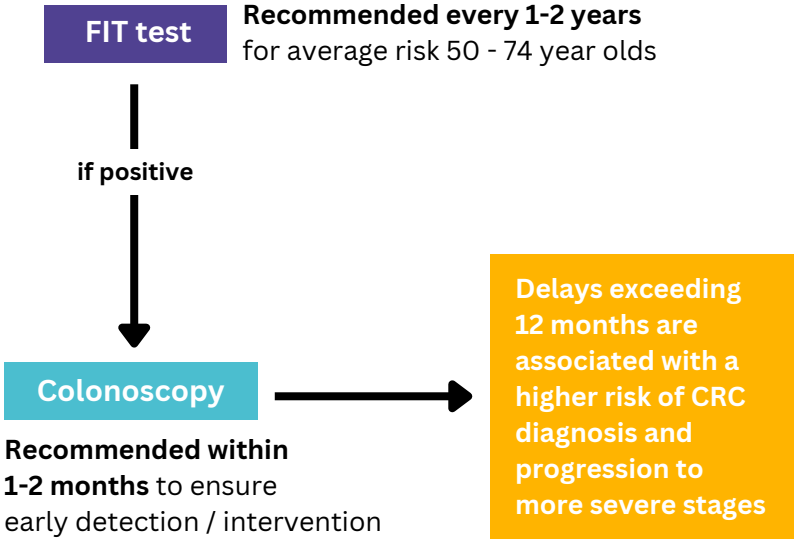
"It took two years from [the onset] of symptoms to my colonoscopy. I did have a family history but I was not high risk...no blood in my stool, no screening so my GP missed it. My symptoms got worse while I waited for my colonoscopy. I had to push my GP for two years because I did not have the typical symptoms."

- Colorectal cancer survivor, female, 46

In Alberta, the diagnostic process typically begins with initial screening using fecal immunochemical tests (FIT) or other stool-based tests, followed by confirmatory diagnostic procedures such as colonoscopy.[3] Early and accurate diagnosis is essential for effective treatment and reducing CRC mortality rates. **Early detection can prevent deaths from colorectal cancer by using screening tools such as fecal immunochemical tests (FIT) and colonoscopies.** In Alberta, FIT is recommended for CRC screening every 1–2 years for average-risk asymptomatic individuals aged 50–74 years old. The current Canadian Task Force on Preventive Health Care guideline recommends a (FIT) every 2 years for the average-risk population.[3]

Once a positive FIT result is obtained, the standard protocol involves scheduling a colonoscopy within a specified timeframe to confirm the presence of cancer or precancerous lesions.[4] The timeliness of this follow-up colonoscopy is crucial, as delays can lead to the progression of the disease to more advanced stages, which are associated with poorer prognoses.[5] Alberta Health Services recommends that follow-up colonoscopies for average-risk individuals occur within 1–2 months after a positive FIT to ensure early detection and intervention.

Fig. 1 Diagnostic Process for Colorectal Cancer in Alberta



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CHALLENGES

Despite established protocols, several challenges impede the efficiency of the diagnostic phase in Alberta.

- **Resource limitations**, such as insufficient availability of endoscopy facilities and trained gastroenterologists, contribute to scheduling delays.[6]
- **Geographic disparities** also play a significant role, with residents in remote and rural areas facing longer wait times for diagnostic procedures compared to those in urban centers.[7]
- Diagnostic delays have been linked to an **increased likelihood of presenting with advanced-stage CRC**, which significantly reduces survival rates.[4]
- Studies indicate that **delays exceeding 12 months from a positive FIT result to colonoscopy are associated with a higher risk** of CRC diagnosis and progression to more severe stages.[5]
- Moreover, **prolonged diagnostic intervals can lead to increased healthcare costs** due to the need for more intensive treatments and longer hospital stays.[8]

OVERVIEW OF POPULATION-LEVEL EVIDENCE IN ALBERTA

Between 2017 and 2024, **four major population-based studies examined colorectal cancer (CRC) diagnosis and screening patterns in Alberta,** each offering a distinct lens and insights into how CRC is detected, how timely follow-up occurs, and what barriers impede equitable access to diagnosis. Drawing on comprehensive provincial datasets—including the Alberta Cancer Registry, Discharge Abstract Database, Ambulatory Care Classification System, and Physician Billing Database—**these studies collectively reveal a consistent pattern of delays and disparities across the CRC diagnostic continuum** linked to timeliness, care coordination, and geographic inequities.

Linked administrative data offered a robust, population-wide view of how **screening participation, referral pathways, and follow-up timeliness intersect with demographic and geographic factors.**

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Abdel-Rahman et al. (2022) conducted a population-based study examining the factors associated with **frequent visits to the emergency department (ED) before a CRC diagnosis**. The study found that female gender, higher comorbidity index, metastatic disease, proximal tumors, and living in the North zone of Alberta were significant factors associated with increased ED visits due to limited access to specialist care.

Brenner et al. (2024) explored the impact of the **time interval between a positive FIT result and follow-up colonoscopy**. The study concluded that delays over 12 months increased the risk of CRC and decreased the effectiveness of screening programs.

Sikdar et al. (2017) analyzed factors influencing the **time to colorectal cancer (CRC) diagnosis in Alberta** using population-level data from the Alberta Cancer Registry and provincial administrative databases. The study identified significant diagnostic delays among non-urgent symptomatic cases, with older adults, individuals with multiple comorbidities, and those living in lower-income areas most affected. Repeated visits to general practitioners and specialists were associated with longer diagnostic intervals, suggesting inefficiencies and gaps in referral coordination across care settings.

Jessiman-Perreault et al. (2023) conducted a geospatial, population-based analysis of **CRC screening participation** across Alberta using multiple linked administrative datasets. The study found that screening rates were lowest among residents of the North and Central Zones, areas characterized by high material and social deprivation and limited access to primary care. Individuals without a regular healthcare provider or living farther from diagnostic facilities were significantly less likely to be screened, revealing persistent geographic and socioeconomic disparities in access to preventive cancer services.

Collectively, **these studies provide a high level of completeness and reliability for assessing timeliness, equity, and care coordination in CRC pathways.**

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OVERVIEW OF FOUR ALBERTA POPULATION-BASED STUDIES

Sikdar et al.

- Data source(s): Alberta Cancer Registry + Administrative Health Data
- Key focus: Mode of detection & diagnostic interval
- Sample size: 9,626 patients
- Main findings: Longer diagnostic intervals linked to multiple provider visits, older age, and comorbidities.
- Policy relevance: Improve coordination between primary and specialist care.

Abdel-Rahman et al.

- Data source(s): Alberta Cancer Registry + NACRS
- Key focus: Emergency Department (ED) visits preceding diagnosis
- Sample size: 25,310 patients
- Main findings: 40% had ≥1 ED visit before diagnosis; higher reliance in North Zone and among women.
- Policy relevance: Expand outpatient diagnostic capacity and strengthen primary care access in underserved areas.

Jessiman-Perreault et al.

- Data source(s): Alberta Cancer Registry + Multiple Databases
- Key focus: Geospatial and socioeconomic disparities in CRC screening
- Sample size: 919,939 Albertans
- Main findings: Low screening uptake and delayed follow-up in deprived and remote regions.
- Policy relevance: Implement targeted outreach and patient navigation programs.

Brenner et al.

- Data source(s): Alberta Cancer Registry + Laboratory Data
- Key focus: Timeliness of colonoscopy after positive FIT
- Sample size: 63,232 individuals
- Main findings: Delays >12 months associated with 40% higher CRC risk and more advanced disease stage.
- Policy relevance: Monitor adherence to 8-week follow-up benchmark and automate reminders.

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STUDY #1. SCREENING TOOLS FOR EARLY DETECTION

Jessiman-Perreault et al. (2023) conducted a geospatial analysis, **identifying areas with high numbers of Albertans lacking colorectal cancer screening**, emphasizing the need for targeted interventions in the North and Central zones of Alberta. This population-based cross-sectional study used multiple administrative health data sources, including the Alberta Cancer Registry, Discharge Abstract Database, Ambulatory Care Classification System Database, and Physician Billing Database. The total study population included 919,939 Albertans aged 52 - 74 as of December 2019 and measured the risk of CRC diagnosis and the stage of cancer at diagnosis based on the time interval between the positive FIT and follow-up colonoscopy.[5]

The results revealed that **individuals from areas with higher material and social deprivation had a higher likelihood of delayed colonoscopies following a positive FIT result**, leading to advanced-stage CRC at diagnosis. The study underscores the **need for targeted interventions in underserved areas** to improve follow-up rates and CRC outcomes.[6]

Regardless of socioeconomic status, the analysis indicated that the risk of CRC, particularly advanced-stage CRC, is associated with significant days. For example, found that **two or more visits to GI specialists added 108 days to the diagnosis**.[6]

Older patients, those with multi-morbidities, and those living in lower-income areas experienced longer diagnostic intervals. This indicates **disparities in the timeliness of CRC diagnosis based on demographic and socio-economic factors**.[6]

Developing integrated care models that improve coordination among GPs, specialists, and other healthcare providers can help reduce diagnostic delays. Designing **targeted interventions for high-risk groups, such as older adults and those with multi-morbidities, can help address specific barriers to timely diagnosis**.[6]

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Ongoing research on colorectal cancer (CRC) detection and diagnosis remains essential to assess the impact of current policies and interventions. Continued evaluation will help identify persistent gaps and guide evidence-informed policy adjustments, ensuring that diagnostic pathways and healthcare practices evolve toward greater effectiveness, equity, and sustainability.[6]

STUDY #2. FACTORS ASSOCIATED WITH FREQUENT EMERGENCY DEPARTMENT (ED) VISITS IN THE 3 MONTHS PRECEDING A CRC DIAGNOSIS

Frequent ED visits in the months preceding a CRC diagnosis are indicative of systemic inefficiencies in timely diagnosis and care pathways. Abdel-Rahman et al. (2022) analyzed the patterns of ED visits in Alberta and identified several contributing factors, including advanced disease stage at presentation, a higher comorbidity index, and geographic disparities in healthcare access.[7] Notably, **patients with proximal tumors, women, and residents of remote or underserved areas such as Alberta's northern zone exhibited a higher likelihood of multiple ED visits**.[7] A total of 25,310 patients diagnosed with CRC between 2004 and 2018 were included in the study along with their records linked to provincial registries in Alberta. The National Ambulatory Care Reporting System was used to identify patients who visited an ED within 3 months of a diagnosis of CRC.[7] Multivariable logistic regression analysis was used to identify factors associated with any ED visits as well as frequent (≥3) ED visits.[7]

These findings underscore the critical gaps in primary care and outpatient services, which, if addressed, could redirect patients to more efficient and cost-effective diagnostic pathways.[7] When linked to broader CRC care disparities across Canada, these findings reveal persistent inequities in healthcare access and utilization. **Vulnerable populations, such as those in socioeconomically underserved areas or remote regions, disproportionately rely on ED services** due to limited access to specialized care and timely diagnostics.[7]

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This over-reliance on EDs not only delays diagnosis but also leads to poorer outcomes, as patients presenting emergently are more likely to have advanced-stage CRC at diagnosis, requiring more intensive treatment with lower survival rates.[7]

An important quality indicator for colorectal cancer (CRC) care is the proportion of patients diagnosed emergently versus electively.[8] **Patients diagnosed in emergency situations are more likely to present with advanced-stage disease, leading to poorer outcomes.** Emergency department (ED) diagnosis is also generally more costly for the healthcare system compared to outpatient ambulatory assessments.[8]

STUDY #3. TIME TO CRC DIAGNOSIS AFTER A POSITIVE FECAL IMMUNOCHEMICAL TEST (FIT)

Brenner et al., (2024) examined the **relationship between the interval from a FIT+ result and subsequent colonoscopy**, and the resulting impact on CRC diagnosis and stage. This population-based retrospective cohort study analyzed data from 63,232 Albertans aged 50–74 who had at least one FIT+ between 2014 and 2017, using linked administrative and laboratory datasets. The study assessed CRC diagnosis and CRC stage at diagnosis following a FIT+ and a subsequent diagnostic colonoscopy between 2014 and 2019. Multivariable logistic regression models were used to evaluate the relative risk of any CRC or advanced-stage CRC, presenting results as crude odds ratio (OR) and adjusted OR (aOR) with 95% confidence intervals (CIs)[4] when follow-up colonoscopies were delayed beyond 12 months after a positive FIT.

Main findings suggest that the risk of CRC remained relatively constant for colonoscopies performed within 1–12 months of a positive FIT. As longer delays increased the probability of being diagnosed with advanced-stage disease, **delays beyond 12 months** were associated with a **40% higher likelihood of CRC diagnosis** (OR = 1.40; 95% CI: 1.13–1.73).

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These findings reinforce the **importance of ensuring diagnostic colonoscopy within eight weeks of a positive FIT**, as recommended in Canadian screening guidelines. Delays exceeding one year significantly reduce the effectiveness of screening programs and may contribute to preventable morbidity and mortality.

STUDY #4. FACTORS INFLUENCING THE DIAGNOSTIC INTERVAL OF COLORECTAL CANCER (CRC) IN ALBERTA

Sikdar et al. (2017) investigated the **factors influencing the diagnostic interval of colorectal cancer (CRC)** in Alberta, Canada. The study analyzed data from the Alberta Cancer Registry and other population-based administrative health datasets, covering all individuals residing in Alberta diagnosed with CRC between 2004 and 2010.[6]

The research focused on identifying demographic, clinical, and healthcare utilization factors related to how CRC is detected (urgent, screen-detected, or symptomatic) and the length of time from the first CRC-related healthcare visit to the diagnosis.[6] The findings highlight the need for improving diagnostic accuracy during colonoscopy to reduce delays in CRC treatment.[6] The study utilized various statistical methods to analyze the impact of these delays.[6]

One of the major challenges highlighted is the significant diagnostic delay for non-urgent CRC cases. **The study found that the median time to diagnosis for non-urgent symptomatic patients was 84 days, with 27% waiting over six months.**[6]

Frequent visits to general practitioners (GPs) and gastrointestinal (GI) specialists were found to increase diagnostic delays. **Patients with three or more GP visits had a median delay of 140 days, while two or more visits to GI specialists added 108 days.**

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Findings suggest that the risk of any CRC or advanced-stage CRC remained high and consistent for follow-up colonoscopies performed within 1–12 months of the the fecal immunochemical test (FIT).[4] After 12 months, the risk increased significantly, especially for advanced-stage CRC. Older patients, those with multi-morbidities, and those living in lower-income areas experienced longer diagnostic intervals. This indicates disparities in the timeliness of CRC diagnosis based on demographic and socio-economic factors.[4]

Fig. 2 Diagnostic delay for non-urgent CRC cases

84 Days median time to diagnosis for **non-urgent symptomatic patients**

108 Days median time to diagnosis for patients with **2+ visits to GP or GI specialist**

140 Days median time to diagnosis for patients with **3+ visits to GP or GI specialist**

Overall, Sikdar et al. (2017) found that **enhancing diagnostic protocols and provider training could lead to more timely surgical interventions and improved patient outcomes.**[6] Patients who experienced sampling errors faced significant delays in receiving surgery, underscoring broader system inefficiencies—particularly poor coordination among healthcare providers—which remain major contributors to delays in CRC diagnosis.[6]

Developing **integrated care models** that improve coordination among GPs, specialists, and other healthcare providers can help reduce diagnostic delays. Designing **targeted interventions for high-risk groups**, such as older adults and those with multi-morbidities, can help address specific barriers to timely diagnosis.

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NEXT STEPS

To address these challenges, several strategies have been proposed and implemented in Alberta:

Sikdar et al. (2017) emphasized **strengthening coordination between primary and specialist care by expanding endoscopy capacity, training more specialists, and investing in advanced diagnostic equipment to reduce wait times**.[6] They also recommended improving communication pathways, referral triage, and shared decision-making to **minimize redundant consultations**. System-wide **monitoring of diagnostic intervals** through centralized databases, paired with **integrated electronic referral systems**, could further support timelier diagnoses and reduce avoidable delays.[6]

Abdel-Rahman et al., (2022) underscored the need to **reduce reliance on emergency settings for CRC diagnosis** through improved access to outpatient diagnostic and screening services. Policy implications include **expanding community-based endoscopy capacity, strengthening primary care pathways for symptom evaluation, and ensuring continuity between emergency and outpatient care through integrated data systems**. As telemedicine initiatives and mobile health units have been introduced to improve access to diagnostic services in remote regions,[7] more targeted outreach in underserved zones could mitigate the geographic disparities that contribute to late-stage emergency presentations.[7]

Jessiman-Perreault et al., (2023) recommended targeted, **equity-oriented interventions** to address the uneven distribution of screening participation. They advocated for the use of **geospatial mapping to identify under-screened populations and guide resource allocation**. Strategies such as mobile screening units, mailed FIT kits, and patient navigation programs could help overcome access barriers. Integrating deprivation indices into health system planning would also enable Alberta Health Services to tailor interventions to high-risk areas, ensuring more inclusive and equitable screening coverage.[5] Therefore, ongoing research and policy adjustments are essential to optimize the diagnostic phase of CRC care in Alberta. Implementing data-driven approaches to identify bottlenecks in the diagnostic pathway can inform targeted interventions.[5]

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Brenner et al., (2024) called for **establishing performance benchmarks for FIT-to-colonoscopy follow-up**, emphasizing that colonoscopy should ideally occur within eight weeks of a positive FIT result. To achieve this, Alberta's health system should **enhance endoscopy capacity, automate electronic tracking and reminder systems for follow-up procedures, and introduce patient navigation programs** to coordinate timely care. Embedding time-to-diagnosis metrics within quality assurance frameworks would promote accountability, optimize resource use, and ensure that screening benefits translate into early and equitable CRC detection.[4] Furthermore, integrating patient navigation programs that provide individualized support throughout the diagnostic process can enhance patient adherence to follow-up procedures and improve overall diagnostic efficiency.

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