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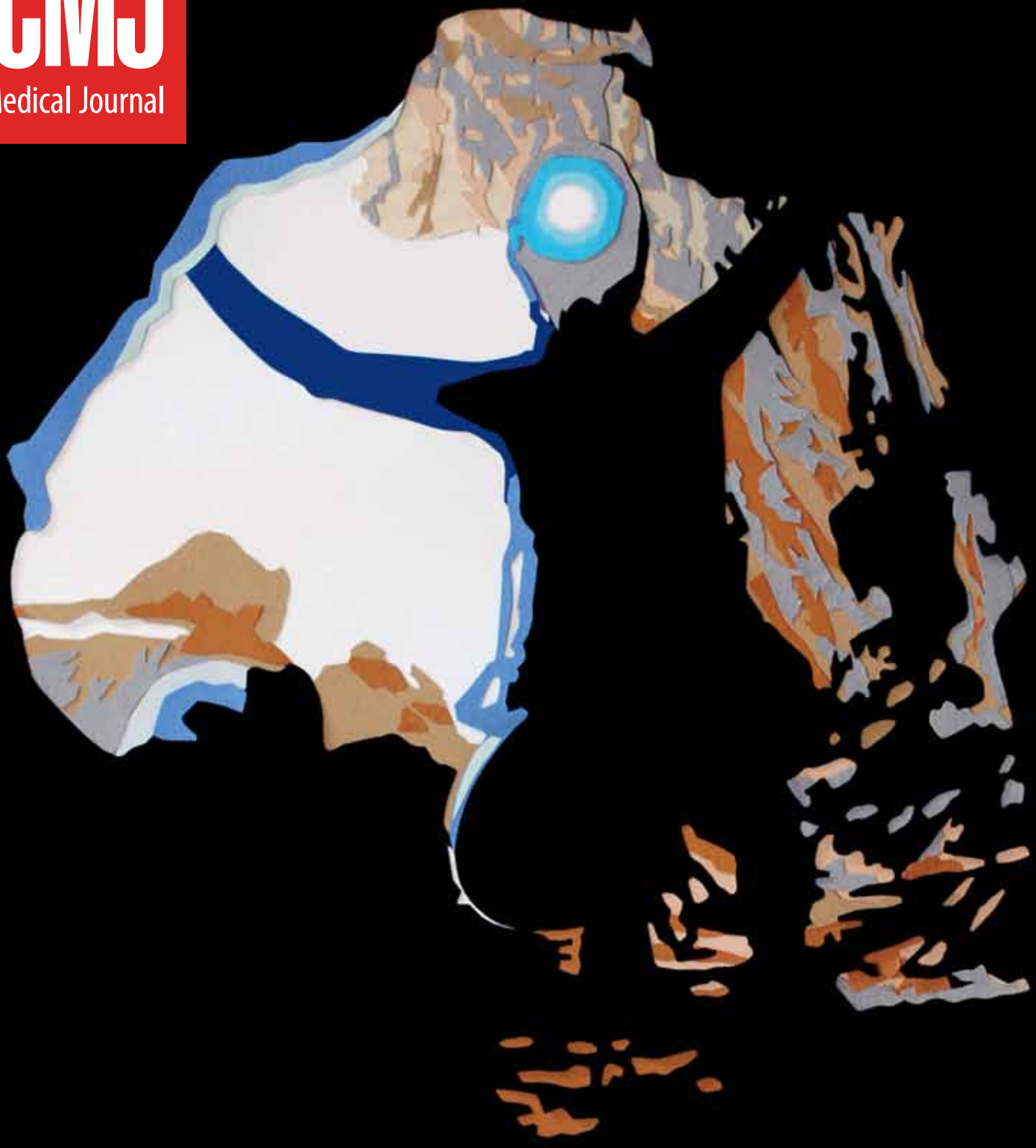
Pages 189–232



THEME ISSUE:

Screening for colon cancer

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July/August 2023
Volume 65 | No. 6
Pages 189–232

Dr Jim Petzold tells his surprising story about Robert William Service's Yukon cabin in the 1970s. "The Dawson City cabin" is on page 228.

Theme articles and contents continued on page 192

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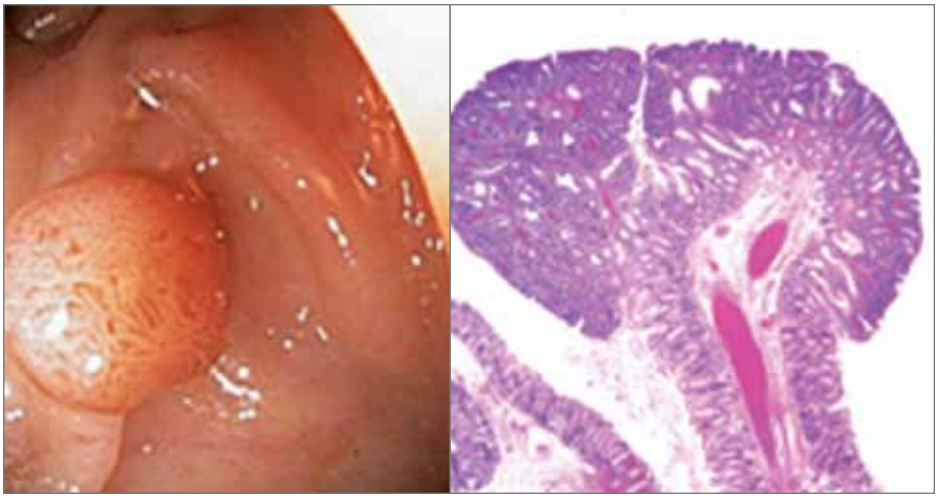
ON THE COVER
Colorectal cancer screening reduces both mortality and incidence through the detection of cancer at an early stage of disease and the detection and removal of precancerous lesions. Theme issue begins on page 200.



Endoscopic (left) and histologic (right) images of a colon adenoma. From the article "Updated guidelines on colonoscopy surveillance," beginning on page 211.

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Theme articles and contents continued from page 191

Looking for the News?
Our News section has moved online so that it can be more timely. Find it at bcmj.org/article-type/news.

Can ChatGPT be your coauthor?

In January 2023, the Elsevier journal *Nurse Education in Practice* ignited a firestorm when it recognized ChatGPT as a coauthor alongside Siobhan O'Connor **[Figure]**.[1] The piece quickly sparked debate among publishers, editors, and researchers about whether a bot can qualify as an author.[2-4]

ChatGPT is an artificial intelligence (AI) language model developed by the company OpenAI. It uses pre-existing books, websites, and other sources to generate human-like text and can assist with things like writing code, composing essays, and answering questions.

Many writers like AI language models because they free up time to focus on higher-level skills like analysis and creativity rather than structure and grammar. Prominent author and Wharton professor Adam Grant has even stated that his classes are now AI mandatory because he does not want to read bad writing anymore.[5] But how should we recognize ChatGPT's contributions?

According to the International Committee of Medical Journal Editors (ICMJE), the criteria for authorship include four concepts: substantial contributions, drafting the work, final approval, and accountability.[6] The fourth criterion is the most glaringly lacking for ChatGPT, as it cannot be accountable for its work, nor can it assume the moral, legal, and ethical responsibilities required to ensure the accuracy and integrity of the work.[3,6] Furthermore, it cannot own or assign copyright because it does not have legal personality. Some have questioned whether ChatGPT meets *any* ICMJE authorship criteria, because its contributions are "merely borrowed ideas from its database of information from the Internet," which is not the same thing as "intellectual content."[3]


Nurse Education in Practice
Volume 66, January 2023, 103537
Editorial
Open artificial intelligence platforms in nursing education: Tools for academic progress or abuse?
Siobhan O'Connor, ChatGPT

FIGURE. Screenshot showing ChatGPT listed as a coauthor of an article.

So the verdict, at least for now, is that ChatGPT is not a valid author.[3] *Nurse Education in Practice* has since published a corrigendum to remove ChatGPT, leaving a sole (human) author on the paper.[8] The most likely approach to AI in publishing appears to be the one taken by *JAMA*, which is that journals will discourage content created by AI and require a clear description of the contribution.[7] The *BCMJ* has updated our own author guidelines (https://bcmj.org/submit-article) in accordance with the ICMJE recommendations. However, this consensus[2] among medical journals does not erase the fact that ChatGPT and other forms of AI have become commonplace writing tools and are not going away.

One thing to consider when using ChatGPT in your scientific writing is that it is a content generator, not a reference librarian. OpenAI acknowledges that the technology will generate "plausible-sounding but incorrect or non-sensical answers."[9] I have found such answers to be frighteningly realistic. For illustration, I asked ChatGPT to create a medical information sheet on "why children should eat ice cream for breakfast." I told it to include references to published literature and write with a medical lens. Snippets of the result are shown in **Boxes 1–3**, and as you can see, it both creates references and includes completely fabricated information from this "published literature" in the written text. When I told it that the references were not real, ChatGPT apologized for any confusion and told me that "as an AI language model I do not have the ability to access external sources or verify the accuracy of references." So, while ChatGPT made a compelling and ostensibly supported argument for ice cream, I am not swapping out my kids' morning oatmeal just yet.

BOXES 1–3

Title: "Exploring the Neurocognitive and Dietary Impact of Ice Cream Consumption at Breakfast in Children: A Review of Literature"

A pivotal study in the American Journal of Clinical Nutrition examined the effects of morning ice cream consumption on cognitive performance(1). Dr. Yoshihiko Koga found that children who consumed ice cream exhibited better performance on mental tasks, faster reaction times, and heightened alertness. The researcher attributed this enhancement to the glucose content in ice cream, providing an immediate source of energy for the brain, thus boosting cognitive functioning.

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Ultimately, while AI like ChatGPT can augment human creativity and productivity, the humans behind the AI are responsible for the final interpretation of the work. The debate of AI authorship underlines the importance of understanding the capabilities and limitations of AI, to harness its potential while upholding academic and scientific integrity. ■

—Caitlin Dunne, MD

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References continued on page 196

The private health care ship has sailed

On 6 April 2023, the Supreme Court of Canada announced its decision to not hear an appeal of the landmark Cambie Surgeries Corporation case, effectively closing the door on private care for all but a privileged few, including out-of-province patients, RCMP, injured workers, and certain others. At a media scrum, BC's health minister celebrated the announcement as "a vindication of the public health care system." He continued: "My focus continues to be to deliver the best possible service in that system, and that's, that's what we're working to do, and we've done that consistently, and that's what we're going to continue to do."[1]

While a measure of self-congratulation is understandable following victory in hard-fought litigation that dragged on for nearly 2 decades, it would have been more reassuring had the minister adopted a humble and solemn tone to mark the occasion. He might have expressed that while he was pleased with the court's decision not to overturn the law banning private care, he recognized that having eliminated the private option, he and his government bear, more than ever, responsibility for ensuring that essential health care is available to all British Columbians at all times. He might even have expressed sadness that he has failed to meet that goal during his 6-year tenure as health minister.

Why a mea culpa? Because in the last decade, a formerly robust medical care system has been allowed to collapse from the ground up. Historically, most medical services in BC were delivered by family physicians (FPs) who provided comprehensive care and managed their offices, and most of the province's hospitals, with the pragmatic sensibility of small-business owners, with one eye on the customer and the other on the account books. Now, 20% of residents do not have an FP, forcing them to seek episodic care at overrun clinics and clog dangerously overburdened emergency rooms. In most communities, the only timely pathway to specialist referral is through the emergency room. Specialists are stressed and demoralized by the need to provide ongoing care to patients without an FP, hampering their ability to see new referrals.

Meanwhile, as public health care is tanking, as of 1 April 2023, contraception will be provided free to all. This and other targeted spending initiatives makes me wonder if the government is more concerned with positive polling than ensuring the constant availability of basic care.

The underlying problem is not a lack of resources but rather a failure of health care leadership to level with the public regarding three economic realities:

1. Health care resources are finite; public health spending in Canada has essentially capped out at approximately 12% of GDP, a percentage exceeding that of most comparable OECD countries. Additional funding from the public purse cannot be expected.
2. Twenty-first-century health care has become so technology reliant, complex, and costly that no state-funded-and-run system can possibly deliver all that modern medicine has to offer "for free" to every citizen.
3. Resource limitations in association with ever-increasing demands on the system necessitate preferential allocation of funding to health care that delivers the biggest bang for the buck—comprehensive primary care.

In both rich and poor countries, functional health care systems ensure that, at a minimum, all patients have access to primary and preventive care. Cuba, a developing country with limited financial resources, achieves laudable outcomes by devoting the lion's share of health spending to such care. Yet in BC, 1 million unattached patients are unable to access longitudinal primary care. Neither patients nor providers are offered any incentive to "choose wisely," such that duplication and overuse of expensive, low-yield investigations are commonplace, and no-holds-barred medical intervention has become a surrogate for honesty and compassion at the end of life. Patients with primary care issues but no FP flock to the emergency room, where long waits, unfamiliar faces, excessive labs, and unnecessary CT scans provide a costly and unsatisfactory substitute for longitudinal care. At a time when the need has never been greater, ongoing psychiatric care has become virtually impossible to access for all but hospitalized patients and those with severe mental illness managed by community mental health teams.

Former British prime minister Tony Blair stated, "The art of leadership is saying no, not saying yes. It is very easy to say yes." It is critical that health leaders stop perpetuating the myth that public health care can do everything for everyone. Access to basic care represents a minimum standard when the private care escape hatch has been sealed. We need new leaders with the courage and conviction to look beyond political expediency when allocating resources. The current failure to soundly manage a complex system is destroying the original vision of medicare—essential health care for all citizens irrespective of means. ■

—David J. Esler, MD

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Letters to the editor

We welcome original letters of less than 500 words; we may edit them for clarity and length. Letters may be emailed to journal@doctorsofbc.ca or submitted online at bcmj.org/submit-letter and must include your mailing address, telephone number, and email address. Please disclose any competing interests.

Best practices in breast cancer screening versus resource constraints: A concordance statement

I would like to thank Dr Gordon for her well-intentioned article,[1] which advocates for improved screening of breast cancer, the most common cancer in Canadian women. I read the data she presented with interest and concern.

My clinical experience has been that breast cancer screening, and its response times, is one of the hardest-hit areas in our health care system as we emerge from the COVID-19 pandemic. I have patients anxiously waiting 12 months for their 6-month follow-up imaging after abnormal initial screens. I recently saw a woman with a high-risk family history present with a palpable breast nodule whose initial appointment for diagnostic mammogram was scheduled 3 months after the requisition was sent. The same patient was subsequently told her biopsy wait time would be 3 to 4 months.

Successful efforts to expedite my own patients' appointments have no doubt left another woman with similar risks, but without the confidence to self-advocate, or without the benefit of a primary care provider to advocate on her behalf, one appointment further down the wait list for her assessments.

The benefit of enhanced screening practices is dependent on a health care system with the resources to facilitate these tests and to respond in a timely manner to positive screens. Dr Gordon has already sounded the alarm to the burgeoning response times between abnormal screens and subsequent scans and biopsies.[2] This lag is distressing to patients and will result in higher morbidity and mortality rates from detected cancers.

The proposed increase in screening of women ages 40 to 49, and annual instead of biannual mammography, would more than double the volume of scans in the Breast Screening Program. Screening ultrasound for women with dense breasts has long wait lists at limited imaging sites where this service can be accessed. Breast MRI, in my practice experience, is a resource so scarce that it is realistically available in this province only to women who are already attached to a cancer centre.

On the treatment end, we all recognize that capacity is strained. Recently in the news we learned that some British Columbian breast cancer patients will be treated at centres in Washington.[3]

While I am strongly in favor of an evidence-based approach to screening optimization, this cannot be pragmatically applied without considering access in our resource-strained system. Dr Gordon's well-referenced article[1] admirably sets out an idealized end goal for our provincial breast cancer screening practices, but until such time as our current program wait times have been addressed, "how to make it even better" requires prioritizing resources to improve the current system before expanding its use.

—Colette Davis, MD
Vancouver

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Access to joint replacement surgeries

I was on the wait list for hip replacement due to osteonecrosis and experienced severe pain; the relief from surgery made life worthwhile. To address the wait list, our government announced the creation of five joint replacement specialty programs throughout BC in 2018.[1] This initiative followed the results of a study at Richmond Hospital (2004–2014), which streamlined joint replacement surgery by using specialized teams operating in linked operating rooms.[2] The program standardized the equipment and procedures and enabled team members to assist each other while rooms were cleaned. Completed operations increased by 135% for the same operating room time. This resulted in significant cost savings, increased expertise, and a decrease in surgical complications.

This specialized team approach was refined by UBC's Centre for Surgical Innovation, using four linked operating rooms, which improved efficiency at all levels and reduced the length of hospital stays. The Victoria Enhanced Recovery Arthroplasty program was recently launched to reduce

postsurgical pain, shorten recovery time, and allow for same-day discharge, which could be feasible in up to 60% of patients.[3]

Since 2018, the wait list for joint replacement surgery has increased, and the five joint replacement programs in BC have not become a reality. The South Island Surgical Centre bought by the government in 2022 could have become a specialized program centre for joint replacement surgery, with four large operating rooms and surgical procedures already being funded by provincial health care. There are many such facilities available in BC.

Money spent buying buildings might be better used to pay for procedures and create community-based specialized programs in BC. Resorting to paying for patients to be treated in the US, as has happened with cancer patients, represents a failure of the health care system. The Government of Ontario has already invested in partnerships with community surgical centres, and I urge our BC government to be bold, creative, and innovative in preserving our public health care system.

BC has developed the most efficient and cost-effective system for joint replacement surgery, and it is time for our government to take action so our surgeons can treat their patients.

—Charles Ludgate, MD, OBC
Victoria

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Correction: Practising environmentally sustainable health care every day

The Council on Health Promotion article published in the May issue (*BCMJ* 2023;65:143-144) has been revised online. The authors requested the highlighted change postpublication: "Other examples include switching from single-use disposable to reusable products, which have lower life cycle environmental impacts, using nonsterile gloves (or no gloves) when possible, choosing oral over parenteral medications, switching ~~to~~ from desflurane or using IV anesthetics, and using the least toxic alcohol-based cleaning agents." Thank you to Dr Roger Taylor for bringing this error to our attention.

EDITORIALS

Continued from page 193

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The stretch from "either/or" to "both/and"

When we live with tension, we must stretch.
When we hold opposing views, we have the chance to stretch.
When we learn new things, we are given the opportunity to stretch.
When we decide to stretch, we grow.
When we choose to stretch, we understand.
When we know how to stretch, we balance.

We are taught in medical training that there is a right answer. That if we have the right information, take the right history, perform the right examination, and order the right tests, with a mastered skill, we will come to the right diagnosis. We will unlock the diagnostic puzzle and all will be solved. Each of us has done many exams to prove this truth. Our knowledge is the power. Our information is the answer. And, if only we had more power in our understanding and information, we would be able to unlock more of the right answers. If only.

Martin Luther King Jr. said: "Power without love is reckless and abusive, and love without power is sentimental and anemic."

Power and love: are they not the same? As an educated, white, straight, cisgender, married, professional man, I carry a lot of privilege and, ultimately, a significant amount of power. But what I do with that power is most important. Do I hold it over people, or do I use it to help empower others? And when it comes to love, I love a few people *a lot*. I care *about* many others. And I care *for* many more. Does that mean I can only love some of them more than the rest?

Does this mean that either I love them or I have power over them? Is it either I care for them or I want to empower them? I neither want to be reckless or abusive nor want my love to be sentimental or anemic.

Can I choose?

What if I stretch? What if I stretch to *both*? What if I both want to empower someone *and* want them to be cared for? What if I want to be both understanding *and* differing? What if I want to both hold the power of knowledge *and* exhibit compassion with love? How do I do that? Do I expect the other person to change? Can I stretch to make this a reality?

There are limits to my stretch. I may not be able to stretch across the entire spectrum. I may not be able to hold the power and love someone unconditionally. The polarity may be too much. But what if I stretch a little more each day? What if I extend my power to care for a patient in my office a little more today than I would have yesterday? What if I stretch into a little more strength when I want to be seen as more than sentimental but still ensure there is substance?

How can I find the balance of both? How can I stretch to find my voice and share my voice and extend my power and empower others and show compassion and love myself, all while ensuring I don't stretch too much or too thin? How much stretch is too much, where I lose my power or become weakened?

I will seek to balance. I will try to stretch and aspire to find my "both/and" instead of my "either/or."

I will seek to find that balance between love and power, and I hope that you will too. ■

—Joshua Greggain, MD
Doctors of BC President

Building awareness of barriers to exercise in rural and remote areas

Expanding awareness of the facilitators and barriers to physical activity in rural communities can lead to more effective physical activity promotion in primary care settings.

Cara L. McCulloch, MD, Alanna Koopmans, BHSc, Sandra Allison, MD, FRCPC, MPH, Chelsea A. Pelletier, PhD

Rates of chronic disease have increased drastically over the past century, putting enormous strain on the global health care system.[1] Physical activity is a well-established and highly effective preventive treatment, showing results for primary and secondary prevention of over 30 chronic health conditions.[2-4] The World Health Organization indicates lack of physical activity to be the fourth-leading risk factor for mortality, responsible for 6% of deaths globally, and a projected economic burden of US$300 billion by 2030.[5,6] In Canada, rates of physical activity are low, with only one in five Canadians meeting the recommended 150 minutes per week of moderate to vigorous physical activity.[7]

In the *BCMJ* there have been discussions about physicians' roles in promoting physical activity and the associated systemic challenges in physical activity counseling and prescribing practices.[8,9] It is important to include the experiences of rural, remote, and northern communities in these discussions. Rates of participation in physical activities are often lower among persons living in rural areas, which contributes to overall worse health outcomes compared with their urban-dwelling peers.[10-12] Understanding barriers to physical activity for rural populations is an important step to addressing physical inactivity and physical activity inequities.

Researchers have examined barriers to physical activity in rural populations around the world and identified fewer available resources and formal organizations promoting physical activity in these areas; long distances to participate in formal physical activity, weather, and perceptions of safety due to wildlife have been documented as barriers.[13-15] For example, a study of adults in rural Saskatchewan found that adverse weather conditions, including fear of falling on ice, were a major barrier to engaging in physical activities.[16] The presence or absence of indoor facilities, access to trails or parks, proximity to compelling destinations, and pleasing neighborhood aesthetics have also been found to influence rates of physical activity.[13,17,18] These factors highlight how the built and natural environments can lead to either increased or decreased rates of physical activity.

Although research has indicated that rural residents have less social support and fewer opportunities to be physically active, rural residents are more likely to prefer and enjoy physical activity than urban residents.[19] Rural locations also have unique factors that can facilitate activity, such as the diversity of physical activity options in natural settings.[20] Working to address barriers to physical activity and incorporate communities' strengths may enable rural health practitioners and patients to meet physical activity guidelines.

In 2017, primary care practitioners from the Northern Health region were asked about their physical activity counseling and prescribing practices. Responses to this survey indicated that practitioners do not have enough time to properly discuss physical activity with patients; exercise may slip to the bottom of the priority list of things to discuss. The demand on primary care providers' time is likely exacerbated for rural practitioners, who tend to have a relatively broader scope of practice.[21,22] Appointment time constraints become particularly salient for practitioners treating patients with comorbid conditions, where adding an additional factor to discuss in an already full appointment may be overwhelming. When practitioners do have capacity to discuss physical activity with patients, they indicate the need for better methods or protocols to communicate exercise recommendations.

Dr McCulloch is a resident physician in emergency medicine at the University of Calgary and a graduate of the University of British Columbia Northern Medical Program. Ms Koopmans is a medical student in the UBC Northern Medical Program and a graduate of the University of Northern British Columbia Bachelor of Health Sciences (Honours) program. Dr Allison is the medical health officer for the Vancouver Island Health Authority and a clinical associate professor in the School of Population and Public Health at UBC. Dr Pelletier is an associate professor in the School of Health Sciences at UNBC and an affiliate associate professor with the Department of Family Practice, Faculty of Medicine, at UBC.

This article has been peer reviewed.

In the 2017 survey, we assessed practitioners' perceptions of barriers to physical activity for rural and remote patients. Some clinicians expressed concern that the population of patients they served was too frail or may not have the ability to participate in physical activity, as well as a lack of motivation or time for patients to meet Canada's physical activity guidelines. Some practitioners also assumed patients would not be interested in a physical activity prescription. Socioeconomic factors such as the costs associated with equipment, winter clothing, fitness classes, and gym memberships were identified as perceived barriers for patients. Environmental factors impacting physical activity participation were also highlighted, including icy weather conditions, limited daylight hours, and few sidewalks.

We further probed practitioners on their perceptions of facilitators to physical activity in the communities they serve. Community infrastructure was discussed as an important facilitator to physical activity engagement, particularly in towns and communities with accessible facilities year-round, such as indoor gyms, swimming pools, and community centres. Responses indicated that engagement in physical activity was facilitated in certain communities in conjunction with adequate infrastructure in that region (e.g., walking trails, cross-country skiing facilities, mountain biking trails, hiking paths). Practitioners highlighted that in some communities there is a culture of fitness, which they saw as an important facilitator to physical activity engagement.

Primary care providers remain an important means of connecting patients to the health care system. Creating awareness of the facilitators and barriers to physical activity in rural populations will lead to more effective promotion of physical activity in primary care in the rural, remote, and northern communities of BC. Understanding these barriers will also facilitate referral to other health and exercise professionals (e.g., kinesiologists, physiotherapists, personal trainers) trained in physical activity promotion to meet patient goals.[23,24]

As demonstrated in our 2017 survey, lack of time can affect a clinician's ability to discuss and promote physical activity with patients, and when we are able to discuss physical activity participation with patients, it is essential we are aware of the potential barriers they face.

As clinicians, it is important we evaluate our perceptions of what is preventing patients from participating in physical activities; we may find our perceptions do not align with patients' realities. Research on rural and remote health continues to build, yet gaps remain in our understanding of specific factors that support community-based physical activity interventions in rural, remote, and northern communities.[12] Ultimately, strategies to increase physical activity in patients living in rural and Northern British Columbia need to focus on the unique aspects of each community and patient. ■

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Jennifer J. Telford, MD, MPH, FRCPC, CAGF, FACG

Screening for colon cancer

Dr Jennifer J. Telford

I completed my Bachelor of Science, medical degree, and internal medicine residency at the University of British Columbia, then moved to Harvard University for my gastroenterology and advanced endoscopy fellowships and a Master of Public Health. I have worked as a gastroenterologist at St. Paul's Hospital since 2004, and I joined the team at BC Cancer in the fall of 2008 to develop the provincial Colon Screening Program, serving as the program's medical director.

I am grateful for the opportunity to serve as the guest editor of this *BC Medical Journal* theme issue and have assembled a multidisciplinary group of authors dedicated to promoting colon screening in our province. More than 3000 British Columbians are diagnosed with colorectal cancer every year, which makes it the third-most-common cancer. While survival rates are very high if detected at an early stage, it remains the second-leading cause of cancer-related death in BC. Screening reduces both colorectal cancer mortality and incidence through the detection of cancer at an early stage of disease and the detection and removal of precancerous lesions. There have been several important publications pertaining to colon screening in the last several years, which have informed clinical practice guidelines in BC.[1,2] Our goal is to review the source literature and discuss the updated screening and surveillance guidelines. We also provide information and links to assist primary care providers in accessing screening services for their patients.

Our first article is an overview of the BC Colon Screening Program. Ms Laura Gentile and Ms Margot Heintz provide informed perspectives from operations and patient navigation, respectively. The program is presented in the context of the national screening landscape and the most up-to-date evidence for colon screening.

In the second article, Dr James Gray, co-chair of the Guidelines and Protocols Advisory Committee, which is a joint endeavor of the BC Ministry of Health and Doctors of BC, discusses early-onset colorectal cancer. There has been a concerning increase in the incidence of colorectal cancer in adults under 50 years of age; numerous publications in medical journals and the lay press have highlighted this trend. Dr Gray reviews the available literature and knowledgeably discusses whether the age to commence colon screening should be lowered.

The third article focuses on colonoscopy surveillance for individuals with a personal history of a precancerous lesion resected from the colon or rectum. Dr David Schaeffer, a gastrointestinal pathologist and the pathology lead for the BC Colon Screening Program, presents a summary of the different types of precancerous lesions in the colon and a review of recent publications that support less frequent colonoscopy surveillance for individuals with low-risk precancerous colorectal lesions. The new BC Guidelines on colonoscopy surveillance represent a significant change from the previous guidelines and physician usual practice.

The final article explores the differences between familial and hereditary colorectal cancer and the different screening strategies tailored to individual risk. We were fortunate to have Ms Jennifer Nuk, practice leader of genetic counseling with the BC Hereditary Cancer Program, as a contributing author.

Our understanding of colorectal cancer risk and screening benefits has evolved significantly during my career, and we can expect further guideline updates as new evidence becomes available. ■

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This editorial has been peer reviewed.

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Laura Gentile, RD, MHA, Margot Heintz, BA, RN, CGN(C), Jennifer J. Telford, MD, MPH, FRCPC, CAGF, FACG

BC Colon Screening Program

Screening for colorectal cancer saves lives. It is more effective when undertaken in an organized screening program.

ABSTRACT: Screening for colorectal cancer reduces colorectal cancer–related morbidity, mortality, and incidence. Screening is most effective when administered through an organized program. The BC Colon Screening Program uses a biennial fecal immunochemical test to screen average-risk individuals from 50 to 74 years of age. The program facilitates colonoscopy for those with a positive fecal immunochemical test or as a primary screening strategy for individuals with a high-risk family history. The program is responsible for the technology infrastructure, recalling participants for repeat testing, setting quality standards, and monitoring participant outcomes. A comprehensive quality assurance and improvement program underpins screening activities and includes regular feedback to participating physicians and health authorities.

Screening for colorectal cancer

Colorectal cancer is the third-most-common cancer diagnosis in British Columbia and the second-leading cause of cancer death. It will affect approximately 1 in 14 men and 1 in 16 women during their lifetime.[1]

Ms Gentile is operations director for the BC Colon Screening Program and the BC Cervix Screening Program. Ms Heintz is a patient coordinator with the Interior Health Authority Colon Screening Program at Penticton Regional Hospital. Dr Telford is a clinical professor of medicine at the University of British Columbia, a gastroenterologist at St. Paul's Hospital, and medical director for the BC Colon Screening Program.

This article has been peer reviewed.

Screening for colorectal cancer detects cancer at an earlier stage of disease, which reduces associated morbidity and mortality and leads to the detection and removal of precancerous colorectal lesions, thereby reducing colorectal cancer incidence. In Canadian modeling studies, several colon screening strategies have been shown to be cost-effective.[2] Screening for colorectal cancer with a biennial fecal occult blood test such as the fecal immunochemical test, preferably conducted through a screening program, is one of the strategies recommended by the Canadian Task Force on Preventive Health Care.[3]

Why screen for colorectal cancer?

- It reduces deaths due to colorectal cancer.
- It reduces diagnoses of colorectal cancer.
- It reduces colorectal cancer treatment morbidity (stoma, adjuvant radiation/chemotherapy).
- It is cost-effective.

The best evidence for screening is derived from trials that randomly assign individuals to a control group (no invitation to screen) or to a group that receives an invitation to be screened. **Table 1** presents the pooled results from randomized controlled trials that assessed annual or biennial guaiac fecal occult blood tests (gFOBTs), 1- or 2-time flexible sigmoidoscopy, and colonoscopy.[4,5] The results are the intention to screen results, which reflect analysis of the entire cohort, whether or not they participated in screening. The period for detecting meaningful differences in colorectal cancer incidence and mortality is at least 10 years. While the meta-analysis of pooled gFOBT trials did not demonstrate a decrease in overall colorectal cancer incidence,[4] there was a reduction in late-stage colorectal cancer incidence: relative risk = 0.92 (95% CI, 0.85-0.99).[3] Colon screening did not reduce all-cause mortality.[3,4]

The gFOBT has been supplanted by the fecal immunochemical test. Several brands are available, which produce either qualitative (positive or negative) or quantitative (mcg globin/g feces) results. Fecal immunochemical tests contain antibodies to human globin, are more specific than gFOBTs, and do not require dietary or medication restrictions. Furthermore, fecal immunochemical tests require a single sample of stool compared with the three specimens required with gFOBTs. These factors have contributed to improved participation in screening

TABLE 1. Results from randomized controlled trials on colon screening.

Test	Trial	CRC incidence RR (95% CI)	CRC mortality RR (95% CI)	Follow-up (years)
gFOBT[4]	Pooled results 5 trials	1.02 (0.93-1.12) 0.90 (0.77-1.04)	0.91 (0.84-0.98) 0.78 (0.65-0.93)	19.5 30.0
Flexible sigmoidoscopy[4]	Pooled results 4 trials	0.78 (0.74-0.83)	0.74 (0.68-0.80)	11.0–17.0
Colonoscopy[5]	NordICC trial	0.82 (0.70-0.93)	0.90 (0.64-1.16)	10.0

CRC = colorectal cancer; RR = relative risk; gFOBT = guaiac fecal occult blood test.

with fecal immunochemical tests compared with gFOBTs.[6] Fecal immunochemical tests also have improved sensitivity in detecting colorectal cancer and high-risk precancerous lesions compared with gFOBTs.[6]

Three trials are currently comparing the results of fecal immunochemical tests with those of colonoscopy.[7-9] A Spanish study (COLONPREV)[7] and a Swedish study (SCREESCO)[8] have published their preliminary results following the first and second rounds of fecal immunochemical test screening, respectively. Both studies report that the group randomly assigned to receive a fecal immunochemical test had a higher participation rate, a similar colorectal cancer detection rate, and a lower high-risk precancerous lesion detection rate compared with the group that underwent a colonoscopy. The final results on differences in colorectal cancer incidence, stage, and mortality will be published when 10 years of follow-up have been completed.

Colon screening programs

Colon screening activities can be divided into programmatic and opportunistic. Programmatic screening is organized, serves a defined population, is supported by technology infrastructure, encompasses quality assurance, and monitors important outcomes such as colorectal cancer incidence, stage, and related mortality. For these reasons, screening in an organized program is recommended where available. The Canadian provinces and territories have implemented or announced plans to implement population-based screening.[10] Implementation of population-based screening has been shown to improve screening participation and important clinical outcomes of reduced colorectal cancer incidence and related deaths.[11,12]

BC Colon Screening Program

The BC Colon Screening Program, implemented on 15 November 2013, offers biennial fecal immunochemical testing to average-risk individuals and provides a follow-up colonoscopy for abnormal results. BC chose a quantitative fecal immunochemical test with a low positivity cutoff of 10 mcg globin/g feces to maximize sensitivity. Individuals with a high-risk family history of colorectal cancer are offered colonoscopy; individuals with a personal history of precancerous lesions are offered a fecal immunochemical test or colonoscopy, as per the BC Guidelines.[13,14] A high-risk family history is defined as a single first-degree relative diagnosed with colorectal cancer before the age of 60 years or two or more first-degree relatives diagnosed at any age. In June 2015, the Northern Health Authority, representing 5.5% of the screening age–eligible BC population, withdrew from the provincial program to follow local screening processes.

Eligibility criteria for the BC Colon Screening Program are as follows:

Who is eligible?

- Average-risk asymptomatic individuals from 50 to 74 years of age.
- High-risk family history, from 40 years of age or 10 years younger than the earliest affected relative to 74 years of age.
- Personal history of precancerous lesions, when due for colonoscopy to 74 years of age.

Who is not eligible and requires individualized care?

- Personal history of colorectal cancer.
- Personal history of Crohn disease or ulcerative colitis.
- Hereditary colon cancer syndrome (e.g., Lynch syndrome).
- Lower gastrointestinal symptoms or new iron-deficiency anemia.

Eligible British Columbians are referred to the Colon Screening Program by their primary care provider, with either a lab requisition form to complete a fecal immunochemical test or a colonoscopy referral form for higher-risk individuals **[Figure 1]**. Once individuals are registered, the Colon Screening Program organizes colonoscopy referrals when required and recalls participants for future fecal immunochemical testing or colonoscopy when due. The following data are collected and stored: participant demographics, participant satisfaction, fecal immunochemical test values, colonoscopy results, pathology results, unplanned medical events that occur in the 14 days following colonoscopy, colorectal cancer diagnoses, colorectal cancer stage, and colorectal cancer–related mortality.

Participation

In 2021, 59% of eligible BC residents were up-to-date with colon screening, defined as having completed a fecal immunochemical test within the past 30 months or a colonoscopy within the last 10 years. Approximately 40% of British Columbians are screened through the Colon Screening Program; an additional 20% access screening outside the program in an opportunistic fashion. Individuals are more likely to be up-to-date with screening if they are participating in the Colon Screening Program (odds ratio = 7.43 [95% CI, 7.38-7.48, $P < .05$]). These results were derived from MSP data and do not account for individuals who are recommended to undergo shorter-interval colonoscopy, such as those with a high-risk family history of colorectal cancer.

In BC, more than 90% of fecal immunochemical tests performed on 50- to 74-year-olds are registered in the Colon Screening Program. In 2020, 33.1% of age-eligible individuals had completed a fecal immunochemical test under the Colon Screening Program in the previous 30 months: 53% were female, and the mean age was 62 years. Screening participation was lowest in the cohort between 50 and 60 years of age.

Retention rate is the proportion of patients who return for a subsequent round of screening; it is an important indicator of long-term participation. If individuals do not return to screen again, it becomes increasingly difficult to maintain participation. Retention rate in the BC Colon Screening Program is approximately 56%. Notably, retention improved to 64% in 2019 when fecal immunochemical test requisitions were mailed directly to participants, which obviated the need for individuals to visit their primary care provider. There continue to be barriers to accessing fecal immunochemical testing, and provinces

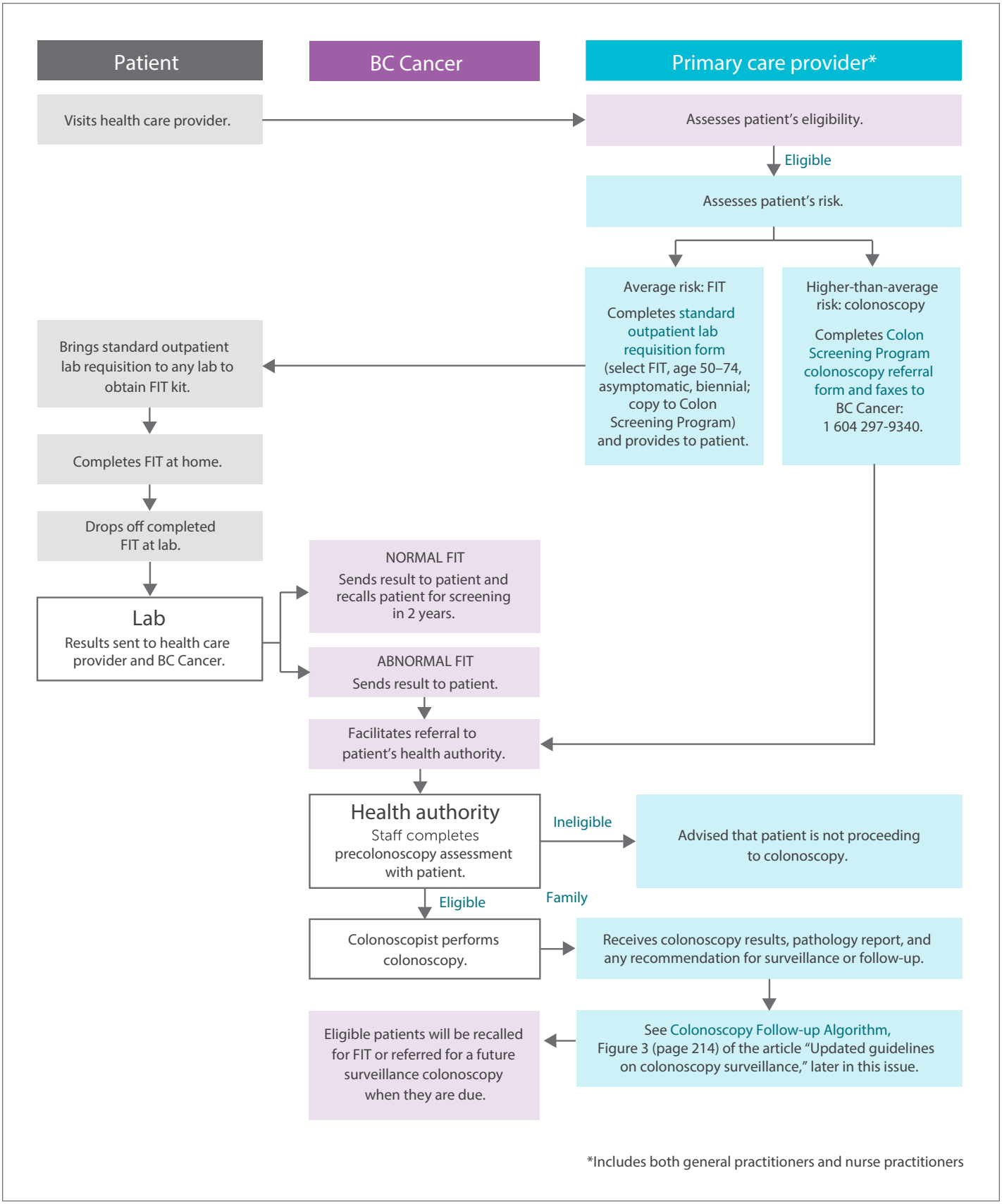

FIGURE 1. Colon screening patient pathway.
FIT = fecal immunochemical test.

(Source: BC Colon Screening Program)

that mail kits to participants report retention rates approximately 10% higher than those recorded in BC.

Fecal immunochemical test performance

BC uses a single-specimen quantitative fecal immunochemical test with a positivity cutoff of 10 mcg globin/g feces (OC-SENSOR, Eiken Chemical Co., Ltd., Tokyo, Japan), which is available at all outpatient laboratories. Once the stool specimen has been added, the kit must be analyzed within 15 days, because the globin can degrade with time, which can lead to false-negative results.

Fecal immunochemical test performance characteristics vary across brands, but the OC-SENSOR is commonly used worldwide and has been studied extensively. A systematic review and meta-analysis of studies that assessed fecal immunochemical test performance characteristics, using colonoscopy as the gold standard, reported sensitivity and specificity in the detection of colorectal cancer as 88% and 91%, respectively, based on the same brand and cutoff used in BC.[15] However, the true value of fecal immunochemical testing is realized with regular serial testing over time.[16] For instance, the Taiwanese Nationwide Colorectal Cancer Screening Program, which includes OC-SENSOR (cutoff of 20 mcg globin/g feces) as one of the two fecal immunochemical test brands used, reported a 34% reduction in advanced-stage colorectal cancer (adjusted relative risk = 0.66 [95% CI, 0.63-0.70]) and a 40% reduction in colorectal cancer mortality (adjusted relative risk = 0.60 [95% CI, 0.57-0.64]) after 10 years of follow-up.[17]

In BC, the overall fecal immunochemical test positivity rate is 9.8% and is slightly higher for first-round screening compared with a subsequent fecal immunochemical test following a previous negative one. Positivity increases with age and is higher in males, which is a reflection of the increased prevalence of colorectal neoplasia.

In 2020, of the nearly 20 000 participants in the BC Colon Screening Program who had a positive fecal immunochemical test and were referred for colonoscopy, 73% completed the colonoscopy: 2% were diagnosed with colorectal cancer, and 19% had a high-risk precancerous lesion removed. The number of participants needed to be screened to detect one individual with colorectal cancer was 684, and the number needed to detect one individual with colorectal cancer or a high-risk precancerous lesion was 56. Of those with a positive fecal immunochemical test, the number needed to receive a colonoscopy to detect one individual with colorectal cancer was 44, and the number needed to detect one individual with colorectal cancer or a high-risk precancerous lesion was 5.

Individuals with a positive fecal immunochemical test who do not undergo a follow-up colonoscopy are at an increased risk of dying from colorectal cancer compared with patients who undergo appropriate follow-up.[18] Patient navigation has been shown to increase patient compliance with follow-up colonoscopy.[19] Patient navigation is an integral part of the BC Colon Screening Program and is the responsibility of health authority patient coordinators—nurses trained in navigating a patient through the precolonoscopy and postcolonoscopy periods **[Box]**; their roles are to assess, educate, schedule, and follow up with each patient undergoing colonoscopy and to liaise with primary care providers and specialists as needed. Because most screening program participants are otherwise healthy, some jurisdictions have trained clerks to screen patients who are referred for colonoscopy to identify those with comorbid medical conditions and to book a precolonoscopy assessment with a patient coordinator. The remaining patients receive educational information and are scheduled for colonoscopy by the clerk. All participants receive a postcolonoscopy phone call from the patient coordinator.

Quality assurance and improvement

An important cornerstone of programmatic screening is a robust quality assurance program that influences screening policy and day-to-day practice **[Figure 2]**. The BC Colon Screening Program monitors clinical outcomes through regular audits and measures the results against established benchmarks when available. To oversee

BOX. Patient navigation in the BC Colon Screening Program.

The patient coordinator:

- **Contacts the patient and completes a precolonoscopy assessment:**
  - Indication for colonoscopy is confirmed.
  - Medical history is taken with particular attention to comorbidities that may increase the risk of colonoscopy-related adverse events (e.g., antithrombotic use; diabetes; cardiac, respiratory, and renal disease).
- **Is responsible for patient education:**
  - Oral and written information on what to expect before, during, and after colonoscopy.
  - Bowel preparation and diet restrictions.
  - Risks of colonoscopy.
  - Sedation options and the need for an accompanying adult to and from the hospital.
- **Coordinates with primary care providers, specialists, local thrombosis clinics, and the colonoscopist, as required, to navigate:**
  - Pericolonoscopy changes in medications.
  - Precolonoscopy specialist consultations.
- **Schedules the colonoscopy appointment:**
  - To improve patient compliance and satisfaction, patient coordinators offer various dates, times of day, and, when possible, colonoscopy sites.
- **Communicates with providers and the Colon Screening Program:**
  - If a patient does not meet the eligibility criteria or they decline colonoscopy, this is communicated to their referring provider to ensure appropriate follow-up.
- **Contacts the patient 14 days postcolonoscopy:**
  - To determine if the patient had any unplanned medical events the day before (during the bowel preparation) and up to 14 days following colonoscopy.
  - To communicate colonoscopy results and future screening recommendations.

these activities, the program established a provincial quality management committee with physician colonoscopy leads from each health authority and representation from primary care, pathology, lab medicine, and operations.

Colonoscopy performance

Ensuring high-quality colonoscopy is essential to colon screening success. The BC Colon Screening Program mandates that all colonoscopy sites actively participate in a quality assurance initiative, the Canada-Global Rating Scale.[20] A high-quality colonoscopy is safe, effective, and comfortable. Colonoscopy effectiveness refers to the detection of colorectal cancer and precancerous lesions and the complete removal of all precancerous lesions. Postcolonoscopy colorectal cancer refers to colorectal cancer that is diagnosed following a colonoscopy in which colorectal cancer was not detected and is attributed, in part, to missed colorectal cancer and missed or incompletely resected precancerous lesions. To minimize the risk of postcolonoscopy colorectal cancer, the bowel preparation must be adequate, the colonoscopy must be complete to the cecum, and the colonoscopist must inspect the entire colonic mucosa and have the technical skill to completely resect precancerous lesions or, in the case of advanced lesions, refer to an expert colonoscopist. Colonoscopy performance at an aggregate and individual physician level is monitored in the Colon Screening Program. For example, adenoma detection rate is a quality indicator of colonoscopy and is associated with patient-, procedure-, and physician-related variables.[21] Patients of physicians who have a lower adenoma detection rate have a higher risk of developing and dying from postcolonoscopy colorectal cancer.[22,23] Each year, physicians in the Colon Screening Program who perform colonoscopy receive a report detailing their individual adenoma detection rate, among other colonoscopy indicators, and whether they are meeting the benchmarks. The Colon Screening Program also supports direct observation of procedural skills,

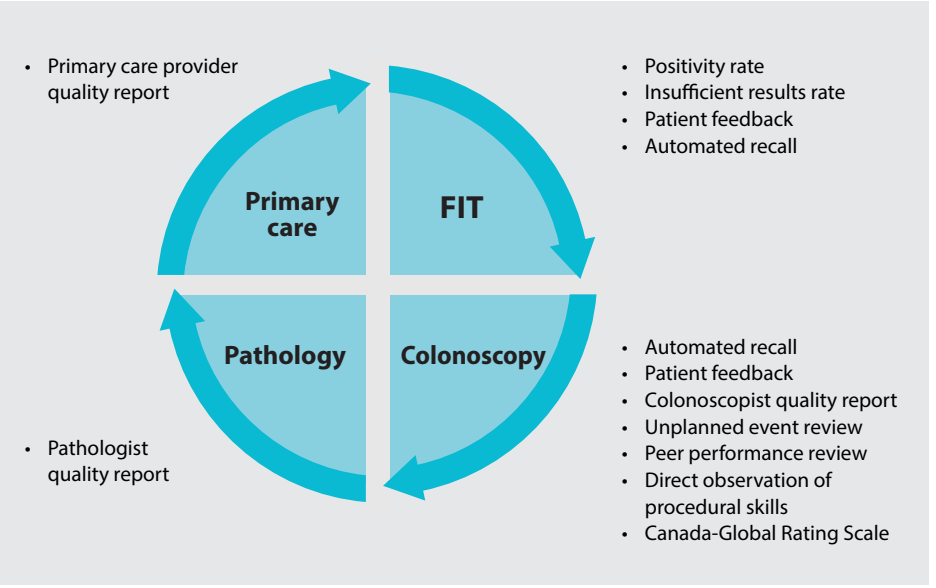

FIGURE 2. Quality assurance in the BC Colon Screening Program.
FIT = fecal immunochemical test.

BC CANCER COLON SCREENING
Provincial Health Services Authority

Colon Screening Program Quality Report (2019 Results)

Colon Screening Statistics	YOUR RESULTS (2019)[1]	PROVINCIAL RESULTS (2019)[2]
Registrations		
Average Risk Patients (FIT screening)	176	270,443
Higher Than Average Risk Patients (colonoscopy screening)	2	3,033
FIT Results		
FIT Positivity Rate[3] (%)	8.8%	11.9%
Colonoscopy		
Average Risk Patients		
Number of patients with positive FIT that had a colonoscopy	13 (76.5%)	19,865 (62.1%)
Number of cancers identified[4]	0 (0.0%)	365 (1.9%)
Number of pre-cancerous polyps identified[5]	6 (46.2%)	11,125 (56.7%)
Higher Than Average Risk Patients		
Number of patients with a family history/personal history that had a colonoscopy[6]	2 (100.0%)	1,963 (64.7%)
Number of cancers identified[7]	0 (0.0%)	4 (0.2%)
Number of pre-cancerous polyps identified[8]	0 (0.0%)	1,072 (55.1%)
Inappropriate Referrals		
Number of patients referred for FIT outside of the eligible age range (50-74)	3 (1.7%)	13,245 (4.9%)
Number of patients referred to colonoscopy with inaccurate family history	0 (0.0%)	98 (3.3%)
Number of patients with a normal FIT recalled prior to 21 months[9]	5 (4.4%)	20,335 (15.0%)
Number of patients that underwent FIT when colonoscopy was the next recommended screening test	0 (0.0%)	263 (2.0%)

FIGURE 3. Example of the BC Colon Screening Program primary care provider quality report.
FIT = fecal immunochemical test. (Source: BC Colon Screening Program)

whereby two trained assessors observe a colonoscopist perform two colonoscopies and complete a validated tool that assesses technical and nontechnical skills.[24] Formative feedback on whether the colonoscopist is meeting standards is provided. Direct observation of procedural skills achievements have been associated with precancerous lesion detection rates.[21] Peer support and hands-on courses on colonoscopy skills improvement are available to colonoscopists who participate in the program.

At the outset of the Colon Screening Program, the quality of colonoscopy performance in BC was unknown. When inviting asymptomatic individuals to undergo a colonoscopy, it is important to ensure the procedure is safe. All unplanned medical events that occur in the pericolonoscopy period are identified, and those that result in death, hospital admission, or additional procedures are carefully reviewed by the committee to determine whether a colonoscopy-related serious adverse event has occurred. These results are reported in aggregate form and to individual colonoscopists. In the BC Colon Screening Program, the rate of serious adverse events associated with colonoscopy is consistent with that of other jurisdictions and meets accepted benchmarks.[25]

Primary care providers who refer patients to the program receive a regular quality report **[Figure 3]**. Quality reports are also sent to pathologists and health authorities.

Summary

Screening for colorectal cancer saves lives. It is more effective when undertaken in an organized screening program. The benefits of the BC Colon Screening Program include the following:

- Automatic recall in 2 years, with mailed laboratory requisition for fecal immunochemical tests.
- Facilitated referral for surveillance colonoscopy when due.
- Patient navigation.
- Audit of outcomes.
- Quality assurance initiatives.

In late 2023, the BC Colon Screening Program will mark the 10-year anniversary of its province-wide implementation, an important time horizon for colon screening outcomes. Over the next several years, the results of the program will become evident and will be shared with the BC medical community. ■

Competing interests

None declared.

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James R. Gray, MD, FRCPC

Early-onset colorectal cancer

The BC Guideline for colorectal cancer screening encourages physicians to evaluate younger adults with symptoms or a family history of colorectal cancer by using colonoscopy.

ABSTRACT: Globally, colorectal cancer is the third-most-diagnosed cancer and the second-leading cause of cancer death. Historically, the population at risk has been over 50 years of age, but over the past 2 to 3 decades, there has been increasing recognition of the rise in incidence before age 50. Although the percentage rise is notable, the absolute numbers of early-onset cancer remain much lower than for conventional late-onset individuals. There is a difference in clinical presentation and pathology in early-onset colorectal cancer. Currently, population screening strategies in British Columbia remain unchanged, but recognition of possible early-onset colorectal cancer requires the vigilance of health care providers.

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Many risk factors for the development of colorectal cancer have been proposed, but the most consistently recognized is advancing age, with incidence rising abruptly after age 50 **[Figure 1]**.[1,2] Hence, most screening guidelines suggest initiation of screening for and consideration of a diagnosis of colorectal cancer in individuals over 50 years of age.[3,4] However, over the past 2 to 3 decades, several countries, including Canada, have noted a rise in the incidence of colorectal cancer in adults younger than 50 years of age **[Figure 2, 3]**. Colorectal cancer arising before age 50 is considered "early onset."[5] This recognition has led to research into understanding the mechanisms and risks of early-onset colorectal cancer and has provoked discussion about

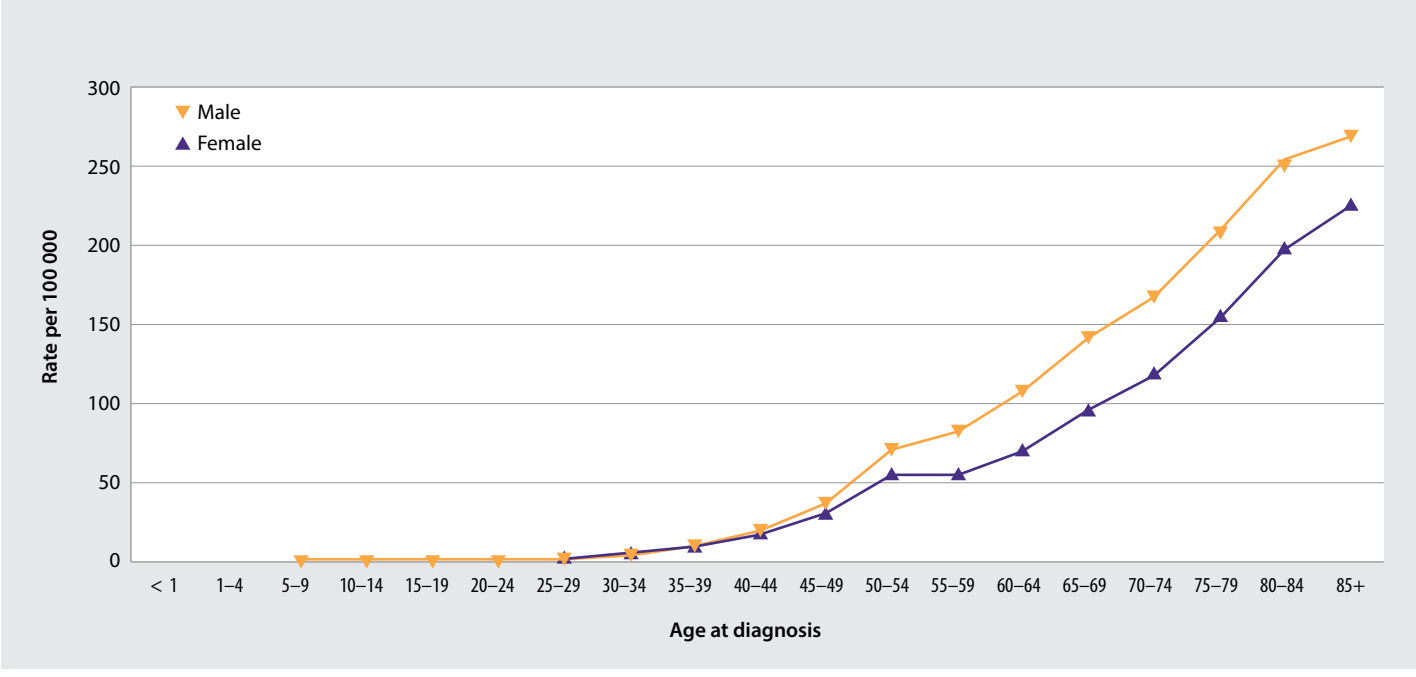

FIGURE 1. Incidence rates of colorectal cancer, by age and sex, in the United States, 2015–2019.
(Source: https://seer.cancer.gov/statfacts/html/colorect.html)

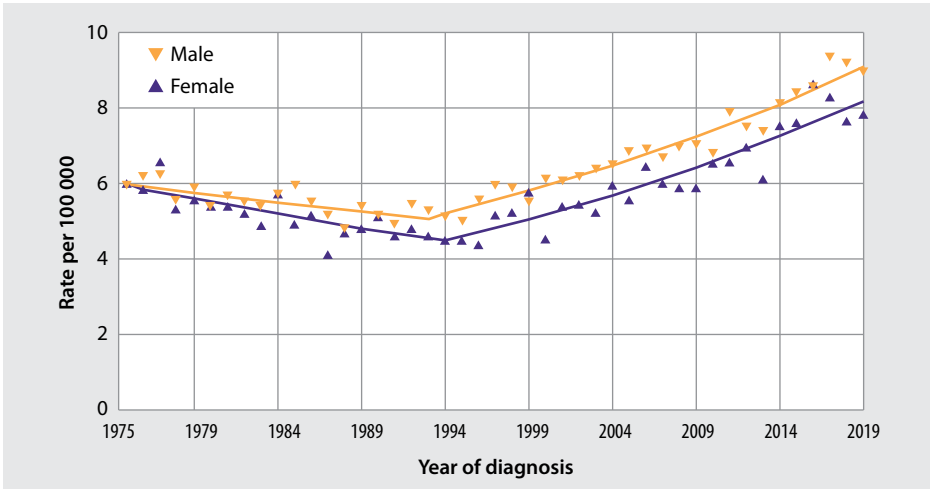

FIGURE 2. Incidence rates of colorectal cancer in those younger than 50 years of age, by sex, in the United States, 1975–2019.
(Source: https://seer.cancer.gov/statfacts/html/colorect.html)

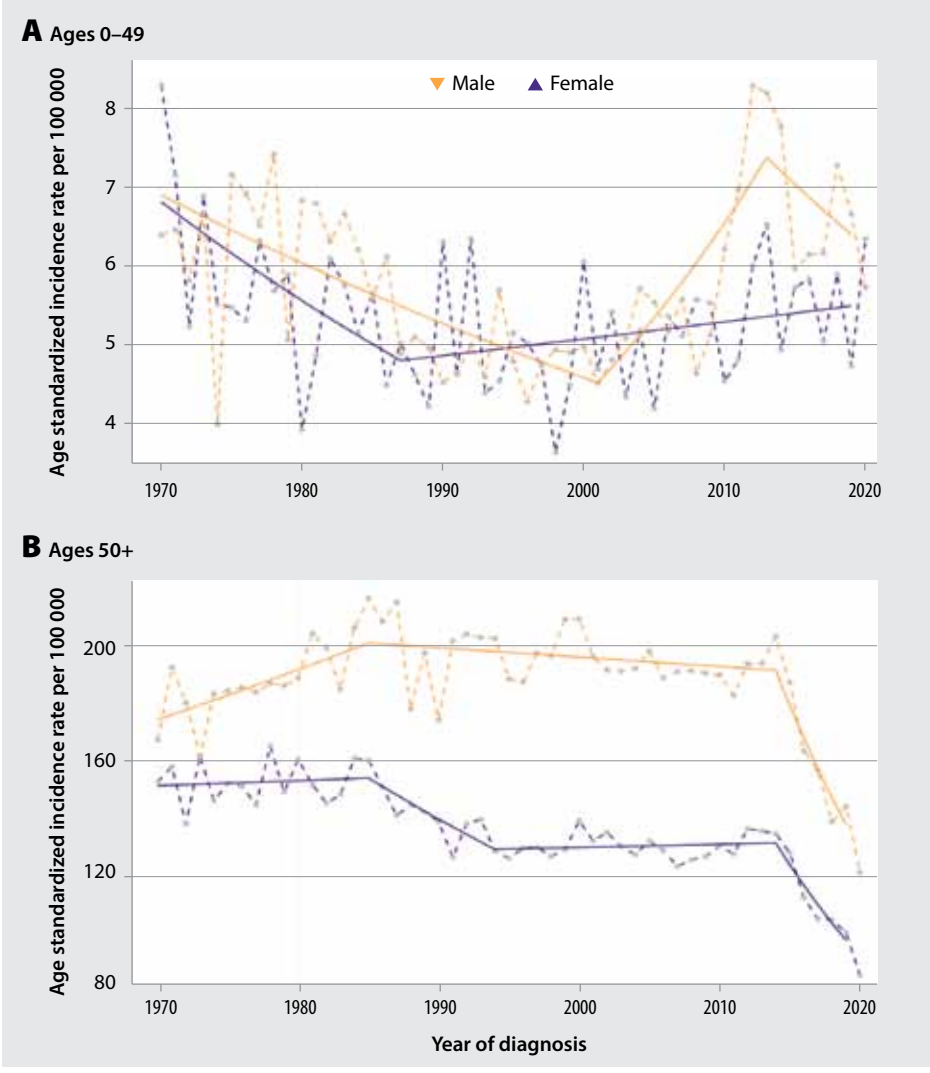

FIGURE 3. Incidence of colorectal cancer in British Columbia by age and gender. A: Ages 0–49. B: Ages 50+.
(Source: BC Cancer)

whether screening guidelines should be altered to accommodate a younger population. The early-onset colorectal cancer cohort is separate from previously recognized populations with hereditary cancer syndromes such as Lynch syndrome, with a family history of premature colorectal cancer, or with long-standing inflammatory bowel disease. These groups are known to be at higher risk of colorectal cancer and have their own screening strategies.[2]

Colon screening

Colorectal cancer screening strategies for BC have recently been revised and published by the Guidelines and Protocols Advisory Committee, a joint committee of Doctors of BC and the BC Ministry of Health.[2] The recommendations include risk stratification of individuals and for those deemed average risk to begin screening at age 50 with biennial fecal immunochemical testing. Colonoscopy is reserved for those with a positive fecal immunochemical test and for individuals at higher risk of colorectal cancer. The value of these screening strategies is based on the slow progression from normal colonic mucosa to precancerous lesions to colorectal cancer. By identifying and removing precancerous lesions, colorectal cancer may be prevented.

In BC, colorectal cancer is the third-most-common cancer diagnosis for women and the second-most-common cancer diagnosis for men; it represented 10% of all new cancer cases in 2022 and 11% of all cancer deaths.[4] In general, there has been a steady decline in both colorectal cancer diagnoses and deaths over the past 20 years **[Figure 4]**.[1] This is attributed partly to screening programs that have led to the detection of colorectal cancer at an earlier stage of disease and to the removal of precancerous lesions. In addition, improvements in surgery and chemotherapy play a beneficial role in outcomes when cancer has already occurred. Lifestyle changes, including reduced smoking, increased physical activity, and achieving a healthy weight, are also important in the primary prevention of colorectal cancer.

Early-onset colorectal cancer

Despite the reduction in colorectal cancer incidence overall, the median age of diagnosis in the United States has shifted from 72 years of age in 2001–2002 to 66 years in 2015–2016, thus reflecting the presentation of this cancer in younger people.[5] Some estimates suggest that within the next decade, 25% of rectal cancers and 10% to 12% of colon cancers will be diagnosed in individuals under the age of 50.[6,7] However, while the percentage increase in younger individuals is striking, the absolute risk remains much lower than for the older population. For example, the risk for Canadian males under age 50 increased from 10/100 000 in 1971 to 12.5/100 000 in 2015, but the risk for those over age 50 was 225/100 000 in 2000.[6]

The concept of a birth-cohort effect, perhaps related to dietary factors or exposures, for those born after 1980 has been proposed as a cause of the increased risk in this group. The exact factors for this are not yet clear.[8] Early-onset colorectal cancer has features that are somewhat different from conventional late-onset colorectal cancer in terms of epidemiology, risk factors, presentation, and histology. Epidemiologically, there is increased risk of early-onset colorectal cancer among those with Caucasian ethnicity, male gender, and a first-degree relative with colorectal cancer. Obesity, hyperlipidemia, smoking, and alcohol consumption also play a role.[8] A study from Ontario identified modifiable risk factors for early-onset colorectal cancer, including sedentary lifestyle and intake of sugary drinks and fast food.[9] From a clinical standpoint, early-onset colorectal cancer presents with a longer duration of symptoms before diagnosis, more rectal cancer than colon cancer, more advanced disease at presentation, and a more aggressive histologic phenotype.[10] Early-onset colorectal cancer progresses more rapidly and aggressively than older-onset colorectal cancer. Given the higher rate of distal colon or rectal cancer in the younger population, there is an increased presentation with actual symptoms, whereas more proximal colon cancer is often asymptomatic. The most common symptoms for distal cancer in the young population are rectal bleeding (38%), abdominal or pelvic pain (33%), and a change in bowel habits (20%).[10]

Early-onset colorectal cancer progresses more rapidly and aggressively than older-onset colorectal cancer.

Recognizing that the development of colorectal cancer from normal mucosa to precancerous lesions occurs over decades, there has been an exploration of different early-life factors that could play a role in early-onset colorectal cancer. Factors that have been examined include breastfeeding in infancy, maternal smoking, childhood obesity, and markers of onset of puberty, but no demonstrable effect has been identified so far.[11] The role of the gut microbiome and alterations related to diet or antibiotic exposure are being explored. Perhaps the strongest risk associations for those with early-onset colorectal cancer that have been determined so far are family history of colorectal cancer, sedentary lifestyle, consumption of a Western diet, and metabolic syndrome.[5] Whereas hereditary factors are present in 3% to 5% of older-onset colorectal cancer, 20% of those with early-onset colorectal cancer have at least one first-degree relative with colorectal cancer.[12]

When an individual is diagnosed with early-onset colorectal cancer, it is important to offer colon screening to their first-degree relatives, because they in turn have a tripled risk of developing colorectal cancer over that of the general population.[13]

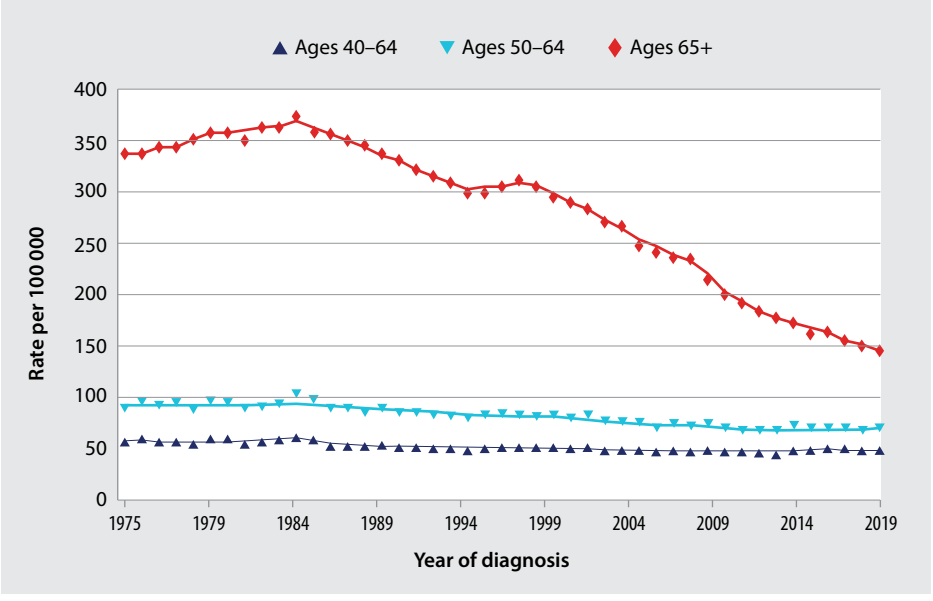

FIGURE 4. Incidence rates of colorectal cancer, by age, in the United States, 1975–2019.
(Source: https://seer.cancer.gov/statfacts/html/colorect.html)

Lowering the screening age

The increased incidence of colorectal cancer in younger adults and the benefits of colon screening in the older population have led to discussion about reducing the age of initiation of screening from 50 years of age to 45 years of age or younger.[7,14] The United States Preventive Services Task Force recommends screening individuals aged 45 to 49 years with a qualified "B recommendation" (moderate certainty of moderate net benefit), whereas screening from age 50 to 75 years is given an "A recommendation" (high certainty of substantial net benefit).[15] This earlier screening age has not been adopted by other national or provincial guidelines to date.[2]

There are several reasons for not immediately adopting an earlier screening strategy. First, the purported value of earlier screening is based on computer modeling, with several assumptions that have not yet been validated by trial data. Second, cost and resource implications need to be considered given that the proposed target population in BC that is aged 45 to 49 years numbers 322 000.[16] It would be challenging to accommodate such a large population within our current screening program. Furthermore, because the increased incidence of colorectal cancer is affecting all young adults, some could argue that screening should begin even before 45 years of age, which would dramatically increase resource use. Third, while the percentage increase in colorectal cancer among young adults may be notable, the absolute number diagnosed remains substantially lower than the number of adults over 50 years of age who are diagnosed. Finally, one must consider the ramifications of shifting resources from the existing higher-risk screening population who have yet to engage with colon screening, including, among others, rural, marginalized, and Indigenous individuals.

Summary

Approximately 40% of eligible British Columbians in the 50- to 74-year age cohort are up-to-date with screening in the Colon Screening Program, and efforts are ongoing to encourage more participation in that age group. Therefore, the updated BC Guideline for colorectal cancer screening continues to advocate for screening individuals aged 50 to 74 years without adopting an earlier initiation, but it encourages physicians to respond to younger adults who present with symptoms or have a family history of colorectal cancer by evaluating them using colonoscopy where appropriate. ■

In general, there has been a steady decline in both colorectal cancer diagnoses and deaths over the past 20 years.

Competing interests

None declared.

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David F. Schaeffer, MD, FRCPC, Jennifer J. Telford, MD, MPH, FRCPC

Updated guidelines on colonoscopy surveillance

New information suggests that more frequent colonoscopy surveillance should be reserved for individuals with high-risk precancerous lesions.

ABSTRACT: Precancerous colorectal lesions may develop along an adenomatous or serrated pathway. These lesions are further classified as low or high risk based on their size, number, and histologic characteristics. Recent evidence has demonstrated that individuals with low-risk precancerous lesions that are resected during colonoscopy are not at significant risk of future colorectal cancer compared with the general population and do not require intense colonoscopy surveillance. Conversely, individuals with high-risk precancerous lesions that are removed appear to benefit from surveillance colonoscopy. This new information has led to updated colonoscopy surveillance guidelines in British Columbia and other jurisdictions.

While the benefits of colon screening are firmly established, the impact of colonoscopy surveillance following removal of precancerous lesions from the colon and rectum is not as clear. Guidelines that recommended surveillance were based largely on expert consensus and studies that used surrogate outcomes. However, over the past 5 years, several large cohort studies have demonstrated that the risk of future colorectal cancer is similar to or lower than that of the general population and for those with a history of low-risk precancerous lesions. This has led to updated surveillance guidelines from the British, European, American, and Asian endoscopic societies. In response to this new evidence and in keeping with other guidelines, the British Columbia Guidelines and Protocols Advisory Committee also revised its colonoscopy surveillance recommendations, which the BC Colon Screening Program has adopted.[1]

Pathogenesis of colorectal cancer

There are three pathways along which colorectal cancer may develop: progression from conventional adenomas (60%); the serrated pathway (15% to 30%), comprising hyperplastic polyps, sessile serrated lesions, and traditional serrated adenomas **[Table 1]**;[2] and hereditary predisposition syndromes (e.g., Lynch syndrome; 3% to 5%). The adenoma-to-carcinoma pathway has been well described, with accumulation of genetic mutations leading to sequential histologic changes.[3] The genetic alterations in the serrated pathway are not yet completely understood, but mutations

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TABLE 1. Features of serrated lesions in the colon and rectum.[2]

Lesion type	Hyperplastic polyp	Sessile serrated lesion	Traditional serrated adenoma
Prevalence	20%	15%	< 1%
Location	Rectum and sigmoid	Proximal to splenic flexure	Distal to splenic flexure
Size	Small	Small	Large
Morphology	Flat or sessile	Flat or sessile	Pedunculated
Histology	Upper crypt serration	Crypt base serration Boot-shaped crypt	Columnar epithelium Eosinophilic cytoplasm

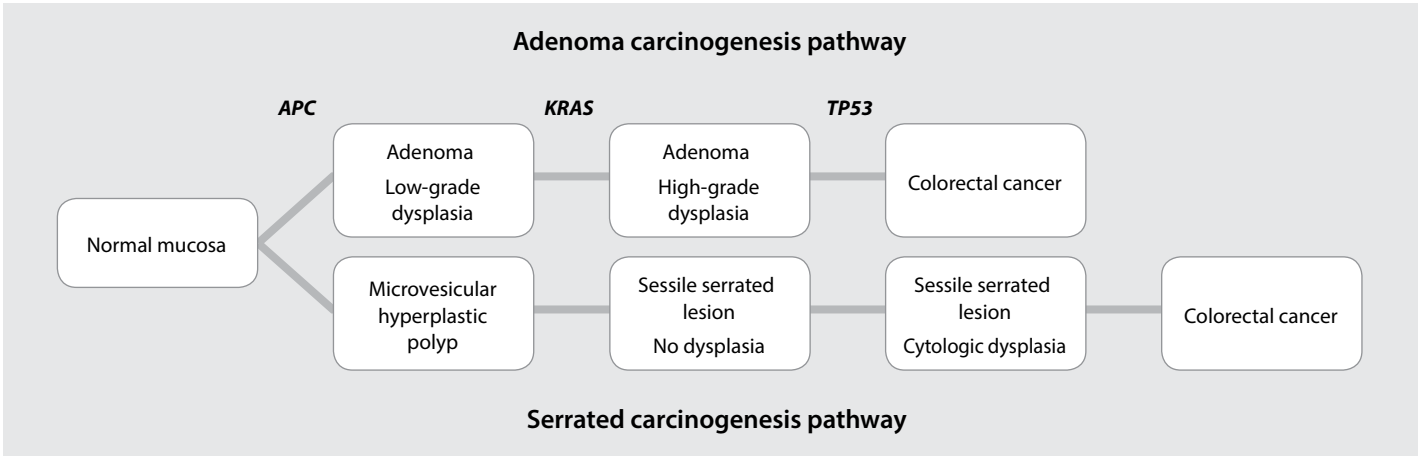

FIGURE 1. Adenoma and serrated colorectal cancer pathways.

in *BRAF* and *KRAS* play a prominent role **[Figure 1]**.[4] Each of the overarching pathways gives rise to molecularly distinct colorectal cancers.[4,5]

Adenomatous lesions

All colonic adenomas consist of dysplastic epithelium and are classified as benign neoplasms **[Figure 2]**. Depending on the extent of the villous component, an adenoma may occur as one of three subtypes: tubular, villous, or tubulovillous.

Carcinomas develop in the geographic centres of adenomas and spread centrifugally, replacing the adenomatous epithelium. Several factors predispose to carcinoma development, including adenoma size, growth pattern, dysplasia grade, and patient age. Both growth pattern and dysplasia grade correlate with lesion size. Small adenomas have the lowest risk of malignant transformation, but the risk is not completely negligible. Adenomas less than 10 mm in diameter usually demonstrate only low-grade dysplasia and have a very low potential for malignant transformation.

Colorectal cancer that has invaded into but not beyond the submucosa (T1) is associated with low rates of lymph node metastases and excellent outcomes. A subset of patients can be successfully managed with endoscopic resection alone, thus avoiding the risks associated with surgical resection.[6] Identification of appropriate candidates for endoscopic resection depends on the absence of certain high-risk histopathologic features that are associated with lymphatic spread.[7,8] Therefore, it is essential for an experienced pathologist to assess the metastatic risk of early colorectal cancer that has been resected at colonoscopy and communicate these findings clearly to the clinician to guide further therapy.

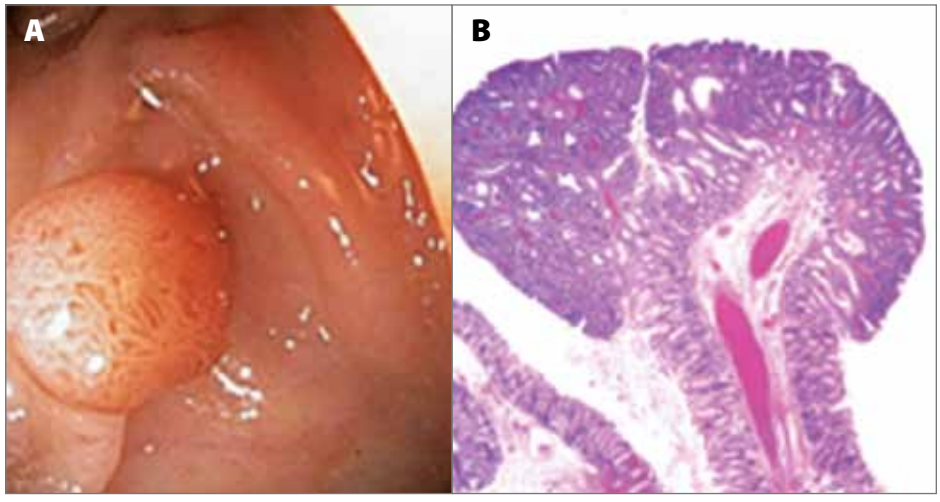

FIGURE 2. Endoscopic **(A)** and histologic **(B)** images of a colon adenoma.

The most critical prognostic factor is the presence or absence of invasion into the submucosa; without invasion through the muscularis mucosae, there is no risk for lymph node metastasis. Therefore, as per the BC Colon Screening Program Pathology Standards, these cases are retained within the high-grade dysplasia category, and the terms "intramucosal carcinoma" and "carcinoma in situ" should not be used, because this may lead clinicians to misinterpret the lesion as colorectal cancer and could result in overtreatment of the patient. This is supported by publications that have documented identical outcomes for lesions that were reported as having high-grade dysplasia, intramucosal carcinoma, or carcinoma in situ.[9]

Serrated lesions

Interpreting studies that have assessed serrated lesions is challenging due to several factors, including the subtle endoscopic appearance of the lesions and their histologic similarity to benign-behaving hyperplastic polyps, and sessile serrated lesions have proven difficult to detect at colonoscopy and diagnose at pathology.[10] Furthermore, the

terminology for these lesions is inconsistent and has changed several times over a short period. Although hyperplastic polyps are generally regarded as lacking malignant potential, the microvesicular subtype has emerged as the likely precursor to sessile serrated lesions.[11] Thus, while small hyperplastic polyps in the rectum and sigmoid are still considered harmless, all other lesions should be removed, and large hyperplastic polyps are managed as sessile serrated lesions.

In the BC Colon Screening Program, among individuals who underwent colonoscopy to follow up a positive fecal immunochemical test, 2.8% had at least one sessile serrated lesion removed and 0.1% had at least one traditional serrated adenoma removed.[12] As seen in other jurisdictions, the sessile serrated lesion detection rate among BC physicians varies (median: 7%; 10th, 90th percentiles[4,10]) and is associated with physician specialty.[13]

Risk stratification of colorectal precancerous lesions

Individuals who undergo colonoscopy with the removal of precancerous lesions can be divided into those with high-risk findings and those with low-risk findings. High-risk findings could refer to either the removal of one or more high-risk precancerous lesions or the removal of multiple low-risk precancerous lesions **[Table 2]**.[1] High-risk precancerous lesions are defined as being larger than 10 mm or by histologic characteristics. This includes advanced adenomas, a term that is falling out of use, and high-risk serrated lesions. An individual who has 10 or more precancerous lesions removed cumulatively during their lifetime may have an inherited predisposition to colorectal cancer and is eligible for assessment by the BC Hereditary Cancer Program.[14]

Several large retrospective cohort studies have shown that individuals with a high-risk adenomatous lesion have an increased incidence of metachronous colorectal cancer and colorectal cancer mortality compared with individuals with no adenomas at colonoscopy, individuals with low-risk adenomas, and the general population.[15-18] Undergoing one surveillance colonoscopy appears to reduce the incidence of metachronous colorectal cancer to that of the general population; a second surveillance colonoscopy reduces the incidence of colorectal cancer below that of the general population.[19]

TABLE 2. Classification of low- and high-risk precancerous colorectal lesions.[1]

Feature	Low risk	High risk
Size	≤ 10 mm	> 10 mm
Number	1 to 4	≥ 5
Histology	• Adenoma with low-grade dysplasia • Sessile serrated lesion with no dysplasia	• Adenoma with high-grade dysplasia • Adenoma with villous features • Sessile serrated lesion with dysplasia • Traditional serrated adenoma

In contrast, following the removal of one or two low-risk adenomas, colorectal cancer incidence and mortality are lower than those of the general population, either in the absence of surveillance colonoscopies or statistically controlling for surveillance colonoscopies.[15-20] In addition, several studies have shown a reduced risk of colorectal cancer, irrespective of how many low-risk adenomas were resected. These finding have led the guideline committees, in varying degrees, to recommend no surveillance or less-intensive colonoscopy surveillance for these individuals. The evidence for high- and low-risk serrated lesions is less robust but follows a similar pattern to that of adenomatous lesions.[16]

Two randomized trials underway in Europe (EPoS trial NCT02319928) and the United States (FORTE NCT05080673) are comparing colonoscopy surveillance intervals for individuals with low-risk precancerous lesions; however, the results will not be available for many years.[21,22]

Baseline colonoscopy

An individual's future risk of colorectal cancer must be taken in the context of their baseline colonoscopy. It is well established that the quality of the baseline colonoscopy is associated with an individual's risk of colorectal cancer incidence and mortality.[23] Experts have questioned whether it is the baseline colonoscopy that provides protection against colorectal cancer rather than the subsequent surveillance.[24] While previous surveillance guidelines were developed prior to widespread adoption of colonoscopy quality assurance and improvement, new guidelines assume a high-quality baseline colonoscopy exam with a high precancerous lesion detection rate and complete resection.

Colonoscopy surveillance recommendations

Figure 3 outlines the updated BC colonoscopy surveillance guidelines, and **Table 3** compares the BC Guidelines to those of other major societies.[25-28] These guidelines are informed by studies that have evaluated adults who are older than 50 years of age; therefore, the recommendations may not be appropriate for younger adults who are diagnosed with precancerous lesions, and shared decision making between physicians and their patients to determine the timing of surveillance colonoscopy is appropriate.

Because the likelihood of colonoscopy-related adverse events increases with age and efficacy decreases due to competing causes of death, surveillance colonoscopy can be discontinued between 75 and 80 years of age.[29]

Potential harms of surveillance colonoscopy

The benefits of colonoscopy surveillance must be weighed against the potential harms. The risk of a serious adverse event following colonoscopy in the BC Colon Screening Program is 44 per 10 000, which generates a number needed to harm of 225.

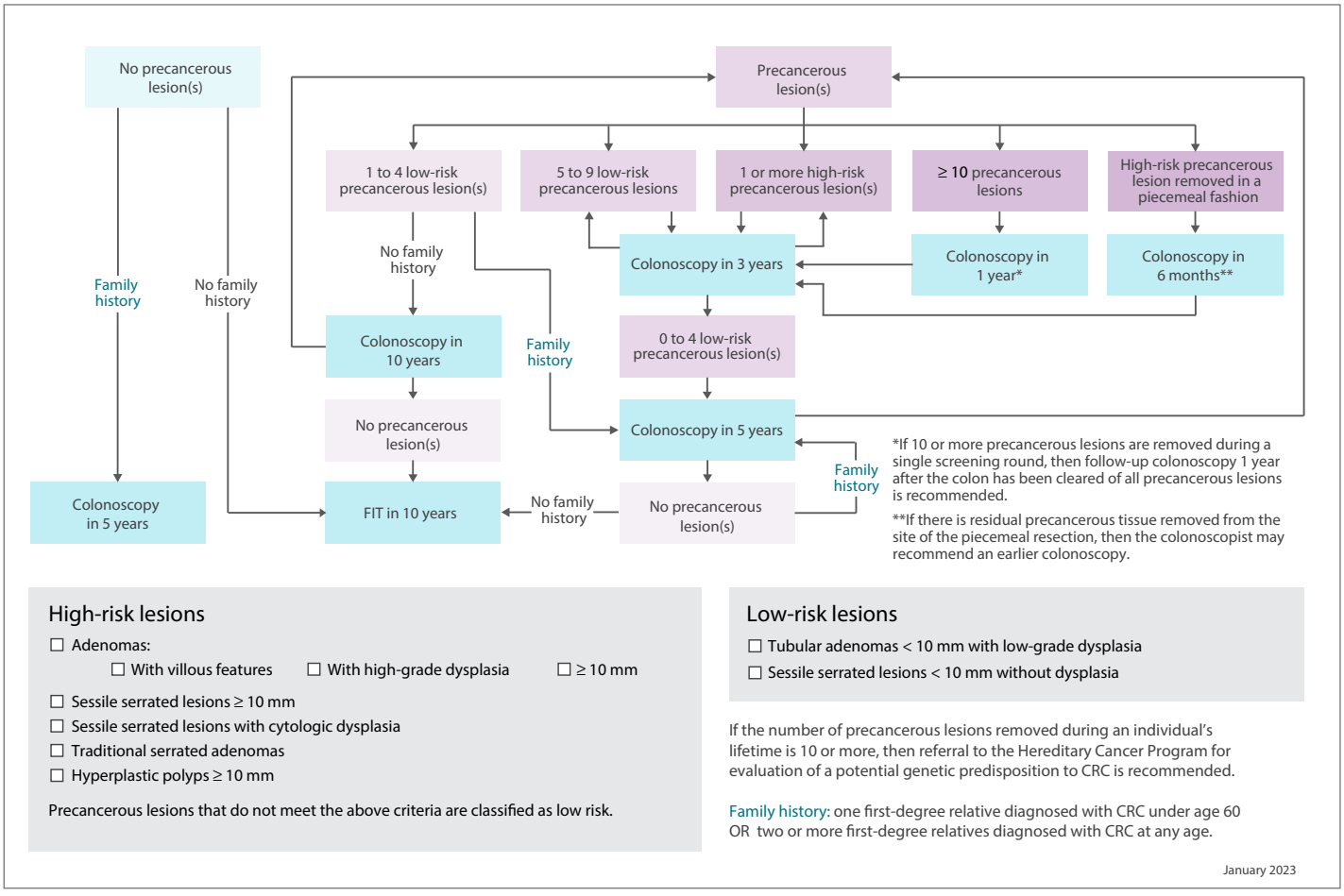

FIGURE 3. BC Colon Screening Program colonoscopy follow-up algorithm.
FIT = fecal immunochemical test; CRC = colorectal cancer.

(Source: BC Colon Screening Program)

TABLE 3. Comparison of colonoscopy surveillance guidelines.

Guideline	Publication year	High-risk findings				Low-risk findings	
		High-risk lesion(s)	Interval (years)	Multiple low-risk lesions	Interval (years)	Test	Interval (years)
BC[1]	2022	≥ 10 mm HGD villous	3 (then 5)	5–9	3 (then 5)	Colonoscopy	10
				≥ 10	1		
United States[25]	2020	≥ 10 mm HGD villous	3	3 or 4	3–5	Colonoscopy	7–10
				5–9	3		
				≥ 10	1		
Europe[26]	2020	≥ 10 mm HGD	3 (then 5)	≥ 5	3 (then 5)	FIT or	10
						colonoscopy	10
Britain[27]	2020	≥ 2 PCLs with one ≥ 10 mm HGD	3 (then FIT)	≥ 5	3 (then FIT)	FIT	When invited
Asia-Pacific[28]	2022	≥ 10 mm HGD villous	3	Not stated	Not stated	FIT or	2
						colonoscopy	10

HGD = high-grade dysplasia; PCL = precancerous lesion; FIT = fecal immunochemical test.

Perforation occurs in 6 per 10 000 cases, bleeding in 26 per 10 000, and death in 3 per 100 000.[30] In addition to fasting and consuming the bowel preparation, colonoscopy may require an individual and their accompanying adult to take time off work, arrange childcare, and make other arrangements. Last, in a setting of finite colonoscopy capacity, redirecting colonoscopy resources to those individuals who will derive the most benefit is an important consideration.

Summary

As we strive to increase participation in colon screening, the number of individuals who undergo colonoscopy will also increase. With advances in physician skill and colonoscopy technology, the proportion of individuals diagnosed with a precancerous lesion at colonoscopy will likely exceed 70% at some point in the near future.[31,32] Taking the high prevalence of precancerous lesions into consideration along with the new evidence and updated guidelines, it is appropriate to reserve more frequent colonoscopy surveillance for those individuals who are at higher risk. ■

Competing interests

Dr Schaeffer has been a consultant at Alimentiv Inc., Pfizer, Merck, Diaceutics, Astellas, and Satisfai Health Inc. Dr Telford received sessional payments as a consultant for the Guidelines and Protocols Advisory Committee in 2021–2022 as a contributing member to the colon screening guidelines.

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Familial and hereditary colorectal cancer

The BC Hereditary Cancer Program serves individuals with suspected hereditary colorectal cancer syndrome. The BC Colon Screening Program is appropriate for those who have a family history of colorectal cancer among first-degree relatives.

ABSTRACT: A family history of colorectal cancer may increase colorectal cancer risk, and more intensive screening may be indicated. The family history may be classified as familial colorectal cancer, which is multifactorial, or hereditary colorectal cancer, which is due to an inherited germline mutation in a cancer gene. Individuals with familial colorectal cancer may be screened through the BC Colon Screening Program using biennial fecal immunochemical testing; higher-risk individuals may be screened by colonoscopy every 5 years. Individuals with a family history of a hereditary cancer syndrome are referred to the Hereditary Cancer Program for genetic testing and for recommendations on colon screening, which is managed outside the BC Colon Screening Program by their colonoscopy provider.

A significant family history of colorectal cancer may be related to a hereditary syndrome, such as Lynch syndrome, or a familial susceptibility. Hereditary colorectal cancer is associated with a germline pathogenic variant in a hereditary cancer gene and accounts for 5% to 10% of all colorectal cancers. Familial colorectal cancer encompasses a heterogeneous group who may have an increased colorectal cancer risk due to multifactorial genetic and shared environmental risk factors.

Familial colorectal cancer

The risk of future colorectal cancer in an individual with a family history of colorectal cancer depends on several factors. Risk increases based on:

- Older age of the individual.
- Increased number of relatives affected.
- Closeness of the affected relative(s).
- Younger age at diagnosis of the affected relative(s).

The British Columbia guidelines for colon screening in individuals with a family history of colorectal cancer but not a hereditary colorectal cancer syndrome were updated in 2022.[1] The recommendations incorporate an updated review of the literature but remain unchanged from the previous guidelines **[Table 1]**.

In 2018, the Banff Consensus, developed by the Canadian Association of

TABLE 1. BC guidelines for screening individuals with a family history of colorectal cancer.

Family history	Test	Start age	Interval
≥ 2 FDRs* diagnosed with colorectal cancer	Colonoscopy	40 years†	5 years
1 FDR diagnosed with colorectal cancer at < 60 years of age	Colonoscopy	40 years§	5 years
1 FDR diagnosed with colorectal cancer at ≥ 60 years of age	FIT‡	50 years	2 years
≥ 1 SDR(s)§ diagnosed with colorectal cancer	FIT	50 years	2 years
≥ 1 FDR(s) diagnosed with a precancerous lesion	FIT	50 years	2 years

* FDR = first-degree relative.
† Or 10 years younger than the earliest age of diagnosis of the FDRs, whichever is earlier.
‡ FIT = fecal immunochemical test.
§ SDR = second-degree relative.

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Gastroenterology and endorsed by the American Gastroenterological Association, was published as a guideline for screening patients with nonhereditary family history of colorectal cancer or adenoma.[2] The guidelines employed the most rigorous evaluation of the published literature and highlighted the low quality of available evidence to inform decisions regarding screening individuals with a family history of colorectal cancer. The systematic review demonstrated a twofold increased risk of colorectal cancer in individuals with one or more first-degree relatives (parent, sibling, or child) diagnosed with colorectal cancer. The risk was lowest for a single first-degree relative and increased with the number of first-degree relatives affected by colorectal cancer. In addition, as a relative's age of diagnosis increased, the risk decreased in a continuous fashion but always remained elevated compared with those without a family history. Therefore, use of an age cutoff of 50 or 60 years to assign alternative risk-based screening strategies was deemed arbitrary.[2] The group recommended colonoscopy as the preferred screening test for individuals with one or more first-degree relatives with colorectal cancer. Fecal immunochemical testing was recommended as a second-line screening option if an individual prefers fecal immunochemical test over colonoscopy or is at increased risk of colonoscopy-related complications, and to ensure equitable access to colon screening when colonoscopy resources are limited.

One year after the Banff Consensus was developed, a systematic review and meta-analysis by Roos and colleagues reported on the cumulative risk of developing colorectal cancer by 85 years of age in individuals with a family history of colorectal cancer in Western European and United States populations.[3] The relative risk for patients with at least one first-degree relative with colorectal cancer was lower than previously reported and was not significantly different from individuals without a family history of colorectal cancer: 1.37 (95% CI, 0.76-2.46) in pooled cohort studies. The relative risk increased to 3.26 (95% CI, 2.82-3.77) when the first-degree relative was less than 50 years of age at the time of diagnosis, and to 2.02 (95% CI, 1.59-2.57) when the first-degree relative was less than 60 years of age at diagnosis. However, the colorectal cancer risk among individuals with a first-degree relative who was diagnosed after 50 years of age was similar to the risk when the relative was diagnosed after 60 years of age, which implies that the increased risk to individuals with a first-degree relative who is diagnosed before 60 years of age is driven largely by those with a first-degree relative who is diagnosed before 50 years of age. These findings support screening individuals with a single older first-degree relative who has been diagnosed with colorectal cancer in a fashion similar to that of the average-risk population.

First-degree relative with colorectal cancer

Screening recommendations for individuals with two or more first-degree relatives with colorectal cancer are consistent across different jurisdictions: colonoscopy every 5 years. Conversely, recommendations for those with a single first-degree relative with colorectal cancer vary, although most guidelines recommend an age cutoff at which to intensify colon screening. The most common cutoff is 60 years of age, although the British guidelines use 50 years of age, which is supported by the findings of Roos and colleagues[3] **[Table 2]**.

Second-degree relative with colorectal cancer

Individuals with one or more second-degree relatives with colorectal cancer have a risk similar to that of the general population and should be screened as per the average-risk population.[2,8] However, an individual with multiple second-degree relatives with colorectal cancer and an early death in the connecting first-degree relative may require more intensive screening and, if the second-degree relatives are younger than 50 years of age at the time of diagnosis, a referral to the BC Cancer Hereditary Cancer Program.

First-degree relative with a precancerous lesion

An individual's risk of colorectal cancer may be affected by first-degree relatives who have had precancerous lesions removed; however, the evidence for this is of very low quality. Colonoscopy and resection of precancerous lesions will reduce an individual's risk of colorectal cancer, but there is no mechanism for determining if or when that precancerous lesion would have progressed to colorectal cancer. Therefore, it is unknown whether the individual's first-degree relatives are at increased risk for colorectal cancer. Risk stratification is further complicated by a lack of documentation to confirm the presence of precancerous lesions and whether the lesion was high risk or low risk. Given the uncertain benefit of and the difficulty with family history validation,

TABLE 2. Screening guidelines for individuals with a single first-degree relative with colorectal cancer.

Guideline	Year published	Single first-degree relative age cutoff
BC[1]	2022	Diagnosed at < 60 years of age
Ontario[4]	2017	Diagnosed at < 60 years of age
Canada (Banff Consensus)[2]	2018	Diagnosed at any age
US Multi-Society Task Force[5]	2017	Diagnosed at < 60 years of age
Britain[6]	2020	Diagnosed at < 50 years of age
Asia-Pacific[7]	2022	Diagnosed at < 60 years of age

most screening programs, BC's included, do not distinguish these individuals from the general population for screening.

However, some clinical practice guidelines have made specific recommendations. For instance, the Banff Consensus recommends initiating screening at 40 to 50 years of age or 10 years younger than the age of diagnosis of a first-degree relative with a confirmed high-risk precancerous lesion.[2] Screening with either colonoscopy every 5 to 10 years or fecal immunochemical testing every 1 to 2 years are options.

Screening with the fecal immunochemical test

The fecal immunochemical test is the most common primary screening modality used in programmatic screening. Although the BC Colon Screening Program offers intensified screening for those with a high-risk family history, in accordance with the BC Guidelines,[1] this is not the case in many screening programs. Several studies have also evaluated fecal immunochemical test performance for individuals with a family history. A cohort study in the BC Colon Screening pilot evaluated 1387 individuals who had one or more first-degree relatives with colorectal cancer. The participants were invited to complete both a fecal immunochemical test and colonoscopy. The positive and negative predictive values of the fecal immunochemical test in the detection of colorectal cancer were 4.8% and 100%, respectively.[9] In addition, the Dutch screening program invited nearly 6000 individuals to complete a fecal immunochemical test and a family history questionnaire. If either the fecal immunochemical test was positive or there was a significant family history of colorectal cancer, a colonoscopy was performed. The addition of the family history questionnaire did not increase the detection of advanced neoplasia (a combined outcome of colorectal cancer and high-risk precancerous lesions).[10] Finally, Quintero and colleagues conducted a prospective trial that randomly assigned 1981 first-degree relatives of patients with colorectal cancer to receive colonoscopy or an annual fecal immunochemical test. Follow-up after 3 years showed both screening strategies detected all the colorectal cancers, and there was no difference in the detection of advanced neoplasia.[11]

The BC Colon Screening Program screens individuals with familial colorectal cancer as follows:

- One first-degree relative diagnosed at younger than 60 years of age or two or more first-degree relatives diagnosed at any age:
  - Fill in and fax the colonoscopy referral form to the Colon Screening Program: www.bccancer.bc.ca/screening/Documents/Colonoscopy-Referral-Form.pdf.
  - The patient will be referred for colonoscopy when they are due, at 40 years of age, or 10 years younger than the age of diagnosis of the earliest affected relative.
- One first-degree relative diagnosed at older than 60 years of age:
  - Refer for biennial fecal immunochemical test at 50 years of age: www.bccancer.bc.ca/screening/Documents/Standard-Outpatient-Lab-Requisition.pdf.

Hereditary colorectal cancer

Identifying an inherited cancer susceptibility in an individual clarifies future cancer risk for both the individual and their family and informs decisions regarding increased screening and surveillance and options for prevention.

The hereditary cancer syndromes that predispose to colorectal cancer and general recommendations for colonoscopy surveillance are outlined in **Table 3**. There is wide variability in overall lifetime cancer risk, age at diagnosis, associated extracolonic cancers, and phenotypic presentation between and within conditions and families. The variability in risk may be related to shared biologic (e.g., genetic risk modifiers), social, and behavioral exposures (e.g., tobacco, alcohol, processed/red meat consumption, physical exercise).

Due to the increased complexity of colorectal screening, as well as the potential need to screen for other gastrointestinal and extraintestinal cancers, individuals with a hereditary colorectal cancer syndrome are not eligible to participate in the BC Colon Screening Program. Rather, they should be evaluated by the BC Hereditary Cancer Program, and their colorectal screening and surveillance should be managed on an individual basis by their colonoscopy provider.

Hereditary colorectal cancer syndromes can be categorized by the histologic subtype of the precancerous lesion and whether polyposis (numerous precancerous lesions), measured cumulatively over time, is a feature. Adenomatous syndromes include Lynch syndrome, which is not usually accompanied by polyposis; familial adenomatous polyposis; attenuated familial adenomatous polyposis; and *MUTYH*-associated polyposis. The hamartomatous polyposis syndromes include Peutz-Jeghers syndrome, juvenile polyposis syndrome, and *PTEN* hamartomatous syndromes. Finally, serrated polyposis syndrome is characterized by numerous serrated lesions.

Adenomatous syndromes

Lynch syndrome

Lynch syndrome is the most common type of hereditary colorectal cancer. It is diagnosed when a pathogenic germline variant is reported in a mismatch repair gene (*MLH1*, *MSH2*, *MSH6*, *PMS2*, or 3' terminal deletions of *EPCAM* causing epigenetic silencing of *MSH2*).[15,16] The mismatch repair system corrects errors in base pair matching that occur during DNA replication. Lynch syndrome is an autosomal dominant condition whereby an individual will inherit a mismatch repair mutation in one allele and then the second allele is later inactivated. If there are inherited mutations in both alleles, this is termed constitutional mismatch repair deficiency and typically presents with multiple malignancies in childhood.[17]

Lynch syndrome should be suspected in individuals with a personal or family history of colorectal cancer or uterine cancer diagnosed at younger than 50 years of

TABLE 3. Hereditary cancer syndromes predisposing to colorectal cancer.[12-14]

Syndrome	Gene	Population frequency	Percentage of colorectal cancer	Cumulative lifetime colorectal cancer risk*	Average age of colorectal cancer diagnosis (years)	Colonoscopy†
Lynch syndrome		1/279	3%–5%			
	MLH1	1/1 946		50%–60%	44	Every 1–2 years from age 25
	MSH2 (includes *EPCAM*)	1/2 841 (*EPCAM* rare)		50%	44	Every 1–2 years from age 25
	MSH6	1/758		20%	42–69	Every 1–3 years from age 30
	PMS2	1/714		Up to 20%	61–66	Every 1–3 years from age 30
APC-associated polyposis‡	*APC*	1/33 000	1%	Classic FAP§: ~100% Attenuated FAP (AFAP): 70%	Classic: 39 (without colectomy) AFAP: 50	• Classic: every 1–2 years from age 10–15 • AFAP: every 1–2 years from late teens
MUTYH-associated polyposis	Biallelic *MUTYH*	Monoallelic: 1/45 Biallelic: 1/8 000	< 1%	70%–90%	45–59	Every 1–2 years from age 25–30
Peutz-Jeghers syndrome	*STK11*	1/25 000–1/280 000	< 1%	39%	40–45	• Baseline age 8 years • No polyps: every 2–3 years from age 18 • Polyps: at least every 3 years
Juvenile polyposis	*BMPR1A/SMAD4*	1/16 000–1/100 000	< 1%	30%–40%	34	• Baseline age 12–15 years • No polyps: every 3 years from age 18 • Polyps: every 2–3 years
PTEN-hamartoma tumour syndrome	*PTEN*	1/200 000	< 1%	Up to 16%	44–58	Every 5 years from age 35–40
Serrated polyposis syndrome	Multifactorial *RNF43/MUTYH*	Not well known; 0.09%–0.4% in average-risk colonoscopy patients	< 1%	15%–35%	50–60s	• Every 1–2 years from diagnosis • Every 5 years from age 40 for FDRs¶ • Every 1–3 years if polyps found

* Estimates typically reflect risk without surveillance.
† May be adjusted based on personal and/or family history of cancer/polyps.
‡ Includes familial adenomatous polyposis and attenuated familial adenomatous polyposis.
§ FAP = familial adenomatous polyposis.
¶ FDR = first-degree relative.

age, synchronous colorectal cancer (more than one colorectal cancer occurring at the same time), metachronous colorectal cancer (more than one colorectal cancer over an individual's life), and multiple Lynch syndrome–associated cancers. The Amsterdam Criteria and revised Bethesda Criteria have largely been replaced by more sensitive clinical prediction models.[15] The use of universal tumour screening of all colorectal cancers for evidence of mismatch repair deficiency will improve detection of Lynch syndrome in cases where it might otherwise go unrecognized. This is described in more detail in the "New colorectal cancer diagnosis" section.

In addition to colorectal cancer, individuals with Lynch syndrome are at increased risk for endometrial cancer (*MLH1*: 40%, *MSH2*: 50%, *MSH6*: 40%, *PMS2*: 13% to 26%), with an average age of diagnosis between 45 and 50 years of age. Depending on the genetic mutation, there is also a risk of ovarian cancer. Prophylactic hysterectomy with bilateral salpingo-oophorectomy is recommended, once childbearing has been completed, from 40 years of age.[18]

Other Lynch syndrome–associated cancers include gastric, hepatobiliary, urinary tract, small intestine, pancreas, brain, and sebaceous carcinomas, with an absolute lifetime risk of less than 5% to 20%, depending on the genetic mutation. Individual

recommendations regarding screening for these cancers depend on the affected gene and which cancers have occurred in a particular family.[18] The terms Turcot syndrome and Muir-Torre syndrome, once used to describe patients who developed glioblastoma and sebaceous skin lesions, respectively, are outdated. Any patient with Lynch syndrome can develop these tumors.

Primary prevention strategies are an important component of Lynch syndrome management. Both excess body weight and smoking are associated with colorectal adenomas in Lynch syndrome individuals.[15] Supporting patients in smoking cessation, exercise, and a healthy diet may reduce their risk. Chemoprevention of colorectal cancer using ASA in individuals with Lynch syndrome was demonstrated in an international randomized controlled trial; the hazard ratio for the per-protocol analysis was 0.65 (95% CI, 0.43-0.97).[19] The benefit was seen at 5 years in subjects who had taken ASA for at least 2 years. The adverse event rate was similar in the treatment and placebo groups. To date, only high-dose ASA, 600 mg daily, has been studied in individuals with Lynch syndrome; however, a trial is underway to examine the use of lower doses of ASA in this population.

APC-associated polyposis

Germline mutations in the tumor suppressor gene *APC* are inherited in an autosomal dominant fashion and result in familial adenomatous polyposis and attenuated familial adenomatous polyposis.[15,20] Individuals with classic familial adenomatous polyposis develop hundreds to thousands of colorectal adenomas in their teenage years and will develop colorectal cancer by 30 years of age unless colectomy is performed. In attenuated familial adenomatous polyposis, individuals develop fewer than 100 adenomas (average 30 adenomas), particularly in the right colon, and have an age of onset between 40 and 60 years of age.[20] Most individuals with familial adenomatous polyposis have a family history consistent with the syndrome, but approximately one-third do not, thus representing either a new germline mutation in that individual or genetic mosaicism.[15]

Small intestinal adenomas are common in familial adenomatous polyposis and attenuated familial adenomatous polyposis, usually in the periampullary region of the duodenum, as well as adenomatous changes in the ampulla of Vater, which results in a lifetime risk of duodenal or periampullary cancer of 4% to 12%. Screening for and resection of any small intestinal adenomas is recommended. Additional familial adenomatous polyposis–associated cancers and attenuated familial adenomatous polyposis–associated cancers include gastric, pancreatic, thyroid, bile duct, medulloblastoma, and hepatoblastoma, all at low absolute lifetime risk. Other features include dental abnormalities, such as supernumerary teeth; soft tissue tumours on the face, scalp, or abdomen (desmoids); osteomas on the skull or jaw; and congenital hypertrophy of the retinal pigment epithelium. These extraintestinal features occur less frequently in attenuated familial adenomatous polyposis.[20]

MUTYH-associated polyposis

MUTYH-associated polyposis is an autosomal recessive syndrome that results from a biallelic germline mutation in the repair gene *MUTYH*, a gene that is critical in repairing oxidative damage to the *APC* gene, among others.[15,20] The phenotype of *MUTYH*-associated polyposis is similar to familial adenomatous polyposis but with a later age of onset, 40 to 50 years of age, and fewer adenomas. The clinical presentation is variable and ranges from early-onset colorectal cancer in the absence of polyposis to mild polyposis (10 to 50 polyps) and, less commonly, to more than 100 polyps. Individuals with *MUTYH*-associated polyposis can also have a mixture of adenomas and serrated lesions.

The extracolonic malignancies are similar to familial adenomatous polyposis but also include ovarian, bladder, skin, and breast cancers. In addition to intensive screening for colorectal cancer, screening for small intestinal adenomas is recommended.

Colonic adenomatous polyposis of unknown etiology

Individuals with 10 or more cumulative colorectal adenomas are considered to have polyposis and are eligible for genetic testing through the BC Hereditary Cancer Program. The pathogenic variant detection rate in this group is 5% or higher, irrespective of age, and there is an increasing likelihood of a genetic mutation in patients with higher polyp counts at younger ages.[21]

People who have 10 or more adenomas in the colon but no pathogenic variants found in hereditary cancer genetic testing are considered to have colonic adenomatous polyposis of unknown etiology.[12] These patients should have their ongoing colon surveillance guided by their colonoscopist based on their prior colonoscopy findings.

Other hereditary adenomatous syndromes

In recent years, a moderate increase in colorectal cancer risk has been associated with genes such as *CHEK2* and *TP53* (Li-Fraumeni syndrome). Preliminary data are available for genes that are associated primarily with rare forms of polyposis, such as *GREM1* (hereditary mixed polyposis syndrome), *POLE/POLD1* (polymerase proofreading–associated polyposis), *AXIN2* (gastrointestinal polyposis and ectodermal dysplasia), *NTHL1* (attenuated polyposis phenotype with biallelic pathogenic variant), *MSH3* (polyposis with biallelic pathogenic variant), *GALNT12* (attenuated polyposis phenotype), and *RPS20* (early-onset colorectal cancer in a single Finnish family with multigenerational colorectal cancer).

Hamartomatous colorectal cancer syndromes[22]

Peutz-Jeghers syndrome

Peutz-Jeghers syndrome is associated with a histologically distinct hamartoma. It is diagnosed when an *STK11* pathogenic variant is found in germline genetic testing and/or is based on two or more of the following features in an individual:[23]

- Two or more Peutz-Jeghers-type hamartomas of the gastrointestinal tract.
- Mucocutaneous hyperpigmentation of the mouth, lips, nose, eyes, genitalia, or finger.
- Family history of Peutz-Jeghers syndrome.

Hamartomas occur throughout the gastrointestinal tract, but data on lifetime cancer risks are limited. Associated extraintestinal cancers include female breast, pancreas, lung, ovary, uterus, and testicular.[12,23] Women with Peutz-Jeghers syndrome can be followed for breast cancer (and other) surveillance through the BC Cancer Hereditary Cancer Program High Risk Clinic.

Juvenile polyposis syndrome

Sporadic juvenile polyps occur in 1% to 2% of children and are not associated with an increased risk of cancer. Juvenile polyposis syndrome is characterized by a pathogenic variant in *BMPR1A* or *SMAD4* in approximately half of people who have a clinical diagnosis of juvenile polyposis syndrome based on at least one of the following:[23]

- Five or more juvenile hamartomatous polyps of the colon.
- Multiple juvenile polyps found throughout the gastrointestinal tract.
- Any number of juvenile polyps in an individual with a family history of juvenile polyposis syndrome.

Adenomas and adenocarcinomas develop within hamartomas that occur throughout the gastrointestinal tract, most commonly in the rectosigmoid. Individuals with a *SMAD4* pathogenic variant should be screened at time of diagnosis for vascular lesions associated with *SMAD4*-related juvenile polyposis syndrome–hereditary hemorrhagic telangiectasia.[12,24]

PTEN hamartoma tumor syndrome

PTEN hamartoma tumor syndrome, including Cowden syndrome, is caused by inactivation of the tumor-suppressor gene *PTEN* and is characterized by a mixed polyposis phenotype, including hamartomas, serrated lesions, adenomas, and ganglioneuromas.[23] *PTEN* hamartoma tumor syndrome is associated with an increased risk of breast, endometrial, thyroid, renal, and melanoma skin cancers. Benign features may include macrocephaly, benign skin tumors, multinodular goiter, and, rarely, dysplastic cerebellar gangliocytoma (Lhermitte-Duclos disease).[25] Women with *PTEN* hamartoma tumor syndrome can be followed for breast cancer (and other) surveillance through the BC Cancer Hereditary Cancer Program High Risk Clinic.

Serrated polyposis syndrome

A clinical diagnosis of serrated polyposis syndrome is made based on World Health Organization 2019 criteria and a cumulative count of serrated lesions.[26] This includes sessile serrated lesions (previously sessile serrated adenomas/polyps) with or without dysplasia, traditional serrated adenomas, and hyperplastic polyps.

Serrated polyposis syndrome is diagnosed when one of the following is met:

- Five or more serrated lesions proximal to the rectum, all at least 5 mm, and two or more lesions at least 10 mm.
- More than 20 serrated lesions of any size and five or more proximal to the rectum.

While most patients with serrated polyposis syndrome are not found to have a single genetic pathogenic variant, a rare few have a pathogenic variant identified in *RNF43* (1.4%) and biallelic pathogenic variants in *MUTYH* (2.5%), often with mixed serrated/adenoma phenotype.[27]

Assessing for hereditary colorectal cancer

Personal or family history

Once an individual with a personal or family history of an inherited syndrome is identified, referral to the BC Hereditary Cancer Program is recommended.

- What to ask when taking a family history:
  - Is there a history of cancer in your biological relatives?
    - How are they related to you?
    - What age were they when they were diagnosed?
  - Has anyone had more than one cancer?
  - Has anyone in your family had genetic testing because of the family history?
  - Are any of your relatives biologically related (first cousins to each other)?
- How to refer to the Hereditary Cancer Program (www.bccancer.bc.ca/hereditary):
  - Current referral criteria are listed on the referral form.
  - If the patient meets any of these criteria, complete the referral form and submit it to the Hereditary Cancer Program.
  - The family history form is required only for patients who do not meet the referral criteria based on their own diagnosis.
  - Contact the Hereditary Cancer Program for answers to any questions (hereditarycancer@bccancer.bc.ca).

The Hereditary Cancer Program offers publicly funded hereditary cancer risk assessment and genetic testing to residents of BC and Yukon. To improve access to genetic testing and reduce wait times, the program has embraced multiple alternative models of service delivery, such as group counseling, mainstreaming (testing ordered directly by providers, with patients referred to the program for abnormal results), and employing genetic counseling assistants. In spring 2022, an online platform was developed to provide a patient-led approach to receiving information and consenting to genetic testing. To increase support for patients and families living with hereditary cancer risk, a follow-up service has been integrated into the Hereditary Cancer Program care pathway for individuals with a germline mutation. It provides annual check-ins for medical care and access to recommended surveillance and prevention and addresses any other support needs.

What to expect from the Hereditary Cancer Program:

- Hereditary cancer risk assessment.
- Publicly funded genetic testing.
- Surveillance and prevention recommendations for the patient and their close relatives.

- Family support for cascade carrier testing.
- Continuing education for providers and the public.

New colorectal cancer diagnosis

For an individual with a new diagnosis of colorectal cancer, universal tumor screening for mismatch repair deficiency is recommended, regardless of age, to improve detection of Lynch syndrome and to identify those who may benefit from immunotherapy **[Figure 1]**.[12,14,28] Screening involves using immunohistochemical staining of the tumor to detect the absence of one of the mismatch repair proteins or to detect microsatellite instability. Microsatellite instability refers to the tendency of uncorrected DNA errors in base pair matching to cluster in repetitive sequences, or microsatellites, which create genetic instability. Approximately 15% to 20% of colorectal cancers have high levels of microsatellite instability, or at least one mismatch repair protein is absent. Most mismatch repair–deficient tumors are related to acquired *MLH1* promoter hypermethylation, which inactivates *MLH1*, and can be inferred by testing tumors for the *BRAF* mutation. If the *BRAF* mutation is not present in the tumor, methylation is less likely, and blood testing for genetic sequencing is performed to assess for Lynch syndrome. Likewise, if the tumor demonstrates loss of *MSH2*, *MSH6*, and/or *PMS2*, germline genetic testing is indicated **[Figure 2]**. Although many pathology departments in BC have adopted universal screening for Lynch syndrome in individuals with a newly diagnosed colorectal cancer, this approach is not yet available in all areas.

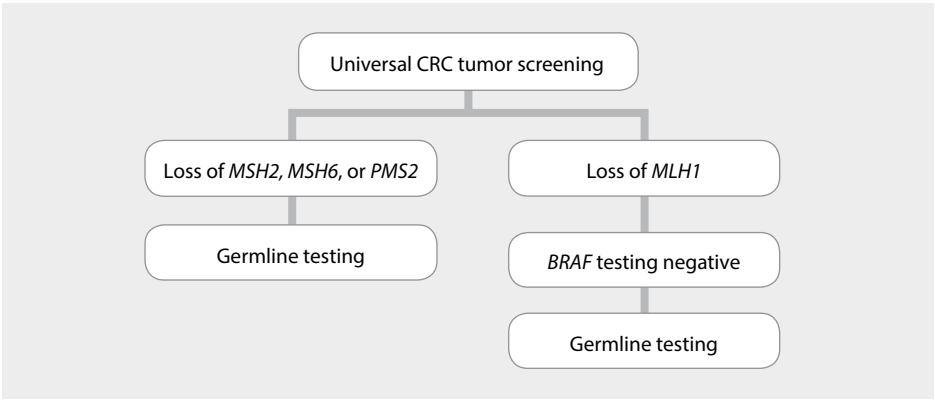

FIGURE 1. Universal screening for Lynch syndrome in colorectal cancer (CRC).

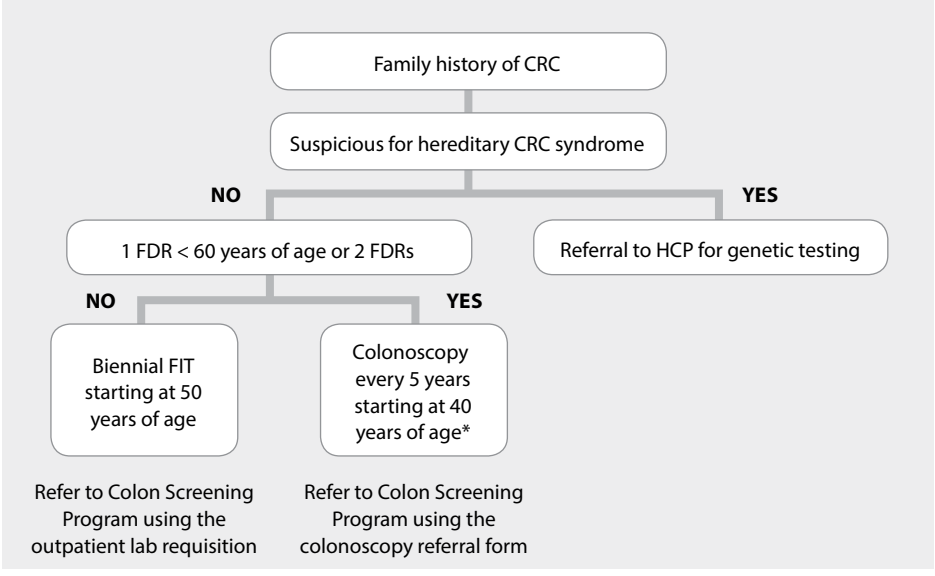

FIGURE 2. Approach to an individual with a family history of colorectal cancer (CRC).

FDR = first-degree relative; HCP = Hereditary Cancer Program; FIT = fecal immunochemical test.
*Or 10 years earlier than the age of diagnosis of the youngest affected relative.

Genetic testing

The Hereditary Cancer Program arranges genetic testing for the following:

- Mismatch repair–deficient colorectal cancer.
- Colorectal cancer diagnosed at 40 years of age or younger.
- Colorectal cancer diagnosed at 50 years of age or younger and no family history known due to adoption.
- Colorectal cancer diagnosed at 50 years of age or younger, plus five or more precancerous lesions.
- Two Lynch syndrome–related diagnoses, at least one at 50 years of age or younger.
- Two or more colorectal adenomas diagnosed at 40 years of age or younger.
- Ten or more cumulative colorectal precancerous lesions.
- Two or more cumulative gastrointestinal hamartomas.
- Five or more serrated lesions proximal to the rectum (all ≥ 5 mm; at least two ≥ 10 mm) or more than 20 serrated lesions of any size throughout the large bowel, with five or more proximal to the rectum.
- Two close relatives (can include the patient) with Lynch syndrome cancer, both 50 years of age or younger.
- Three or more relatives (can include the patient) with Lynch syndrome cancers, at least one diagnosed at 50 years of age or younger.
- Known pathogenic or likely pathogenic variant in a family member.

Individuals who are not eligible for publicly funded services or those who want to access testing as soon as possible may

consider private pay genetic testing through an accredited laboratory. If a pathogenic variant is found in a hereditary cancer gene, the patient should be referred to the Hereditary Cancer Program. In addition, confirmatory germline testing through an accredited laboratory is recommended when a potential pathogenic variant is identified by commercial entities that provide ancestry (and sometimes health) information. These tests typically use microarray-based single nucleotide polymorphism testing, which has not been validated for clinical use and can have a high degree of error.[29]

Summary

In evaluating an individual's risk of familial or hereditary colorectal cancer, a comprehensive family history is essential. If the presence of a hereditary colorectal cancer syndrome is suspected, the Hereditary Cancer Program is an excellent resource for genetic testing and guidance on screening for colorectal cancer and other at-risk cancers. While waiting for a Hereditary Cancer Program appointment, it may be appropriate to refer for colonoscopy. For those who do not appear to have an inherited syndrome but who have a family history of colorectal cancer among first-degree relatives, screening within the BC Colon Screening Program is appropriate **[Figure 2]**. ■

Competing interests

Dr Telford received a sessional fee from the Guidelines and Protocols Advisory Committee in 2021–2022 for her contributions to the colon screening guidelines.

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Referring your WorkSafeBC patients to a specialist, and notes for specialists

Physicians and nurse practitioners can refer patients with a WorkSafeBC claim to a specialist and have it billed to WorkSafeBC. No prior WorkSafeBC authorization is required by the referring clinician or the receiving specialist as long as the referral is for the injury, mental health condition, or occupational disease accepted on the claim (even if the decision on whether the claim can be accepted is still pending). Check the status of a claim at https://pvc.online.worksafebc.com.

Routine referrals

Make routine referrals as you would for patients without WorkSafeBC claims. Indicate your patient's claim number prominently in the referral letter so WorkSafeBC is billed for the visit instead of MSP.

Expedited referrals

Why expedite?

For patients off work, every day away increases the risk of chronic worklessness with its associated medical and social harms.[1] To help protect your patients' livelihoods, WorkSafeBC supports expedited referrals to specialists either by direct referral to a community specialist willing to expedite an appointment or by requesting a referral to the Richmond WorkSafeBC Visiting Specialist Clinic (VSC).

How to request an expedited referral to a community specialist/clinic

1. Find a specialist/clinic willing to expedite a referral. Specialists do not require authorization from WorkSafeBC to expedite a patient encounter for patients with pending or accepted WorkSafeBC claims as long as they can incorporate this into their patient flow. However, you will need to find a specialist willing to expedite appointments.

Use Pathways BC (https://pathwaysbc.ca) to help: search "WorkSafeBC," "expedited," and the specialty or clinic type for a list of specialists interested in providing expedited appointments for WorkSafeBC patients in your area.

Note to specialists: Check your profile and your clinic's profile on Pathways BC to ensure it reflects your interest (or not) in expediting appointments for patients with a pending or accepted WorkSafeBC claim.

2. Write a referral letter prominently noting it is a WorkSafeBC patient. Specialists do not require prior authorization from WorkSafeBC to bill for an expedited visit, but they may miss the window of opportunity to meet billing rules[2] if they are not aware that the patient is a WorkSafeBC patient. Displaying the claim number prominently in your referral letter allows them to triage patients accordingly.

Note to specialists: Use fee codes 19911 and 19912 for expedited consults—see the billing guide for these codes (www.worksafebc.com/en/resources/health-care-providers/guides/how-to-bill-fee-code-19911-19912).

How to request an expedited referral to the Richmond WorkSafeBC VSC

Physicians and nurse practitioners can request that their patients be seen at the Richmond WorkSafeBC VSC (https://pathwaysbc.ca/clinics/47; login required). If the request is approved by the WorkSafeBC decision-making officer assigned to your patient, the WorkSafeBC medical advisor will write a referral on your behalf, and the VSC will contact your patient with the date and time of the appointment.

There are three ways to request a VSC referral:

- Make a RACE request (www.raceconnect.ca) by phone or through the app.
- Leave a voicemail on the WorkSafeBC medical advisor information line at 1 855 476-3049. Your message will be picked up within 24 hours on business days and routed as high priority to one of our physicians.
- Indicate your interest on Form 8/11 by checking the box to contact a medical advisor. In the text area, explain that you need a referral to the VSC and don't need a phone call as long as the referral is made. (Caution: If you fill in the text area but do not check the box to speak to the medical advisor, your request may be missed.)

If you cannot find a community psychiatrist to see your WorkSafeBC patient

If you have trouble finding a psychiatrist to see your WorkSafeBC patient for a mental health condition through a community referral, expedited or not, contact a medical advisor to discuss. We may be able to facilitate a referral to a roster of psychiatrists who see injured or ill workers. You can make a request to WorkSafeBC through RACE, leave us a voicemail on the WorkSafeBC medical advisor information line at 1 855 476-3049, or indicate your need on

Continued on page 226

This article is the opinion of WorkSafeBC and has not been peer reviewed by the BCMJ *Editorial Board.*

The urgent need to address mental health and substance use structural stigma in BC

British Columbians living with mental health and substance use (MHSU) disorders are experiencing a "quality chasm"[1] and are dying at unprecedented rates, in part due to structural stigma. Structural stigma refers to the inequitable deprioritization, devaluation, and othering of MHSU—as compared with physical health—within health care delivery, governance, knowledge building, and training systems, creating and perpetuating health and social inequalities and poorer standards of care for people with MHSU disorders. Structural stigma is particularly damaging because it represents unfairness and inequity embedded in how we think and act toward people with MHSU disorders and in the fabric of our institutions.

Structural stigma limits access to quality care for MHSU disorders, leading to increased emergency department presentations, more severe and harder-to-treat illnesses, and increased mortality. Indigenous people are disproportionately affected, highlighting structural racism and the ongoing perpetuation of colonial violence. This is happening within the context of a worsening opioid crisis.

The 2023 BC provincial budget includes $1 billion for MHSU funding over the next 3 years. However, it is essential that funds are spent wisely to ensure they are tied to evidence-based frontline services. Since "every system is perfectly designed to get the results it gets,"[1] it's time to treat structural stigma as a quality-of-care indicator and a health-equity issue and to prioritize system redesign.

We need reduced fragmentation and a cohesive system built on the understanding that mental health is intimately tied to all other aspects of health.

How structural stigma manifests in the health care system:

- Unequal funding for MHSU compared with physical health even after considering the new investment.
- Artificial separation of services for substance use disorders and mental illnesses, especially since concurrent disorders are the rule rather than the exception.
- Limited MHSU training in primary care and other specialties relative to the burden of disease.
- Lack of acknowledgment that unaddressed MHSU disorders impact outcomes in virtually all specialties.[2]
- Absence of a comprehensive vision or action plan for MHSU care provincially, with large gaps in prevention and treatment in the current provincial strategy.[3]
- High distress levels and frustration felt by providers, patients, and families from working in and/or accessing MHSU care in a subpar system.
- Anticipated stigma and system distrust, leading to decreased willingness to seek help.
- Siloing the Ministry of Mental Health and Addictions (MMHA) from the Ministry of Health (MoH) and children's mental health services residing in the Ministry of Children and Family Development (MCFD).

While there can be benefits to creating a distinct entity to draw attention to MHSU, creating more separation between other domains of health ultimately contributes to the chasm. We need reduced fragmentation and a cohesive system built on the understanding that mental health is intimately tied to all other aspects of health.

How to decrease harm and create a cohesive system that delivers high-quality care:

- Reduce fragmentation by evaluating the structure of institutions, including the MoH, MMHA, and MCFD. Evaluate allocation of funding to prioritize and support evidence-based frontline care.[1]
- Measure wait times and outcomes for MHSU disorders with benchmarks, wait-time targets, and treatment pathways so all patients can expect high-quality care regardless of identity or home community. Embedded measurements and targets will allow for transparency and hold the government and health authorities accountable for system performance.
- Review all health and human service policies, along with accreditation standards for hospitals and medical schools, through a health-equity lens to address the barriers to MHSU services for so many people.

This article is the opinion of the authors and not necessarily the Council on Health Promotion or Doctors of BC. This article has not been peer reviewed by the BCMJ *Editorial Board.*

COHP

- Include training on robust stigma reduction and structural competency components for all health professions.[4]
- Examine biases, seek further education, and advocate.

Courageous, bold personal and collective action at all levels is needed to address MHSU structural stigma. The statement "there is no health without mental health" could not be more true. ■

—Rachel Grimminck, MD, FRCPC
COHP Vice-Chair

—Stephanie Knaak, PhD
Adjunct Assistant Professor, Department of Psychiatry, Cumming School of Medicine, University of Calgary
Adjunct Clinical Associate, Faculty of Nursing, University of Calgary
Adjunct Professor, Department of Community Health Sciences, University of Manitoba

—Andrew Szeto, PhD
Associate Professor, Department of Psychology, University of Calgary

—Veronic Clair, MD-PhD, FRCPC
COHP Chair

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Continued from page 224

Form 8/11 and check the box to contact a medical advisor.

Please note that WorkSafeBC does not run an emergency/urgent care service. For emergency/urgent situations, use the same community services you would for patients without a WorkSafeBC claim (i.e., facilitate steps for your patient to be seen through hospital emergency services). ■

—Celina Dunn, MD, CCFP
Medical Services Manager, WorkSafeBC

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Obituaries

We welcome original tributes of less than 700 words; we may edit them for clarity and length. Obituaries may be emailed to journal@doctorsofbc.ca. Include birth and death dates, full name and name deceased was best known by, key hospital and professional affiliations, relevant biographical data, and a high-resolution head-and-shoulders photo.

Dr Avi Ostry
1958–2023

Dr Avrum Jay (Avi) Ostry was born in Flin Flon, Manitoba, on 4 March 1958, to George and Anne (Lev) Ostry, and later joined by two brothers, Mark and David.

In July 2021, Avi was diagnosed with multiple myeloma. As a pathologist, he was well aware of the implications of his disease. He was a pragmatist and faced his disease with courage and forthrightness.

Avi studied marine biology and medicine at UBC (1985) and achieved a postgraduate degree in pediatric pathology at BC Women's and Children's Hospital. He did further training in cardiac pathology (Mayo Clinic) and breast pathology. He practised in Sydney and Halifax, NS, and finally as an anatomic pathologist at St. Paul's Hospital in Vancouver. Avi was also an associate professor in pathology and laboratory medicine at UBC and was involved in medical school admissions at UBC and Royal College of Physicians and Surgeons of Canada examinations in Ottawa. He was also director of medical laboratory services for Yukon and parts of Northern BC.

Avi died at home in Sechelt, a place he loved, with his wife Fran at his side. He will be missed by Fran; daughters Leah (Peter) and Neshama ("Nikki"); grandchildren Rebecca, Blake, and Isla; and the families of his brothers Mark (Margot and Neve) and David (Lesley, Julia, and Sarah). His love ripples out to extended family members, cherished friends, and colleagues. We remember Avi for his humor, kindness, intelligence, loyalty, and philanthropy. Avi was a force in our lives. We deeply love and miss him. In lieu of flowers, please consider a donation to Myeloma Canada at https://myelomacanada.ca.

—Fran Ostry
Vancouver

Recently deceased physicians

The following Doctors of BC members died between June 2022 and May 2023. Thank you to their families for sharing this information with the Membership Department. If you knew any of the deceased, please consider submitting an obituary for the *BCMJ* to journal@doctorsofbc.ca.

Dr Daniel Walter Froese
28 November 1926–25 December 2022
Obituary: https://vancouversunandprovince.remembering.ca/obituary/daniel-froese-1086997273

Dr William Beresford Gough Gubbins
17 June 1946–2 April 2023

Dr Andrzej (Andrew) Tadeusz Jakubowski
25 April 1954–27 January 2023
Obituary: www.dignitymemorial.com/obituaries/west-vancouver-bc/andrzej-jakubowski-11144593

Dr Lukas Cornelius Klopper
1 May 1956–1 May 2023

Dr Henry Frank Mizgala
28 November 1932–11 December 2022
Obituary: https://vancouversunandprovince.remembering.ca/obituary/henry-mizgala-md-frcpc-1086983826

Dr Grahame Walter Karl Thorkelson
28 December 1929–24 June 2022
Obituary: www.legacy.com/ca/obituaries/okanaganvalley/name/grahame-thorkelson-obituary?id=39988990

Dr Paul Waraich
24 August 1971–3 March 2023
Obituary: https://necrocanada.com/obituaries-2023/paul-s-waraich-md-friday-march-3rd-2023/

The Dawson City cabin

Jim Petzold, MD

In the early 1970s, as a young man in my 20s seeking to find myself, I left Ontario and headed west to explore a part of Canada I had never seen. With a Trapper Nelson pack on my back, I hitchhiked across the country to British Columbia. After the Rockies, Tofino, and Haida Gwaii, I cast my eyes north and headed up the Alaska Highway to the idyllic northwestern BC town of Atlin. From there I was drawn to the once-thriving Klondike gold rush town of Dawson City, Yukon.

I arrived in Dawson late on a summer's evening. It was dusk, and I wandered through the unfamiliar streets of the town unsure where I would pitch my tent for the night. I eventually came across an old log cabin, sitting off by itself, looking quite deserted. The door to the cabin was open so I entered and was delighted to find a forlorn-looking single bed in the one-room structure. Since the place was obviously uninhabited, I had no qualms about unrolling my sleeping bag and stretching out for the night. Alas, no sooner had I drifted off to sleep than I was awoken to a bright light shining in my eyes. A deep and somewhat angry voice said, "Young man, do you know whose bed you are sleeping in?"

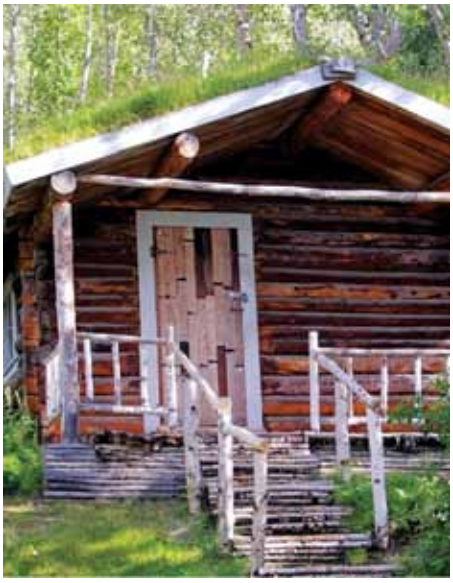
The cabin had been the home of Robert William Service (16 January 1874–11 September 1958), the famous "Bard of the Yukon," who had lived in Dawson in the early 1900s toward the end of the gold rush days. The man whose flashlight beam was shining in my eyes was the cabin's custodian. Realizing that I was innocent of any wrongdoing or intent, he kindly allowed me to spend the night in Service's bed. The next morning I followed a path leading from behind the cabin to the Midnight Dome lookout, from which I enjoyed a spectacular view of the city and the confluence of the Klondike and Yukon Rivers. I wondered how many times the famous poet had done the same.

Years later, after I completed UBC medical school and an internship at Royal Columbian Hospital, my wife Sharon and I decided to settle on the Sunshine Coast, where I began a 40-year career in family medicine. Early on in my practice, a new patient presented one day. His name was Thomas Byrne. He was a delightful elderly Irish man, slight of stature with a constant impish smile and a gleam in his eyes. He told me he had just arrived from Dawson City, where he worked every summer. Upon further questioning, I learned that his job, more like a passion for him, was to do afternoon readings of Robert William Service's poems for the tourists in Dawson City. And where did he do those readings? Why, where else but from the steps of the Bard's cabin!

It is a small world indeed. ■

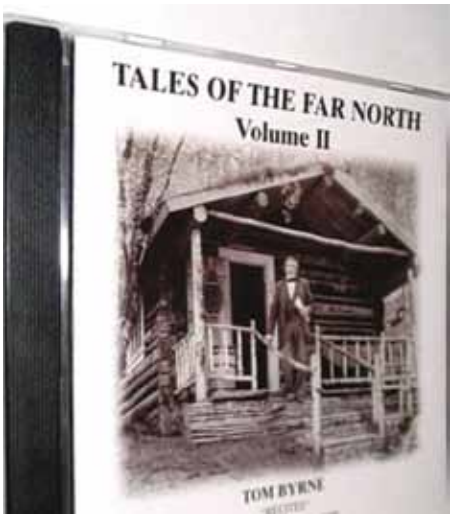
View of Dawson City and the confluence of the Klondike and Yukon Rivers from the Midnight Dome lookout.

This article has been peer reviewed.



Robert William Service's cabin in Dawson City, Yukon.

The single bed in the one-room cabin.



Tales of the Far North Volume II: Tom Byrne Recites Robert W. Service in Dawson City, Yukon, *CD.*

Classifieds

Pricing: There is a two-tier pricing structure for classified ads. Choose to run an ad online only at our monthly online rates or pay a $25-per-month surcharge for an ad to be included in a print issue as well as online.

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Place a classified ad: www.bcmj.org/classified-advertising. Payment is required at the time that you place the ad.

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We are inviting full-time, part-time, or locum family practice/walk-in physicians to join a new medical clinic within our busy, multidisciplinary North Vancouver clinic. We provide family practice, walk-in, in-person, and virtual care. Experienced medical office assistants and IT support available. Newly equipped dedicated exam rooms thoughtfully designed for in-person care. The location is central and accessible, with free parking. The medical clinic is part of a comprehensive health services facility with physiotherapy, massage therapy, counseling/psychology, dietitian, and kinesiology services all in one location. We provide a competitive fee split. Contact 604 575-2262 or offie.lastimoza@backinmotion.com for more information.

RICHMOND—SPECIALISTS/FAMILY MEDICINE

An excellent opportunity for specialty-trained and family physicians to join a new multidisciplinary clinic, led by two pain management physicians. The clinic will provide in-person and virtual consultations, family practice, and walk-in care. The location is waterfront with a nice view of the Fraser River. Parking is secure and free. The clinic will have a fluoroscopy suite for interventional pain procedures, an IV infusion treatment area, a physiotherapy clinic, and counseling support. We offer MOA and IT support for all clinicians, in addition to a competitive fee split. For more information, please email your CV to patrick@tridentmedical.ca.

SURREY/CLAYTON HEIGHTS—FULL-TIME FP

Beyond Health & Medical is looking for a full-time family physician to join our team. Thrive in a supportive and collaborative environment and maximize your time and effort, while saving up to 50% on overhead costs. If you have a passion for providing exceptional care and helping people live their best lives, join a fun and innovative medical practice working alongside other health care professionals that have the same passion as you. Beyond Health & Medical is a busy

practice with a beautiful office environment located in a very high-traffic area of Clayton Heights in Surrey. Juno EMR, MOA, and office manager supported. Competitive split. Contact Leah at leah@beyondhealth.ca.

VICTORIA—HOSPITALISTS
The South Island Hospitalists group is looking for hospitalists to join our dynamic team in beautiful Victoria. Hospitalists in Victoria provide a 24-hour MRP service at the Victoria General and Royal Jubilee Hospitals. There is a lot of variety and pathology, and we enjoy a high degree of autonomy while being well supported by our specialist colleagues. Our care covers patients aged 17–100+ and includes addictions, palliative care, geriatrics, and co-management of surgical and rehabilitation patients. Qualifications include CCFP/equivalent or FRCPC (internal medicine), eligible for CPSBC, and ACLS; hospital experience an asset. Contact Shannon Williams at medstaffrecruitment@islandhealth.ca.

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WEST VANCOUVER—SPACE FOR FT/PT PHYSICIAN
Join our West Vancouver clinic as a FT/PT family practice physician, providing in-person/virtual longitudinal care. Our clinic is equipped with dedicated exam rooms, experienced MOAs, and IT support. Building includes lab, X-ray, physio, various specialists, and free parking. Competitive fee split. Email resume to hollyburnmedical@gmail.com.

MISCELLANEOUS

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