BCMJ
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Intestinal parasites identified by microscopy

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FRAME WORKS

Strata Medical Office for Purchase or Lease

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Opportunity to purchase or lease healthcare office space in Vancouver's new innovative health and wellness hub, near the new St. Paul's Hospital

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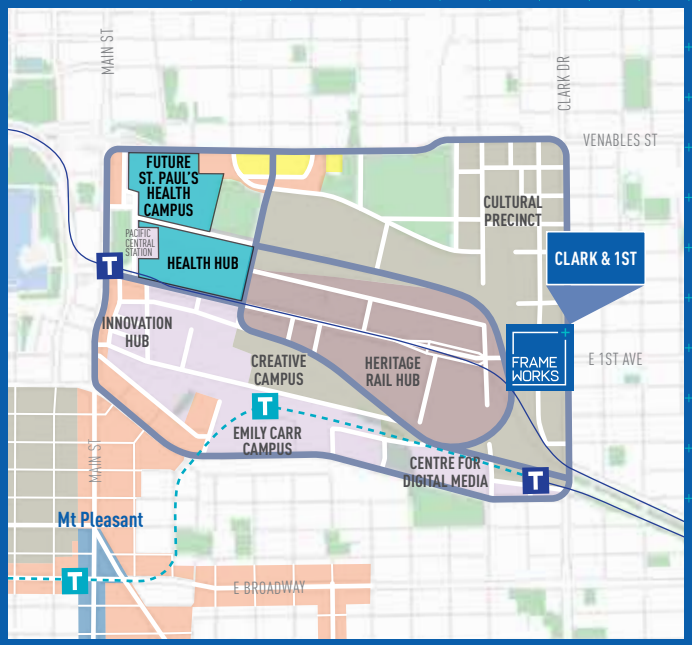

DISCOVER A NEW ERA OF OFFICE SPACE

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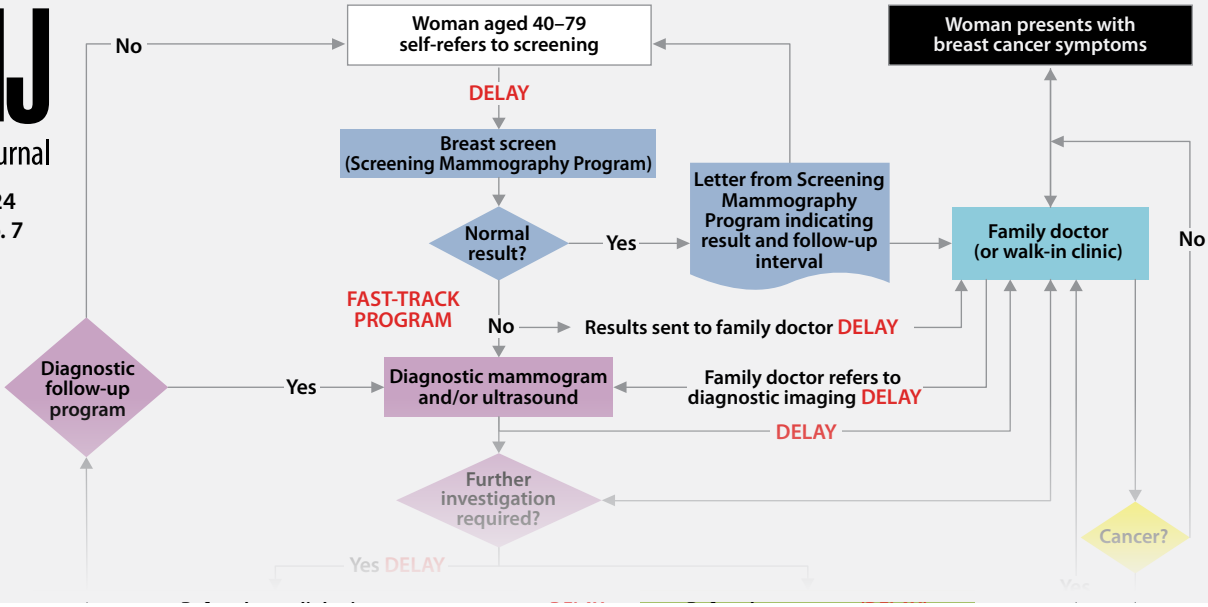

As demonstrated by this diagnostic pathway for breast cancer, treatment is an interdisciplinary endeavor. Delays among the independently functioning components of the care continuum have contributed to increasing wait times. Article begins on page 240.

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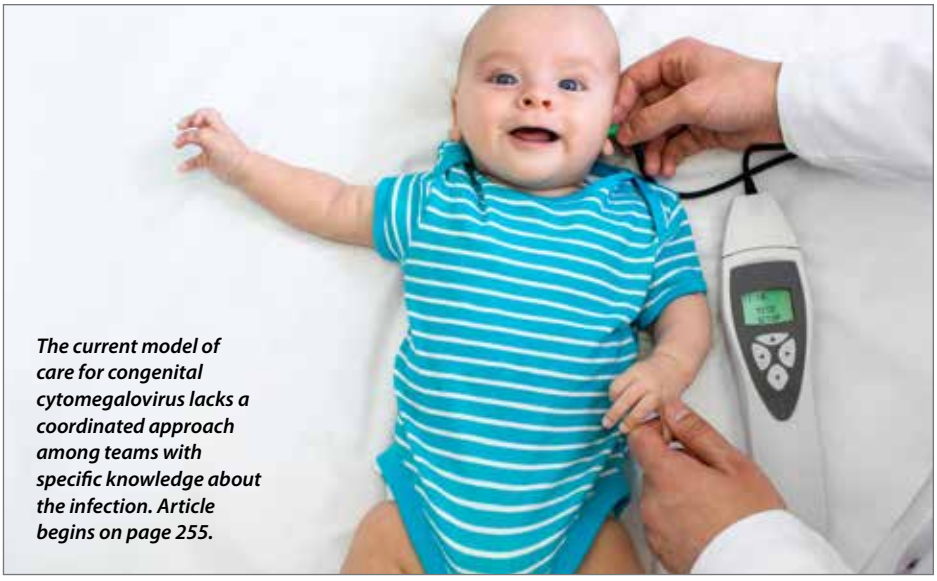
We humbly acknowledge the traditional territories of First Nations within British Columbia and that our offices are situated on the unceded territories of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh (Squamish), and səlilwətaɬ (Tsleil-Waututh) Nations. For Doctors of BC, acknowledging the traditional territories is an expression of cultural humility that involves recognizing our commitment to support the provision of culturally safe care to Indigenous Peoples in BC.

ON THE COVER
Several potentially pathogenic parasites could be missed if only IDP-NAAT is used to detect intestinal parasites. Article begins on page 248.



The current model of care for congenital cytomegalovirus lacks a coordinated approach among teams with specific knowledge about the infection. Article begins on page 255.

Mission: The *BCMJ* is a general medical journal that shares knowledge while building connections among BC physicians.

Vision: The *BCMJ* is an independent and inclusive forum to communicate ideas, inspiring excellent health care in British Columbia.

Values
Quality: Publishing content that is useful, current, and reliable.
Connections: Sharing diversity of thought and experiences from across the province and promoting communication between BC doctors.
Impact: Striving for healthier patients and communities by amplifying physicians' voices, opinions, research, and news.

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CLINICAL

Sober October?

Has the time come to re-examine our love–hate relationship with drinking? A recent episode of the *New York Times* podcast *The Daily*[1] got me thinking about how we talk to patients, and ourselves, about alcohol.

The general teaching when I was in medical school was that alcohol was a good thing . . . in moderation. The term *French paradox* was coined after evidence suggested that drinking red wine was responsible for a reduction in heart disease in some European countries.[2] In 1991, after *60 Minutes* aired a story on the research, sales of red wine in the United States increased 40%.[3,4]

Research eventually also found health benefits in beer and other drinks.[5,6] Alcohol was credited with lower rates of ischemic heart disease[7] and ischemic stroke,[8] theoretically due to benefits to cholesterol profile, endothelial inflammation, and coagulation factors.[7-9]

A meta-analysis in *Archives of Internal Medicine* (2006) demonstrated that death from all-cause mortality was lowest with moderate drinking. The article's now infamous J-shaped curve compared various quantities of alcohol consumption to "abstainers" and concluded that one to two drinks per day for women and two to four for men was a healthy range.[9] Cheers to salubrious spirits!

Let's be honest: wasn't that what everyone wanted to hear anyway? How wonderfully convenient to have one of our most beloved rituals supported by science. But why weren't we talking more about the negative effects of alcohol? Addiction, increased risk of cancers, cirrhosis, and death from accidents? Publication bias, you say? Don't be a buzzkill.

More recently, new evidence has changed the narrative. Published in January 2023, *Canada's Guidance on Alcohol and Health: Final Report* by the Canadian Centre on Substance Use and Addiction contains what are likely the strictest drinking guidelines of any country.[2,10]

Compared with 2012 guidelines, which suggested that women could consume up to two drinks (27 g) daily and men up to three drinks (40 g) daily, the 2023 update dramatically cut consumption recommendations. The current message is, unequivocally, that no amount of alcohol is good for your health and that men and women are to consume a maximum of zero to two drinks (27 g) per *week*.[10]

Professor Tim Stockwell, a psychologist and alcohol researcher from Victoria, conducted a number of meta-analyses, including data that were foundational in Canada's most recent guidelines on alcohol.[11,12] In his April 2024 address to the Royal College of Physicians of Edinburgh, Professor Stockwell dove into some of the nuances, assumptions, and misinterpretations in past research that led to overly generous estimates of alcohol's benefits. Among them are that data were mainly restricted to white populations in high-income countries and that the maximum doses for benefit were very low, around one to three drinks per week. He also suggested we give sober second thought to some of the improbable benefits of alcohol reported in older studies—reduced asthma, deafness, common colds, liver disease, and falls in the elderly, and improved infant development.[2]

The crux of the issue, however, appears to be how older studies categorized "abstainers" versus "moderate drinkers." A closer look at study subjects reveals that "abstainers" had higher baseline risks and unfavorable socioeconomic factors and included sick quitters, which systematically biased nondrinkers to ill health.

If we now accept that drinking can harm our health and shorten our lives, how will this impact our behavior? Alcohol is a ubiquitous social lubricant, and it can be hard to avoid.

What do you think—is it time to raise a mocktail and toast Sober October? Or do you plan to keep calm and pour on? ■

—Caitlin Dunne, MD, FRCSC

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Connecting and *tree*-ting with nature

The fragile symbiosis between human beings and our planet is at risk. Patient–planetary health co-benefit frameworks are increasingly being recognized, and health professionals are encouraged to take a more active role in climate change mitigation efforts.[1]

My efforts to provide good patient care require more consideration of the planet, and there are many recognized actions that health professionals can pursue in this regard.[1] Connecting within nature is an action I can promote in my practice.[1]

My knowledge and love of trees have grown exponentially since I met my partner, a horticulturalist; his passion for trees is infectious. I feel connected to nature when I am among trees. Not only do they provide oxygen, absorb greenhouse gases, prevent soil erosion, produce food, and provide shelter, but these ancient organisms also offer me solace. The revitalizing aroma of my coffee in the morning; the melodious sound of a western meadowlark perched on a giant Colorado spruce; the refreshing green space that exists at my home in the form of Norfolk pines, fig trees, swamp oaks, and hibiscus; the fruit-bearing orchard; and my invigorating runs in the forest, with its earthy aroma, all contribute to my inner peace.

I was also recently introduced to the concept of forest bathing by a friend in Kamloops, who is always trying to better our planet while practising as a neurologist. She reminisces about how, for her, forest bathing became a retreat and a peaceful refuge, alone and with others, during the pandemic. Forest bathing, or *shinrin-yoku*, is a meditative practice that involves being present with and mindful of your senses while you are in a woodland setting. It was conceptualized in the 1980s by the Japanese Ministry of Agriculture, Forestry and Fisheries to prevent further nature deprivation and protect the diminishing forests and is based on a concept of reciprocity. As people immerse themselves in nature and receive physical and mental benefits, they want to protect and preserve this environment.[2] Studies have shown that *shinrin-yoku* can lower cortisol concentrations, pulse rates, and blood pressure.[2]

As forest bathing becomes more popular in Western culture, we can also take inspiration from the practices followed by Indigenous Peoples that emphasize a spiritual bond with nature and a responsibility to respect, nurture, and protect the land.

As for local academic research, the Multidisciplinary Institute of Natural Therapy (https://mint.forestry.ubc.ca), an initiative of the University of British Columbia's Faculty of Forestry, is exploring the physiological and psychological effects of forest therapy on humans. It is developing innovative ways of bringing the sounds, scents, and lighting of the forest indoors—virtual forest bathing—making it accessible to all.

My efforts to help patients connect with nature are gaining momentum. I have created a mini–green space in my clinic. The waiting room is full of plants and small trees, and the TV plays the nature channel, so the sound of nature emanates in every room. My patients' favorite room in the clinic has a wall-sized mural of a forest, and they always comment on how calm they feel in that space.

I am also a registered prescriber of the PaRx program, whereby physicians can offer a "prescription for nature," asking patients to be present in nature for 2 hours per week, 20 minutes at a time, and a Discovery Pass, which reduces barriers to nature across Canada. PaRx is an evidence-based program that originated in the US over a decade ago and was launched here in November 2020 by the BC Parks Foundation, expanding to many provinces since then. The PaRX website (www.parkprescriptions.ca) lists numerous studies showing how spending time in nature has positive effects on human health.

Dr Chahal with her family at Kew Gardens in London, UK.

Finally, having participated in Doctors of BC's annual Walk with your Doc event (https://walkwithyourdoc.ca), I wonder whether next year's walks could be organized as forest-bathing events.

Ultimately, whatever the impetus, I encourage everyone to connect with nature and perhaps even hug a tree. ■

—Jeevyn K. Chahal, 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 city or town of residence, telephone number, and email address. Please disclose any competing interests.

Re: Driving toward injury-free roadways

As a car-free family physician who has been campaigning against overdependence on personal motor transportation for over 30 years, I welcomed Dr Schwandt's editorial in the June issue of the *BCMJ* [2024;66:146]. I have long been dumbfounded by Canadian politicians' passivity regarding the profoundly negative medical and environmental impacts of car culture. Not only do we need robust measures to make driving slower, less convenient, and more expensive, but we must also legislate limitations on the width and height of motor vehicles.

—Thomas DeMarco, MD
Whistler

Heatstroke and sweating

Thank you for the timely article titled "Preventing heat-related illness: Identifying workers at risk of heat stress due to hotter days in the context of climate change" by May, Janke, and Maruti [*BCMJ* 2024;66:179-180]. We would like to comment on the description of heatstroke signs, specifically the description of the skin as being dry and nonsweating. While such presentation is typical for classic heatstroke, which occurs in the elderly, small children, and some deconditioned individuals, it is not typical for exertional stroke, where metabolic heat generation plays a role. This type of heatstroke can be seen in those who perform physical work in hot environments. Exertional heatstroke may present with wet and sweating skin. Epstein and Yanovich[1] describe the two types of heatstroke well. Importantly, listing dry skin without sweating at the beginning of the description of signs and symptoms is misleading, as it may lead to delayed early identification of exertional heatstroke. We suggest it is important to inform clinicians and the public not to rely on dry skin and the absence of sweating as important signs of heatstroke.

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The role of Real-Time Virtual Support in improving rural health care delivery

In urban settings, the scope of practice for family physicians is often narrowed, with most solely managing clinic patients.[1] Rural family physicians may face more varied challenges. Due to a lack of medical specialists in many rural areas, these doctors need to adopt a broad scope of practice, spanning both acute and chronic conditions across every age group. Depending on where they are situated, rural family physicians often require further training in advanced skills such as adult and pediatric resuscitation, simple fracture reduction, casting techniques, venous access, lumbar puncture, endotracheal intubation, and obstetrical care.

For rural family physicians, skills that are not used regularly are susceptible to decline. In Northern British Columbia's rural communities, physicians encounter obstetric and pediatric cases less frequently due to a predominant elderly population.[1] As a result, when faced with such cases, especially complicated deliveries or acutely ill infants, physicians may grapple with challenges. Furthermore, trauma cases are infrequent in rural emergency departments compared with bustling urban centres, which can pose challenges when they do arise.[2] Continually participating in training programs to prepare for these rare cases becomes impractical for rural physicians. It detracts from time spent serving already underserved communities, and access to the training facilities, which are often located in distant urban areas, is both time-consuming and challenging.

The experience gap faced by rural family physicians in addressing infrequent cases has been substantially bridged by telehealth consulting services.[3] In April 2020, British Columbia introduced the Real-Time Virtual Support initiative, which provides around-the-clock clinical assistance to health care providers in rural regions.[4] These programs facilitate direct videoconferencing, guiding health care professionals through diagnosis, management, and use of medical equipment.[3] The program's scope has broadened since its inception and now includes phone access to specialists in pediatric, maternity, and newborn care.[4] Highlighting the program's evolution, Rural Urgent Doctors in-aid (RUDi), one of the four Real-Time Virtual Support programs, garnered only a couple calls upon its launch in 2020.[5] In 2023, RUDi doctors answered an average of 34 calls over a 12-hour shift.[4] Due to high demand, the service sometimes encounters delays.

The challenges encountered by rural family physicians and nurses in managing infrequently encountered conditions require innovative solutions. While Real-Time Virtual Support has provided a safety net, expansion to more rural communities, increased funding, and recruitment of more specialists to ensure timely support are essential.[6] Specialists are encouraged to get involved by signing up at https://rccbc.ca/stay-connected/contact-us.

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Improving ambulance services for effective rural emergency care

Rural BC emergency departments are often unequipped to treat a variety of emergencies, including major trauma, surgical emergencies, severe burns, complicated obstetric cases, neurological emergencies, complex cardiac cases, complicated pediatric cases, toxicological emergencies, rare or severe infectious diseases, and mental health emergencies. This is because rural emergency departments primarily depend on physical examinations, basic laboratory investigations, and point-of-care ultrasounds for diagnosis.[1] It is often necessary to transfer patients to urban centres by ambulance for further assessment and treatment.

BC Emergency Health Services is a centralized dispatch system that coordinates ambulance responses across the province.[2] In our opinion, at least two ambulances should be on standby near each sizable rural community. However, current realities often deviate from this ideal. In urban areas, a fully equipped hospital is often only a short drive away. In contrast, rural ambulance services may encounter hours-long journeys, during which they are unavailable for other emergencies. In rural areas, a limited number of ambulance units, a lack of paramedics with advanced training, and staffing shortages can lead to significant service gaps.[3]

In the face of this challenge, telemedicine, such as the Emergency Physician Online Support program in BC,[4] has become a vital resource. Paramedics can now receive real-time guidance from physicians before they reach the hospital.[4] However, signal connectivity in rural areas can be poor, and while telemedicine can guide care, it cannot replace the need for increased staffing and more equipment on rural ambulance units.

Operational costs for ambulance services can also rise in rural settings. Longer runs increase fuel consumption and wear and tear on vehicles. Unfortunately, reimbursement models, particularly in regions where such services might be publicly funded or subsidized, may not account for these added operational demands, placing financial strain on these service providers.[5]

To truly alleviate the pressures on rural ambulance services, the core issue—funding and expanding rural hospitals—must be tackled head-on. In the interim, recruiting more paramedics, better equipping ambulances, delivering more advanced training to paramedics, integrating telemedicine use, and increasing funding for ambulance services are crucial temporary solutions.

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Physician knowledge gaps on concussion care

Concussion has a high burden of injury and risk of secondary sequelae across all Canadian demographics in various settings.[1,2] Despite concussion's high prevalence, care is variable due to gaps in knowledge and evidence-based standardized management.[2,3] Recent advances (e.g., 6th International Conference on Concussion in Sport consensus statement on concussion in sport, American Congress of Rehabilitation Medicine diagnostic criteria for mild traumatic brain injury) have aimed to improve concussion outcomes and reduce prolonged recovery.[1] Recommendations are continually produced surrounding concussion knowledge, diagnosis, and management; however, there is a disconnect with dissemination to our frontline providers.

A 2018 Canadian public opinion survey of 391 physicians and medical professionals evaluated awareness of concussion diagnostic and management tools.[2] Approximately 60% recognized the Canadian Guideline on Concussion in Sport and the Sport Concussion Assessment Tool (SCAT; a standardized objective concussion diagnostic tool), while 15% were unaware of any commonly used tools.[2] Additionally, there is limited formal medical training in concussion.[4] A 2023 study on medical students and residents at Memorial University of Newfoundland found that 42.2% had concussion education and 25% could identify red-flag symptoms.[4] Although these statistics are limited, there have been improvements in concussion knowledge.[3] Between 2013 and 2022, the use of the SCAT by family physicians increased from 34.2% to 65.0%, and return-to-play guidelines increased from 29.8% to 56.1%.[3] Treatment recommendations shifted toward brief rest (24 to 48 hours) and subthreshold or modified exercises instead of complete rest.[1,3]

Numerous strategies can help narrow the gap between research and frontline practices. Starting with training, standardized updated concussion education is recommended across all Canadian medical schools to create a baseline of information. Some universities, such as the University of British Columbia, have included concussion education in their curriculum; however, uniform training across the country is limited.[4,5] Additionally, given the newest protocols incorporating nurse practitioners and other medical professionals to treat concussions, reviewing this education may be worthwhile.[1]

Many of our frontline providers are not up to date with the newest recommendations for concussion.[2] This gap can be addressed through CME, governing bodies (e.g., Doctors of BC, Divisions of Family Practice) endorsing the use of educational resources and guidelines (e.g., BC Guidelines and Protocols Advisory Committee, Pathways BC), updating commonly used websites (e.g., UpToDate, DynaMed), and social marketing or educational campaigns. CME is an effective avenue for knowledge translation across various subspecialties, and 53.7% of BC physicians dedicate 2–3 hours/week to professional development.[5] The Concussion Awareness Training Tool—a free, online, up-to-date, evidence-based educational tool endorsed provincially through the BC Ministry of Health and nationally through the Concussion Harmonization Project—is an effective CME resource that improves knowledge and concussion diagnostics and management.[5] Although successful, numerous CME barriers to knowledge translation have been reported, including time, accessibility, and awareness of resources and education that need to be addressed and mitigated.[5]

A substantial gap often persists between evidence-based practices and the delivery of frontline care in Canada, impacting concussion diagnosis and management. Addressing this disparity demands comprehensive strategies encompassing standardized education, ongoing training, and updated guideline and resource dissemination.

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National Day for Truth and Reconciliation

This 30th of September will mark the fourth annual National Day for Truth and Reconciliation, an opportunity for us to reflect on the painful legacy of the residential school system and its impact on Indigenous people. It is also an opportunity for us as physicians to assess how we can continue to help address anti-Indigenous racism in health care and do all we can to make the system more culturally safe, collectively and as individuals.

While we have made strides, there is still much work to do to educate ourselves, to recognize and unlearn colonialism and racism, and to take concrete action to build a health care system that safely meets the needs of Indigenous people in BC. Many of us remember when the last Indian hospital in BC closed in 1970. These were hospitals created for the express purpose of segregating Indigenous patients from the rest of the population.

The legacies of segregation and residential schools and the ongoing impacts are of significant concern for us all. Indigenous people have continually expressed not feeling safe in hospitals and emergency departments—our caring institutions. We continue to see that, despite significantly higher health care needs and comorbidities because of colonialism and racism, Indigenous patients continue to access health care services, including physicians and laboratory tests, at a fraction of the rate of the rest of the population. The use of emergency departments among Indigenous populations is almost twice that of the rest of the population, and there is much less primary care attachment. These systemic challenges for Indigenous patients have a significant impact, with reduced life expectancy and increased rates of living with chronic disease. This also manifested during the pandemic, when Indigenous people had higher rates of contracting COVID-19 and higher risks of being admitted to hospital.

Along with this, Indigenous physician colleagues continue to experience challenges. More than half of Indigenous physicians and nurses report having experienced racism at work, yet most feel unsafe to report this behavior and feel as though reporting it would have no impact. In my mind, this perhaps serves as the greatest indictment—even our colleagues, while working in the health care system, feel unsafe and unable to change it.

As a profession, we need to acknowledge the truths of the Truth and Reconciliation Commission of Canada's reports and the *In Plain Sight* report (https://engage.gov.bc.ca/app/uploads/sites/613/2020/11/In-Plain-Sight-Summary-Report.pdf) to reconcile our country, our communities, and with our patients. Yes, we have made progress, but there is much more work to be done, and it needs to be done intentionally. This is a long-term endeavor that will take continued commitment, humility, and action to achieve. Indigenous patients and physicians must feel safe in the health care system, both as care providers and receivers. Indigenous cultural safety and cultural humility on the part of the provider must become a key priority and a foundational principle in BC's health care system. However, such significant change and transformation can occur only by acknowledging the past.

To support physicians on their reconciliation journey, Doctors of BC, through the Joint Collaborative Committees, has worked with Indigenous partners to learn about and share the truth of Canada's history of violence toward and oppression of Indigenous people, residential schools, and missing and deceased children, and the impact these tragedies have on our health care system and society today.

More information on our commitment, including ongoing work and programs, can be found on Doctors of BC's Cultural Safety and Humility web page (www.doctorsofbc.ca/about-us/cultural-safety-humility). You can also learn more about upcoming learning sessions on the Joint Collaborative Committees website (www.collaborateonhealthbc.ca/events). I encourage you to consider participating in one of these webinars, taking the S<u>a</u>n'yas Indigenous Cultural Safety Training Program (https://sanyas.ca), and reviewing the health-related Calls to Action (#18–#24) from the Truth and Reconciliation Commission of Canada.

And on the 30th of September, I encourage you to wear orange to honor the survivors of residential schools, attend a local event in your community, and reflect on the effects of colonialism, its impacts on Indigenous Peoples, and the actions we must take to address anti-Indigenous racism in health care. Above all else, I urge you to be an ally for your Indigenous colleagues. As physicians, we can create lasting change—to create a health care system that is safe for all patients and providers. ■

—Ahmer A. Karimuddin, MD, FRCSC
Doctors of BC President

Dr Sepehr Khorasani

A case of mistaken identities and intertwining lives for the newest *BCMJ* Editorial Board member.

Tara Lyon

Dr Sepehr Khorasani

Dr Sepehr Khorasani, the newest member of the *BCMJ* Editorial Board, is clear about his reasons for wanting to be a surgeon. "I wanted to do surgery from the very beginning," he explains. "Even as a child, I was very hands-on with cooking—cleaning and prepping a whole chicken, that sort of thing. I guess I loved the anatomy and procedural aspects." He laughs. "I recognized that surgery is a profession where I can use my skills and do what I love, while making a positive difference in others' lives and well-being."

Ms Lyon is a staff member of the BC Medical Journal.

Dr Khorasani grew up in Isfahan, Iran, and his family immigrated to Canada when he was a teenager. His older brother, Mohammadali "Sohrab," is also a surgeon. Two brothers close in age who are both athletically and academically competitive might have butted heads as teens, but the opposite was true for Sepehr and Sohrab. "He's the very best big brother, always kind and supportive toward me. We're 2 years apart. We walk the same; we act the same. People think we're twins."

As teens in Iran, Sepehr and Sohrab played high-level soccer and tennis, often training together. Sepehr was close to going professional in tennis and was ranked the top junior player in the country at one point. Putting that aside to move to Vancouver was tough, but he found that embracing life in a new place was easier than he'd expected. "I feel like I should have felt lonely and out of place, but what's so great about Canada, and Vancouver specifically, is that I felt so welcomed in high school. Even

Dr Sepehr Khorasani, the newest member of the BCMJ *Editorial Board, with his brother, Dr Mohammadali "Sohrab" Khorasani, sharing many interests and pursuits.*

speaking very little English, I found everyone so supportive and nice. I never felt like an outsider." Getting involved in the community through sport helped Sepehr integrate into the new environment—as did having Sohrab as a built-in friend and companion.

Sohrab stuck by Sepehr's side in medical school as well, although that wasn't initially the plan. When the time came for Sohrab to choose a career path, he went into electrical engineering. Two years later, he decided to change his focus and go into medicine, which happened to be the same time Sepehr was entering medical school. "We ended up in UBC med school together, did our surgical residency together, and both got accepted to Toronto for our surgical fellowships. He did surgical oncology; I did colorectal surgery. We even overlapped in the same hospitals during fellowship."

Once the brothers' decade-long education journey was complete, they were both offered positions in Victoria, and they continue to work in the same hospitals. "Now Sohrab and I live less than 2 kilometres apart—a 20-minute walk. We run cases by each other and assist one another in the operating room, and people continue to mix us up all the time, thinking we are the same person, just like always!"

This tale of two surgeon brothers and a lifelong case of parallel lives continued with Sepehr's recruitment to the *BCMJ* Editorial Board. When the *BCMJ* was looking for a new board member, editor-in-chief Dr Caitlin Dunne heard about two highly recommended surgeons—brothers—in Victoria. Regretfully, Sohrab had to pass on the opportunity due to his other educational and research commitments. Sepehr explains: "Dr Dunne got in touch with Sohrab and said 'I understand your brother has a research education; it seems like he might be a perfect fit for us' and asked him to run the idea by me. When Sohrab and I talked about it, we wondered if once again we had been mixed up to begin with, as it's true, my research background makes me a great fit for the role as well." He laughs and says, "At any rate, all's well that ends well. I'm glad I can bring my perspective on research and surgical aspects of care to the Editorial Board."

When speaking about his own experience with medical publishing and the importance of local research, Dr Khorasani strongly encourages young authors to consider writing and submitting articles to the *BCMJ*. "Publication gives physicians and health care providers a voice. It's a great venue to share your passion, build on each other's experiences and knowledge, and advocate to improve and enhance patient care," he says. "The first article is the most difficult, but once you publish one, you'll find it's addictive. You feel heard, and believe me, you'll save that hard copy forever."

Dr Khorasani's first editorial appeared in the July/August 2024 issue. ■

Social prescribing for the loneliness epidemic

Patients are living longer, but often with fewer social supports, family, and friends than they would like. As physicians, can we improve their quality of life through social changes?

A. Hoverman, DO, MPH, CCFP, K. Schuld, MSN, H. Baillie, MD, FRCPC

Nonmedical determinants of disease include poverty, lack of employment and housing, uncertainty, and limited access to care. Here we highlight a growing area of concern among such fundamental causes of poor health: the loneliness experienced when elders find themselves isolated and short on common social connections, the relationships we have with people around us that ground us in our functional well-being.

Vancouver Island has a population of 864 000, 26% of whom are 65 years of age and over.[1] Some would consider Vancouver Island a retirement destination. In our practices, we see people who are sometimes sick and sometimes not. They come to our offices for advice, education, medications, plans for surgical intervention, and, quite commonly, connection. Our patients may live alone, with family far away. Some are bereaved, and some may be frail in mind and body.

Patients confide in us their hopes, fears, anxieties, and vision of the future. They may be living in an empty nest, grieving the loss of a loved one, or subsisting on a limited pension in inflationary times. They may not be well enough to join a walking group (arthritis) or drive a car (dizziness). Their vista can change from abundant connections with others to a flight of stairs and two or three rooms. They usually make it to their doctor's appointments to refill a prescription, renew an acquaintance, or just confirm their interest in a periodic assessment. As physicians, we are their confidants, friends, and health advocates, and we are privileged to learn about our patients' circumstances in the office, in the hospital, in a meeting room, or in public. It is both the nature of our job and a unique obligation to empathize and respond to the plight of the disadvantaged, including those who are lonely—feeling empty, alone, and unwanted due to solitude.[2]

Compounding this epidemic of loneliness is a clear ripple effect from the COVID-19 lockdown period, which resulted in a wave of social isolation, thanks to reduced nurse visits, bridge parties, trips to the theatre, and chitchat at the grocery checkout. Life became less colorful; grandchildren didn't come to visit, or visits were reduced to waving through a window or standing at a distance in the driveway. The stoic refrain of the time, "I'm getting by," sums it up. But "getting by" does not imply quality, enjoyment, fulfillment, or fun. Looking further into the past, we see that the phenomenon of disconnection precedes the COVID-19 lockdown, precipitated by even larger and more pervasive forces than a global pandemic.

In 2018, the City of Vancouver Seniors Advisory Committee[3] produced a set of recommendations to mitigate the erosive aspects of social isolation and loneliness. And it is not only physicians who see the burden of loneliness from day to day. A survey by Statistics Canada in mid-2021[4] found that more than 40% of Canadians feel lonely some or all of the time, with the problem worst among single people and those who live alone. In "A kingdom of one: The great loneliness pandemic,"[5] Nava makes clear that social isolation confers a greater risk of premature death than obesity. The data clearly show that this condition shares equivalent potential for harm with other illness promoters (e.g., cigarette smoking). Loneliness has been linked to reduced cognitive function and a higher risk of dementia, as well as stroke, heart disease, and cancer mortality. It contributes to the prevalence of anxiety, depression, and even suicide.

Recognizing that loneliness is associated with reduced physical activity, insomnia, hypertension, cardiac disease, and early mortality, the UK appointed its first Minister for Loneliness in 2018.[6] Similar appointments followed in Japan, Australia,

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and New Zealand. Last year, US Surgeon General Dr Vivek Murthy called loneliness a growing health epidemic on par with every chronic public health issue of import over the past half century.[7] A 2022 report from the National Institute on Ageing estimates that 12% of Canadians aged 65 years and older feel socially isolated, and 24% report low social participation.[8] Other estimates are substantially higher. The report acknowledges that few long-term strategies have been adopted to address these health issues and advocates for metrics to track their prevalence. Recognizing that we need to develop and share effective programs, it offers six policy recommendations:

1. Adopt consistent definitions.
2. Raise awareness and destigmatize these conditions.
3. Raise public and health provider awareness of the adverse outcomes of loneliness at any age.
4. Continue research on impacts of social isolation and loneliness and evaluate the effectiveness of interventions.
5. Build capacity for organizations to address isolation and loneliness.
6. Prioritize equity, accessibility, and inclusion-based approaches.

Recently, a pharmacist colleague who emigrated from Armenia shared her experience of coming to Canada 15 years ago. She found the "warehousing of elders" to be disorienting compared with the intergenerational homes she was used to in Europe. She said that her first few years in Canada were some of the loneliest of her life. Our society may have evolved traits that are potentially injurious to mental and physical health—a fact that may be more apparent to those accustomed to intergenerationally integrated environments.[6]

Our fragmented and individualistic society is failing our elders' need for networking, communication, encouragement, and support. Remember Dr Bonnie Henry's clarion call during the pandemic to be kind, be calm, be safe? What if what the world needs most right now is the wisdom and care of the elderly?

Within BC and across Canada, a movement called social prescribing is evolving to better respond to these pervasive nonmedical and social needs of seniors. Social prescribing connects people at risk of loneliness and its complications with activities and people in the community. It acknowledges that health is more than the absence of disease and aims to support mental, physical, and social well-being through enhanced access to community, cultural, and recreational stimulation. Such a resource should be in the toolbox of all health care providers. For this population, we might reflect that quantity has been achieved, but where is quality? If we ask seniors what quality looks like to them, we might be surprised how often it comes down to connectivity with friends, family, neighbors, activity groups, the arts, health care professionals, and others.[9] Such informal connections have long been observed to be a vital component to effective care.

We should ask patients "What matters to you?" And our response should be a codesigned, coproduced attempt to connect them with others, with local resources, and with local networks. Activating these networks[10] is at the core of high-quality social prescribing. We can learn key aspects of successful coproduction from the UK's National Health Service. Those interested in implementing social prescribing into their practice can access information from the World Health Organization, the Red Cross, the United Way, the Canadian Institute for Social Prescribing, the Canadian Alliance for Social Connection and Health, and the Genwell Human Connection Movement.[10-12]

Repairing social malfunction requires something simple and human: social connectedness. The Minister of Health and the Office of the Seniors Advocate have recognized our escalating burden of human disconnection, with support for programs that target this anomaly. With a clear and present epidemic of loneliness, especially among our elders, we hope that all health professionals will participate in social prescribing and coproduction programs as they roll out across British Columbia. It starts by asking patients "What matters to you?" Connections are likely to be the cure. ■

Competing interests
None declared.

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Deteriorating wait times for breast cancer patients at a regional hospital in BC, 2013 versus 2023

Treating breast cancer is an interdisciplinary endeavor, but delays among the various independently functioning components of the care continuum have contributed to increasing wait times.

ABSTRACT

Background: Breast cancer is a common condition, and the number of cases is projected to increase 52% between 2012 and 2030. Care of breast cancer patients occurs along an interdisciplinary continuum involving family physicians, general surgeons, radiologists, pathologists, medical oncologists, radiation oncologists, and allied health workers. There are national benchmarks for wait times between each step from diagnosis to treatment. In this quality improvement project, we sought to measure these wait times at our hospital by comparing results for 2013 and 2023, identifying causes of delays, and proposing solutions to reduce wait times.

Methods: We included all patients who were diagnosed with breast malignancies and referred to the general surgery service at Vernon Jubilee Hospital in 2013 and 2023. Results were analyzed using the two-tailed *t* test and Fisher exact test for continuous and categorical variables, respectively. A *P* value less than .05 was considered significant.

Results: The number of patients increased from 69 in 2013 to 113 in 2023. Mean wait times from initial imaging referral to surgery increased from 67 to 114 days ($P < .01$) during this period. Mean wait times from imaging referral to pathology diagnosis increased from 36 to 71 days ($P < .01$), due primarily to an increase from 34 to 80 days for symptomatic patients who were referred by their family physician ($P < .01$); wait times for asymptomatic patients who were identified by the Screening Mammography Program increased from 40 to 58 days ($P = .09$). Mean wait times from biopsy to final biomarker report (ER/PR/HER2) increased from 25 days to 29 days ($P = .25$), from surgery to final pathology increased from 11 to 17 days ($P < .01$), from surgical consultation to surgery increased from 17 to 31 days ($P < .01$), from referral to medical oncology consultation increased from 14 to 30 days ($P < .01$), and from referral to radiation oncology consultation increased from 78 to 106 days ($P = .025$). Most wait times met benchmark wait times in 2013 but failed to meet them in 2023.

Conclusions: Wait times increased at every stage of the care continuum for breast cancer patients between 2013 and 2023 at Vernon Jubilee Hospital. Implementing an interdisciplinary approach to care is necessary to remediate sources of delays at each step. Possible solutions include creating a fast-track pathway for symptomatic patients, performing biomarkers and pathology slide preparation locally, increasing operating room time, and tripling the number of oncologists in the region.

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This article has been peer reviewed.

Background

Breast cancer is a common condition among Canadian women, with one in eight diagnosed within their lifetime.[1] Despite stable or decreasing age-standardized incidence, the number of cases in British Columbia is increasing due to population growth and aging. Breast cancer operations in BC increased 28% between 2012 and 2022,[2] and the number of breast cancer cases is projected to increase 52% between 2012 and 2030.[3] Breast cancer care is an interdisciplinary endeavor involving family

physicians, general surgeons, radiologists, pathologists, medical oncologists, and radiation oncologists, plus other allied health workers. With the increasing trend in the use of neoadjuvant chemotherapy before surgery in up to 15% of breast cancer cases, multidisciplinary cancer conference discussions are also increasingly required.[4]

The diagnostic pathway for breast cancer is complicated and fraught with delays, as shown in the Breast Health Action Plan developed in BC in 2010 **[Figure 1]**.[5] The interdisciplinary nature of breast cancer care also leads to silos of care, where groups of physicians focus on their area of specialty with limited coordination with other groups. Without feedback from all physicians involved throughout the entire journey, overall wait times increase.

National benchmarks

According to the pan-Canadian standards for breast cancer surgery,[6] the benchmark wait time from abnormal breast imaging or

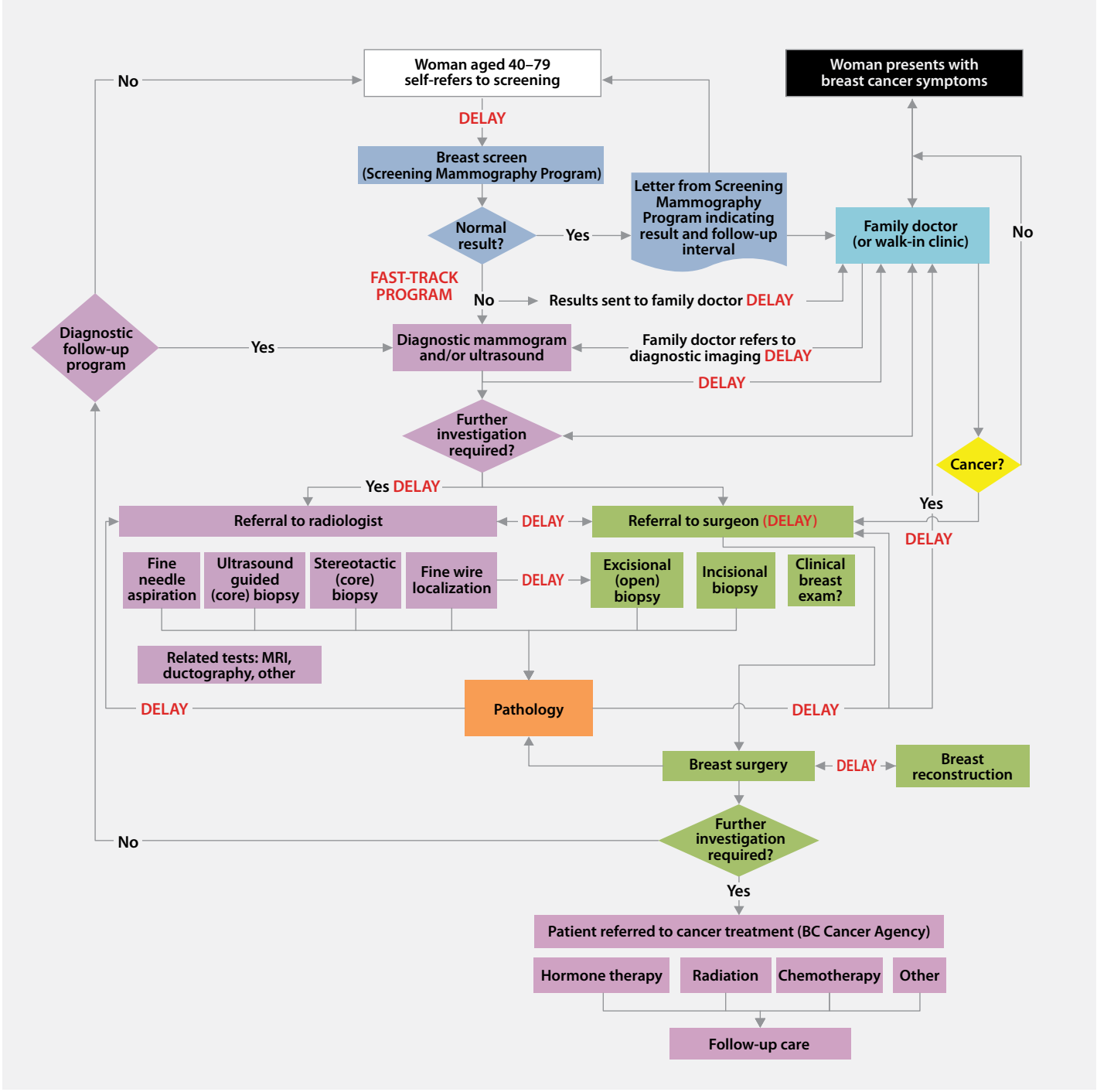

FIGURE 1. The diagnostic pathway for breast cancer.[5]

clinically suspicious finding to diagnosis is 42 days; core biopsy pathology should be reported within 7 days; biomarker results should be reported "in a timely manner"; surgical consultation should occur within 14 days of referral; final pathology should be reported within 14 days; surgery, chemotherapy, and/or radiation therapy should be initiated within 28 days of oncology consultation; and adjuvant chemotherapy should be initiated within 84 days of surgery. Twenty-one days from abnormal screen or symptomatic presentation to diagnostic result has also been proposed.[7]

According to Health Canada's Quality Determinants of Organized Breast Cancer Screening Programs in Canada, the time from abnormal screening to first assessment should be 21 days, the time from first assessment to diagnosis should be 28 days, and total duration from abnormal screening to diagnosis should be 49 days.[8] The benchmark for referral to radiation oncology consultation is 28 days.[9] According to the head of BC Cancer,[10] the benchmarks for referral to medical oncology consultation and for radiation oncology consultation to radiotherapy initiation are also 28 days. Therefore, the wait time from referral to chemotherapy or radiotherapy should be 56 days (28 + 28 days). These are the benchmark standards we used in our comparisons **[Table 1]**.

TABLE 1. Diagnostic and treatment benchmarks.

Diagnostics	Benchmark
Abnormal screening (imaging or clinically suspicious finding) to diagnosis	42 days* 49 days†
Abnormal screening to diagnostic imaging	21 days†
Diagnostic imaging to biopsy	14 days†
Diagnostic imaging to diagnosis	28 days†
Biopsy reporting	7 days*
Biopsy to biomarker results	7 days¶
Final surgical pathology reporting	14 days*
Treatment	
Referral to surgical consultation	14 days*
Surgical consultation to surgery	28 days*
Referral to medical oncology consultation	28 days§
Referral to radiation oncology consultation	28 days‡
Oncology consultation to chemotherapy initiation	28 days§
Oncology consultation to radiotherapy initiation	28 days§
Referral to chemotherapy initiation	56 days§
Referral to radiotherapy initiation	56 days§
Surgery to adjuvant chemotherapy initiation	84 days*

* Canadian Partnership Against Cancer;[6] † Canadian National Breast Cancer Screening Strategy;[8] ‡ Canadian Institute for Health Information;[9] § BC Cancer;[10] ¶ Expert opinion of authors.

Objective

Our objective was to quantify wait times across the continuum of interdisciplinary breast cancer care, identify causes of delays, and propose solutions to shorten the overall time from diagnosis to treatment of breast cancer at our hospital.

Methods

This quality improvement project was screened for ethics using the ARECCI tool[11] and deemed low-risk; therefore, it did not require a formal ethics review.

We included all patients who were diagnosed with invasive breast carcinoma, ductal carcinoma in situ, or phyllodes tumors of the breast and referred to the general surgery service at Vernon Jubilee Hospital (VJH), a 196-bed regional hospital in the Regional District of North Okanagan. We limited the comparison to the calendar years of 2013 and 2023. Cases of benign breast lesions were excluded.

Using a combination of family physician or surgeon office chart review and review of hospital and BC Cancer electronic records, the following dates were recorded: referral for breast imaging, screening mammogram, diagnostic mammogram, focused

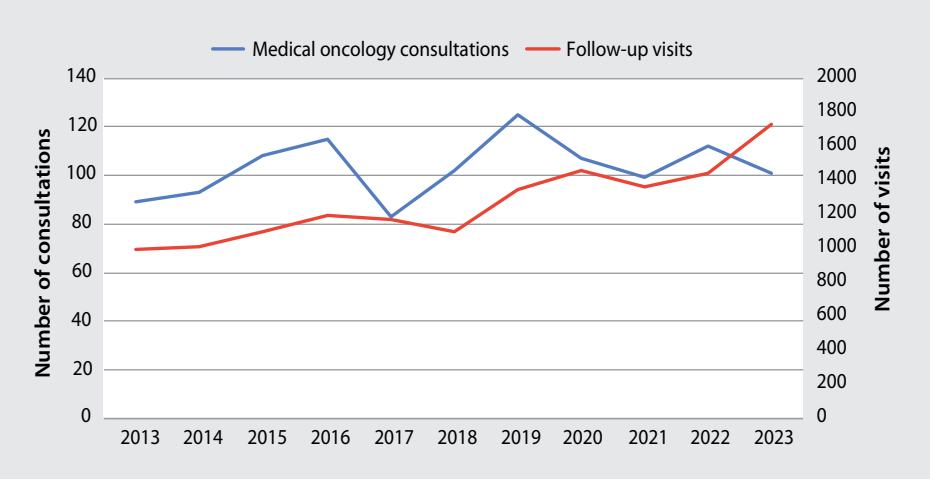

FIGURE 2. Breast cancer appointments with medical oncology at Vernon Jubilee Hospital, 2013–2023.

TABLE 2. Characteristics of breast cancer patients at Vernon Jubilee Hospital, 2013 versus 2023.

	2013 (*n*)	2023 (*n*)	*P*
Patients	69	113	
Pathology			
Ductal carcinoma	59	85	.13
Lobular carcinoma	3	9	.54
Mixed ductal/lobular carcinoma	1	1	1
Mucinous carcinoma	0	3	.29
Micropapillary carcinoma	0	1	.0
DCIS*	5	10	.79
Paget's disease of the nipple (aka Paget's disease of the breast)	1	0	.38
Phyllodes tumor	0	4	.30
Received palliation without surgery	2	3	1
Received neoadjuvant chemotherapy	3	13	.11
Biomarkers reported in non-useful time frame (after surgery date)	27/66	31/105	.14
Triple-negative or HER2†-positive	6	23	.039
Did not receive neoadjuvant chemotherapy	5	13	.36
Biomarkers reported in non-useful time frame (either less than 7 days before operating room date or any time after surgery)	3	6	1
Same- or next-day biopsy after diagnostic imaging	39	18	< .01

*DCIS = ductal carcinoma in situ; †HER2 = human epidermal growth factor receptor 2.

ultrasonography, breast biopsy, reporting of biopsy pathology, reporting of biomarkers, referral to general surgeon, general surgeon consultation, surgery date, referral to cancer agency, medical oncology consultation, radiation oncology consultation, chemotherapy initiation, and radiotherapy initiation. We also noted whether patients required neoadjuvant chemotherapy, surgical procedure, and pathology diagnosis.

We used the two-tailed *t* test to compare continuous variables and the Fisher exact test to compare categorical variables using an online calculator.[12] Confidence intervals were calculated using Microsoft Excel. A *P* value less than .05 was considered significant.

Results

The number of breast cancer cases referred to the general surgery group at VJH increased from 69 in 2013 to 113 in 2023 (64%). **Figure 2** shows the number of breast cancer appointments with medical oncology at VJH during this period. **Table 2** shows patient characteristics in 2013 versus 2023. **Table 3** summarizes the various wait times. The mean overall wait from initial imaging referral to surgery increased from 67 days in 2013 to 114 days in 2023 ($P < .01$). **Table 4** shows the benchmark wait times that were met and not met in 2013 versus 2023.[6,8-10]

Diagnostics

There were significant increases in diagnostic wait times from 2013 to 2023 **[Table 4]**. Many wait times that met benchmarks in 2013 no longer did so in 2023. In particular, patients who presented to their family physician with symptoms such as a palpable mass (family physician referral) experienced larger increases in wait times than patients without symptoms who were identified through the Screening Mammography Program.

The wait time from biopsy to final biomarker reporting did not increase significantly from 2013 to 2023, but it was already 25 days in 2013. In many cases, the final biomarker reporting was after the surgery date. **Table 2** shows that in both years, the biomarkers for several patients who were either triple-negative or HER2-positive and did not receive neoadjuvant chemotherapy were reported in a non-useful time frame (either less than 7 days before the surgery date or after the surgery date).

Wait-one time

Wait-one time is defined as the time from primary care referral to surgical consultation. It increased from 10 to 14 days from 2013 to 2023 but was not a significant increase **[Table 3]**, and it met the benchmark of 14 days in both time periods **[Table 4]**.

Wait-two time

Wait-two time is the time from surgical consultation to operation. It increased significantly from 17 to 31 days from 2013 to 2023 **[Table 3]**. The wait time met the benchmark in 2013 but failed to meet it in 2023 **[Table 4]**.

Oncology referral and treatment

The wait time for referral to medical oncology consultation increased significantly from 14 to 30 days from 2013 to 2023 **[Table 3]**, and in 2023, it failed to meet the 28-day benchmark **[Table 4]**. The wait time for referral to chemotherapy initiation did not increase significantly **[Table 3]** and met the benchmark in both periods **[Table 4]**. The wait from surgery to adjuvant chemotherapy did not increase significantly **[Table 3]** and met the benchmark in both periods **[Table 4]**. The wait time for medical oncology consultation to chemotherapy initiation decreased slightly but not significantly from 2013 to 2023 **[Table 3]** and met the benchmark in both periods **[Table 4]**.

For patients who required neoadjuvant chemotherapy, the wait time from referral to the cancer agency for chemotherapy initiation increased from 18 days ($n = 3$, 95%

TABLE 3. Wait times for breast cancer diagnosis and treatment at Vernon Jubilee Hospital, 2013 versus 2023.

	2013		2023		*P*
Patients *(n)*	69		113		
	Mean no. days *(n)*	**95% CI**	**Mean no. days *(n)***	**95% CI**	
Imaging referral to surgery	67 (63)	56-78	114 (93)	100-128	< .00001
Diagnostics					
Imaging referral to pathology diagnosis	36 (68)	29-43	71 (110)	60-82	.000017
Screening Mammography Program (SMP) mammogram to pathology diagnosis	40 (24)	31-49	58 (43)	45-71	.09
Family physician (FP) referral to pathology diagnosis	34 (44)	25-43	80 (67)	64-96	.000051
SMP mammogram to biopsy	36 (24)	28-44	54 (43)	41-57	.09
FP referral to biopsy	31 (44)	22-40	75 (67)	59-91	.000093
SMP mammogram to diagnostic imaging	22 (24)	15-29	24 (43)	15-33	.76
FP referral to diagnostic imaging	20 (44)	12-28	43 (67)	32-54	.0023
Diagnostic imaging to biopsy	12 (69)	8-16	31 (111)	24-38	.00031
Biopsy to pathology report	3.0 (69)	2.4-3.6	4.5 (112)	3.6-5.4	.019
Biopsy to biomarker report	25 (68)	21-29	29 (108)	24-34	.25
Surgery to final pathology reporting	11 (67)	9-13	17 (110)	15-19	< .00001
Wait-one time					
FP referral to general surgery consultation	10 (59)	7-13	14 (111)	11-17	.06
Wait-two time					
General surgery consultation to operation	17 (60)	14-20	31 (95)	27-35	< .00001
Oncology					
Referral to medical oncology consultation	14 (65)	10-18	30 (102)	25-30	.00017
Referral to chemotherapy initiation	37 (21)	28-46	44 (31)	36-52	.26
Surgery to adjuvant chemotherapy initiation	50 (18)	42-58	58 (19)	50-66	.15
Medical oncology consultation to chemotherapy initiation	25 (21)	18-32	19 (31)	14-24	.20
Referral to radiation oncology consultation	78 (37)	67-89	106 (73)	91-121	.025
Referral to radiotherapy initiation	114 (28)	95-133	143 (49)	122-165	.077
Radiation oncology consultation to radiotherapy initiation	43 (29)	31-65	28 (49)	20-36	.38

CI 8-28) to 27 days (n = 12, 95% CI 22-32) but was not significant (P = .12) and met the 56-day benchmark in both periods.

The wait time for referral to radiation oncology consultation increased significantly from 2013 to 2023 but not for referral to radiotherapy initiation **[Table 3]**; however, the wait times for both failed to meet the benchmark in both years **[Table 4]**. The wait time from radiation oncology consultation to radiotherapy initiation decreased from 2013 to 2023 but not significantly **[Table 3]** and failed to meet the benchmark only in 2013 **[Table 4]**.

Discussion

Wait times for both diagnosis and treatment of breast cancer at VJH increased significantly from 2013 to 2023, and several benchmarks that were met in 2013 were not met in 2023. The overall wait time from abnormal imaging to surgery increased from 67 days in 2013 to 114 days in 2023 and did not compare favorably to a median wait time of 52 days in Ontario for 2003 to 2011[13] (Ontario data are not available for 2013 or 2023).

The 64% increase in breast cancer referrals to general surgery in our study was higher than the 13% increase in new breast cancer medical oncology consultations from 2013 to 2023. It was also greater than the 28% increase in breast cancer operations conducted provincially between 2012 and 2022.[2] This could be explained by the fact that some referrals from outside the Regional District of North Okanagan were diverted to other centres by the local medical oncology service due to a shortage of medical oncologists at VJH in 2023, while surgeons continued to accept out-of-region referrals. Additionally, in the North Okanagan and Columbia–Shuswap Regional

TABLE 4. National benchmarks met (green cells) or not met (orange cells), 2013 versus 2023.

	Benchmark	2013 (mean no. days)	2023 (mean no. days)	Change
Diagnostics				
Imaging referral to pathology diagnosis	42 days* 49 days†	36	71	97%
Screening Mammography Program (SMP) mammogram to pathology diagnosis	42 days* 49 days†	40	58	45%
Family physician (FP) referral to pathology diagnosis	42 days* 49 days†	34	80	135%
SMP mammogram to biopsy	35 days†	36	54	50%
FP referral to biopsy	35 days†	31	75	142%
SMP mammogram to diagnostic imaging	21 days†	22	24	9%
FP referral to diagnostic imaging	21 days†	20	43	115%
Diagnostic imaging to biopsy	14 days†	12	31	158%
Biopsy to pathology report	7 days*	3.0	4.5	50%
Biopsy to biomarker report	7 days¶	25	29	16%
Surgery to final pathology reporting	14 days*	11	17	55%
Wait-one time				
FP referral to general surgery consultation	14 days*	10	14	40%
Wait-two time				
General surgery consultation to operation	28 days*	17	31	82%
Oncology				
Referral to medical oncology consultation	28 days§	14	30	114%
Referral to chemotherapy initiation	56 days§	37	44	19%
Surgery to adjuvant chemotherapy initiation	84 days*	50	58	16%
Medical oncology consultation to chemotherapy initiation	28 days*	25	19	–24%
Referral to radiation oncology consultation	28 days‡	78	106	36%
Referral to radiotherapy initiation	56 days§	114	143	25%
Radiation oncology consultation to radiotherapy initiation	28 days*	43	28	–42%

* Canadian Partnership Against C ancer;[6] † Canadian National Breast Cancer Screening Strategy;[8] ‡ Canadian Institute for Health Information;[9] § BC Cancer;[10] ¶ Expert opinion of authors.

Districts, the population aged 65 years or older increased 43% between 2013 and 2023.[14]

Delays in imaging—A prominent contributor

Abnormalities are detected in 9.1% of screening mammograms, and 6.1% of those are diagnosed as cancer.[15] Shorter wait times for diagnosis have been achieved by coordinating radiologic and clinical care[16]—for example, by adopting a policy of completing diagnostic workups without requiring new requisitions or keeping dedicated rapid-access appointments for breast biopsy within a short period, such as less than 1 week. This might improve the rate of same- or next-day biopsies after abnormal diagnostic imaging, which declined significantly from 57% in 2013 to 16% in 2023 in our study. A possible factor in the decline in same-day biopsies was a shortage of radiologists at our hospital in 2023, which was not an issue in 2013. Without radiologists, image-guided biopsies cannot be performed; this applies not only to breast lesions but also to other organs that require tissue diagnosis. Improving radiologist human resources should be a high priority in our health region.

Establishing a breast health clinic such as the one based in Kamloops[17] and employing a nurse navigator[18] can also reduce wait times, but this is dependent on additional funding. Strategies to reduce wait times for diagnostic imaging without obtaining additional funding could include a fast-track pathway for high-suspicion symptomatic patients.

The Screening Mammography Program has dedicated resources for monitoring wait times and other outcomes. There is

no equivalent monitoring system for symptomatic patients who are referred by their family physician, which has likely led to the unintended discrepancy in wait times between the two groups in our study. There should be an annual audit of wait times for symptomatic patients to ensure outcomes are equivalent to those of Screening Mammography Program patients.

Biomarkers logistics—A major problem

Biomarkers, estrogen/progesterone, and HER2 receptors are crucial factors that impact clinical decision making. Delays in reporting lead to delays in surgery or oncology consultation. Sixteen percent of our patients had triple-negative or HER2-positive disease. Ideally, these cases should be discussed at multidisciplinary conferences and locally attended by general surgery, radiology, pathology, and oncology, and those with larger tumors or positive nodes should be considered for neoadjuvant chemotherapy before surgery.[4] However, less than half the cases of potentially eligible patients in our study were discussed at multidisciplinary conferences, and the biomarkers of half those patients were reported either within 7 days of the operating room date or even after the surgery was completed. We believe biomarkers should be reported within 7 days of the biopsy, but this was not possible due to logistical issues. The testing was done only in Vancouver and required samples to be transported between centres. If immunohistochemistry interpreted the HER2 receptor as "equivocal," then in situ hybridization testing led to further delays. The results were reported on one system at BC Cancer, but they did not seamlessly transfer to the local health authority system. Therefore, workarounds were required, which were not consistent and led to triple-negative or HER2-positive status sometimes being discovered only after the surgery had been performed. It should be noted that although proportionally fewer patients underwent surgery in 2023 without having biomarker results available compared with those in 2013, this was not due to improved biomarker reporting times. Rather, in many cases, surgery was delayed because the consensus at the multidisciplinary conference was that neoadjuvant chemotherapy might be necessary and dependent on the results. To reduce the turnaround time to acceptable levels, both immunohistochemistry and in situ hybridization testing of biomarkers should be performed within the region, either in Kelowna or locally in Vernon, and not in Vancouver. In addition, the attending surgeon should be identified through a centralized referral pathway so they can be copied on any biomarker result addenda to the original biopsy.

Lack of local pathology processing

There was a significant increase in the time from surgery to the final pathology results. This is also crucial information that impacts and delays adjuvant treatment. Processing of pathology specimens (embedding, cutting, and slide generation) is currently performed in Kelowna, though previously it was done locally in Vernon. This service should be re-established to reduce wait times and help expedite oncology treatments.

Operating room access below the provincial average

Delays from diagnosis to surgery can lead to increased mortality.[19] Though the wait time from referral to surgical consultation in our study did not increase significantly and remained within benchmarks in both years, shorter wait times to surgery have been achieved with centralization of surgical referrals.[20] This should be implemented at VJH to equalize surgical wait times.

The 2021 median wait time for breast cancer surgery in Canada was 18 days.[9] The 17-day mean and 15-day median surgical wait times in 2013 in our study compared favorably with this, but the 31-day mean and 28-day median wait times in 2023 did not. The 82% increase in mean wait time from general surgery consultation to operation in our hospital could be explained by a relative shortage of operating room access compared with the rest of BC. While breast cancer cases increased 64% from 2013 to 2023 in our study, operating room time for the general surgery service increased only 10%, from 20 to 22 operating room days per month. The mean number of operating room days per surgeon per month in our study was 4.0 (20 days/5 surgeons) in 2013 and 3.1 (22 days/7 surgeons) in 2023; the mean in BC was 4.2 in 2022.[2] Increasing operating room access to match the provincial average would require an additional 7.5 operating room days per month, which would help reduce wait times.

Extreme oncology human resource challenges

Once patients saw either a medical or radiation oncologist, their treatment initiation was very prompt and was even significantly reduced for radiotherapy in 2023 compared with 2013. However, the wait time to see a medical oncologist more than doubled from 2013 to 2023. In some instances, the delays were due to biomarker reporting times or those for Oncotype DX results, genetic tests on the breast tumor that are performed in California; however, this was not the major factor. Most delays to see a medical oncologist were due to human resource shortages at our local BC Cancer clinic. In 2023, many patients were diverted to other centres in the region, which had resource challenges of their own.

Waiting more than 84 days for radiotherapy has been associated with poorer outcomes.[21] In our study, the wait time for radiotherapy was already unacceptably long in 2013 (114 days), greater than the 56-day benchmark, but then increased even more to 143 days in 2023 (25%). This also points to a major shortage in human resources; the wait times will continue to worsen unless this shortage is addressed. We estimate that three times the number of current medical and radiation oncologists in the region are needed to handle the current demand.

Study limitations

This project was limited to key dates along the breast cancer care continuum and did not delve into individual reasons for delays, such as those due to patient reluctance

toward investigation or treatment. It also shows wait times only at VJH, though we believe the results are generalizable to other facilities throughout the province because many of the issues we identified are systemic and not limited to VJH. Another important limiting factor was the severe shortage of primary care physicians and the associated impact on patients without a family doctor who had limited access to the Screening Mammography Program or investigation of a new breast lump. Additionally, the wait time from self-referral to screening mammography was unknown, because these data were not available.

Conclusions

Treating breast cancer is an interdisciplinary endeavor, but this is a source of weakness, because delays among the various independently functioning components along the care continuum contribute to overall increasing wait times. Our study showed that the wait times from referral to surgery increased from 67 days in 2013 to 114 days in 2023 (70%), the wait from referral to radiotherapy increased from 114 to 143 days in the same period, and extremely slow biomarker reporting compounded delays. An interdisciplinary approach to each component of the delay is necessary to improve patient outcomes. The **Box** lists our recommendations for improving wait times for each component along the continuum of care for breast cancer patients at VJH. ■

BOX. Recommendations for improving wait times for breast cancer diagnosis and treatment at Vernon Jubilee Hospital.

Diagnostics:
- Complete imaging workup without requiring new requisitions.
- Keep dedicated rapid-access appointments for image-guided biopsy within 1 week.
- Establish a fast-track pathway for high-suspicion symptomatic patients.
- Perform annual audits of imaging wait times for symptomatic patients to ensure outcomes are equivalent to those for Screening Mammography Program patients.
- Perform biomarker testing within the region.
- Identify attending surgeons early through a centralized referral pathway so they can be copied on biomarker results.
- Re-establish pathology slide processing locally.

Wait-one time:
- Establish centralized referral for surgical consultation.

Wait-two time:
- Increase operating room time for the Vernon Jubilee Hospital general surgery service by 7.5 days per month to meet the provincial average of 4.2 operating room days per surgeon per month.

Oncology:
- Triple the number of medical and radiation oncologists in the region.

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Competing interests

None declared.

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Prevalence of intestinal parasites identified by microscopy prior to implementation of infectious diarrhea panel nucleic-acid amplification testing (IDP-NAAT): What are we missing?

Many parasitic pathogens could be missed if only IDP-NAAT is used to diagnose intestinal parasitic infections.

ABSTRACT

Background: Since 2022, diagnostic laboratories in British Columbia have been advised to replace microscopy for intestinal ova and parasites with infectious diarrhea panel nucleic-acid amplification testing (IDP-NAAT). However, this multiplex assay captures only four common parasites: *Cyclospora cayetanensis*, *Cryptosporidium* spp., *Entamoeba histolytica*, and *Giardia* spp.

Methods: An audit was conducted from September 2022 to August 2023, 1 year prior to implementation of IDP-NAAT in LifeLabs BC, when microscopy was the method used to identify intestinal parasites.

Results: Pathogenic parasites were identified in 6149 of 52 221 stool specimens. The most common pathogens were *Blastocystis hominis* (78.47%), *Dientamoeba fragilis* (12.23%), *Giardia* spp. (4.93%), and *Cyclospora* spp. (1.07%). *Entamoeba histolytica/dispar*, *Strongyloides stercoralis*, *Cryptosporidium* spp., *Ascaris lumbricoides*, *Diphyllobothrium* spp., *Enterobius vermicularis*, *Hymenolepis nana*, *Schistosoma mansoni*, *Taenia* spp., *Trichuris trichiura*, and *Clonorchis sinensis* each accounted for less than 1% of the pathogenic parasites identified. *Enterobius vermicularis* was also identified in 46 of 1569 pinworm paddle specimens.

Conclusions: Several potentially pathogenic parasites could be missed if only IDP-NAAT is used to detect intestinal parasites. If indicated, microscopy orders would be needed to capture parasites not detected by IDP-NAAT.

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This article has been peer reviewed.

Background

Traditionally, stool culture and microscopy for ova and parasites are the diagnostic methods of choice to detect intestinal pathogens. In 2022, diagnostic laboratories in British Columbia were advised to replace this testing method with the infectious diarrhea panel nucleic-acid amplification test (IDP-NAAT).[1] It combines a multiple gene target (multiplex) that detects a minimum of 14 common viral, bacterial, and parasitic pathogens **[Box 1; Figure 1]**. The BC Guidelines state that the list of pathogens may be modified periodically, in line with changes in epidemiology and technology. Potential pathogens to be considered include parasites such as *Blastocystis hominis* and *Dientamoeba fragilis*, even though they may not be pathogenic in each case.[2] The minimum pathogen list in the BC Guidelines includes only four parasites, while the number of possible intestinal parasites can be countless.[2] Moreover, the BC Guidelines recommend that if either stool culture or microscopy for ova and parasites is ordered, the laboratories will automatically substitute with IDP-NAAT and, thus, potentially miss the correct diagnosis. The BC Guidelines state that stool microscopies may be warranted if patients have a history of recent travel or immigration from low- or middle-income countries or are severely immunocompromised.

LifeLabs BC implemented IDP-NAAT in September 2023. Our laboratory conducted a retrospective audit on all intestinal parasites detected in our regional microbiology laboratories from 1 September 2022 to 31 August 2023, 1 year prior to implementation of IDP-NAAT. Our regional

microbiology laboratories are connected with 129 collection centres in urban and rural communities in the province, and they provided the laboratory data on intestinal parasites, which indicated their local prevalence in community settings. The aim of this study was to identify intestinal parasites that would not be detected by IDP-NAAT and postulate plans to ensure the correct diagnosis is not missed.

Methods

Microscopies for ova and parasites in stool specimens

Microscopies for ova and parasites in stool specimens were ordered by clinicians. Patients or their caregivers were instructed to provide stool specimens in a clean vial with no liquid medium and a vial with sodium acetate–acetic acid–formalin fixative, which were then transported to the regional microbiology laboratories. Using a disposable plastic pipette, trained medical laboratory technologists placed a small amount of well-mixed sediment of the stool specimen on a plain glass microscope slide, which was then pressed by a coverslip. The technologists examined the entire area of the coverslip, first under 100× magnification and then under 400× magnification if suspicious features were seen. Iodine or carbol fuschin stain was used to enhance the detection of oocysts. When the presence of *Cryptosporidium* spp. or *Cyclospora* spp. was suspected, acid-fast stain was used. When testing for *Strongyloides* spp. or *Schistosoma* spp. was requested, a minimum of three slides were examined. The technologists were instructed to read each concentrate for an average of 9 minutes. The presence of ova, cysts, trophozoites, oocysts, larvae, adult worms of pathogenic parasites, and nonpathogenic parasites was reported.

Microscopies for pinworm paddle specimens

Microscopies for pinworm paddle specimens were ordered by clinicians. Patients or their caregivers were instructed to press the sticky surface of the pinworm paddle against the anal area early in the morning before arising

BOX 1. The minimum 14 pathogens in the infectious diarrhea panel nucleic-acid amplification test used in each diagnostic laboratory in BC.

- Viral pathogen: adenovirus 40/41, norovirus GI/GII, rotavirus.
- Bacterial pathogen: *Campylobacter* spp., *Clostridioides difficile*, Shiga toxin-producing *Escherichia coli*, *Salmonella* spp., *Shigella* spp., *Yersinia enterocolitica*, *Vibrio* spp.
- Parasitic pathogens: *Cyclospora cayetanensis*, *Cryptosporidium* spp., *Entamoeba histolytica*, *Giardia* spp.

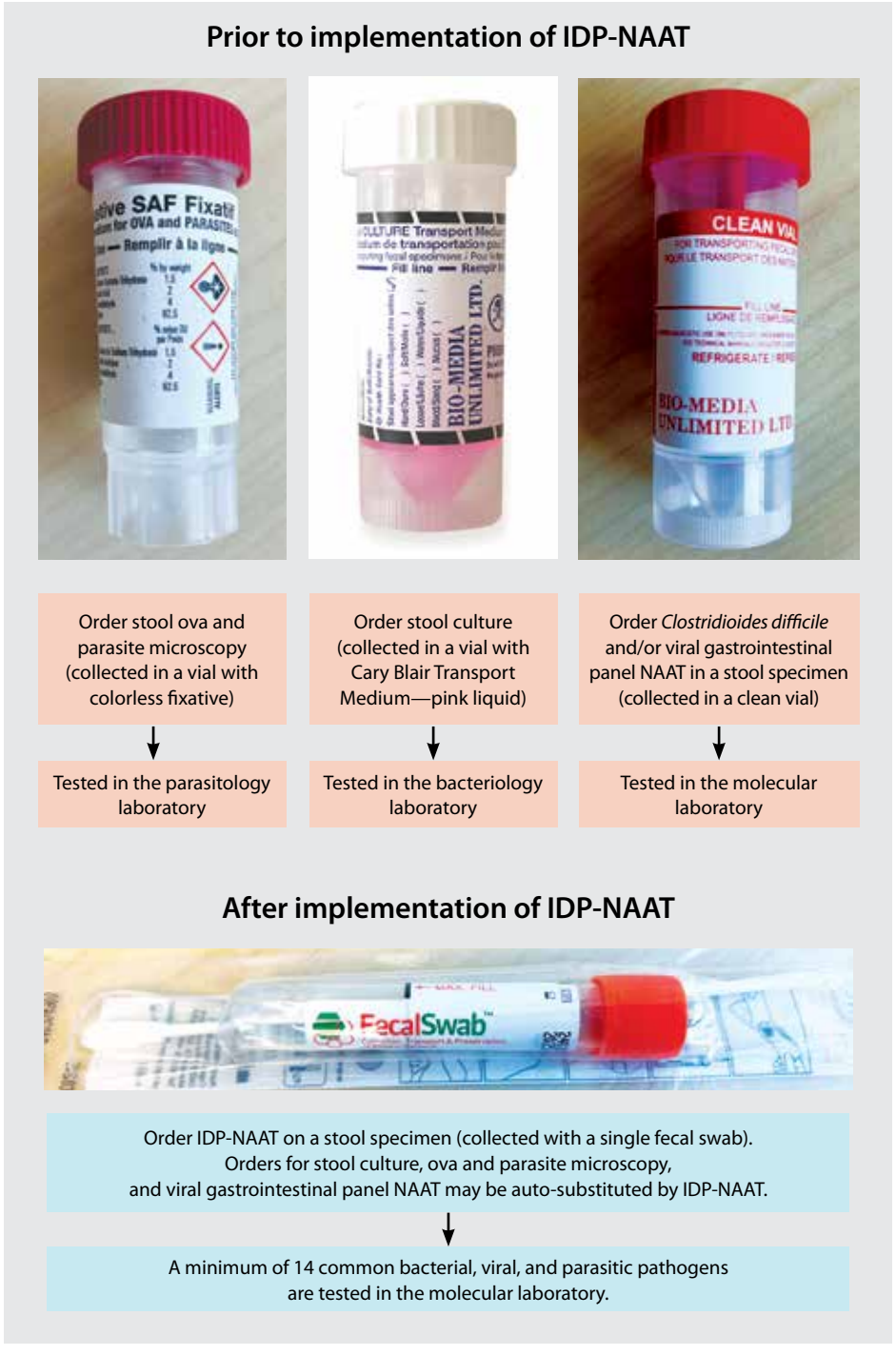


FIGURE 1. Flow chart explaining the change in stool microbiology test ordering in British Columbia prior to and after implementation of the infectious diarrhea panel nucleic-acid amplification test (IDP-NAAT).

or before bowel movement. The paddles were put in a vial and then transported to the regional microbiology laboratories. Each specimen was placed sticky side up on a glass microscope slide. Under 100× magnification, the technologists systematically examined the entire area of the paddle. The presence of pinworm (*Enterobius vermicularis*) ova and parasites was reported.

Data collection and analysis

Microscopies for ova and parasites and pinworm paddle orders were conducted from 1 September 2022 to 31 August 2023. The Microbiology Electronic Worksheet System software (version 5.00.267; LifeLabs, Toronto, ON) was used to generate data from all the microscopies. An entire year of data from patients of all ages and sexes was collected to reduce bias due to seasonality, differences in clinical practices, and other potential confounders. GraphPad Prism software (version 6.0c; GraphPad Software Incorporated, Boston, MA) was used to perform statistical analysis when needed.

Results

Microscopies for ova and parasites in stool specimens

Pathogenic and nonpathogenic parasites were identified in 6149 and 1016 of the 52 221 stool specimens, respectively. The most common pathogens were *Blastocystis hominis* (78.47%), *Dientamoeba fragilis* (12.23%), *Giardia lamblia* (4.93%), and *Cyclospora* spp. (1.07%). *Entamoeba histolytica/dispar*, *Cryptosporidium* spp., *Enterobius vermicularis*, *Hymenolepis nana*, *Strongyloides stercoralis*, *Diphyllobothrium* spp., *Clonorchis sinensis*, *Taenia* spp., *Ascaris lumbricoides*, *Schistosoma mansoni*, and *Trichuris trichiura* each accounted for less than 1% of pathogenic parasites identified **[Figure 2]**.

Microscopies for pinworm paddle specimens

Enterobius vermicularis was identified in 46 of 1569 pinworm paddle specimens.

Discussion

The results of this study suggest that several potentially pathogenic parasites could be missed if only IDP-NAAT is used to detect intestinal parasites. The most common intestinal parasitic pathogens identified were *Blastocystis hominis* (78.47%) and *Dientamoeba fragilis* (12.23%); however, it remained controversial whether they were true pathogens in each clinical case. In the absence of other diagnoses, it may be important to report when patients' symptoms clinically correlate with the presence of these parasites, which can be roughly quantified (e.g., rare, few, many) in order to help clinicians determine the significance of their symptoms.[2] The current IDP-NAAT would not be able to report the presence of these parasites or quantify the amount of any parasite in a test sample.

Most of the parasites detected in this study accounted for less than 1% of all those found. Although it can be argued that the incidences of parasites missed by IDP-NAAT were statistically insignificant, statistics do not always apply in incidents of patient safety: one severe, highly nonconforming event, regardless of probability, would be considered significant.[3] If stool microscopy orders were automatically replaced with IDP-NAAT, as the BC Guidelines suggest, many intestinal parasite diagnoses could be missed. Clinicians do not always order intestinal parasite testing simply to determine the cause of diarrhea. They may look for the following parasites in other clinical situations:

- *Ascaris lumbricoides*—associated with eosinophilia, intestinal blockage, and impaired growth.[4,5]
- *Clonorchis sinensis*—associated with eosinophilia, gallbladder obstruction, jaundice, and hepatomegaly.[6]
- *Diphyllobothrium* spp.—associated with weight loss, vitamin B12 deficiency, pernicious anemia, intestinal obstruction, and gallbladder disease.[7]
- *Enterobius vermicularis*—associated with perianal itching.[8]
- Hookworm—associated with anemia and chronic protein deficiency, especially in children.[4]
- *Schistosoma* spp.—associated with fever and hematochezia (even though serologic testing may be preferred).[9,10]
- *Strongyloides stercoralis*—associated with hyperinfection syndrome, characterized by abdominal pain, diffuse pulmonary infiltrates, and septicemia or meningitis (even though serologic testing may be preferred).[11,12]
- *Taenia solium*—associated with cysticercosis (even though neuroimaging and serologic testing may be preferred).[13]
- *Trichuris trichiura*—associated with anemia and rectal prolapse.[4]

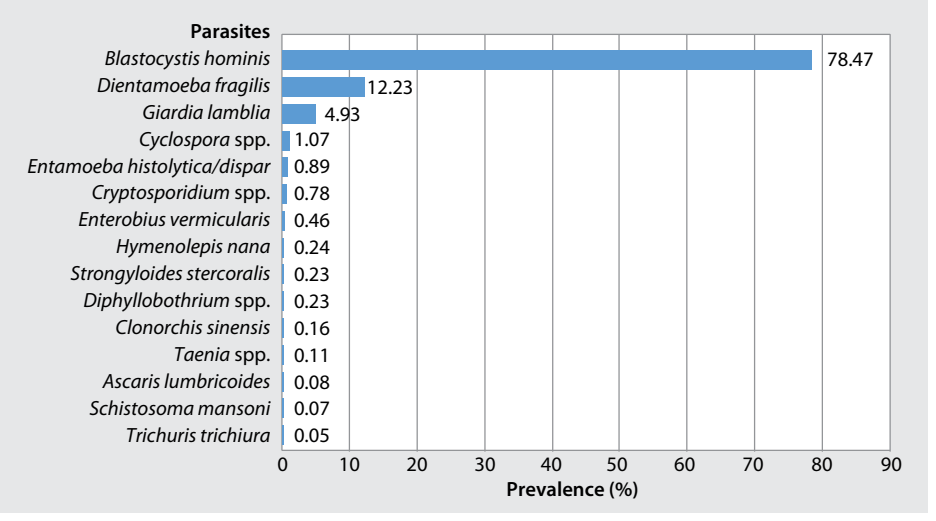
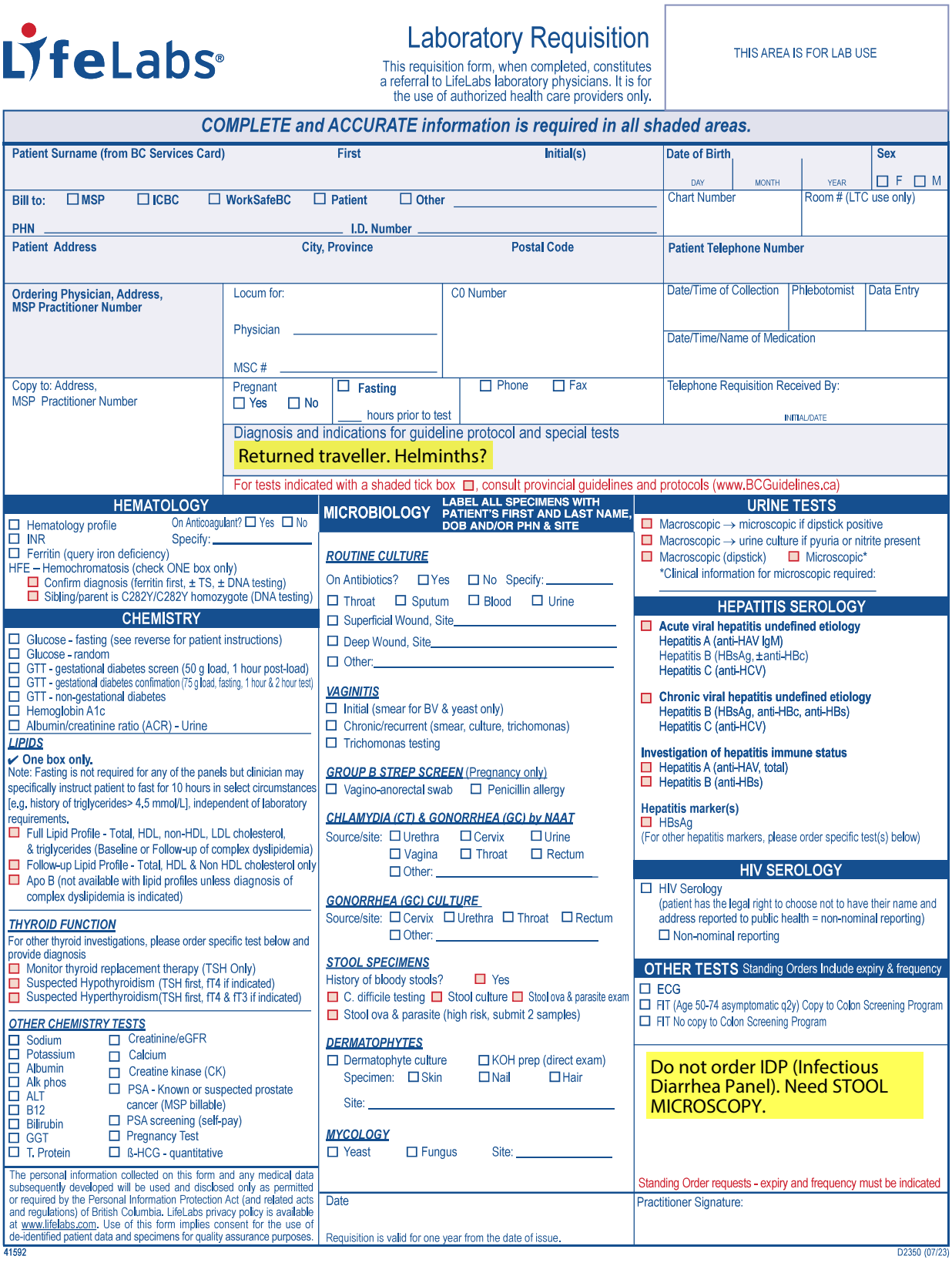


FIGURE 2. Pathogenic intestinal parasites (*n* = 6149), from the most to the least prevalent, collected from stool specimens in the community from 1 September 2022 to 31 August 2023.



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Patient Address | City, Province | Postal Code | Patient Telephone Number

Ordering Physician, Address, MSP Practitioner Number | Locum for: Physician _____ MSC # _____ | C0 Number | Date/Time of Collection | Phlebotomist | Data Entry | Date/Time/Name of Medication

Copy to: Address, MSP Practitioner Number | Pregnant ☐ Yes ☐ No | ☐ Fasting ___ hours prior to test | ☐ Phone ☐ Fax | Telephone Requisition Received By: INITIAL/DATE

Diagnosis and indications for guideline protocol and special tests

Returned traveller. Helminths?

For tests indicated with a shaded tick box ☐, consult provincial guidelines and protocols (www.BCGuidelines.ca)

HEMATOLOGY

- ☐ Hematology profile — On Anticoagulant? ☐ Yes ☐ No
- ☐ INR — Specify: _____
- ☐ Ferritin (query iron deficiency)

HFE – Hemochromatosis (check ONE box only)

- ☐ Confirm diagnosis (ferritin first, ± TS, ± DNA testing)
- ☐ Sibling/parent is C282Y/C282Y homozygote (DNA testing)

CHEMISTRY

- ☐ Glucose - fasting (see reverse for patient instructions)
- ☐ Glucose - random
- ☐ GTT - gestational diabetes screen (50 g load, 1 hour post-load)
- ☐ GTT - gestational diabetes confirmation (75 g load, fasting, 1 hour & 2 hour test)
- ☐ GTT - non-gestational diabetes
- ☐ Hemoglobin A1c
- ☐ Albumin/creatinine ratio (ACR) - Urine

LIPIDS

✔ One box only.

Note: Fasting is not required for any of the panels but clinician may specifically instruct patient to fast for 10 hours in select circumstances [e.g. history of triglycerides> 4.5 mmol/L], independent of laboratory requirements.

- ☐ Full Lipid Profile - Total, HDL, non-HDL, LDL cholesterol, & triglycerides (Baseline or Follow-up of complex dyslipidemia)
- ☐ Follow-up Lipid Profile - Total, HDL & Non HDL cholesterol only
- ☐ Apo B (not available with lipid profiles unless diagnosis of complex dyslipidemia is indicated)

THYROID FUNCTION

For other thyroid investigations, please order specific test below and provide diagnosis

- ☐ Monitor thyroid replacement therapy (TSH Only)
- ☐ Suspected Hypothyroidism (TSH first, fT4 if indicated)
- ☐ Suspected Hyperthyroidism(TSH first, fT4 & fT3 if indicated)

OTHER CHEMISTRY TESTS

- ☐ Sodium
- ☐ Potassium
- ☐ Albumin
- ☐ Alk phos
- ☐ ALT
- ☐ B12
- ☐ Bilirubin
- ☐ GGT
- ☐ T. Protein
- ☐ Creatinine/eGFR
- ☐ Calcium
- ☐ Creatine kinase (CK)
- ☐ PSA - Known or suspected prostate cancer (MSP billable)
- ☐ PSA screening (self-pay)
- ☐ Pregnancy Test
- ☐ ß-HCG - quantitative

The personal information collected on this form and any medical data subsequently developed will be used and disclosed only as permitted or required by the Personal Information Protection Act (and related acts and regulations) of British Columbia. LifeLabs privacy policy is available at www.lifelabs.com. Use of this form implies consent for the use of de-identified patient data and specimens for quality assurance purposes.

MICROBIOLOGY

LABEL ALL SPECIMENS WITH PATIENT'S FIRST AND LAST NAME, DOB AND/OR PHN & SITE

ROUTINE CULTURE

On Antibiotics? ☐ Yes ☐ No Specify: _____

- ☐ Throat ☐ Sputum ☐ Blood ☐ Urine
- ☐ Superficial Wound, Site _____
- ☐ Deep Wound, Site _____
- ☐ Other: _____

VAGINITIS

- ☐ Initial (smear for BV & yeast only)
- ☐ Chronic/recurrent (smear, culture, trichomonas)
- ☐ Trichomonas testing

GROUP B STREP SCREEN (Pregnancy only)

☐ Vagino-anorectal swab ☐ Penicillin allergy

CHLAMYDIA (CT) & GONORRHEA (GC) by NAAT

Source/site: ☐ Urethra ☐ Cervix ☐ Urine ☐ Vagina ☐ Throat ☐ Rectum ☐ Other: _____

GONORRHEA (GC) CULTURE

Source/site: ☐ Cervix ☐ Urethra ☐ Throat ☐ Rectum ☐ Other: _____

STOOL SPECIMENS

History of bloody stools? ☐ Yes

- ☐ C. difficile testing ☐ Stool culture ☐ Stool ova & parasite exam
- ☐ Stool ova & parasite (high risk, submit 2 samples)

DERMATOPHYTES

☐ Dermatophyte culture ☐ KOH prep (direct exam)

Specimen: ☐ Skin ☐ Nail ☐ Hair

Site: _____

MYCOLOGY

☐ Yeast ☐ Fungus Site: _____

Date

Requisition is valid for one year from the date of issue.

URINE TESTS

- ☐ Macroscopic → microscopic if dipstick positive
- ☐ Macroscopic → urine culture if pyuria or nitrite present
- ☐ Macroscopic (dipstick) ☐ Microscopic*

*Clinical information for microscopic required: _____

HEPATITIS SEROLOGY

☐ **Acute viral hepatitis undefined etiology**
Hepatitis A (anti-HAV IgM)
Hepatitis B (HBsAg, ±anti-HBc)
Hepatitis C (anti-HCV)

☐ **Chronic viral hepatitis undefined etiology**
Hepatitis B (HBsAg, anti-HBc, anti-HBs)
Hepatitis C (anti-HCV)

Investigation of hepatitis immune status

- ☐ Hepatitis A (anti-HAV, total)
- ☐ Hepatitis B (anti-HBs)

Hepatitis marker(s)

- ☐ HBsAg

(For other hepatitis markers, please order specific test(s) below)

HIV SEROLOGY

☐ HIV Serology
(patient has the legal right to choose not to have their name and address reported to public health = non-nominal reporting)
☐ Non-nominal reporting

OTHER TESTS Standing Orders Include expiry & frequency

- ☐ ECG
- ☐ FIT (Age 50-74 asymptomatic q2y) Copy to Colon Screening Program
- ☐ FIT No copy to Colon Screening Program

Do not order IDP (Infectious Diarrhea Panel). Need STOOL MICROSCOPY.

Standing Order requests - expiry and frequency must be indicated

Practitioner Signature:

41592 D2350 (07/23)

FIGURE 3. An example of how to fill out a laboratory requisition form to prevent the auto-substitution of microscopy with infectious diarrhea panel (IDP) nucleic-acid amplification test orders. The highlighted area in the "Other tests" box (bottom-right corner of the page) indicates a stool microscopy rather than IDP testing is needed. The highlighted area in the "Diagnosis and indications" box (top third of the page) explains the rationale for the order.

Implications for clinicians

Although IDP-NAAT, in general, is more sensitive than microscopy and culture testing, a "multiplex" IDP-NAAT is not "omniplex." Now that BC diagnostic laboratories are transitioning to IDP-NAAT, which captures 14 common intestinal pathogens, it is expected that clinicians will need to be more familiar with the various pathogens beyond these 14 common ones to aid their differential diagnoses. If the multiplex IDP-NAAT does not include targets for the potential pathogens in their differentials, additional specific testing would be required, especially if the patient is still symptomatic and has no clear diagnosis.

Another potential change of practice is the timing to order test of cure for occupational clearance, especially for bacterial intestinal infections, depending on local occupational health and public health policies. IDP-NAAT is highly sensitive and could generate reactive results, even when patients are no longer infectious.[14] The BC Guidelines do not specify whether a test of cure is needed for each pathogen. Laboratories may have their own laboratory-developed assays and therefore no published guidance on when to order repeat testing, if indicated.

Furthermore, if laboratories are transitioning to automatic substitution of stool microscopy orders with IDP-NAAT, clinicians would have to clearly indicate on their order requisition forms that microscopy is needed and provide the rationale for it. An example of how to fill out a requisition form is provided in **Figure 3**. To further prevent errors, when handing requisition forms to patients, clinicians may want to remind them that they should anticipate receiving vials (for stool microscopy) rather than swabs (IDP-NAAT) from the laboratory patient service centres **[Figure 4]**. These tips are summarized in **Box 2**.

Although the BC Guidelines recommend stool microscopies if patients have a history of recent travel or immigration from low- or middle-income countries or are severely immunocompromised, these criteria may not capture all at-risk patients. For instance, *Diphyllobothrium* infections generally occur in the northern hemisphere, including Europe; newly independent states of the former Soviet Union; North America; and Asia.[7] Fish-borne parasitic infections, secondary to *Anisakis* spp. and *Diphyllobothrium* spp., are endemic in cosmopolitan regions in Japan.[15] Several intestinal parasites, including *Ascaris lumbricoides*, *Trichuris trichiura*, and *Taenia* spp., isolated from human stool specimens in Ontario were deemed to be endemic in Canada rather than imported.[16] Strongyloidiasis could be asymptomatic or cause minimal symptoms in its acute phase **[Figure 5]**. Thus, it is not apparent in recent travelers and immigrants, but clinical disease can be lifelong and turn into hyperinfection or disseminated disease when patients become immunocompromised.[11,12]

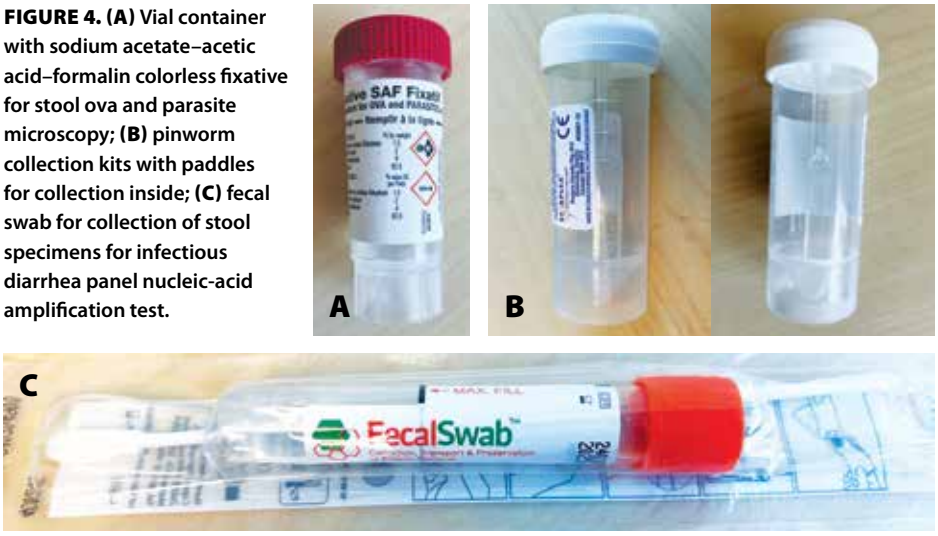

FIGURE 4. (A) Vial container with sodium acetate–acetic acid–formalin colorless fixative for stool ova and parasite microscopy; **(B)** pinworm collection kits with paddles for collection inside; **(C)** fecal swab for collection of stool specimens for infectious diarrhea panel nucleic-acid amplification test.

Implications for epidemiologists

Changes in test methods can lead to pseudo-outbreak.[17] An increase in incidents of certain pathogens could be due to the superior sensitivity of IDP-NAAT compared with microscopy.[18] Epidemiologists may need to determine the implementation dates of IDP-NAAT in different laboratories and set new baseline surveillance rates. The prevalence of some intestinal pathogens, such as *Blastocystis hominis* and *Dientamoeba fragilis*, may seem to decline, but it may be that they are not being identified by IDP-NAAT.

Implications for laboratorians

Similar to epidemiologists, laboratorians should conduct their own surveillance studies of intestinal pathogens detected in their

BOX 2. Practice tips on how to prevent auto-substitution of microscopy with infectious diarrhea panel orders, if clinically indicated.

When and how to order microscopy rather than infectious diarrhea panel (IDP)—use the acronym PICH:

- Consider stool microscopy if **p**arasitic infections are in your differential diagnoses but are beyond the four parasites in the IDP (i.e., *Cyclospora cayetanensis*, *Cryptosporidium* spp., *Entamoeba histolytica*, *Giardia* spp.). Consider pinworm collection kit when **p**inworm (*Enterobius vermicularis*) is suspected.
- **I**ndicate the rationale for why stool microscopy is needed in the "Diagnosis and indications" section of the laboratory requisition form (e.g., recent travel or immigration from a low- or middle-income country, immunocompromised).
- **C**larify in the "Other tests" box of the laboratory requisition form that microscopy, not IDP, is needed.
- When **h**anding out the requisition form, remind the patient that a vial container, not a swab, should be given.

laboratories. If there has been a significant decrease in the prevalence of intestinal pathogens since the implementation of IDP-NAAT, it could be that they are not being identified by that test. Consideration can be given to incorporating those pathogens into the multiplex panel.

Comparison to other studies

In this study, the most common intestinal parasitic pathogens identified were *Blastocystis hominis* and *Dientamoeba fragilis*. They were also the most predominant intestinal parasites found in stool testing among refugees at a primary care clinic in Toronto, Ontario.[19] Similar to our study, that study found infrequent occurrences of parasitic helminths,[19] which are not among the 14 common intestinal pathogens listed in the BC Guidelines. The variety of parasites identified in our study was consistent with studies of parasitic diseases that were conducted in Canada in the 1970s and 2000s.[16,20] However, unlike those studies, our study did not detect *Toxoplasma* spp. or *Trichinella spiralis*, which are diagnosed mainly using serological testing.

Study limitations

A major limitation of this study was the exclusion of data from hospitals, whose clinicians may have different indications warranting the need for stool microscopies in addition to IDP-NAAT. Hospital laboratories are welcome to conduct their own audits to observe changes in pathogen prevalence due to implementation of IDP-NAAT. Another limitation of this study was that not all of the 53 790 orders (52 221 stool and 1569 pinworm paddle specimens) were evaluated to determine whether a diagnosis could be missed. This study was meant to hypothesize about diagnoses that could be missed if only IDP-NAAT was used for diagnosing intestinal parasitic infections. In addition, this study did not investigate bacterial pathogens that could be missed, because IDP-NAAT recommends testing only seven common bacterial pathogens but not some rare ones such as *Aeromonas* spp., *Plesiomonas* spp., *Edwardsiella* spp., and *Yersinia* spp., other than *Yersinia enterocolitica*.[1,21,22] Further studies may determine whether testing for these pathogens should be included in IDP-NAAT. Despite this study's limitations, its major strength was the inclusion of almost all community microbiology data; therefore, the results should be generalizable to the community population in BC.

FIGURE 5. ***Strongyloides stercoralis*** **larvae detected by stool microscopy at LifeLabs. This microorganism would not be detected if a fecal swab were submitted for IDP-NAAT, whose targets do not include *S. stercoralis*.**

Conclusions

This 1-year study demonstrated that many parasitic pathogens could be missed if only IDP-NAAT is used to diagnose intestinal parasitic infections. If indicated, microscopy orders would be needed to capture these additional parasites. ■

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Competing interests

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Reimagining congenital cytomegalovirus care in British Columbia

The current model of care for congenital cytomegalovirus lacks a coordinated approach among teams with specific knowledge about the infection.

ABSTRACT: Cytomegalovirus is the most common congenital infection in British Columbia and Canada, but current models of care are suboptimal for affected children and families. This review aimed to understand caregiver and health care provider perceptions about current care models for congenital cytomegalovirus. Caregivers (n = 18) and health care providers (n = 26) of children affected by congenital cytomegalovirus were surveyed to explore their perceptions about the current quality of care and any unmet needs and to obtain recommendations for improving care as part of a health system redesign project. Caregivers stressed the need for improved cytomegalovirus education, prevention, and diagnostic processes. Health care providers expressed concerns about testing delays; access to care; and uncertainty regarding diagnosis, clinical practice guidelines, and management of the infection. This review informed the development of a multidisciplinary program at BC Women's Hospital and Health Centre and BC Children's Hospital, one of the first in Canada aimed at improving care for families affected by congenital cytomegalovirus.

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Cytomegalovirus is a DNA herpes virus and is endemic worldwide.[1] The virus is typically spread by person-to-person transmission through urine, saliva, genital secretions, or other body fluids.[2] In otherwise healthy children and adults, including pregnant women, primary cytomegalovirus infection is often asymptomatic or may cause minor symptoms such as fever, sore throat, and myalgias. Infants who are affected by congenital cytomegalovirus, where the infection is transmitted perinatally, are at risk of serious morbidity and require timely diagnosis and treatment and long-term follow-up with multidisciplinary teams.[2]

Cytomegalovirus is the most common congenital infection in British Columbia and Canada, affecting approximately 1 in 150 to 240 live births.[2-4] Infants with congenital cytomegalovirus face varying levels of morbidity, ranging from asymptomatic to severe disease. Notably, congenital cytomegalovirus is the leading cause of nonhereditary sensorineural hearing loss, among other significant sequelae that may not be present at birth **[Box 1]**.[2-4]

The seroprevalence of cytomegalovirus among childbearing-age individuals in Canada is estimated to be 40% to 54%, increasing with age and parity. This population faces the risk of virus reactivation or reinfection,

BOX 1. Important sequelae impacting children affected by congenital cytomegalovirus.

- Sensorineural hearing loss
- Epilepsy
- Cerebral palsy
- Neurodevelopmental disabilities
- Intellectual delay
- Developmental delay
- Visual impairment

leading to intrauterine transmission in 0.5% to 1.5% of pregnancies. Primary infections, affecting approximately 2% of pregnancies, pose a higher risk of transmission, at rates of 30% to 40%, depending on gestational age at time of infection.[2] While routine screening for cytomegalovirus during pregnancy is not standard, up to 74% of pregnant individuals express interest in screening once they are informed of its implications for pregnancy and child development.[5] Despite this, current guidelines from the Society of Obstetricians and Gynaecologists of Canada emphasize the complexity of antenatal cytomegalovirus diagnosis through noninvasive routine screening alongside sonography and amniocentesis.[2]

During pregnancy, congenital cytomegalovirus may be suspected if there is maternal seroconversion; maternal clinical signs; or features suggestive on fetal ultrasonography, including intrauterine growth restriction, echogenic fetal bowel, or brain calcifications. Seroconversion involves detecting the emergence of anti-cytomegalovirus IgG antibodies in individuals who previously lacked them, which indicates recent cytomegalovirus infection.[6] Due to the lack of routine screening for cytomegalovirus in women before conception, documenting cytomegalovirus seroconversion is rare, making primary infection diagnosis challenging.[7] Other tests, including Ig avidity, in which low-avidity IgG antibodies generated at the time of initial infection develop increased avidity with subsequent maturation, and cytomegalovirus IgM antibodies and cytomegalovirus shedding have been studied, but these tests are not standardized, and sensitivity, specificity, and predictive values differ based on prevalence in a population and stage of illness.[7] Additionally, the presence of cytomegalovirus-specific IgM may not indicate primary infection because it can also occur during reactivation or reinfection.[7] Consequently, clinical guidelines do not universally recommend serological screening during pregnancy. Addressing this gap in cytomegalovirus care necessitates further research to establish such guidelines for clinical practice.[8]

Given the challenges with antenatal diagnoses and current evidence that suggests that antiviral treatment has a limited role in antenatally diagnosed cytomegalovirus, the Society of Obstetricians and Gynaecologists of Canada stresses the importance of having multidisciplinary support from experts in maternal-fetal medicine and reproductive infectious diseases and emphasizes the need for increased awareness and education, which are crucial for implementing effective prevention strategies. Previous studies have indicated that informed pregnant individuals show strong willingness to adhere to these strategies.[2]

Early identification of congenital cytomegalovirus is crucial for initiating timely treatment, which has shown significant benefits in improving hearing and neurodevelopmental outcomes when started in the first month of life.

Following delivery, congenital cytomegalovirus may be clinically suspected in infants with microcephaly, intrauterine growth restriction, hepatosplenomegaly, petechiae, jaundice, hypotonia, and seizures.[1,4] Other clinical signs include abnormal findings on brain imaging, failed newborn hearing screen, chorioretinitis, and, less frequently, optic atrophy or central vision loss.[1,2,4] Laboratory findings often include elevated liver enzymes, thrombocytopenia, and elevated serum bilirubin. Confirmation of congenital cytomegalovirus involves detecting the virus in samples from newborns within the first 3 weeks of life by urine cytomegalovirus polymerase chain reaction (PCR) testing, which is the current gold standard testing modality; alternatives include saliva cytomegalovirus PCR. If not collected within this time frame, cytomegalovirus PCR can be requested from the dried blood spot (DBS) card collected for newborn screen at the time of birth, although it has variable sensitivity and is typically helpful only to rule *in* congenital cytomegalovirus (a negative test does not rule out congenital cytomegalovirus) given poor test sensitivity.[1,2,4]

Approximately 90% of congenital cytomegalovirus–infected infants are asymptomatic at birth, which makes them challenging to identify initially.[9] However, 10% to 15% of asymptomatic infants may later develop long-term neurological issues, notably hearing loss and developmental delays, which are difficult to assess before the age of 2 years. The remaining 10% of infants with congenital cytomegalovirus are symptomatic at birth, and 36% to 90% of them develop permanent sequelae, such as hearing loss (35%), neurodevelopmental deficits (43%), and vision impairment (6%).[1,2,4]

Early identification of congenital cytomegalovirus is crucial for initiating timely treatment, which has shown significant benefits in improving hearing and neurodevelopmental outcomes when started in the first month of life.[4,10] Infants who are suspected of having congenital cytomegalovirus should undergo diagnostic testing with further evaluation for disease severity, including screening for blood counts and liver enzymes, head imaging, hearing assessment, and ophthalmologic evaluation for potential complications. If seizures or sepsis is suspected, lumbar puncture for central nervous system evaluation is recommended.[4]

Expert opinions vary on indications for initiation of congenital cytomegalovirus treatment. Mildly symptomatic cases, involving one or two systems with transient and mild features, typically do not require treatment. However, moderately to severely symptomatic cases, characterized by central nervous system involvement, chorioretinitis, or multisystem disease, usually warrant treatment. The initiation of treatment for hearing loss alone remains debated. According to Canadian Paediatric Society guidelines, treatment with ganciclovir or

valganciclovir for a total of 6 months is recommended for eligible cases.[4,10]

Infants with moderate to severe congenital cytomegalovirus should have timely referral to a multidisciplinary team comprising pediatricians; infectious diseases specialists; audiologists; ear, nose, and throat specialists; and infant development programs. Infants who do not meet treatment criteria because they are mildly symptomatic or asymptomatic are still at risk for adverse outcomes and need ongoing hearing and developmental surveillance, as well as general pediatric care. This approach enables early detection of late-onset or progressive sequelae and facilitates prompt intervention and rehabilitation to improve medical, developmental, and educational outcomes.[1,9,11] However, identifying asymptomatic or mildly symptomatic infants with congenital cytomegalovirus can be challenging. Two provinces have implemented routine DBS-based screening for all infants: Ontario, since 2019, and Saskatchewan, since 2022. While many centres perform targeted screening for infants who fail the newborn hearing screen, this strategy misses more than half of those with congenital cytomegalovirus-related sequelae, including hearing loss, who would have benefited from early intervention services.[2]

Research on the lived experience of those affected by congenital cytomegalovirus is limited, but studies have highlighted parental concerns regarding limited cytomegalovirus awareness prior to and during their pregnancies and poor access to cytomegalovirus-knowledgeable health care teams.[12-14] Though anecdotal, rich qualitative reports available through public domains highlight these same concerns, as well as concerns about delays in care and testing and challenges navigating specialist appointments.[15,16] Research has indicated that there is limited knowledge of congenital cytomegalovirus among both the general population and perinatal health care providers, and reports from health care providers cite insufficient expertise as the main reason for avoiding discussions about congenital cytomegalovirus.[2,13,14] However, there is a gap in the literature regarding the perceptions and experiences of caregivers and health care providers who are involved in congenital cytomegalovirus care in Canada.[15,16]

Until 2022, reproductive infectious diseases specialists at BC Women's Hospital and Health Centre cared for women with possible cytomegalovirus during pregnancy in a BC Women's physician-only clinic. Infants diagnosed with congenital cytomegalovirus received general pediatric care in the community with consultation from pediatric infectious diseases specialists (and other specialists where needed) at BC Children's Hospital. Despite being situated on the same campus, these services operated independently. In 2022, with Health System Redesign funding, care of pregnant people with possible cytomegalovirus during pregnancy and outpatient care of infants with congenital cytomegalovirus were combined in a multidisciplinary clinic that had previously developed a women- and family-centred model of care for HIV in a collaborative, cross-campus, multidisciplinary clinic aimed at providing integrated maternal and infant care for perinatal infections.[17] The redesign was informed by focus groups and individual interviews with physicians who care for patients impacted by congenital cytomegalovirus and was supplemented by surveys on the experiences of caregivers and health care providers who care for children with congenital cytomegalovirus in BC and Canada. The inclusion of the perspectives of those with current lived experience within our systems allowed us to examine the strengths and weaknesses of current care models, barriers to access and quality of care, unmet needs, and recommendations for improvement. The findings, in addition to literature reviews, informed the development of a collaborative and multidisciplinary congenital cytomegalovirus care program in BC.

While many centres perform targeted screening for infants who fail the newborn hearing screen, this strategy misses more than half of those with congenital cytomegalovirus-related sequelae, including hearing loss, who would have benefited from early intervention services.

Methods

Data collection

Two online surveys were developed: one for caregivers with lived experience of congenital cytomegalovirus, the other for health care providers who deliver care to families and children affected by congenital cytomegalovirus. The surveys were developed based on a review of the literature and consultation with health care providers, families, and an evaluation/survey expert. The surveys included both closed and open-text questions to capture the respondents' lived experiences. The final surveys were pretested with health care providers and families to ensure comprehension and ease of completion. The surveys were administered through REDCap between October 2021 and January 2022.

Surveys for caregivers were distributed by newsletter, website, and social media platforms through the Canadian CMV Foundation, a society with expertise in engaging with families with lived experience of congenital cytomegalovirus, and through pediatric and ear, nose, and throat clinics across Canada that care for children affected by congenital cytomegalovirus, as identified through physician networking. Surveys for health care providers were delivered through the BC Pediatric Society and Doctors of BC and through snowball sampling, in which health care providers in the community were identified and asked to recruit others who may have cared for children affected by congenital cytomegalovirus. This project was reviewed by the University of British Columbia Research

Ethics Board and was determined to be in keeping with quality improvement work; thus, it did not require a Research Ethics Board review.

Analysis

Data were analyzed descriptively using SPSS Statistics version 25.0. Inferential statistics were not calculated due to small sample sizes, especially when data were cross-tabulated by role, years of experience, and region. Qualitative data from open-text questions were analyzed thematically using inductive techniques. Data were further coded by two independent reviewers (N.B. and S.Z.), and their frequency counts were reported. Any discrepancies in coding were discussed to reach consensus. Codes were further collapsed to develop overarching themes and subthemes.

Results

Caregiver perspectives

In total, 25 surveys were collected from caregivers. Seven participants were excluded because they did not complete the survey or they were living outside of Canada. The remaining 18 participants either were from Ontario (n = 8), Alberta (n = 3), Quebec (n = 1), or Yukon (n = 1) or did not disclose their location (n = 5). Due to the sampling method, the response rate could not be calculated. Eleven participants lived in urban locations; two lived in rural communities. All participants had some level of postsecondary education, ranging from technical education to university graduate degrees.

Sixty-one percent of caregivers had a child diagnosed with congenital cytomegalovirus within the first month of life; 39% had a later diagnosis. Before pregnancy, 89% of participants (n = 16) had limited knowledge of cytomegalovirus, and only 11% (n = 2) recalled receiving cytomegalovirus education from their health care provider during pregnancy. After diagnosis, survey respondents saw multiple subspecialists, including family physicians; ear, nose, and throat specialists; general pediatricians; pediatric infectious diseases specialists; neonatologists; neurologists; ophthalmologists; psychologists; and audiologists, but 28% (n = 5) felt their providers were unable to adequately address their questions about congenital cytomegalovirus. Respondents also found it challenging to arrange follow-up tests and appointments with their many health care professionals. Improving education and awareness of cytomegalovirus infection during pregnancy was identified as the most crucial need for improving care; it was recommended by 89% (n = 16) of participants. These themes were consistently highlighted in the qualitative survey responses:

- "No health professional ever mentioned [cytomegalovirus] during pregnancy. I had not heard of the virus until my son's sudden hearing loss at 3 months old."
- "Pregnant people should be advised of [cytomegalovirus], even something as basic as 'This is what the virus is, this is what it could do to your child in a congenital infection, here are a couple ways of preventing infection (e.g., hand hygiene).'"

Caregivers also found it difficult to navigate supports within their community and desired a more coordinated approach to access their appointments. Respondents experienced stigma and financial burden and felt overwhelmed by the multiple appointments and treatments involved in their child's care:

- "I also found it difficult to navigate the various supports in my community."
- "I only wish my nurse in the NICU wasn't so judgmental with me. That's the only negative experience I had."

Health care provider perspectives

In total, 38 physicians participated in the survey; however, 12 were excluded because they did not complete it **[Table]**. Although 73% (n = 19) of participants felt confident identifying signs and symptoms of congenital cytomegalovirus, this varied with years of experience: 93% (n = 11) of physicians with 21 years of practice or more were confident identifying signs and symptoms of congenital cytomegalovirus, compared with only 33% (n = 2) who had 5 years of experience or less. Only 54% (n = 14) of all respondents felt confident in knowing which diagnostic tests to order for congenital cytomegalovirus, and 58% (n = 15) felt uncomfortable identifying which children would require treatment. Only 51% (n = 13) and 62% (n = 16) of respondents felt at least somewhat confident in providing short- and long-term outcome counseling, respectively, for children with congenital cytomegalovirus.

When asked about system improvement strategies, respondents who had cared for children with congenital cytomegalovirus (n = 11) identified a need for improvements in access to testing, family-focused education resources, and early childhood developmental services. Access to subspecialty advice and timeliness of patient referrals were identified as working well.

Through the open-text questions, respondents highlighted a need for improved

TABLE. Characteristics of health care provider participants.

Characteristics	*n* (%)
Role	
Pediatrician or pediatric subspecialist	16 (62)
Family physician	9 (35)
Physician or surgeon from other specialities	1 (4)
Years in practice	
0–5	6 (23)
6–10	6 (23)
11–20	2 (8)
21+	12 (46)
Health region	
Vancouver Coastal Health	7 (27)
Fraser Health	6 (23)
Interior Health	6 (23)
Island Health	6 (23)
Northern Health	3 (12)
Rural vs urban	
Rural	2 (8)
Urban	24 (92)

standards of care, noted difficulty in establishing a diagnosis, and voiced concerns about delays in access to care. They recommended improving prenatal education, creating a more centralized source of information, and developing guidelines and care pathways. They raised questions about the merit of universal screening at birth:

- "[The] current model seems very inadequate, and most cases are missed."
- "I believe there are features [of cytomegalovirus] that are easily missed or attributed to other causes."

Across all BC health regions, concerns were raised about delays accessing care. Some respondents suggested the delays were related to their own lack of understanding about the need for timely diagnosis and access to treatment and to delays in initial hearing assessments and accessing testing results. Furthermore, the need for more education within the physician community was emphasized, including the need for more information on the short- and long-term outcomes of congenital cytomegalovirus and the safety and efficacy of treatment.

Discussion

Health care providers emphasized the need for an improved standard of care for congenital cytomegalovirus, including better prenatal education; centralized sources of information; and accessible, up-to-date guidelines and care pathways. They also identified the need for education to provide better care and counseling to affected families. Many of the needs identified by health care providers were echoed by caregivers, including the need for improved prenatal education, informed counseling, and standardized testing. Both groups expressed concerns about delays in receiving care and challenges in coordinating services.

Updated clinical practice guidelines for congenital cytomegalovirus for health care providers of pregnant individuals and children were published by the Society of Obstetricians and Gynaecologists of Canada in 2021 and the Canadian Paediatric Society in 2020, respectively.[2,4] Additionally, BC-specific resources are available online through the Shared Health Organizations Portal, including information and policy statements on indications for congenital cytomegalovirus testing and workup, guided scripts to support early discussions with families at risk, patient information handouts, logistics and techniques regarding saliva or urine collection for diagnostic assessment, and algorithms to outline follow-up investigations and referrals for infants who test positive.

Efforts to streamline follow-up investigations and referrals for infants who test positive for congenital cytomegalovirus are essential. Surveyed caregivers and health care providers stressed the need for standardized testing and prompt access to care. Currently, only Ontario and Saskatchewan have implemented routine newborn screening for congenital cytomegalovirus. BC and Manitoba have targeted screening programs, but initially asymptomatic infants remain unidentified.[18] Other provinces and territories lack province- and territory-wide screening measures. Debate on the cost-effectiveness of universal screening persists, despite higher disease burden of many screened disorders.[11] Research on the economic impact of congenital cytomegalovirus in Canada is limited, but international studies suggest that universal screening can lead to substantial cost savings by reducing unnecessary tests and supporting children at risk of late-onset hearing loss with appropriate medical, therapeutic, and educational interventions.[11,19]

BC Women's and BC Children's implemented a cross-campus multidisciplinary service aimed at providing integrated maternal and infant care for congenital cytomegalovirus and other perinatal infections through the Oak Tree Clinic **[Box 2; Figure]**. The clinic provides shared care in collaboration with community obstetricians, family physicians, midwives, and maternal-fetal medicine specialists across the province, and pediatricians, otolaryngologists, the BC Early Hearing Program, and other pediatric subspecialists. It aims to expand the care provided for reproductive or congenital infectious diseases, including cytomegalovirus, with the aim of facilitating access to comprehensive congenital cytomegalovirus care, including in-person and telephone consultations for pregnant people, caregivers, and children. The clinic includes nursing, pharmacy, dietitian, and social work support. Access to up-to-date and easily understandable resources that are tailored to caregivers and families at key stages of their cytomegalovirus journey are also provided **[Box 2; Figure]**.

BOX 2. Resources and roles provided by the multidisciplinary teams involved in the care pathway for congenital cytomegalovirus at the Oak Tree Clinic.

- The Oak Tree Clinic at BC Women's Hospital and Health Centre provides specialized clinical care to women who may have cytomegalovirus in pregnancy and infants with a new congenital cytomegalovirus diagnosis. For further information and referrals, see www.bcwomens.ca/our-services/specialized-services/oak-tree-clinic.
- BC Women's reproductive infectious diseases specialists can provide consultations for people who may have cytomegalovirus or other infections during pregnancy.
- BC Children's Hospital's pediatric infectious diseases specialists can provide phone or in-person consultations for inpatients with congenital cytomegalovirus.

Study limitations

Our surveys, while informative for program design, had limitations. Sampling through advocacy organizations may introduce selection bias and potentially skew results toward highly educated individuals. A lack of BC participants was mitigated by including national respondents, although we expect that caregivers' wishes and recommendations for improving care would likely be similar across the country. Additionally, the survey method may have hindered participation by those with limited time and resources, including electronic access to the survey. Although the response rate could not be computed due to the sampling method used,

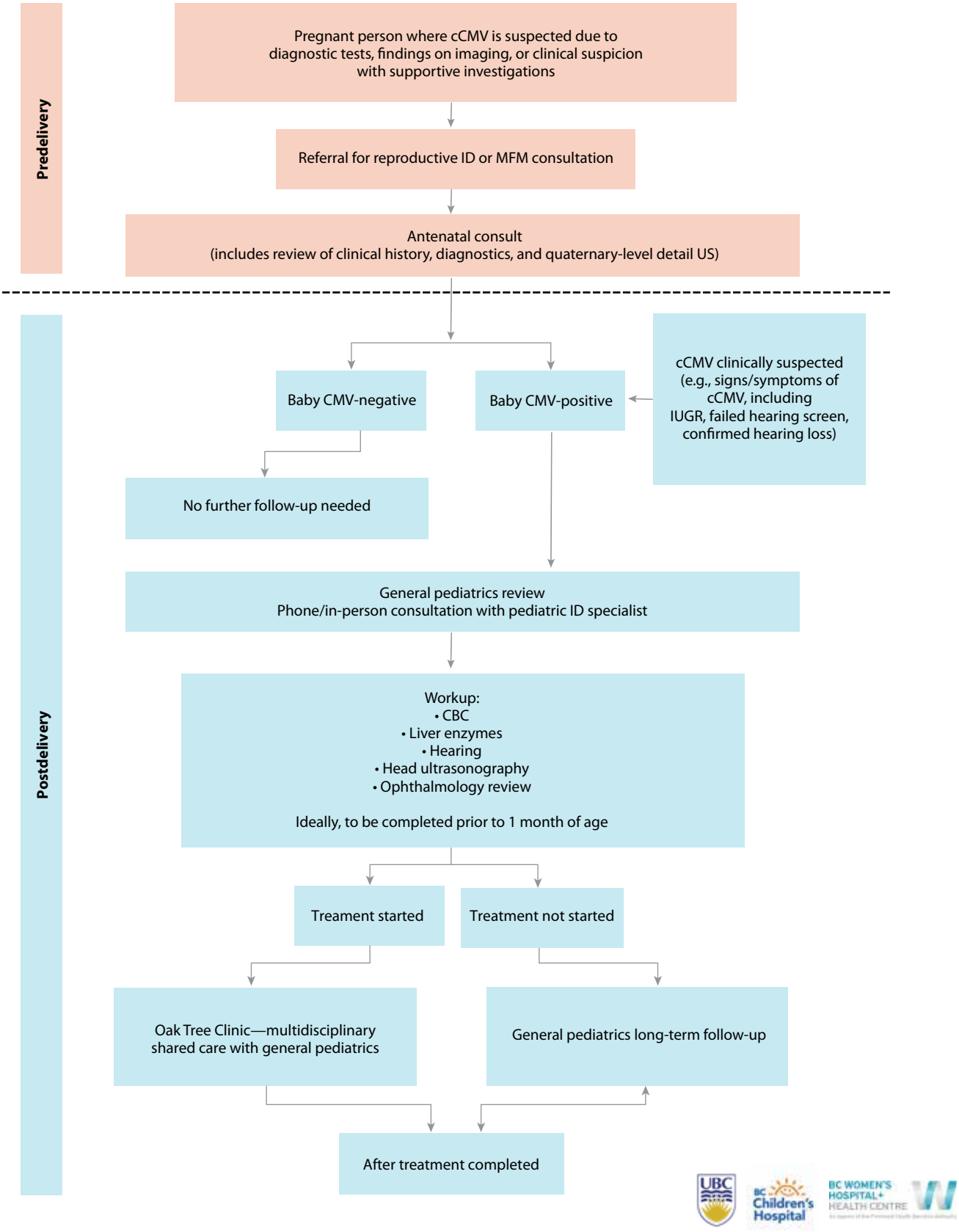

FIGURE. Suggested integrated pathway for managing congenital cytomegalovirus (cCMV) infection in pregnant individuals and newborns from diagnosis to care. ID = infectious diseases; MFM = maternal-fetal medicine; US = ultrasonography; IUGR = intrauterine growth restriction; CBC = complete blood count.

the overall number of survey responses was lower than expected. Furthermore, caregivers represented mainly urban populations, which limited comparisons with rural communities, although health care providers highlighted rural-specific challenges in accessing care and multidisciplinary support. It is critical that interventions for congenital cytomegalovirus care address rural barriers.

Conclusions

Despite our study's limited sample size, the qualitative data provided valuable insight into caregiver and health care provider perspectives on care for congenital cytomegalovirus, which align with concerns raised by those in previous studies outside of BC and Canada. The current model of care across BC and Canada is lacking a coordinated approach among teams with specific knowledge about cytomegalovirus. In this study, both health care providers and patient caregivers advocated for improved models of care that include better education, both antenatally and perinatally; increased health care provider awareness of congenital cytomegalovirus; better standards of testing; and greater coordination of care among health care services. These findings guided the design of combined maternal and infant care for congenital cytomegalovirus in BC through the Oak Tree Clinic as we work toward improved standards of care for congenital cytomegalovirus in BC and across Canada. ■

Competing interests

None declared.

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Work-related dental injuries: Considerations for replacing teeth with implant-retained restorations

Dental injuries in the workplace are generally related to oral or facial trauma and can result in the loss of teeth. Dental implants have revolutionized the field of dentistry, offering a reliable and long-lasting solution for replacing missing teeth. Implant-retained dental restorations are now the preferred treatment option for replacing teeth in many clinical situations.

Advantages of dental implants

Dental implants are artificial tooth roots made of titanium, a biocompatible material. They are surgically installed into the maxillary and/or mandibular dental arch to provide a foundation for replacement restorations. Once installed, a dental implant fixture fuses with the adjacent bone. This process of osseointegration typically takes 4 to 6 months to complete. Once the implant is successfully integrated, a connecting component that passes through the gingival tissue, referred to as an abutment, is screwed onto the implant fixture. The final prosthesis, which may be an individual tooth, a bridge, or a denture replacing multiple teeth, is then attached to the abutment(s).

Implant-retained restorations look and feel like natural teeth while restoring chewing and speaking abilities to re-establish overall oral function. An implant-retained restoration replacing one or more teeth provides several advantages over other tooth replacement options. For example, a tooth-supported fixed bridge is a common treatment option for replacing teeth, but these restorations require reduction of adjacent teeth to support the cemented bridge. An implant-retained restoration replaces teeth without sacrificing the health of neighboring teeth. In addition, implant fixtures mimic natural tooth roots, stimulating adjacent bone and reducing bone loss that commonly occurs after tooth loss.

Implant-retained restorations look and feel like natural teeth while restoring chewing and speaking abilities to re-establish overall oral function.

Complete dentures supported and retained by dental implants offer superior stability for denture wearers because the implant fixtures hold a denture securely in place. Individuals with implant-retained dentures can eat, laugh, and speak without their denture slipping. Another treatment option for replacing all teeth in a dental arch is a full arch implant-retained fixed bridge restoration. Bone grafts are typically required to establish adequate bone volume for the multiple dental implant fixtures required to support these full arch fixed restorations, but this is the treatment solution that comes closest to replacing a full arch of natural teeth.

Potential complications

Though success rates are high with implant-retained restorations, complications can arise after installing the implant, and implant failures can occur, resulting in the loss of the implant fixture and the restoration it supports. Early implant failures are typically caused by an infection at the implant site or a failure to integrate with adjacent bone, with inadequate bone density at the implant recipient site, excessive heating of the bone during the osteotomy, or poor healing contributing to osseointegration failure. Failures that occur more than 3 months after implant placement are usually due to peri-implantitis. Peri-implantitis is an inflammatory reaction in the tissues surrounding the implant fixture, with resulting loss of supporting bone. Peri-implantitis is typically progressive and not self-arresting, and responsiveness to treatment is often not ideal. Peri-implant bone loss can result in the loss of an implant-retained restoration that was initially successful.

Today, achieving successful integration of a dental implant fixture with the surrounding bone is highly predictable, and a strong focus is placed on the long-term maintenance of peri-implant hard and soft tissues. Individuals can expect long-term service from a dental implant if the implant fixture is placed well, maintained with an adequate level of personal daily oral hygiene, and supported by regularly scheduled professional dental maintenance.

Patients who have damaged their teeth at work

When workers damage their teeth or dentures because of a workplace incident, dentists are among the first health care professionals they see. WorkSafeBC works closely with members of the dental profession. If you see a patient with a work-related

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Pathogen genomics in the post-COVID-19 era

One core function of a provincial public health laboratory is to conduct pathogen surveillance by characterizing the genetic material of microbes, also known as "fingerprinting," to monitor circulating strains, understand local and global epidemiology and transmission dynamics, and support outbreak investigations to determine the risks to individuals and the population. This function is key for many public health activities, including food safety investigations (e.g., *Salmonella* contamination of imported melon), emerging pathogen response (e.g., detection of a novel disease), and vaccine effectiveness (e.g., determining how closely the seasonal influenza vaccine matches the circulating influenza strain). The value of these functions has been demonstrated during the SARS-CoV-2 pandemic and multiple recent public health incidents, such as a *Listeria* outbreak associated with plant-based milk identified through the coordinated PulseNet Canada enteric surveillance program,[1] which is built on a pathogen genomics framework.

Advanced fingerprinting—Whole-genome sequencing

Many technologies have been evaluated in the past 2 decades to identify a pathogen's unique fingerprint to inform possible pathways of transmission. The technology with the highest discriminatory power is the recently emerged next-generation sequencing. In 2015, the BC Centre for Disease Control Public Health Laboratory (BCCDC PHL) started transitioning to next-generation sequencing to replace traditional fingerprinting of enteric pathogens. Supported by significant infrastructure and knowledge translation from the National Microbiology Laboratory, this new genomics era for foodborne illness monitoring revolutionized PulseNet Canada's surveillance system for foodborne illness. Funding through external grants, including from Genome BC, enabled further sequencing advancements as modern technologies were evaluated for various microbial applications, including surveillance and outbreak response to multidrug-resistant bacterial infections in BC health care facilities. By the time the COVID-19 pandemic hit, the BCCDC PHL became a key leader in the national response to the pandemic by rapidly implementing a detection assay and high-throughput sequencing that informed public health, scientists, policy, decision-makers, and the public on the variants circulating in BC in real time.

In the future, pathogen genomics and DNA sequencing technologies will be increasingly woven into all areas of public health and the health care system

Role of genomics during the pandemic

In response to the pandemic, the BCCDC PHL rapidly expanded the pathogen genomics program that transitioned SARS-CoV-2 detection and characterization into a robust surveillance tool that informed policy decisions in BC and Canada. The nature of the rapidly evolving SARS-CoV-2 virus during the pandemic brought the need for genomics to the forefront. No other technology would have been capable of providing the means to track and characterize the variants that arose due to mutations across a broad range of applications, such as epidemiology, virulence, or antigenicity of the virus. These variants were monitored by public health officials for signs of potential impact on vaccine efficacy, effectiveness of antivirals, disease presentation, and transmissibility. In BC, genomic data for SARS-CoV-2 is accessible through the surveillance dashboards offered by the BCCDC and contributed significantly to global publicly available data.

How genomics is used today

The BCCDC PHL has gone from providing sequencing capacity for a few enteric organisms to now covering a range of respiratory (e.g., influenza), emerging (e.g., mpox), nosocomial (e.g., *Clostridioides difficile*), and wastewater pathogens, with the ability to respond to future pathogens.

These genomic innovations are transforming patient care. Much like how advances in molecular approaches such as nucleic acid testing became the standard for diagnosis compared with more traditional culture-based techniques, genomics is also proceeding in that direction. Genomics methods are now considered the standard of practice in the UK and part of a global strategy for surveillance by the World Health Organization.[2,3] In 2023, the BCCDC PHL was the first laboratory in Canada to move to genomics-based testing for TB genotyping and offer amplicon sequencing for identification and macrolide resistance prediction for nontuberculous mycobacteria identification. Hepatitis C genotyping has also transitioned to an in-house

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next-generation sequencing method. In both cases, turnaround time for results has been dramatically reduced, to the benefit of patient care.

These genomic innovations are also transforming population care. With pathogen genomics, highly refined cluster detection for outbreak investigations is made possible through development of bioinformatic tools. The ability of PulseNet Canada to respond to enteric illness outbreaks has been advanced significantly with genomics, resulting in a decreased burden of illness and even food industry changes. Pathogen genomics has become an essential tool for managing antimicrobial-resistant organisms, such as carbapenemase-producing organisms, *Clostridioides difficile*, and methicillin-resistant *Staphylococcus aureus*, in health care facilities across BC. Along with infection prevention and control measures, the discriminatory power of pathogen genomics is essential for resolving outbreaks of health care–associated infections in acute care settings. Pathogen genomics also plays a significant role in quality assurance by enabling monitoring of validated assays to detect new variants of organisms with mutations that may impact assay performance, an essential function of a public health laboratory. Finally, the BCCDC PHL is positioned to be even more responsive to emerging zoonotic threats through a partnership with the BC Ministry of Agriculture's Animal Health Centre, where pathogen surveillance data is shared using a "One Health" approach. By sharing animal and human pathogen genomics information, we can monitor and respond to threats such as avian influenza (H5N1) in BC. Genomics can also inform rapid test development for novel pathogens so scale-up can occur to meet testing demands.

Pathogen genomics of tomorrow

In the future, pathogen genomics and DNA sequencing technologies will be increasingly woven into all areas of public health and the health care system for patient care, population safety, and threat response. Sequencing can replace a range of traditional testing—from diagnostics to fingerprinting to treatment susceptibility. A single genomics test can replace multiple traditional tests.

While much of this work is invisible to the general health care system and to most health care providers, its ongoing application and support are important. It provides continuously innovative approaches and operational advancement along with the capacity to understand communicable disease transmission dynamics through routine surveillance activities. Genomics informs preparedness activities and, ultimately, prevention and control measures. ■

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dental injury—whether at your medical clinic or in an emergency room—please submit a Physician's First Report (Form 8) to WorkSafeBC. Encourage the patient to file a claim with WorkSafeBC and consult with their dentist or a community dentist of their choice.

If you would like additional information or assistance for a patient with a work-related dental injury, contact the WorkSafeBC dental consultant through a medical advisor in your nearest WorkSafeBC office or through a RACE request (www.raceconnect.ca). ■

—Alison Kaplen, DMD
WorkSafeBC Dental Consultant

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Dr Derek Leonard French

1931–2024

Dr Derek Leonard French, 92, of Victoria, passed away peacefully on 17 March 2024.

Derek was born on 9 April 1931, the eldest child of Leonard and Gladys French, in the London suburb of Bow, England. He grew up amid the turbulence of World War II, an experience that deeply shaped his life. In his youth, Derek excelled in sports such as soccer, boxing (he was London champion and second in England), and cricket, and he relished exploring the English countryside on his bicycle, sometimes cycling hundreds of kilometres.

Derek met Shirley Daventry, his life partner and spouse of nearly 70 years, while they were students at Barking Abbey School. They married in 1954 as he completed his medical studies, becoming a physician. As was required of young men in post-war England, Derek embarked on his national service, practising medicine in Tripoli, Libya, and Egypt during the Suez Crisis. He did his internship in Manchester and later did additional training in anesthesia.

Derek and Shirley immigrated to Victoria in 1959, where Derek worked for decades as a family physician. He provided holistic care with a focus on preventive medicine and pain management. He spent many years on the board of the Victoria Cool Aid Society and working at the clinic. He was an early adopter of sedation for dental procedures and focused solely on this later in his career.

Outside of work, Derek raced a 6-metre sailboat with friends, and he learned to ski and garden. He was a founding member of the Iyengar Yoga Centre of Victoria. A quiet and contemplative person, Derek loved the wild, natural beauty of Vancouver Island, especially rural Metchosin, where he lived for more than 60 years. Derek was a quintessential lifelong learner. He was well read and had a quick, keen wit. He took great pleasure in a lively conversation over a good meal paired with wine.

His family will remember him as a talented storyteller and eclectic philosopher. His dry English humor and astute observations will be missed by his wife, Shirley; his children, Rachel (Carlos), Stephanie (Chris), and Adrian (Michele); his seven grandchildren, Adriana (Greg), Miguel (Abby), Andres, Pierre Sebastian (Francesca), Elise (Parker), Eligh, and Henry; and his great-grandchild, Mattea.

—French family

Dr Nasser Gholi Shojania

1930–2024

I learned that every mortal will taste death. But only some will taste life.

—Rumi

It is with profound sadness that we announce the passing of Dr Nasser Shojania, who died peacefully at home at age 94. He is survived by his loving and devoted wife of 61 years, Mitra; his younger brother, Dr Majid Shojania; his children, Kamran (Anna), Keyvan (Lindsay), and Nima (Maureen); and his grandchildren, Alexander, Christianne, Yasmin, and Jordan. His many surviving cousins, nieces, nephews, and other extended family span three continents.

Born in Iran to Mojtaba Shojania, a descendant of the Qajar dynasty, and Naiereh Ashraf Khalvati, of the Aga Khan family, Nasser was the fifth of nine children. He attended medical school in Tehran before marrying Mitra and starting a family. Together they moved to Winnipeg in 1965 so that Nasser could complete his medical

residency, and they decided to stay in Canada. After 10 years in Winnipeg, being mentored by Dr Hogg in dermatopathology, Nasser attained the level of assistant professor at the University of Manitoba. The more temperate climate of Victoria beckoned, and the growing family eventually relocated to settle in the city that he loved most. He joined the pathology department at both Victoria General Hospital (VGH) and Royal Jubilee Hospital, where he practised as a dermatopathologist until he retired at 75.

Nasser worked as a pathologist for 40 years. His contributions to medicine include introducing a screening service in cytopathology and a fine needle aspiration service at VGH and teaching colleagues the technique. This is still in place today, although it is now based at Royal Jubilee Hospital. He also started the fledgling immunohistochemistry service at VGH. His administrative work included working as the vice-chief of pathology at St. Joseph's Hospital (which later became VGH).

Nasser was honored to give the annual Victoria Medical Society Listerian Oration in 2005 titled "An optimistic look at the cross sections of the world through the magical microscope—a Persian physician and a Canadian pathologist."

Although he was a physician with a scientific nature, he was also an artist, poet, and writer. His acrylic paintings and wood sculptures are featured prominently in the homes of his family members and friends. He translated books and poetry from Farsi to English and French, and he wrote an autobiography titled *A Persian Letter* to memorialize family histories. A true renaissance man, he was as comfortable with frozen sections and a microscope as he was quoting Hafiz and Rumi or dancing with Mitra.

Always active and happiest in nature, Nasser made the most of the moderate weather and spent time outdoors almost every day of his life. He could be spotted most days along the trails near Arbutus Cove or at Gyro Beach with his walking stick in hand. In his later career and postretirement years, he spent more time at the Victoria Golf Club with Mitra and friends. They enjoyed a rich social life and hosted countless parties and fundraisers for a variety of causes over the decades before settling into quieter pursuits in recent years, like small dinner parties and playing duplicate bridge.

Nasser treasured his family above all. Perhaps his greatest early influence was his beloved mother, whom he revered. She survived World War II and the years after as a widow with nine children, all of whom benefited from her wisdom and her admonition to pursue knowledge and find their own paths. He imparted the same advice to his sons as they laid their own plans—two following him into medicine and one going into law. He was proud of their accomplishments and enjoyed the time he spent with them and their wives over the decades. His greatest joy was in watching the evolution of his grandchildren as they matured, and he was able to discuss philosophy and poetry with them as well.

While we grieve the loss of our extraordinary family patriarch, we celebrate the remarkable 94-year journey that brought him to his forever city and are grateful that he departed the way he lived: in comfort, with family, reading Hafiz one last time.

In lieu of flowers, please consider making a donation in his memory to Arthritis Research Canada (www.arthritisresearch.ca/donate).

Goodbyes are only for those who love with their eyes. Because for those who love with heart and soul there is no such thing as separation. —Rumi

—Anna Shojania, MBA
Vancouver

—Kam Shojania, MD, FRCPC
Vancouver

—Nima Shojania, MD, FRCPC
Kelowna

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Beneath the surface of emergency medicine—The dark sides we seldom talk about

The majority of presentations in the emergency room are far from glamorous, and they are also the most challenging.

Li (Danny) Liang, MD, BEng, CCFP-EM

When I tell people that I am an emergency physician, they often think I spend my time dealing with gunshot wounds, stab wounds, major traumas, and other adrenaline-filled life-or-limb emergencies. Reality is far less glamorous. The majority of presentations in the ER are far more mundane. For every crashing patient with a life-threatening emergency where every second matters, I see 10 patients who present with chronic health issues, from a patient who came in to get a second opinion on a rash that had been bothering them for over a year, to a patient asking to get their cholesterol checked, to one with chronic pain or dizziness who decided that enough was enough and wanted an answer *now*.

The mismatch between what bread-and-butter cases in the ER entail and the perception that many people have is perpetuated partly by us, ER physicians. We are more likely to tell medical students, colleagues, and friends and family about the resuscitation or trauma cases than about the people who come in for a prescription refill because they cannot access their family doctor, or those who are struggling to cope with caring for a parent's dementia at home.

The major traumas, the patients in septic shock, and the heart attacks and strokes are also not the most challenging cases; they usually have fairly straightforward treatment algorithms that we have learned in our training. The challenging cases are providing good care to the non-emergencies that arise when patients do not have timely access to their family physicians and outpatient allied health resources like psychotherapy or physiotherapy, and there are limited resources to work up and manage more chronic complaints in the ER. Increasingly, emergency physicians have become the embodiment of Atlas, the god of strength and endurance in Greek mythology, having to hold up the increasing weight of our collapsing health care system on our shoulders.

In addition, we are not infrequently screamed and sworn at by patients in the ER, many of whom feel frustrated and neglected by our overstretched health care system. I often spend hours on a shift advocating for patients with consultants who are reluctant to see a patient who I think needs to be admitted, especially late at night or on the weekend. I sometimes deal with the moral distress of being the only overnight emergency physician on shift and having to choose between providing good and thorough care to the patient in front of me versus going faster but providing suboptimal care so that someone does not die in the waiting room when there are 9-hour wait times and 50 patients to be seen. On very busy shifts, which have become the norm, I sometimes don't have time to go to the bathroom or eat for the whole shift. I ask myself if it is morally acceptable to be taking a quick break to grab a bite when patients have 9-hour wait times. I also remember the many birthdays and social events I've missed due to working six weekends in a row. To add to this, shift work is a class 2 carcinogen, according to the World Health Organization.[1]

These are but some of the not-so-glamorous aspects of working in the ER that many aspiring medical students or residents may not realize. However, despite all this, I feel fortunate to be doing this job, and I thank my lucky stars every day that I have the opportunity to do what I do. It is a privilege to care for patients in their most vulnerable moments, to have the tool kit to manage and make a difference to whoever comes through the door, to be able to solve some of the most interesting mysteries in medicine daily, and to work with a fun and high-functioning team that thrives on the chaos that is the ER. At the end of the day, it is a magical and fulfilling job, and I would not trade it for anything else in the world. ■

Dr Liang is an emergency physician for Fraser Health and Vancouver Coastal Health and a clinical instructor in the Faculty of Medicine at the University of British Columbia.

This article has been peer reviewed.

Reference

1. International Agency for Research on Cancer. Night shift work. IARC monographs on the identification of carcinogenic hazards to humans. Vol 124. 2020. Accessed 11 July 2024. https://publications.iarc.fr/593.

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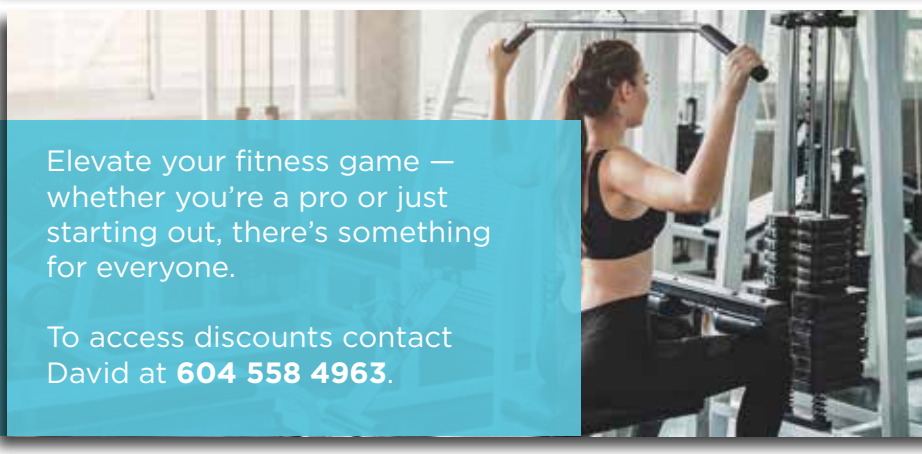

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