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ON THE COVER

The hepatitis C treatment revolution

The development of direct-acting antiviral agents has reduced disease burden, expanded treatment options for patients with different hepatitis C genotypes or other pre-existing comorbidities, and significantly improved cure rates, which now exceed 95% with newer antiviral agents. Eliminating hepatitis C infections in British Columbia is now a realistic goal.

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A laughing matter

"Do you have time to come in and say 'hi' to your sister?"

"I have a sister? Why didn't anyone ever tell me?"

This is a conservation I recently had with my father. He was referring to my mother, but his addled brain often mixes things up. You see, my father has Alzheimer disease. Over the last few years he has gradually deteriorated to the point where his cognitive issues are now obvious to everyone. However, I suspect this dementing process has been going on for much longer than we know. My father is outgoing and constantly joking, so he can make it seem like he knows someone without ever actually having to identify them. He still talks to everyone, and he'll tell me that he used to play golf with complete strangers he meets at the store. These confabulations fit seamlessly into the day-to-day situations he is confronted with. (As an aside, I suspect that he has been making up his golf scores for years.) I'm not sure he is even aware of who I am at times. I still get glimpses of the man he used to be, and I am very thankful that his underlying personality hasn't changed. He remains happy, pleasant, appreciative, and easygoing. So far he hasn't demonstrated any significant irritability or agitation and is blissfully unconcerned about his declining mental functions.

If you asked friends and family to describe my father in one word, I'm pretty sure it would be *jokester*. My father would never turn down an opportunity to goof around, make someone laugh, or dress up in some funny—often inappropriate—costume. This is the man most likely to be found at the office in a gorilla suit, not necessarily on Halloween. I distinctly remember him coming to my parent-teacher interviews and drawing funny faces on the chalkboard. In old party photos he is often dressed up as a woman holding a liquor bottle, but that's another story. My parents' house was often adorned with singing Christmas trees, fish, dogs, etc. If my father knew he was going to get dementia, he would have probably made jokes about it and encouraged me to make fun of him when he no longer made any sense.

Now, don't get me wrong, this disease is terrible and causes much sadness. I am losing my father, my mother has lost her partner, and my children have lost their grandfather. When I remember the man he was, I suffer a little despair as to all that is missing. However, the humorous things he does make the progression of his dementia more tolerable, and I know he would encourage everyone to laugh along if he could. So, if I giggle a little, I feel less guilty because I remind myself that making people laugh has been his lifelong mission.

Recently friends took him to visit my mother in hospital, which is a 30-minute drive from his house. Later, I asked him how he got there, and after thinking for a while he stated, "I think I walked."

After a chuckle, I thought to myself that living with his dementia really is a journey, and as we walk together I will do my best to support him with grace, love, and laughter.

—DRR

Lessons, priorities, mindfulness, challenges, and epiphanies

We buried a colleague recently. To be more precise, we said farewell to a now-deceased colleague. He was a true gentleman, an excellent surgeon, and notably, possessed an incredible capacity to make his family, his friends, and his patients feel special. What was really astounding about him, though, was how he navigated all of the challenges of his personal and professional life with such grace and balance. (He was the only surgeon in town when he first arrived, and is the only surgeon I've ever known to do house calls.) How did he do it? How did he cultivate a resiliency adequate to the demands of his life? And, as his former colleague who is struggling with similar demands, how can I do the same?

Most of his (and my) colleagues who were at his memorial were either fully retired or had relinquished their hospital privileges years ago. None of them ever expressed regret over their decision to leave the hospital, and many of them told stories of the moments that were the proverbial straw that broke the camel's back.

I had been using work to escape from some of the personal challenges I faced. I have stopped doing that and am now enjoying having the majority of my weekends completely free to exercise, cook, read, relax, and spend time with my loved ones.

I almost had one of those moments a few weekends ago after a particularly grueling overnight call shift and group ward rounds over the same weekend. Although these irritants don't happen often, when they do it is extremely upsetting. After being at the hospital from early Saturday morning to early Sunday afternoon, I was about to pull into my garage when my pager went off. The call was from a nurse asking me to return to the hospital to provide a consent for transfusion on a patient who was about to be transfused for the 16th time over the previous year. I asked politely for her to check the patient's file, as he had received a transfusion as recently as 10 days prior. The nurse looked through his file, found the necessary document, and a return trip to the hospital was avoided.

I planned an early night with the hope of getting a good recovery sleep. It was not to be. My home phone rang at 2:15 a.m. from a different nurse regarding the same patient. I asked the nurse, in my most polite voice, why he was calling me at that hour as opposed to calling the doctor on call for our group. He told me that it was because he thought I was the doctor responsible for the patient on any day at any hour. The nurse soon realized that I wasn't even this patient's family doctor, so he told me that he would call my colleague instead. Hastily, I corrected him and referred him to the call schedule for our group. He must have been new, as he was completely oblivious to the on-call system at our hospital. So, at 2:15 in the morning, instead of getting a good amount of sleep, I found myself in a highly irritated state trying to politely school this nurse into figuring out which doctor was on call.

The following day I came this close (my right thumb and index finger are just millimetres apart) to giving up my hospital privileges. After venting to colleagues and practising some mindfulness, I was able to calm down. But the events of that weekend along with personal factors in my life have made me re-evaluate my priorities.

I had had an epiphany a few weeks prior. I had been using work to escape from some of the personal challenges I faced. I have stopped doing that and am now enjoying having the majority of my weekends completely free to exercise, cook, read, relax, and spend time with my loved ones. I'm starting to feel like a normal person, perhaps for the first time since I qualified as a doctor. I feel more resilient and happier in my work and personal life. When I remarked on this to my 18-year-old son, he informed me that he had known for years what I had just realized about myself. What a smart kid he is. Hopefully he won't take after his dad!

—DBC

Let's be real, we need more failure

As we scroll through Facebook photos and Instagram stories, it's easy to think that everyone else is winning at life with their perfect meals, epic beach vacations, and overachieving children. While sometimes opportunity does meet preparation, reality is usually full of burned dinners, rainouts, and excruciating tantrums.

In health care, we have our own culture of perfection where success is rightly celebrated, but we are slow to move away from the traditionally judgmental nature of morbidity and mortality rounds or the stoked competition of quantifying our learners through hallway pop quizzes. We've all experienced the disappointments and frustrations of working hard—often to the point of burnout, or worse—to compensate for a health care system that hasn't evolved to meet the increasing needs of our patients and communities. Yet just as we wouldn't improve as cooks, planners, and parents without the occasional defeat along the way, we cannot have progress in health care without failure.

We've all experienced the disappointments and frustrations of working hard—often to the point of burnout, or worse—to compensate for a health care system that hasn't evolved to meet the increasing needs of our patients and communities.

History has shown that success rarely comes quickly or easily—and certainly not without failure. The next time you fix your squeaky door you can thank the engineers who failed 39 times before finding the water-displacing formula that is still used more than 65 years later in WD-40.[1] And while you may not remember Apple's desktop computer, Lisa, Steve Jobs learned from that mistake and focused his vision on creating the Macintosh, which paved the way for the iPhones and iPads so central in our lives today. And millions of us have seen the SpaceX landing, but how could we possibly dock a rocket on a raft without a number of unexpected ocean splashes?

In health care, a teenager's failure to create a synthetic form of an antimalarial drug led to the creation of purple dye, which in turn allowed Dr Paul Ehrlich to found the field of immunology.[2] And thanks to Wilson Greatbatch's use of the wrong transistor while trying to record a heartbeat, the implantable cardiac defibrillator was discovered.[3]

However, conditions necessary for the productive process of failure are rarely in place. So how can we change this?

Move past blame

"Remember that failure is an event, not a person." *—Zig Ziglar*

Despite the politicized times we live in, we must move past blaming others and recognize that health care is extremely complex, and failure is inevitable. We experience this in our clinical lives: some couples require more IVF treatments than others; some cancers respond to a certain chemotherapy while others don't; and some patients develop postsurgery complications while others who have undergone the same procedure, in the same hospital, with the same team, don't. Depersonalizing failure will allow us to fairly assess outcomes and reassure others that they won't be judged solely by their outcomes, but rather by their efforts, intentions, iterations, and inclusivity.

Encourage and support failure

"I have not failed. I've just found 10 000 ways that won't work." *—Thomas Edison*

Like any process, failure requires resources. Although there are hundreds

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of books on the importance of failing fast, our clinical, family, and other personal commitments often act as barriers to our involvement at the systems level. But we need to encourage participation and create a culture that rewards innovation and doesn't decry failure—surely we can find ways to allow people to give their time, ideas, and feedback. Sure, there is a financial cost to failing—at least in the short term—but without a proper, protected budget, governments and health authorities have no incentives to be ambitious, and instead continue down the safer path, making small changes or blaming foundational issues on those who came before.

Learn and iterate

"It is fine to celebrate success, but it is more important to heed the lessons of failure." *—Bill Gates*

The goal is not to fail, but rather to courageously try our best, and when failure occurs, as it often will, to analyze and learn from the experience. Our biggest mistake is not in failing, but in failing to learn from our failures.[4] The health care landscape is full of ambitious ideas and projects such as one person/one record EMRs, alternative payment models, pooled referrals, primary care networks, and urgent primary care centres. They will not—cannot—all succeed everywhere at once. And these bumps in the road will inform the rest of the journey, giving us the opportunity to improve all aspects of these projects, from change management, to funding, to local needs, to leadership, even the assessment process itself.

So let's move beyond the curated personas we see online and get real about helping our patients and building a better health care system, because only by recognizing the value of failure and supporting innovation can we ever truly succeed.

—Eric Cadesky, MDCM, CCFP, FCFP
Doctors of BC President

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What Doctors of BC does for me

As a student on a budget, I love the word *free*, so I took an inventory of what's free out there for medical students. I knew that my Doctors of BC membership is free during my 4 years of medical school, but I had forgotten that this includes a free CMA membership, which means free access to handy resources such as RxTx and DynaMed Plus, not to mention various additional deals and discounts.

I knew that I received free life insurance with Doctors of BC through my 4 years of medical school as well, but as of the 2018–19 school year Doctors of BC disability insurance is also free through all 4 years. That's saving me at least $925 in premiums!

I knew about the rural-rotation travel stipend of up to $800, but I almost forgot about the $250 weekly housing allowance for up to 8 weeks: all the more reason to do a rural elective in fourth year.

I knew that Doctors of BC provides some of the needs-based bursaries applied through the UBC Student Service Centre (up to $250 000 is donated each year), but I was not aware of other ways to win money. I could win a $1000 prize for submitting an article to the *BCMJ*, a $250 prize for writing a *BCMJ* blog post, a $5000 award for demonstrating interest in rural medicine, and a $1000 Changemaker Award for demonstrating leadership in advocacy.

Of course, Doctors of BC hosts the much-anticipated annual Backpack Day for first-year students, but this year I attended the other big (and arguably more important) annual event—Find Your Match, where I and other students got insider tips from physicians from various disciplines while enjoying a scrumptious, fully catered meal.

Free membership plus all those extras—that's a lot of value.

—Jessie Wang
Medical Student Intern,
Doctors of BC

Changes to GPSC fees

The GPSC has made changes to some of its fees to enable delegation, simplify billing, and clarify requirements. These changes are part of the GPSC's continued efforts to support full-service family doctors to improve access to care and services.

Enabling delegation

As part of the service requirements for the GPSC planning fees, doctors may now delegate non-face-to-face planning tasks to College-certified allied care providers working in a GP practice. This change affects the following four GPSC incentives:

- G14033: GP Complex Care Planning and Management Fee
- G14043: GP Mental Health Planning Fee
- G14063: GP Palliative Care Planning Fee
- G14075: GP Frailty Complex Care Planning and Management Fee

Simplifying billing

The Personal Health Risk Assessment (Prevention) (G14066) has been amended to align with the GPSC planning fees. Physicians are no longer required to bill a visit fee in addition to the G14066 fee. A visit fee may still be billed in addition if medically required and does not take place concurrently with the face-to-face planning included under G14066. This change is effective 1 January 2019.

Clarifying documentation

To reflect a recent change to MSP's counseling fee 0120, the GPSC added the following note to some of its mental health fees: "Documentation of the effect(s) of the condition on the patient and what advice or service was provided is required." This note has been added to the following five GPSC fees:

- G14044: GP Mental Health Management Fee age 2–49
- G14045: GP Mental Health Management Fee age 50–59
- G14046: GP Mental Health Management Fee age 60–69
- G14047: GP Mental Health Management Fee age 70–79
- G14048: GP Mental Health Management Fee age 80+

It is recommended that GPs ensure that clinical notes for any 0120 or GPSC mental health management fee billing include the required documentation as of 1 December 2018.

For details on all of these changes, including links to updated GPSC billing guides, visit www.gpscbc.ca.

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John Fan, Morris Pudek, PhD, FCACB, Andre Mattman, MD, FRCPC, Marshall Dahl, MD, PhD, FRCPC, Sophia Wong, MD, FRCPC

When vitamin supplementation leads to harm: The growing popularity of biotin and its impact on laboratory testing

High biotin concentrations in blood samples for immunoassays that employ biotin-streptavidin interactions can interfere with investigations for cardiac disease, endocrine disorders, malignancies, anemias, and infectious diseases and lead to falsely low or falsely high results.

ABSTRACT: Biotin, also known as vitamin B7 or vitamin H, has seen a surge in popularity in recent years based on limited evidence that it enhances hair, skin, and nail growth. Due to its water-soluble properties, biotin is excreted through the urinary system and is considered nontoxic even at large doses. However, a high concentration of biotin in blood can interfere with laboratory tests that use technology dependent on biotin-streptavidin interactions. These tests include immunoassays used to investigate or monitor cardiac disease, endocrine disorders, malignancies, anemias, and infectious diseases. Increasingly, cases of erroneous laboratory results due to biotin use have been reported in the medical literature. The results can be falsely low or falsely high, and in either case can lead to patient misdiagnosis and mismanagement. Mitigation is possible when biotin interference is identified. Patients can be advised to discontinue the supplement before follow-up testing or physicians can order an alternative testing method. While laboratory professionals have been aware of biotin interference for many years, greater awareness among health care providers in general is needed to ensure that biotin supplementation is identified and mitigation strategies are considered.

A 54-year-old female was being assessed for thyroid dysfunction following self-reported symptoms of weight gain and lethargy. The patient had no neck tenderness and exhibited no symptoms of goiter. Past medical history was significant for relapsing-remitting multiple sclerosis and anxiety. Laboratory investigations were ordered and the results were consistent with thyrotoxicosis: thyroid-stimulating hormone (TSH) of 0.08 mU/L (reference range 0.34–4.82 mU/L), free thyroxine (FT4) of 33.2 pmol/L (10.0–20.0 pmol/L), and free triiodothyronine (FT3) of 46.1 pmol/L (3.5–6.5 pmol/L). Given that these laboratory values were not supported by the clini-

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This article has been peer reviewed.

cal presentation, new blood work was ordered. When a similar pattern of values was found (TSH 0.01 mU/L, FT4 > 103.0 pmol/L, FT3 > 46.1 pmol/L), a referral was made to endocrinology. Upon being questioned by the endocrinologist, the patient described taking high-dose biotin for her multiple sclerosis. The patient was advised to stop the biotin for 1 week before repeat testing. Follow-up blood work revealed the patient to be euthyroid, with a TSH level of 1.78 mU/L, FT4 of 12.6 pmol/L, and FT3 of 3.7 pmol/L, along with an undetectable TSH receptor antibody titre.

Clinical and commercial use of biotin

Biotin, also known as vitamin B7 or vitamin H, is a water-soluble vitamin that serves as a cofactor for a number of carboxylase reactions, making it essential to the functioning of various metabolic pathways.[1-4] It is involved in fatty acid synthesis, catabolism of branched-chain amino acids, gluconeogenesis, islet cell gene expression, insulin secretion, and the Krebs cycle.[4] The recommended dietary reference intake for biotin is 30 μg/day. The vitamin is found in various foods, including egg yolk, pork, liver, whole cereals, soybeans, avocado, cauliflower, and leafy greens.[1-4] Because of its abundance in a typical North American diet, biotin deficiency is uncommon, and supplementation is rarely indicated. Clinically, biotin may be prescribed in patients with malabsorptive disorders or in those on total parenteral nutrition. It may also be useful in relieving muscle cramps in hemodialysis patients.[5] High doses of biotin (5 to 30 mg/day) are recommended in certain inborn errors of metabolism, such as in biotinidase deficiency, propionic acidemia, or in holocarboxylase synthetase disorders.[6] More recently, mega-doses of biotin (up to 300 mg/day) have shown promise in secondary progressive multiple sclerosis.[7]

In the past decade, biotin supplementation in doses up to 20 mg a day has been marketed to promote hair, skin, and nail growth. Although there is limited evidence to support this claim, marketing led to biotin sales of up to 49.6 million units in the US alone between July 2016 and July 2017.[1] Biotin is currently the top-selling multivitamin supplement on Amazon.ca. Locally, a survey of 660 patients visiting the Diamond Health Care Centre Outpatient Laboratory at Vancouver General Hospital found that 50 respondents (7.6%) were taking biotin. The majority of users were female (92%) and biotin users tended to be younger than non-users: age 49 (19 to 85) years versus age 54 (19 to 98) years. The prevalence of biotin supplementation in our survey population was similar to that reported by the Mayo Clinic, which found 7.7% of outpatients to be ingesting biotin.[1]

Biotin interference with laboratory tests

As biotin is readily available over the counter and is perceived to be harmless, patients may not disclose their biotin use to physicians unless specifically asked. Further, health care providers may also view biotin supplementation as innocuous. However, when found in high concentrations in blood, biotin can interfere with laboratory tests that employ biotin-streptavidin interactions as part of the assay technology. Biotin-streptavidin binding is commonly used in immunoassays due to its avidity and stability, which facilitate immunoassay sensitivity and specificity. A 2017 study by Holmes and colleagues found that out of the 374 methods operated by 8 of the most popular immunoassay analyzers in the US, 221 (59%) were biotin-based.[4] Depending on the laboratory and the analytical platforms used, a broad range of tests may be affected by biotin supplementation, including those used in the diagnosis

Increasingly, biotin consumption is being found to result in inaccurate laboratory findings that lead to misdiagnosis and mismanagement.

or monitoring of cardiac disease, endocrine disorders, malignancies, anemias, and infectious diseases (**Table 1**).[6]

Biotin-containing blood samples can affect laboratory tests by competing with biotinylated reagents for binding to streptavidin. Depending on whether the assay is noncompetitive or competitive, the result may be falsely low or falsely high (**Figure**). In noncompetitive or sandwich immunoassays, supplemental biotin competes with reagent biotin for binding to streptavidin-coated beads. With a smaller volume of reagent biotin-streptavidin complexes formed, the assay signal is decreased and a factitiously low result is reported. This is in contrast to competitive immunoassays, which are generally used to measure small molecules such as FT4 or FT3, where the assay signal is inversely proportional to the analyte concentration. In these immunoassays, biotin competes with labelled biotinylated analyte for binding to streptavidin and results can be spuriously high.

Table 1. Immunoassays at high risk for analytic interference from biotin supplementation.

Conditions	Immunoassays
Cardiac disease	• Troponin I, troponin T • Brain natriuretic peptide (BNP), N-terminal pro brain natriuretic peptide (NT-pro BNP)
Endocrine disorders	• Thyroid stimulating hormone (TSH), free thyroxine (FT4), free triiodothyronine (FT3), anti-thyroid peroxidase (TPO) antibodies, anti-TSH receptor antibodies, thyroglobulin • Estradiol, progesterone, luteinizing hormone (LH), follicle stimulating hormone (FSH), testosterone, sex hormone binding globulin (SHBG), dehydroepiandrosterone sulfate (DHEAS) • Human chorionic gonadotropin (hCG), prolactin, growth hormone • 25-hydroxyvitamin D, parathyroid hormone (PTH) • Cortisol
Malignancies	• Gastrin, alpha fetoprotein (AFP), carcinoembryonic antigen (CEA) • Cancer antigen (CA) 19-9, CA 125, CA 15-3 • Calcitonin • Prostate-specific antigen (PSA)
Anemias	• Ferritin • Folate, vitamin B12
Infectious diseases	• Hepatitis A virus (HAV) serologies: HAV total, anti-HAV total, anti-HAV IgM • Hepatitis B virus (HBV) serologies: HBsAg, anti-HBs, anti-HBc total, anti-HBc IgM, HBeAg, anti-HBe • Hepatitis C virus (HCV) serologies: anti-HCV • Herpes simplex virus (HSV) serologies: HSV-1 IgG, HSV-2 IgG • Rubella serologies: rubella IgG, rubella IgM
Others	• C-reactive protein (CRP) • Procalcitonin • Anti-CCP (cyclic citrullinated peptide) antibodies • IgE • Digoxin, cyclosporine, sirolimus

Adapted from Holmes E, Samarasinghe S, Emanuele A, Meah F.[4]

In the Holmes study referred to above, 37% of the biotin-based immunoassays evaluated were affected by serum biotin levels of less than 51 ng/mL.[4] Mean peak serum biotin concentrations of 8.6 ng/mL have been reported following consumption of a single dose of 1 mg, while concentrations of 495 ng/mL have been reported following consumption of 100 mg.[4] In a study by Grimsey and colleagues, ingestion of biotin for 5 consecutive days was found to produce peak median serum biotin levels of 46 ng/mL (5 mg dose daily), 103 ng/mL (10 mg dose daily), and 184 ng/mL (20 mg dose daily).[8] The higher the dose of biotin ingested, the more likely that biotin-based laboratory assays will be impacted.

Increasingly, biotin consumption is being found to result in inaccurate laboratory findings that lead to misdiagnosis and mismanagement. Misleading thyroid function results are often described in the medical literature,[2,3,9-13] as biotin causes falsely high FT4 and FT3 values and falsely low TSH results that mimic hyperthyroidism. In one reported case, a newborn female with a positive screening test for congenital hypothyroidism was found to have decreasing TSH levels and elevated FT4 levels on subsequent testing.[12] Further investigations revealed that the neonate had been started on a vitamin cocktail containing 10 mg of biotin daily because the baby's sibling had died of organic acidosis a few years prior. Discontinuation of biotin supplementation and repeat thyroid function testing using an alternative methodology confirmed the initial diagnosis of hypothyroidism, and thyroxine therapy was initiated.

In another case, a 64-year-old female with end-stage renal disease was thought to have adynamic bone disease due to a low normal parathyroid hormone (PTH) level, intermittently

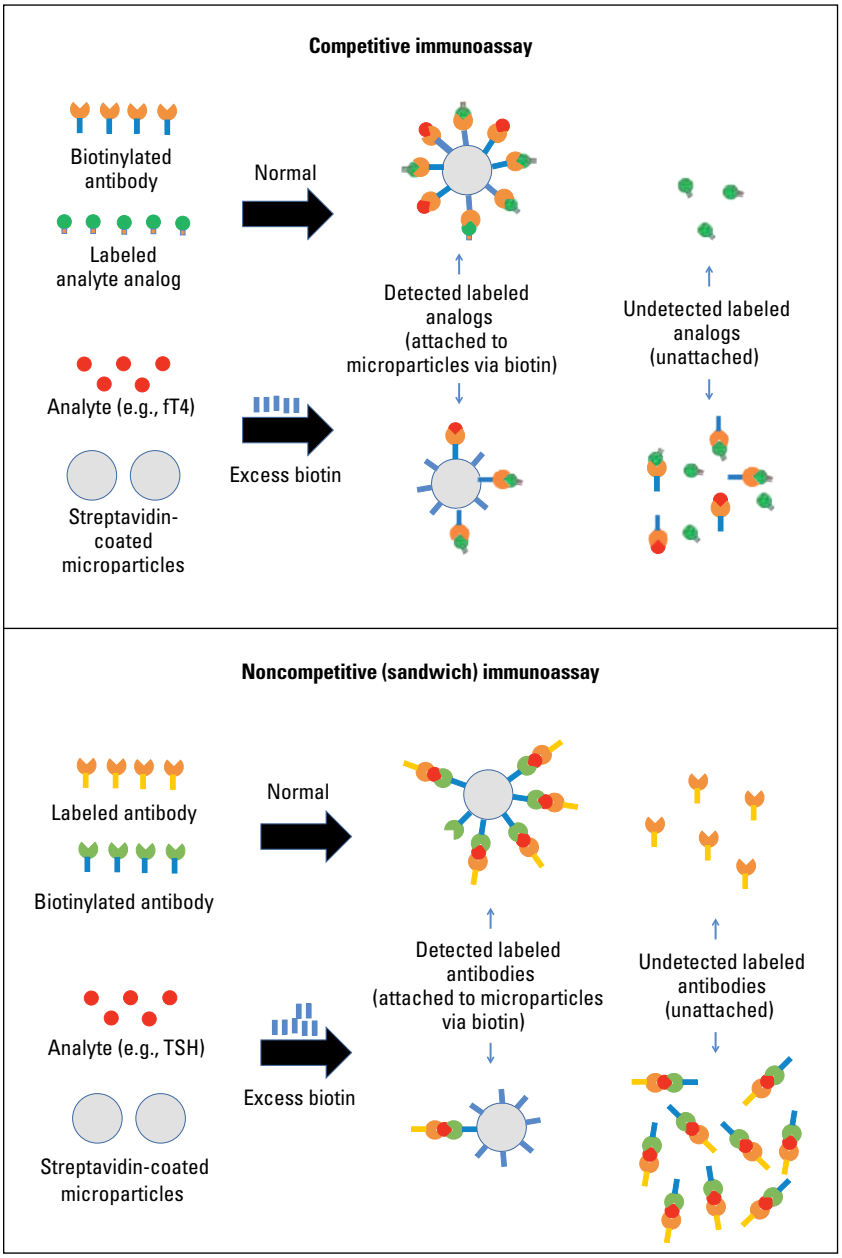

Figure. Mechanism of biotin interference with competitive and noncompetitive immunoassays.

increased serum calcium level, and severe osteoporosis.[14] However, her increased alkaline phosphatase result was inconsistent with the low bone turnover observed in adynamic bone disease. It was later discovered that the patient had been ingesting 10 mg of biotin per day for restless leg syndrome. Repeat testing on a different analytical perform that did not use biotin-streptavidin technology found the patient's PTH concentration to be markedly elevated, consistent with secondary hyperparathyroidism.

Mitigating biotin interference

While laboratory professionals have been aware of biotin interference for many years, the problem has been amplified recently with increasing use of the supplement. In November 2017 a growing number of adverse events associated with biotin, including one patient death following an incorrect cardiac troponin assessment secondary to biotin interference, led the US Food and Drug Administration (FDA) to warn the public, health care providers, and laboratory personnel that biotin may interfere with certain laboratory tests and cause misleading test results.[15]

It is paramount that health care providers and patients be informed of the potential errors in laboratory results with biotin use. Physicians should always ask their patients about biotin supplementation during history taking. The question should be thoughtfully posed (e.g., "Are you taking any supplement for hair, skin, or nail benefits?") since patients may not be aware of the ingredients in a supplement, as these are not always listed clearly on the label.

Patients taking biotin should be advised to discontinue the vitamin for at least 1 day before a blood test, or up to a week before testing if high doses have been consumed. The half-life of biotin is dependent on various factors, including the patient's kidney function and the dose and duration of biotin use. In individuals with normal renal parameters, the half-life of biotin after a single dose of 0.6 mg has been reported as less than 2 hours. In contrast, the half-life following a single biotin dose of 100 mg to 300 mg is between 8 and 19 hours.[4,16]

When patients on biotin require urgent blood work, such as when they present to the emergency department, the ordering physician should consult

local laboratory staff. Laboratory physicians can provide information on which particular assays on the test menu may be affected by biotin, the magnitude and direction of interference, and whether some laboratory tests on the same analytical platform are more vulnerable to biotin interference than others. Further, the laboratory physician can arrange for alternative testing using a different methodology not affected by biotin or may be able to request removal of biotin from the sample via pretreatment with streptavidin-coated beads.[6,17]

Fortunately, the results of a recent survey completed by 18 endocrinologists in BC indicate a good understanding of biotin interference (**Table 2**). However, endocrinology is not the only specialty affected, and further work is needed to ensure information about the impact of biotin on laboratory testing is disseminated to all physicians.

Summary

The case of a 54-year-old female being assessed for thyroid dysfunction demonstrates the harm vitamin supplementation can cause. In this case, laboratory findings erroneously indicated thyrotoxicosis—findings that were eventually determined to be the result of high-dose biotin supplementation when the patient received follow-up testing, and she was ultimately diagnosed as euthryoid.

When found in high concentrations in blood, biotin can interfere with laboratory tests that employ biotin-streptavidin interactions as part of the assay technology. Depending on whether the assay is noncompetitive or competitive, the result may be falsely low or falsely high. Increasingly, biotin consumption is being found to result in inaccurate laboratory findings that can lead to misdiagnosis and mismanagement.

While responses from a recent survey completed by endocrinologists in BC indicate a good level of understanding where biotin interference is concerned, more must be done to ensure that physicians working within and outside the laboratory become familiar with the potential of biotin to interfere with test results. BCMJ

Competing interests

None declared.

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Table 2. Responses from June 2018 survey about biotin supplementation completed by 18 BC endocrinologists.

Question	Possible answers	Responses	Percentage
1. Biotin supplements are known to affect certain laboratory tests when taken in high doses. Which tests are most likely to be affected?	a. Immunoassays	14	78%
	b. Electrolytes	0	0%
	c. Liver and/or muscle related enzymes	0	0%
	d. Creatinine and albumin	0	0%
	e. Mass spectrometry tests	0	0%
	f. I don't know	4	22%
Answer: a. Immunoassays Immunoassays are the most common methodology used in endocrinology testing. Many immunoassay methods employ streptavidin-biotin technology and are known to be affected by biotin supplementation.			
2. What percentage of patients are taking enough biotin to significantly bias one or more laboratory test results?	a. < 0.1%	3	17%
	b. 1%	3	17%
	c. 5%	4	22%
	d. > 10%	3	17%
	e. I don't know	5	28%
Answer: c. 5% Estimates are that approximately 5% of the population is taking enough biotin to bias one or more laboratory test results.			
3. Does biotin cause positive biases (e.g., falsely elevated) or negative biases (e.g., falsely depressed) on test results?	a. Falsely elevated	3	18%
	b. Falsely depressed	0	0%
	c. Neither	0	0%
	d. Both	13	76%
	e. I don't know	1	6%
Answer: d. Both Depending on the assay, laboratory results may be falsely high or falsely low.			
4. If a patient were taking biotin, how long should they stop the supplement before going to the laboratory for blood tests?	a. Overnight (8–12 hours)	0	0%
	b. 24 hours	0	0%
	c. 2 days	10	59%
	d. 7 days	6	35%
	e. I don't know	1	6%
Answer: There is no single biotin washout period that will guarantee interference-free test results. Interference thresholds differ widely among assays. Also, high biotin doses take more time to clear than low doses, and clearance takes longer in patients with impaired renal function. As a general rule: • If a patient has been taking 10 mg of biotin per day, we recommend laboratory testing 24 hours following discontinuation of biotin for tests listed in Table 1. • If a patient has been taking 300 mg of biotin per day, we recommend laboratory testing 7 days following discontinuation of biotin for tests listed in Table 1.			
5. If the patient takes a high dose of biotin prior to the blood sample collection, will the laboratory be able to detect interference before issuing a report?	a. Yes	0	0%
	b. No	16	94%
	c. Not sure	1	6%
Answer: b. No The laboratory will not be able to detect the interference. We recommend health care providers always ask about biotin supplementation . If the patient is taking biotin, be sure to communicate this information to the laboratory. If you encounter a laboratory result that is inconsistent with the patient's clinical presentation, contact the laboratory to perform additional investigations or arrange for alternate testing, as needed.			

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The revolutionary changes in hepatitis C treatment: A concise review

The replacement of interferon-based therapy with highly effective and well-tolerated direct-acting antiviral therapy makes eliminating hepatitis C infections in British Columbia a realistic goal.

ABSTRACT: Since hepatitis C was discovered in 1989, the pharmacological management of infections caused by the virus has undergone revolutionary changes, significantly improving cure rates and reducing patient morbidity and mortality. Early treatment options included interferon and ribavirin, which were associated with significant side effects and poor efficacy. In 2011 the first direct-acting antiviral agents were introduced and since have continued to improve both the efficacy and tolerability of treatment. The development of the direct-acting antiviral agents has reduced disease burden, expanded treatment options for patients with different hepatitis C genotypes or other pre-existing comorbidities, and significantly improved cure rates, which now exceed 95% with newer antiviral agents. Barriers to using this therapy in British Columbia include suboptimal population screening and diagnosis, variable patient and physician knowledge, high drug costs, lack of insurance coverage for some antivirals, and difficulty accessing coverage under Pharmacare. Reinfection is also an ever-present risk. Using the antiviral therapies currently available and ensuring patients have better access to care would make eliminating hepatitis C possible in British Columbia, especially if health care providers, patient communities, and government agencies all strive to achieve this goal.

Worldwide, hepatitis C is a major public health concern, with an estimated 71 million people being chronically infected with the virus (www.who.int/news-room/fact-sheets/detail/hepatitis-c). Individuals with untreated hepatitis C infection have an approximate fivefold increase in all-cause mortality and a twentyfold increase in liver-related mortality.[1] Acute hepatitis C infections can present asymptomatically, and approximately 85% of acute infections will develop into chronic disease.[2] Chronic hepatitis C infections can cause significant liver damage, including the development of cirrhosis and hepatocellular carcinoma.[3,4] In addition

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to the hepatic manifestations, acute and chronic hepatitis C can have extra-hepatic manifestations, including disease processes associated with the virus and more specific immune-related end-organ effects.[5] Disease processes associated with hepatitis C infection include renal insufficiency, type 2 diabetes, and insulin resistance, while more specific hepatitis C immune-related manifestations include sicca syndrome, arthralgia, myalgia, and mixed cryoglobulinemia.[5] The hepatic and extra-hepatic manifestations contribute to the huge burden of disease that negatively impacts patient well-being and quality of life.

In British Columbia, more newly reported hepatitis C cases are reported than elsewhere in Canada,[1] with the Metro Vancouver area having an alarmingly high incidence rate of 37.3 per 100 person-years among young injection drug users.[6] In a recent study of more than 1.1 million individuals in BC tested for hepatitis C, a prevalence rate of 5.8% was reported.[1] While high incidence rates are associated with sex-trade work, incarceration, and injection drug use, high prevalence rates in British Columbia are associated with the following: male gender, a birthdate from 1945 to 1964, HIV or hepatitis B co-infection, a mental health condition, a substance and/or alcohol abuse disorder, and low socioeconomic status.[1]

Despite advances in management and better understanding of viral genotypes,[7] hepatitis C infection continues to pose a threat to public health in Canada and other countries.[2]

Screening

A high proportion of Canadians with chronic hepatitis C infection remain undiagnosed,[8] making it important for physicians and other health care providers to understand screening recommendations that will help with diagnosis and, ultimately, eradication of hepatitis C. The Canadian Association for the Study of the Liver released updated guidelines in 2018 that include recommendations on the assessment, evaluation, and management of hepatitis C.[8] The 2018 guidelines recommend taking a risk-based and population-based approach to screening.[8] Chronic hepatitis C infection is prevalent in individuals born from 1945 to 1975.[8] Despite the high prevalence of hepatitis C infection in this birth cohort, screening rates are low[8] and the guidelines recommend one-time screening in all individuals in the 1945 to 1975 birth cohort, independent of individual risk factors.[8] For those with risk factors, testing for hepatitis C infection is recommended.

Some notable risk factors for hepatitis C are:

- A history of injection drug use.
- Having received a blood transfusion, blood products, or an organ transplant in Canada before 1992.
- A history of or current incarceration.
- Having received chronic hemodialysis.
- HIV infection.

Initial screening includes a test for hepatitis C antibodies.[8] If test results are positive, active infection should be confirmed with an RNA screen for hepatitis C.[8] Subsequently, patients should be referred to practitioners with experience in hepatitis C management to optimize treatment and outcomes.[8]

The 2018 guidelines also recommend that patients with confirmed hepatitis C infections undergo further testing to help establish a baseline and individualize treatment.[8] Suggested testing includes routine blood work with a complete blood count, liver enzymes (alanine transaminase, aspartate transaminase, alkaline phosphatase), liver function (bilirubin, INR, albumin), and creatinine.[8] Additionally, serology is recommended to exclude other infections (HIV, hepatitis B) and common liver diseases (transferrin saturation for hemochromatosis evaluation, IgG for autoimmune hepatitis).[8] Furthermore, all patients with hepatitis C should undergo staging of their liver disease, including a baseline ultrasound and evaluation for fibrosis.[8]

Other recommendations include resistance testing, if indicated, and genotype testing.[8] Six hepatitis C genotypes have been identified based on nucleotide differences. In turn, these numbered genotypes have been further classified by letter (1a, 2b, 3c, etc.).[7] Geographic differences are seen in the prevalence of some variants, with genotypes 1, 2, and 3 being common throughout the world, genotype 4 being common in the Middle East, and genotype 1 being overwhelmingly dominant in North America. Knowing a patient's genotype can help select the most effective treatment.

Early treatment options

The first pharmacological regimen for hepatitis C was introduced in the 1990s and consisted of non-pegylated interferon alpha-2a or alpha-2b monotherapy.[9] The treatment duration was 24 or 48 weeks, depending on the hepatitis C genotype, and required thrice weekly injections.[9] As well as being cumbersome to patients and having significant side effects, the treatment was not very successful in achieving viral clearance as measured by the sustained virological response—undetectable hepatitis C RNA levels at 12 weeks or 24 weeks following the end of therapy. To increase the rates of sustained virological response, ribavirin was added to the interferon alpha treatment regimen, which improved outcomes and increased the response rates to approximately 30% to 40%.[9] However, treatment

response was heavily dependent on the hepatitis C genotype, with relatively poor cure rates reported in cases of genotype 1 and 4.[9]

In the latter half of the 1990s, pegylated interferon alpha formulations were introduced. Pegylation slows down the rate of drug absorption, reduces distribution, and decreases the rate of elimination.[10] With pegylation, ideal plasma concentrations for inhibiting viral replication are better maintained, improving drug efficacy and increasing rates of sustained virological response.[10] However, response rates for pegylated interferon were found to be heavily dependent on patient-specific characteristics: body mass index, degree of pretreatment hepatic damage (specifically, cirrhosis), IL-28B genotype, and hepatitis C RNA viral load. In cases of patients with treatment experience, the response to previous treatment (i.e., relapse vs nonresponse) was also a factor.[11,12] Although patients treated with pegylated interferon plus ribavirin required only one rather than multiple injections per week, the therapy had a number of side effects.[10] Adverse effects associated with interferon therapy included neutropenia, thrombocytopenia, alopecia, hypothyroidism, hyperthyroidism, flu-like symptoms, nausea, vomiting, and weight loss.[13] Interferon therapy was also associated with neuropsychiatric side effects, namely impaired memory and concentration, depression, and irritability.[13] Additional side effects associated with ribavirin specifically included anemia, respiratory complications, and teratogenicity.[13] Due to the many potential systemic toxicities and complications, interferon therapy was contraindicated in many patients. For genotype 1, the most common genotype in Canada, the likelihood of achieving a sustained virological response was a disappointing 40%, at best, in noncirrhotic patients after 48 weeks of therapy.[14] For the combined genotype 2 and 3 patients, 24 weeks of pegylated interferon and ribavirin yielded a sustained virological response of 76%.[15] Cirrhotic patients in general responded less well to any interferon-based therapy, and those with advanced cirrhosis requiring a liver transplant tolerated the therapy poorly and experienced significant adverse side effects, including worsening decompensation and death.[16] In short, interferon-based therapies were associated with significant side effects and suboptimal treatment success rates, and the use of interferon was contraindicated in patients with advanced liver disease.

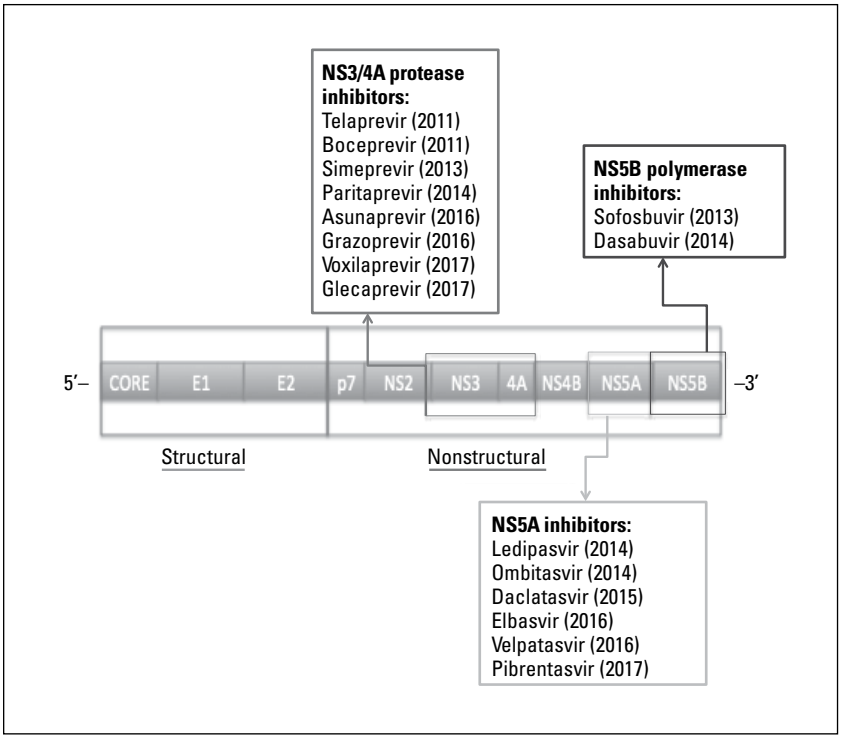

Figure. Direct-acting antiviral agents used to target products of the nonstructural coding sequence of hepatitis C. The year each agent received FDA approval is indicated in brackets.[5,18]

Current treatment options

In 2011 the first direct-acting antiviral agents were developed and approved for the treatment of hepatitis C infection.[17] These novel antiviral medications include the following classes of drugs: NS3/4A protease inhibitors, NS5A replication complex inhibitors, and NS5B polymerase inhibitors. As shown in the **Figure**,[18] direct-acting antiviral agents were developed to target the products of the nonstructural coding sequence of hepatitis C, thus directly impairing the replicative machinery of the virus rather than relying on the nonspecific antiviral effects of pegylated interferon and ribavirin.[7] The **Table** shows a list of the currently available products and their pivotal registration clinical trials.[19-53] Each product uses a combination of drugs to achieve an additive or synergistic effect. The cure rates with these

extremely well tolerated antiviral formulations is 95% to 99%.

Barriers to overcome

Treatment of hepatitis C has undergone revolutionary changes since the early 1990s. The introduction of direct-acting antivirals in particular has improved cure rates and reduced patient all-cause and liver-specific mortality and morbidity. Treatment has gone from being cumbersome and ineffective to being well tolerated and highly effective. But although good treatment options exist, the complete eradication of the disease in British Columbia will require overcoming some barriers. These include suboptimal population screening and diagnosis, variable patient and physician knowledge, high drug costs, lack of insurance coverage for some antivirals, and difficulty accessing coverage under Pharmacare. In addition, direct-acting antivirals do not work for a small but real minority, and reinfection is an ever-present risk.[54]

The World Health Organization has declared that eliminating hepatitis C globally by 2030 is feasible.[55] Using the antiviral therapies currently available and ensuring patients have better access to care would make eliminating hepatitis C a realistic goal in British Columbia, especially if health care providers, patient communities,

Table. Commonly used direct-acting antiviral agents in Canada.

Brand name	Manufacturer	Genotype	Drugs and doses	Treatment duration	Common side effects	Notable drug-drug interactions	Important drug trials	BC Pharmacare coverage	Additional Comments
Harvoni	Gilead Sciences[19]	1a, 1b, 4, 5, 6[8]	90 mg ledipasvir, 400 mg sofosbuvir[19, 20]	8–24 weeks[8]	Fatigue, nausea, headache, diarrhea, insomnia[19]	Amiodarone, P-glycoprotein inducers (e.g., rifampin, St. John's wort)[20]	ION I, ION II, ION III, SYNERGY, SOLAR-I, ION-IV, ELECTRON-2[21–26]	Yes	
Epclusa	Gilead Sciences[27]	1–6[8]	400 mg sofosbuvir, 100 mg velpatasvir[27]	12 weeks[8]	Headache, fatigue[27]	Amiodarone, proton-pump inhibitors, digoxin, rosuvastatin, tenofovir, P-glycoprotein inducers[27]	ASTRAL 1, ASTRAL 2, ASTRAL 3, ASTRAL 4, ASTRAL 5[27–31]	Yes	
Zepatier	Merck[32]	1a, 1b, 4[8]	50 mg elbasvir, 100 mg grazoprevir[32]	12–16 weeks[8]	Fatigue, nausea, headache[33]	CYP3A inducers (e.g., efavirenz), CYP3A inhibitors (e.g., lopinavir)[33]	C-EDGE TN, C-EDGE TE, C-SWIFT, C-WORTHY, C-EDGE, C-SURFER, C-EDGE CO-STAR[33–39]	Yes	For use in patients with chronic kidney disease (including dialysis patients)[39]
Vosevi	Gilead Sciences[41]	1–6[8]	400 mg sofosbuvir, 100 mg velpatasvir, 100 mg voxilaprevir[41,42]	12 weeks[8]	Headache, fatigue, nausea, diarrhea[41]	Amiodarone, CYP inducers, P-glycoprotein inducers, strong inducers of OATP1B1/B3 (e.g., rifampin) [41]	POLARIS 1, POLARIS 2, POLARIS 3, POLARIS 4[43, 44]	Yes	
Maviret	AbbVie[45]	1–6[8]	100 mg glecaprevir, 40 mg pibrentasvir[45]	8–16 weeks[8]	Headache, fatigue[46]	Amiodarone, HMG CoA reductase inhibitors, carbamazepine, efavirenz, proton-pump inhibitors[46]	SURVEYOR-I, SURVEYOR-II, ENDURANCE-I, ENDURANCE-II, ENDURANCE-III, EXPEDITION-I, EXPEDITION-II, EXPEDITION IV, MAGELLAN-I, MAGELLAN-II[47–52]	No	For use in patients with chronic kidney disease (including dialysis patients)[53]

and government agencies all strive to achieve this goal. BCMJ

Competing interests

Over the past 22 years Dr Yoshida has been an investigator in hepatitis C clinical trials sponsored by Gilead Sciences, Merck (previously Schering-Plough), Janssen, AbbVie, Vertex, Hoffmann-La-Roche, Boerhinger Ingelheim, Pfizer, Human Genome Sciences, and Novartis. In the past 2 years he has received honoraria for CME/Ad Board lectures from Gilead Sciences Canada, Merck Canada, and AbbVie Canada.

Treatment of hepatitis C has undergone revolutionary changes since the early 1990s.

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Using population-level integrated health data to monitor and assess patients' progression across care and treatment continuums

Care cascades

Care cascades are visual tools used to track patients' journeys across illness and care stages such as screened or diagnosed, referred to care, treatment assessment, treatment, and status of treatment goal (e.g., viral suppression or cure). They can be constructed at various levels, from groups of patients at one or more clinics to entire geographic areas such as a health authority or province. Care cascades[1] are usually presented as bar graphs, showing stages of care for a particular disease, and the number or portion of people progressing through each stage, thereby helping to rapidly identify stages where patients fall out of care and where barriers to care progression may be occurring; determine program effectiveness; and monitor progress toward achieving desired health outcomes.

Using integrated health data

Tracking patients across disease and care stages at the population level requires integrating data from multiple sources, such as surveillance and diagnostic laboratory data, health care utilization and prescription medication dispensing data, disease registries, and vital statistics records. Data linked at the patient level are used to produce population-level estimates of care and treatment progress, which are visualized as a care cascade. Because health and administrative data already exist, integrating them to estimate these measures is an efficient method to assess care cascades, and eliminates many biases associated with other types of data sources (e.g., clinical or cohort studies).

This article is the opinion of the BC Centre for Disease Control and has not been peer reviewed by the BCMJ *Editorial Board.*

Care cascades for hepatitis C

While hepatitis C virus infection is associated with various liver and nonliver complications and high morbidity and mortality, the advent of highly effective direct-acting antiviral medications has revolutionized its management, prompting the World Health Organization to issue global hepatitis elimination goals.[2] To monitor progress toward achieving these goals, systems tracking patient progress across hepatitis C virus illness and care stages are needed. To this end, in British Columbia, laboratory testing, prescription dispensation, mortality, and other health care administrative data have been integrated to create the BC Hepatitis Testers Cohort (BC-HTC), which contains health information on over 2 million BC residents.

In BC, the stage of care with the largest improvement in recent years has been driven by the availability of direct-acting antiviral medications, shown to improve all-cause mortality and reduce the risk of cirrhosis and liver cancer.

BC-HTC has helped identify gaps along the hepatitis C virus care continuum,[3] such as many patients not receiving confirmatory hepatitis C virus RNA testing after a positive hepatitis C virus antibody test. These findings supported improved care-provider training, resources for care providers and patients, and a reflexive hepatitis C virus RNA testing pilot study at the BCCDC Public Health Laboratory. Having multiple data sources in the BC-HTC permits hepatitis C virus care cascades to be stratified by age, gender, geographic location, disease stage, comorbidities, and co-infections. Stratification of hepatitis C virus care cascades based on these characteristics identified gaps in urban, rural, and remote services delivery, and highlighted how well population-specific needs are being met.

In BC, the stage of care with the largest improvement in recent years has been driven by the availability of direct-acting antiviral medications, shown to improve all-cause mortality and reduce the risk of cirrhosis and liver cancer. However, the cascade of care in BC demonstrates continued gaps in treatment uptake among people with a history of injection drug use.[4] Curing hepatitis C virus among people who inject drugs can prevent transmission to others, but to improve real-world health outcomes and meet hepatitis C virus elimination goals, more comprehensive harm reduction, addiction, and mental health supports are required.

Care cascades for other health conditions

Care cascades have been used to track care and treatment progress for HIV

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Access to safe drinking water in First Nations communities and beyond

The First Nations Health Authority reports on the successes, the struggles, and the work still required to ensure all Canadians have potable water in their homes.

Helena Swinkels, MD, MHSc, FCFP, FRCPC, Sylvia Struck, PhD, Linda Pillsworth, Btech, CPHI(C)

As public health professionals at the First Nations Health Authority (FNHA), which serves First Nations communities in BC, we read with great interest Dr Charuka Maheswaran's article, "Water, water everywhere but not a drop to drink!" in the May 2018 issue of the *BCMJ*.[1] We would like to thank Dr Maheswaran and the Environmental Health Committee of the Doctors of BC's Council on Health Promotion for their interest in this very important topic. We agree that it should indeed be possible for all Canadians to have potable water in their homes, and are working on this in partnership with First Nations communities in BC and the Department of Indigenous Services Canada (ISC).

There are common issues across remote, rural, and very small systems in Canada, including lack of access to and ability to retain trained operators, issues of scale, and treatment acceptance (chlorination), among others. In general, however, and unlike in some areas of Canada, in First Nations communities in BC all homes that are occupied year round have access to piped water, and there is a low frequency of significant water quality issues such as E. coli and chemical exceedances in community and public water systems. Out of the 334 community and public water systems that the FNHA reports on, 4% of drinking water systems are currently under drinking water advisories (as of 31 October 2018).[2] The number of advisories can fluctuate mainly due to short-term advisories.

Out of the 334 community and public water systems that the FNHA reports on, 4% of drinking water systems are currently under drinking water advisories.

While the majority of First Nations community water systems meet Canadian guidelines for safe drinking water, additional progress can and must be made to improve support for systems under advisory and for smaller systems (those with fewer than five connections), which currently do not receive infrastructure funding through the federal government. The following key activities are supporting progress toward sustainable access to safe drinking water:

- First Nations communities work with the FNHA to assess if water meets or exceeds federal and provincial guidelines for drinking water quality, and support access to safe drinking water.
- The FNHA and First Nations communities work together to increase the capacity and ownership of water systems in communities. The FNHA trains and funds members of First Nations communities as community-based water monitors to sample and test drinking water using in-community and accredited labs, and fully supports and funds this testing.
- ISC provides funding for community water systems infrastructure and operation and has committed additional funding to support the resolution of drinking water

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This article has been peer reviewed.

Dr Swinkels is the senior medical officer public health for the First Nations Health Authority. Dr Struck is the manager, drinking water safety program, for the First Nations Health Authority. Ms Pillsworth is the manager, environmental health services, for the First Nations Health Authority.

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advisories. The FNHA's drinking water safety program manager and environmental health officers work with ISC to resolve drinking water issues and provide sustainable access to safe drinking water in First Nations communities.

- ISC provides training for First Nations water systems operators, and supports the Circuit Rider Program, which provides training and mentorship by highly experienced and certified operators and works with operators in First Nation communities to support operation of drinking water systems.
- First Nations leaders have expressed interest in determining and developing priorities and strategies for safe drinking water legislation and a framework that would effectively support safe and sustainable drinking water for communities.
- First Nations water operators in BC and Yukon have launched their own network (First Nations' Operators Water Net) to support and advocate for their profession.

This great work needs to be sustained and expanded. Community or public water systems may not address all water needs in First Nations communities; the federal fiduciary responsibility to these communities needs to be extended to fund and support smaller systems, which also serve residents in First Nations communities. We also need to recognize that First Nations view water holistically, extending beyond what comes from the tap to source water and issues that arise in watersheds. Joint collaboration across First Nations communities, local governments, provincial ministries and regional health authorities, and land owners is needed to achieve effective source water protection.

While supporting the continued drive to improve services, we also need to highlight what is going *well* in First Nations communities. The development of highly skilled women and men as water treatment plant operators and caretakers of their water, installation of modern-day treatment facilities, and a supportive network of community, government, and FNHA staff have all contributed to a reduction in the number and duration of advisories. The excellent work carried out by First Nations water treatment plant operators, community-based drinking water monitors, community health staff, and many others in communities who support provision of safe drinking water is but one example of First Nations individuals and communities leading wellness.

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infection, tuberculosis, substance use treatment, and syphilis partner notification. This concept can easily adapt to other diseases to improve health outcomes. However, various data sources need to be integrated and updated at the provincial level in order to track gaps in services, which in turn can inform how services are best delivered to improve health outcomes.

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Disclaimer

All inferences, opinions, and conclusions drawn in this article are those of the authors and do not reflect the opinions or policies of the BC Ministry of Health and data stewards.

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Physician networks: Improving practice coverage, patient care, and physician support

Physician networks are connections between doctors that are built on formal or informal relationships. They enable doctors to rely on each other for practice coverage, and to support each other with clinical services to meet the comprehensive care needs of their patients. The supportive, connected nature of physician networks will place them at the foundation of primary care networks as they are built.

In physician networks, GPs can increase their capacity to support patients, access shared team-based care resources, provide peer support for clinical matters, and increase work-life balance. A network can comprise a group of doctors and a combination of relationships: GP to GP, GP to specialist, and patient medical home to patient medical home. Physicians determine the makeup of their networks and decide which services they will collectively provide to best support local needs. Patients benefit from these relationships through increased access to continuous, comprehensive primary care, improved coordination of specialist care, and better access to after-hours care.

Physicians in some areas are already part of a network or on-call group, or are starting networks with colleagues to provide care for specific patient populations, including residential care, maternity, in-hospital, and end-of-life care. In many communities, divisions of family practice are actively involved in (or planning for) the development of formal physician networks with funding from the GPSC and Shared Care. Here are some examples of how physician networks are enabling physicians to better support each other and their patients.

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Division maternity care projects

The division and Shared Care maternity care projects highlighted in the GPSC column in the January/February issue of the *BCMJ*[1] represent networks that enable family doctors, midwives, and obstetricians to provide coverage for patients—and for each other. Maternity care provides an example of how networks can be organized in different ways—for instance, the Burnaby Maternity Clinic is a GP-to-GP network, while the South Okanagan Maternity Centre networks GPs and midwives to provide patients with collaborative care.

By fostering and supporting collegial relationships between local GPs, Neighbourhood Networks create a systemic approach to coordinating multidisciplinary care, patient attachment, physician recruitment, peer support, and practice coverage.

Richmond Neighbourhood Networks

Richmond is a city that comprises many small, unique neighborhoods, each with distinct socioeconomic, cultural, language, and health care needs. To enhance primary care capacity in these diverse communities, the Richmond Division of Family Practice created Neighbourhood Networks[2]—geographically clustered groups of GPs—with the belief that enhancing support to physicians at the practice level would create parallel effects of enhanced patient experience.[3] By fostering and supporting collegial relationships between local GPs, Neighbourhood Networks create a systemic approach to coordinating multidisciplinary care, patient attachment, physician recruitment, peer support, and practice coverage.

The division has created a series of papers outlining what they have learned and recommendations for creating Neighbourhood Networks, which are available on their website.[2]

Chilliwack Gender Care Network

The Chilliwack Division of Family Practice supports the Chilliwack Gender Care Network, with the goal of improving the quality of care for transgender, two-spirit, and gender-diverse clients in the community. This network consists of a physician and nurse practitioner who have received additional training through the PHSA for hormone readiness assessment, hormone therapy, and surgical readiness assessments. Network members are also members of the Chilliwack Gender Care Committee, which includes patients, parents, service providers, and organizations that work with transgender clients to promote public education and stigma reduction. Visit www.gendersupportnetwork.com to learn more.

Sunshine Coast Addictions Network

The Sunshine Coast Division's Addictions Network consists of GPs, specialists, an addictions nurse, and a pharmacist. The goal of this work is to

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enhance pathways for patients seeking addiction treatment on the Sunshine Coast. The division has sponsored two education sessions for physicians on addiction medicine and is planning to conduct a short research project that will track patients who go to an ER in part due to substance use.

Surrey–North Delta Opioid Agonist Therapy Network

The Surrey–North Delta Division's Opioid Agonist Therapy Network is a mentoring and support system for family physicians interested in taking on patients who need opioid agonist therapy, with a focus on stigma reduction, trauma-informed practice, and effective buprenorphine-naloxone therapy in full-service family practice.

Victoria and South Island FP Palliative Network

The Victoria and South Island Divisions of Family Practice have collaborated to create the FP Palliative Network. This network links together a group of geographically diverse South Island and Victoria physicians who accept unattached end-of-life patients based on referrals from Victoria Hospice and the BCCA Pain and Symptom Management Clinic.

Physician networks are an evolving area of work, and these are just a few examples that have been formed around the province. As work unfolds on primary care networks—including data gathering and evaluation—more information will become available about how connecting GPs, specialists, nurse practitioners, and other care providers through physician networks will help to improve physician experience and patient access to care in communities around the province.

Visit the GPSC (www.gpscbc.ca/what-we-do/patient-medical-homes/physician-networks) and the Shared Care (www.sharedcarebc.ca/our-work/spread-networks) websites to learn more about physician networks.

—Afsaneh Moradi
Director, Community Partnership and Integration

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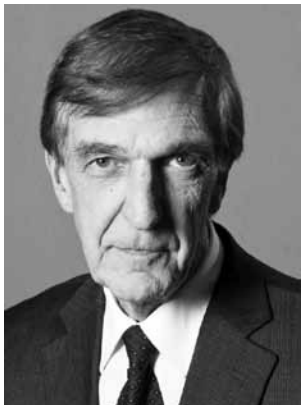
Dr Peter Doris 1948–2018



Dr Peter Doris grew up in Ontario. He was a medical student at Queen's University at Kingston and later a general surgeon at affiliated hospitals. Mid-career he moved to Surrey, BC, where he was quickly recognized as an outstanding surgeon, especially for abdominal pathology. On appointment as chief of the Department of Surgery at Surrey Memorial Hospital, he addressed the management of surgical services in the emergency room and moved to 24-hour surgical care. As surgical chief he found himself on numerous committees, where he was a popular advocate. On executive committees he found himself increasingly involved with Surrey Memorial Hospital's role in the rapid expansion of Surrey's community and its multicultural development. Dr Doris's dream was that Surrey Memorial would be the link, as a teaching hospital, between the University of British Columbia and the Surrey campus of Simon Fraser University. He had the support of the medical staff but not of the administration, which over subsequent years removed physicians from roles in the hospital's development.

Despite having a busy surgical practice, his door was always open to colleagues seeking advice on patients or hospital issues, and he continued to press for physician involvement in the hospital's development. He spoke about the role of the physician in the hospital system at the 2016 College of Physicians and Surgeons of BC annual general meeting, and his presentation was so popular that it was repeated twice during the day.

Struck by sudden illness, Dr Doris lingered in hospital care, and it is saddening that in his final months he didn't have the attention he needed and deserved.

—John O'Brien-Bell, MB
Surrey

Dr Ralph William Spitzer 1918–2018

Dr Ralph William Spitzer passed away in Victoria, BC, on 17 October 2018 at the age of 100. He is survived by his loving family: wife, Hisako Kurotaki; daughter, Eloise (Rob); and granddaughter, Kali. Ralph was predeceased by his first wife of 59 years, Therese, and their son, Matthew.

Ralph's contribution to building a superb laboratory medicine–chemical pathology service in the Lower Mainland was immense. I was fortunate to have been chosen by him in the postdoctoral program in clinical biochemistry that he had set up at Royal Columbian Hospital in 1970; thus, my career in the medical biochemistry field was launched because of his vision. I am eternally grateful.

Ralph was a unique individual with a strong commitment to a pluralistic and diverse society. He lived his values and supported many initiatives that were embedded in those values.

He had a brilliant mind, graduating from Cornell University in Ithaca, New York, with a BSc in chemistry at the age of 20, and completing a PhD at the age of 23. His PhD mentor was Dr Linus Pauling, winner of two Nobel prizes. Ralph pursued an academic career at Oregon State University as an associate professor in biochemistry. In 1949, he became a victim of the McCarthy era in the United States and was fired from the university for his political views. In 1950, while traveling and lecturing in Europe, he was arrested, incarcerated, and held in isolation in Rotterdam. His passport confiscated, he was forced to return to the United States. In 1954 Ralph decided to move to Canada, which benefited Canada greatly. He completed medical school at the University of Manitoba, and in 1958 the family moved to New Westminster, where he began his long career as a chemical pathologist with the newly formed group, Dr C.J. Coady and Associates, which operated BC Biomedical Medical Laboratories and provided consultative services to the Royal Columbian Hospital regional laboratory system.

Ralph contributed to the academic world and was a professor at the UBC School of Medicine. He was a true pioneer, being the first medical biochemist in the province, developing both a high-level community-based laboratory service as well as contributing to academic excellence. He took the practice of biochemistry to patients' bedsides, thus benefiting thousands of patients who received care at the Royal Columbian Hospital. Laboratory medicine also

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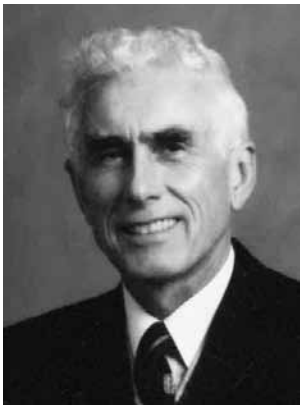
benefited from Ralph's creative energy, innovative mind, and commitment to excellence. He was generous in teaching and mentored several postdoctoral students for successful careers in clinical biochemistry.

Ralph was a man of many seasons. Besides being a brilliant scientist, clinician, and teacher, he had many outside interests. He was an avid skier and a mountaineer. He became a bonsai gardener, and he learned to play the organ in retirement, building an organ in his living room that had over 2000 pipes. He traveled widely well into his 90s, visiting Europe, Turkey, China, Japan, Southeast Asia, India, South America, and Antarctica.

Stenciled at the base of Ralph's massive pipe organ is a phrase that perfectly captured his perspective on life: *ars longa, vita brevis* (art is long, life is short). He was loved and admired by his colleagues, friends, and family. He will be missed by his colleagues and students, whose lives he influenced significantly.

—Arun K. Garg, PhD, MD
New Westminster

Dr W. Donald Watt
1924–2018



It is with sadness that we announce the passing of Dr (William) Donald Watt. Don was born in Allendale (now Barrie) Ontario on 14 November 1924, and passed away peacefully in his sleep on 29 December 2018 at the age of 94 in Abbotsford, BC. He was predeceased by his wife of 57 years, (Victoria) June Watt; his parents, Rev (William) John Watt and Edith Catherine Watt; his six older siblings and their partners; and his first grandchild, Lorraine. He is survived by his children, (William) David Watt (Cindy), George Donald Watt (Ying), Victoria Joy Manson (Bradley), and Elizabeth June Watt (Denis Durand).

Don joined the Royal Canadian Air Force after high school and received his wings as World War II was ending. He graduated from the University of Toronto with his MD in 1950, then interned and worked at the Wellesley Hospital, Hospital for Sick Children, and Toronto Western Hospital for the next 2 years where he met June, a nurse and former World War II Wren (member of the Women's Royal Canadian Naval Service).

In 1952 Don began a 38-year career working for the United Church of Canada (UCC), Board of Home Missions. Initially placed as the lone MD on the Queen Charlotte Islands (now Haida Gwaii), he delivered medical care via plane, truck, and boat, with June volunteering by his side. He was soon assigned the position of coroner, justice of the peace, and medical health officer. He set up clinics in Sandspit, Skidegate Village, Masset, and in logging camps at Juskatla and Cumshewa Inlet, and facilitated building the 21-bed Queen Charlotte City Hospital, which opened in 1955.

In 1956 Don moved to Bella Coola, where he spent 7 years as physician, hospital superintendent, and caregiver to lighthouses and remote logging camps in the area. He was later adopted into the Nuxalk (Bella Coola) Nation by the Walkus and Edgar families and named Nooskumiich (one who heals with his hands) and Nenetsmlayc (one who brings back to life) at the opening of the new Bella Coola Hospital in 1980.

In the early 1960s Don moved to Prince Rupert and then Vancouver as medical superintendent for all the UCC hospitals across Canada. A gifted orator, he spent the next 24 years traveling to UCC medical outposts from BC to Newfoundland negotiating the building of new hospitals and acquiring new equipment, recruiting dedicated staff, encouraging local hiring, and ensuring local representation on hospital boards. He continued to practise medicine as a relief physician wherever needed.

While in Vancouver, Don served on the boards of St. Michael's Centre, Chalmers Lodge, St. Stephen's United Church, and the Alcohol-Drug Education Service. A proponent of full-service family medicine, Don received his CCFP in 1971 and his FCFP in 1974. Beginning in 1980 he served two terms as president of the BC College of Family Physicians, and in 1986 was president of the College of Family Physicians Canada. A champion of the 2-year family practice residency, he spent 25 years as a clinical instructor for the UBC Medical School. Don received an honorary doctorate of divinity from Union College, UBC, in 1970, and the David M. Bachop Gold Medal in 1989 in recognition of "his successful and resourceful efforts to bring care to small, isolated communities."

Don and June will be forever missed, but their legacy of hospitality, selflessness, humor, grace, and excellence in delivering medical care to those who needed it most remains. More of their story can be found in the book *Healing in the Wilderness*, by Rev. Bob Burrows. A memorial service and celebration of this extraordinary life was held at Trinity United Memorial Church in Abbotsford on 2 February.

—Elizabeth J. Watt, MD
Abbotsford

Can frailty be prevented? Or is it the inevitable decline in function that accompanies aging?

What is frailty?

Frailty is a state of increased vulnerability and decreased physiologic reserve that impedes the body's ability to withstand and recover from minor challenges.[1] Frailty is multidimensional and consists of psychological, social, and physical aspects, and puts people at risk of adverse health outcomes, including falls, disability, admission to hospital, and death, and has been reviewed in the *CMAJ*.[2]

Despite what one might intuit, frailty is not an inevitable part of aging, although its prevalence does rise with age, from 16% of people 65 years old to over 50% of those over 85.[3] Mounting evidence suggests that early identification and intervention can not only slow the progression of frailty but even prevent it. The interventions include physical activity, nutritional support, and social networking.[4]

How can frailty be assessed?

One can start assessing frailty with the PRISMA 7 questionnaire[5] and the Timed Up and Go test.[6] Additionally, the Clinical Frailty Scale, developed and validated in 2005, is still in use today. More recently, the Fraser Health Authority launched the Community Actions and Resources Empowering Seniors (CARES) model in BC, a collaborative primary care model using an electronic comprehensive geriatric assessment and coaching to prevent frailty. A patient's comprehensive geriatric assessment is loaded into the physician's EMR, which calculates a frailty index. Once the frailty index is determined, supports such as health coaches can be put in place to assist the pre-frail senior. Preliminary data from a pilot CARES study show that with 6 months of coaching, the number of participants exercising frequently increased by 65%, and walking independently increased by 30%. Moreover, participants endorsing a positive health attitude increased by 59%.[7]

Despite what one might intuit, frailty is not an inevitable part of aging, although its prevalence does rise with age, from 16% of people 65 years old to over 50% of those over 85.

What programs are feasible to address frailty?

In a current project targeting seniors (but including other ages), the White Rock–South Surrey Division of Family Practice partnered with the Peace Arch Hospital and Community Foundation to offer subsidized personal exercise prescriptions through the MOVE for LIFE program.[8] Other divisions can team up with local groups such as the YMCA to offer programs suitable for their communities, and many already are.

For a home-based program, the Go4Life website[9] from the National Institute for Aging provides seniors with simple tools to prevent frailty and maintain independence. This includes exercises and videos focused on improving flexibility, strength, balance, and endurance.

How early should frailty be addressed?

We know that obesity rates are increasing in both children and adults, and obesity is associated with type 2 diabetes, cardiovascular disease, and musculoskeletal impairments. We also know exercise improves cardiorespiratory fitness, enhances psychosocial well-being, and reduces obesity.[10] Habits established in childhood and reinforced throughout life are more likely to endure later in life. Additionally, regular exercisers are less likely to live with chronic diseases that contribute to frailty. BC programs such as Be Active Every Day[11] are one way for family physicians and educators to collaborate in establishing healthy exercise and eating habits early in school-age children.

As our population ages, frailty becomes an increasingly prevalent condition that threatens the health of seniors and the viability of our health care system. We know it can be prevented by targeted assessments at the primary care level with specific interventions that can begin early in life. Preventing frailty is consistent with the foundational concepts of the patient medical home, and should be considered in the evolution of primary care networks and public policy decisions.

—Steven Larigakis, MD

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This article is the opinion of the Athletics and Recreation Committee, a subcommittee of Doctors of BC's Council on Health Promotion, and is not necessarily the opinion of Doctors of BC. This article has not been peer reviewed by the BCMJ *Editorial Board.*

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special feature

Ready or not for the CCFP exam

An environmental scan and resident rating of available study and exam-preparation resources for the Canadian Certification Examination in Family Medicine.

Paul Dhillon, MBBChBAO, LRCP&SI, EMDM, CCFP, DRCOG, DTM&H(Lon), FRGS, Simon Moore, MD, CCFP

The College of Family Physicians Canada (CFPC) conducts a biannual Certification Examination in Family Medicine. There is a disparity between the pass rates of practice-eligible candidates and residency-trained candidates. The **Table** (page 87) provides a current and comprehensive list of resources available to physicians preparing for the CCFP exam. This list contains resources beyond those on the CFPC's study resources web page. While the heterogeneity of the listed resources may complement the wide variety of study strategies that candidates employ, the quality of these resources is highly variable. We conducted an online search for resources clearly identified as specific to preparation for the CCFP exam. Current residents and practice-eligible candidates were surveyed nationally to critique the completeness of the list and name missing resources. Over a 3-month period, 495 CCFP exam candidates from across Canada attending The Review Course in Family Medicine were asked to peer-review and rate the resources. The survey response rate across all five sites was 48% (n = 236). A complete list of peer ratings derived from survey data of the resources is available online at www.thereviewcourse.com/resources.

While the heterogeneity of the listed resources may complement the wide variety of study strategies that candidates employ, the quality of these resources is highly variable.

Dr Dhillon is an assistant professor of Academic Family Practice at the University of Saskatchewan, and a clinical assistant professor in the Department of Family Practice at the University of British Columbia. Dr Moore is a clinical assistant professor in the Department of Family Practice at the University of British Columbia. Drs Dhillon and Moore are cofounders of The Review Course in Family Medicine.

This article has been peer reviewed.

Competing interests

Dr Dhillon and Dr Moore are founders of The Review Course in Family Medicine.

Table. Preparation resources for the Canadian Certification Examination in Family Medicine in alphabetical order.

Resources	Cost
Books	
Dash M, Arnold A. Guide to the Canadian Family Medicine Examination. McGraw-Hill Education. 2017. Paperback and e-book.	$100.95
O'Toole D. Family Medicine Notes. Preparing for the CCFP Exam. 2019. Hard copy and e-book.	$80.00–$120.00
Ranev D, Pabani W. The Ninety-Nine: Study Guide for Canadian Family Medicine Residents. 2019. Paperback and e-book	$47.61
Courses [in person]	
BC College of Family Physicians Exam Practice Session (Vancouver):* https://bccfp.bc.ca/professional-development/resources-for-all/ccfp-certification (office@bccfp.bc.ca)	$575.00
Ontario College of Family Physicians, CFPC Certification Exam Workshop (Toronto):* https://ocfp.on.ca/cpd/credit-login/cfpc-certification-exam-workshop	$1500
The Review Course in Family Medicine (Vancouver, Calgary, Toronto, Montreal): www.thereviewcourse.com	$979.00†
University of Calgary, Preparation Course for the CCFP Exam (Calgary):* https://cumming.ucalgary.ca/cme/event/2018-03-17/preparation-course-ccfp-exam	$1550.00
E-newsletter	
The Review Course in Family Medicine, Exam Study Tips Newsletter: www.thereviewcourse.com/studytips	Free
Podcasts	
Dr Brady Bouchard podcasts: https://99topics.drbouchard.ca	Free
Dr Mike Kirlew podcasts: http://siouxlookoutareadocs.libsyn.com	Free
Online resources	
99 Topics for the CCFP, Study Notes (2016): http://99topics.drbouchard.ca/studynotes.pdf	Free
CCFP, Exam Preparation: www.CCFPexams.com	$150.00
CFPC, Evaluation Objectives: www.cfpc.ca/EvaluationObjectives	Free
CFPC, FAQs for the Certification Examination in Family Medicine: www.cfpc.ca/certification_FAQs	Free
CFPC, Sample SAMPs: www.cfpc.ca/uploadedFiles/Education/Sample-SAMPs.pdf	Free
CFPC, Self Learning Program: https://selflearning.cfpc.ca/#/lng-en/	$236.00 ‡
CFPC, Self Study: www.cfpc.ca/HomeStudy	Free
CFPC, Simulated Office Orals (SOOs): www.cfpc.ca/SOOs	Free
CFPC, Preparing for the Certification Examination in Family Medicine: www.cfpc.ca/PreparingfortheFamilyMedicineExamination	Free
CFPC, Priority Topics and Key Features: www.cfpc.ca/PriorityTopics	Free
Family Medicine Study Guide (app): www.familymedicinestudyguide.com	$19.99
McGill Family Medicine Exam Orientation Manual (2015/16): www.mcgill.ca/familymed/education/postgrad/exam	Free
Preparing for the CCFP exam 2015 (blog by a UBC resident): www.ccfpprep.com	Free
Review Course in Family Medicine, selected guidelines and helpful links: www.thereviewcourse.com/guidelines	Free
UBC CCFP Exam Prep: https://postgrad.familymed.ubc.ca/resident-resources/exam-information/exam-prep-resources	Free
UBC Wiki, Course:PostgradFamilyPractice/ExamPrep/99 Priority Topics: https://wiki.ubc.ca/Course:PostgradFamilyPractice/ExamPrep/99_Priority_Topics	Free
University of Calgary, Family Medicine, SAMP Overview (PowerPoint 2017): http://calgaryfamilymedicine.ca/residency/images/images/SAMPR1s.pdf	Free
University of Manitoba CCFP study tips: http://umanitoba.ca/faculties/health_sciences/medicine/education/cpd/sdl/ccfp_studytips.html	Free

Prices are in Can$ and reflect prices listed online at the time of article submission.
* Practice-eligible physicians only.
† Cost reimbursed for residents at some sites as part of their residency program or Resident Education Fund.
‡ Provided for free to residents by the CFPC.

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Some pregnant women don't believe cannabis is harmful to their fetus

Up to one-third of pregnant women do not believe cannabis is harmful to their fetus, according to a review by University of British Columbia researchers. In some cases, women perceived a lack of communication from their health care providers about the risks of cannabis as an indication that the drug is safe to use during pregnancy.

The findings are outlined in a new review, published in *Preventive Medicine*, in which UBC researchers sought to identify the latest evidence on women's perspectives on the health aspects of cannabis use during pregnancy and postpartum, and whether their perceptions influence decision making about using the drug. The research suggests that, over the past decade, more women seem to be using cannabis during pregnancy, even though evidence of its safety is limited and conflicting. For the review, researchers identified six studies conducted in the United States that looked at women's perceptions about cannabis use during pregnancy. Across the studies, the rate of cannabis use among pregnant women varied considerably. In a large US population-based study, nearly 4% of women self-reported using cannabis within the past month, while 7% self-reported using cannabis within the past year. In another study that saw researchers also test hair and urine samples, the rate of cannabis use increased to 28%.

Pregnant cannabis users were more likely to be under age 25, unemployed, single or uninsured, African-American, and to have low income and education, or use other substances such as tobacco and alcohol. A diagnosis of anxiety or depression was also associated with cannabis use during pregnancy. Researchers found that cannabis use rates were highest during the first trimester (7.4%) and lowest during the third trimester (1.8%). Most pregnant users reported using cannabis to treat nausea early in their pregnancy. In one study involving 306 pregnant women, 35% reported being cannabis users when they realized they were pregnant. Two-thirds of those women quit after finding out they were pregnant, but among those who continued to use cannabis, half reported using almost daily or twice a week. When women were asked about their perception of general harm associated with cannabis use, 70% of both pregnant and nonpregnant cannabis users responded that they perceived slight or no risk of harm. In another study, when asked if they believed cannabis is harmful to a baby during pregnancy, 30% of pregnant women responded "no." When women were asked to identify substances most likely to harm the baby during pregnancy, 70% chose alcohol, 16% chose tobacco, and 2% chose cannabis (see **Figure**).

While research on the health effects of cannabis is limited, some studies have shown an increased risk of problems for pregnant women, including anemia, low birth weight, stillbirth, and newborn admission to the neonatal intensive care unit. Due to the risk of potential problems, many professional organizations, including the Society of Obstetricians and Gynaecologists of Canada, recommend women not use cannabis when trying to conceive, during pregnancy, and while breastfeeding. Still, some women reported that not having specific counseling provided about the risks of cannabis use suggests that the drug is safe. One finding revealed that some people don't consider cannabis to be a drug, making it especially important for health care providers to ask specific questions about cannabis use during pregnancy and breastfeeding.

Lead author, Hamideh Bayrampour, is an assistant professor in the UBC Department of Family Practice and an affiliate investigator at BC Children's Hospital Research Institute. The review article, "Women's perspectives about cannabis use during pregnancy and the postpartum period: An integrative review," is available online at www.sciencedirect.com/science/article/pii/S0091743518303773?via%3Dihub (login required).

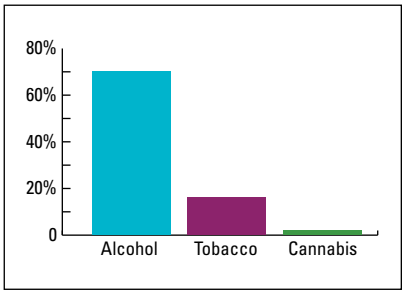

Figure. Pregnant women's perception of substances most likely to harm the baby during pregnancy.

Preventing overdose deaths among people recently released from a correctional facility

A new project aimed at supporting people transitioning back to their communities when they are released from a correctional facility could prevent overdoses and help clients get on a healthier path.

Roughly two-thirds of British Columbians who died of an illegal drug overdose between 1 January 2016 and 31 July 2017 had recent contact with the criminal justice system, according to a death review panel report[1] released by the BC Coroners Service in 2018. Of those, 10% (333 people) died within their first month of release from a correctional facility.

Five new community transition teams stationed throughout BC aim to address this problem by helping people with opioid-use disorders access treatment in their communities after release from a corrections facility.

The teams are currently stationed in Surrey, Prince George, Kamloops, Nanaimo, and Port Coquitlam. Each consists of a social worker and a peer—a person with lived experience

with drugs, the correctional system, or both. The teams will work with clients for approximately 30 days following their release to connect with a community physician, fill prescriptions, and access other recovery supports.

Recently incarcerated clients at greater risk of overdose

Dr Nader Sharifi, medical director for Correctional Health Services and addictions lead for BC Mental Health and Substance Use Services, reports that currently about 40% of people in corrections facilities receive opioid agonist treatment, which includes medications such as Suboxone and methadone to treat opioid use disorder. He says people are at heightened risk when they leave corrections and no longer have access to the facility's physician. Additional risk factors include lowered tolerance and the trauma associated with release.

Role of peers in recovery is vital

Andrew MacFarlane, provincial executive director for Correctional Health Services, has spent 20 years working with people with mental health and substance use issues, and the last 5 working with people on Vancouver's Downtown Eastside. MacFarlane and his team designed the community transition team project after consulting with regional health authorities

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A model of global health engagement

The Canada India Network Society was established in 2010 to connect leaders from Canada and India in order to build collaborative opportunities among the countries' academic institutions and industries. The Canada India Network Initiative 2018 was the society's third conference. Though focused on a subset of the South Asian population, the conference vision was global engagement and building links between people through health care.

The conference started with welcome remarks from the Honourable Adrian Dix, Minister of Health, and Dr Arun Garg, the conference chair. Sessions included:

- War on Diabetes. Deljit Bains, leader at the South Asian Health Institute, advocated for transformation in the community in health promotion through direct engagement at places like gurudwaras and temples. Dr Gulzar Cheema shared his work on the interCultural Online Health Network, a community-driven health-promotion initiative that supports multicultural communities, patients, and caregivers across BC to optimize chronic disease prevention and self-management. Sean McKelvey shared his work in making diabetes care drug-free. The final speaker, Dr JST Thakur of India, addressed the approaching tsunami of diabetes.
- Mental Illness. Dr Nitasha Puri spoke about the need for immediate action in the prevention and cure of addictions in the context of her work with Fraser Health's Roshni Clinic. Dr Suman Kollipara focused on alternative and integrated approaches like meditation and self-empowerment tools for prevention of mental illness.
- Public Health Approaches to Palliative Care in India and BC, looking at the work done by the Two Worlds Cancer Collaboration, was presented by Drs Doris Barwich and Gillian Fyles and facilitated by Dr Simon Sutcliffe.
- Leadership in Health. Drs Arvind Lal, Anupam Sibal, and Robert Woollard brought decades of experience to shed light on the need for better practices in health care.
- Empowering Physicians. This session was presented using the LEADS framework, including principles of leading self, engaging others, achieving results, developing coalitions, and transforming systems.
- Integrative Medicine and Health. Medical professionals, research scientists, traditional Chinese medicine practitioners, and yoga practitioners reflected on their personal journeys as well as their patients' journeys. Presentations covered the importance of integrative medicine in the prevention of dementia, supportive cancer care, food as medicine, traditional Chinese medicine, Indigenous medicine, and integrated yoga therapy. The overall message was that chronic disease requires an integrative approach to care.
- Technology and Innovation. Discussions centred on artificial intelligence in health care, taking action against tuberculosis, the role of technology in access to health information, mobile technologies, and using neuroethology in youth depression and addiction. Kathy Kinloch, BCIT President, and the Honourable Bruce Ralston, Minister of Jobs, Trade and Technology, were featured speakers.
- Two roundtable discussions on technology and integrative medicine focused on identifying research opportunities between India and Canada—building bridges between modern innovation and ancient technologies.

For more information about the conference and the organization, visit www.thecins.org.

—Arun K. Garg, MD
—Reza Alaghehbandan, MD
—Suman Kollipara, MD

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and the First Nations Health Authority, and analyzing other evidence-based models across Canada.

The community transition team peers have been chosen strategically—they work with community organizations throughout the province that will keep helping clients after the short-term work with community transition teams concludes. The teams began connecting with their first clients in January. The Provincial Health Services Authority hopes to scale the project up next year based on results. A short video about the community transition teams is available at https://youtu.be/JuUqCPOlJvs.

Reference

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UBC research examines living well while dying

A University of British Columbia professor in the Faculty of Health and Social Development, School of Nursing, Kelowna, has determined that people diagnosed with terminal cancer—who have hope, positivity, and family support—are able to live well during the advanced stage of the disease.

Carole Robinson, professor emeritus with the UBC Okanagan School of Nursing, recently published a paper with co-authors explaining the process of living well with an awareness of dying. Robinson notes that globally there are 14.1 million new cancer cases diagnosed each year, 8.2 million cancer deaths, and 32.6 million people living with cancer. Historically, researchers have studied the concept of living well with a chronic illness, but not specifically cancer. Robinson says those studies convey the idea it may be possible to live well with advanced cancer, but little is known about how it is done or how to support it.

The study analyzed 22 interviews with Spanish adults involved in previous research that explored their experience of living with advanced cancer. The researchers found the participants engaged in a five-phase iterative process: struggling, accepting, living with advanced cancer, sharing the illness experience, and reconstructing life. This process revolved around participants' awareness of dying, which differed from people living with chronic illness, and was a unique aspect of this new research.

Each phase was revisited and, as the disease advanced, living well got more challenging. Participants talked about strategies for living with advanced cancer, including making life adjustments, maintaining a positive attitude, normalizing, and hoping.

Over time, participants realized struggling against the disease created additional difficulties. They understood it was counterproductive so they made a conscious choice to let go of struggling. Some referred to it as being the only choice they could make while living with the uncertainty of advanced cancer. This enabled accepting their life circumstances at some level and learning to live alongside their illness.

Robinson says that the importance of family love and support cannot be underestimated. For all the participants, she adds, awareness of dying led them to focus on living well. Sharing the experience with loved ones softened suffering remarkably. They were aware they did not have time to lose. Robinson says the key takeaways to living well encompass a balance between dependence and independence, being able to see the positive, and maintaining hope even in the end stages of the disease.

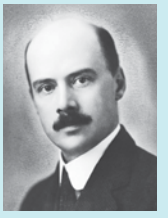
The study, "People with advanced cancer: The process of living well with awareness of dying," was published in *Qualitative Health Research*. It is available online at https://journals.sagepub.com/doi/10.1177/1049732318816298.

STUDENTS:

Cash prizes for writing

J.H. MacDermot Writing Award

The *BCMJ* invites writing submissions from student authors, and each year awards a prize of $1000 for the best medical student submission accepted for print and online publication. Students are encouraged to submit full-length scientific articles and essay pieces for consideration.



The J.H. MacDermot Writing Award, sponsored by Doctors of BC, honors John Henry MacDermot, who served as editor for 34 years (1932–1968), overseeing the publication's transition from the Vancouver Medical Association Bulletin to the *BCMJ* in 1959. Dr MacDermot also served as BCMA president in 1926.

BCMJ Blog Writing Prize

To encourage med students to take their first foray into medical writing, the *BCMJ* awards an additional writing prize of $250 twice per year for the best 200- to 400-word blog submission accepted for online publication.

For submission guidelines and contest deadlines, please visit www.bcmj.org/submit-article-award.

HELP MAKE DOCTORS OF BC MORE **DIVERSE AND INCLUSIVE**

BC doctors are a diverse group – comprised of different genders, nationalities, religious affiliations, sexual orientations, ages, practice locations and more.

Doctors of BC is seeking to find ways to be more inclusive of all these groups within our governance structures – the Board, Representative Assembly and committees.

Over the next few months, we will ask for your views on how we can do this. Our goal is to bring new and fresh perspectives from those who are currently under-represented, so that we can do a better job of planning for the future of the whole profession.

Make your mark. Find out how you can get involved at doctorsofbc.ca.

Questions? E-mail us at communications@doctorsofbc.ca.

doctors of bc

We all have our mark to make.

Concussions and return-to-work considerations

To better understand concussion and optimize care of concussion patients injured at work, there are two valuable resources: the Concussion in Sport Group consensus statement that arose from the Berlin Conference of October 2016;[1,2] and the Ontario Neurotrauma Foundation's Guidelines for Concussion and Minor Traumatic Brain Injury and Persistent Symptoms,[3] which includes advice for returning to work after concussion and many helpful algorithms for the management of common symptoms. The following concepts are emphasized in these documents.

Rest is no longer recommended for an indefinite period of time.[4] After an initial 24 to 48 hours of rest, the worker should be activated. Activation begins using a concept of symptom threshold wherein key symptoms are provoked at certain levels of aggravation. Producing a slight aggravation of symptoms is not harmful and is thought that, over time, will set the threshold higher and higher until normal activities both in and out of work are no longer symptom provoking.

Individuals should gradually resume normal physical and cognitive work-related activities. While this is sometimes difficult to initiate and understand, a rule of thumb that I have incorporated into my practice is to begin with the 10-20-30 rule. Cognitive activity can be initiated in 10-minute periods followed by 30-minute rest periods. If doing this three successive times does not exacerbate the symptoms, progress to 20-minute activity periods followed by 30-minute rest periods, three times. Once the 30-minute level is reached without symptom exacerbation, the injured worker can consider returning to work part-time, with adaptations to the work environment (sunglasses, earplugs, quieter workspace, area with less movement) for specific symptoms.

Early introduction of aerobic physical activity is a major factor in rapid recovery. Lawrence and colleagues reported that, "for each successive day in delay to initiation of aerobic exercise, individuals had a less favorable recovery trajectory."[5] Dr John Leddy of the University of Buffalo Concussion Clinic pioneered the concept of subsymptom exercise threshold rehabilitation.[6] Patients can be exercise-challenged to determine the level, duration, and intensity of activity at which symptoms appear and peak no more than 2 out of 10 above their baseline symptoms. The doctor can then prescribe an individualized exercise regimen, gradually increasing intensity and duration to the endpoint of submaximal heart rate exercise for 30 minutes without symptom exacerbation. This has been shown to accelerate recovery.

Interventions that are associated with better outcomes include early education and early psychological and physical support.[7,8] Setting a patient's expectations of recovery and reentry into the workplace and establishing a goal of returning to their previous job early in the course of treatment and management is recommended. Occupational therapists have a 4-P strategy for assisting return to work: prioritize, pace, plan, and position (that is, change positions frequently and switch up activities).[9] This approach can be initiated by the patient's primary care physician and supported by allied health care professionals such as physiotherapists or occupational therapists.

Primary care physicians can play a significant role in identifying injured workers with significant multiple risk modifiers who should be considered for early referral to a multidisciplinary clinic, such as WorkSafeBC's Head Injury Assessment and Treatment Service (HIATS). Significant modifiers include a history of prior concussions or migraine headaches, and patients for whom headache is the predominant symptom.

For more information or assistance with treatment of work-related concussion in a worker patient, or to discuss referral to HIATS, please contact a medical advisor in your nearest WorkSafeBC office.

—David J. Rhine, MD, FRCPC
WorkSafeBC Medical Advisor and HIATS Medical Consultant

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

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OBESITY SUMMIT
Vancouver, 6 Apr (Sat)
To be held at the Morris J. Wosk Centre for Dialogue, UBC CPD's 7th annual Obesity Summit aims to connect health care practitioners with specific interests in caring for patients who are obese. Expert and guest speakers from the obesity discipline will discuss a broad range of topics on obesity and bariatrics. Target audience: family physicians, surgeons, registered dietitians, nurses, physiotherapists, occupational therapists, residents, and others interested in caring for patients who are obese. Topics covered: medical and dietary management of obesity, challenging medico-surgical case rounds, preoperative and postoperative patient care, and obesity management with additional medical issues. Course format consists of collaborative didactic lectures and interactive small-group workshops and panel discussions. Time has been set aside for networking. Join us at the end of the day for a reception to meet with friends and colleagues. Program details and online registration: https://ubccpd.ca/course/BCOS2019. BC Obesity Society website http://bcobesity.net/. Tel 604 675-3777, email cpd.info@ubc.ca; ubccpd.ca.

NUTRITION IN PRIMARY CARE
Vancouver, 6 Apr (Sat)
Nutrition in Primary Care: Update and Controversies 2019 will be held at SFU Harbour Centre. This program is designed to enhance primary care providers' knowledge of applied nutritional biochemistry and the associated research literature pertaining to several conditions commonly encountered in clinical practice. Various levels of evidence will be presented for evaluation and discussion in order to facilitate improved communication with patients about health promotion, disease prevention, and preferences for treatment. This group learning program has been certified by the College of Family Physicians of Canada for up to 5.75 Mainpro+ credits. At the conclusion of this activity, participants will be able to critique current evidence for nutritional support in several conditions commonly encountered in primary care, including the prevention of dementia and support of cardiovascular health; evaluate claims for potential health benefits or adverse effects resulting from popular weight loss diets; explain nutritional biochemistry related to specific metabolic pathways and physiological processes influencing stress and adrenal health; and communicate knowledgeably with patients about their preferences for treatment, including the use of specific diets and nutritional supplements. Download the program brochure for additional information. Scholarships are available to undergraduate and graduate medical students. Online registration: https://isom.ca/event/npc-bc/. Email info@isom.ca.

CME ON THE RUN
VGH and various videoconference locations, 12 Apr–10 May (Fri)
CME on the Run sessions are held at the Paetzold Lecture Theatre, Vancouver General Hospital, and there are opportunities to participate via videoconference from various hospital sites. Each program runs on Friday afternoons from 1 p.m. to 5 p.m. and includes great speakers and learning materials. Date and topics: 12 Apr (gynecology & urology). Topics include: Current STI guidelines; Management and prevention of kidney stones; What's that in my sack? Assessing testicular masses; Female genital dermatology: The good, the bad, and the unexpected; New drugs for overactive bladder; Menopause and HRT 2019; Current approach to UTIs and bacterial vaginosis in pregnancy; Microscopic hematuria: When to be concerned and what to do. The next session is 10 May (internal medicine). To register and for more information visit ubccpd.ca, call 604 675-3777, or email cpd.info@ubc.ca.

MINDFULNESS IN MEDICINE WORKSHOPS AND RETREATS
Tofino, 26–29 Apr (Fri–Mon)
Cortes Island, 14–19 Jun (Fri–Wed)
Join Dr Mark Sherman for an exploration of mindfulness and meditation and how these practices support the work you do, the life you live, and the person you are. Tofino: Foundations of Theory and Practice Workshop for Physicians and Partners. Cortes Island (Hollyhock): A Physician Meditation Retreat. For more information or to register please go to www.livingthismoment.ca/events.

TROPICAL AND GEOGRAPHIC MEDICINE INTENSIVE SHORT COURSE
Vancouver, 6–10 May
The University of British Columbia Faculty of Medicine is pleased to offer this 6th annual CME course for health care providers who seek to learn an approach to preventing, diagnosing, evaluating, treating, and managing tropical diseases. It is especially useful for those who intend to practise in areas endemic for these diseases. Three broad areas are emphasized: clinical tropical medicine, parasitology, and public health. Material to be covered includes clinical descriptions and approaches to evaluation and treatment of tropical diseases and strategies for infection control within

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communities that makes a critical difference to survival. Participants will gain practical experience through laboratory and problem-solving exercises. Register early as space is limited. More information at www.spph.ubc.ca/continuing-education/tgm2019/. Contact: spph.ce@ubc.ca, tel 604 822-9599.

ORTHOMOLECULAR MEDICINE TODAY CONFERENCE
Vancouver, 31 May–2 Jun

To be held at the Fairmont Hotel, the 48th annual International Orthomolecular Medicine Today conference is a continuing education event for medical doctors, naturopathic doctors, nurse practitioners, pharmacists, and other health care professionals. The conference is presented by the International Society for Orthomolecular Medicine, which brings together orthomolecular associations established in more than 20 countries around the world. Orthomolecular Medicine Today provides a forum for leading clinicians and researchers to present current advances in orthomolecular oncology, immunology, and general medicine. Learn about the safe and effective use of non-patentable molecules for improving patient outcomes. Additional information and online registration at https://isom.ca/event/omt2019/. Email: info@isom.ca

EMERGENCY AND CRITICAL CARE CONFERENCE
Parksville, 1–2 Jun (Sat–Sun)

Join us in Parksville on Vancouver Island for this year's Vancouver Island "Top 5 in 10" Emergency and Critical Care conference. This course will be held at the Parksville Community Centre and is geared to emergency physicians, family physicians, registered nurses, residents, and students. This event has been expanded to 2 days and will maintain the same great format of 10-minute lectures, fun intermissions, contests, entertainment, and videos. Come laugh and learn. Saturday night mixer with special guest Dr Brian Goldman. Course features at the new venue will now include the critical care component. Great speakers: Drs Grant Innes, Peter Rosen, David Williscroft, and more. There may also be an APLS pre-conference course—stay tuned. Accommodation: The Beach Club Resort: http://bit.ly/viec2019rooms. Group code: UBC CPD-Vancouver Island Emergency Conference. Booking deadline: 30 Apr. Program details and registration: https://ubccpd.ca/course/viec2019. Tel 604 675-3777, email cpd.info@ubc.ca.

PRACTICE SURVIVAL SKILLS
Vancouver, 15 Jun (Sat)

The 12th annual Practice Survival Skills—What I Wish I Knew in My First Years of Practice conference will be held at the UBC AMS Nest and emphasize practical, nonclinical knowledge crucial for your career. Topics include billing and billing forms, rural incentives, MSP audits, medicolegal advice and report writing, job finding and locums, financial and insurance planning, practice management and incorporation, licensing and credentialing, and digital communication advice. Target audience: family physicians, specialty physicians, locums, IMGs, physicians new to BC, family practice and specialty residents, and physicians working in episodic care settings. Course format comprises collaborative didactic lectures and interactive small group workshops; plenty of networking opportunities, and practice-based exhibits. Join us in the afternoon for a job fair and networking reception to meet with colleagues and make career connections. Program details and online registration at https://ubccpd.ca/course/practice-survival-skills-2019. Tel 604 675-3777, email cpd.info@ubc.ca.

GP IN ONCOLOGY TRAINING
Vancouver, 9–20 Sep and 3–14 Feb 2020 (Mon–Fri)

The BC Cancer's Family Practice Oncology Network offers an 8-week General Practitioner in Oncology training program beginning with a 2-week introductory session every spring and fall at the Vancouver Centre. This program provides an opportunity for rural family physicians, with the support of their community, to strengthen their oncology skills so that they may provide enhanced care for local cancer patients and their families. Following the introductory session, participants complete a further 30 days of customized clinic experience at the cancer centre where their patients are referred. These can be scheduled flexibly over 6 months. Participants who complete the program are eligible for credits from the College of Family Physicians of Canada. Those who are REAP-eligible receive a stipend and expense coverage through UBC's Enhanced Skills Program. For more information or to apply, visit www.fpon.ca, or contact Jennifer Wolfe at 604 219-9579.

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NORTH VAN—FP LOCUM
Physician required for the busiest clinic/family practice on the North Shore! Our MOAs are known to be the best, helping your day run smoothly. Lucrative 6-hour shifts and no headaches! For more information, or to book shifts online, please contact Kim Graffi at kimgraffi@hotmail.com or by phone at 604 987-0918.

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RICHMOND—HOSPITALIST
Looking for hospitalist locum to work with a group of congenial physicians at Richmond Hospital. Community hospital, well supported by other specialist colleagues. Great place to work for new or recent grads with an interest in teaching. For more information, please contact David at daveli2006@yahoo.ca.

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SOUTH VAN/RICHMOND—FP/SPECIALIST
The South Vancouver Medical Clinic seeks family physicians and specialists. Split is up to 80/20. Closing your practice? Want to work part-time? Join us to see only booked patients or add walk-ins for variety. OSCAR EMR. Positions in Richmond also available. Contact Dr Balint Budai at tgr604@gmail.com.

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The Department of Otolaryngology at East Kootenay Regional Hospital in Trail is seeking a general otolaryngologist. The ENT program currently has one full-time otolaryngologist who offers the full range of ENT services. This is a new position due to needs of the growing community. Flexibility within work schedules can be arranged. There are currently 1.5 OR days per week that will be divided equally between the two surgeons. Join us in Trail and enjoy breathtaking vistas year round and a welcoming community atmosphere. Apply today and live work and play where others only vacation! Email CV to PhysicianRecruitment@InteriorHealth.ca.

VANCOUVER (INNER CITY)—PT/FT GENERAL PRACTITIONER
The Vancouver Native Health Society medical clinic is seeking general practitioners to join us in providing primary health care promoting both Indigenous and Western approaches to health and wellness, healing and medicines, and culturally safe care. Payment schedule: sessional. In addition to providing general primary care in a community setting, the clinic also has robust addiction medicine and HIV/HCV programs. The VNHS medical clinic is a multidisciplinary comprehensive care clinic responding to the needs of the Indigenous and non-Indigenous community. We welcome applications and inquiries from interested physicians. Contact recruitment: VNHS at hra@vnhs.info.

VANCOUVER (VGH)—CLINICAL ASSOCIATE/HOSPITALIST, VANCOUVER ACUTE KIDNEY TRANSPLANT PROGRAM
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VANCOUVER (W BROADWAY)—SEEKING PHYSICIANS
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VICTORIA—GP/WALK-IN
Shifts available at three beautiful, busy clinics: Burnside (www.burnsideclinic.ca), Tillicum (www.tillicummedicalclinic.ca), and Uptown (www.uptownmedicalclinic.ca). Regular and occasional walk-in shifts available. FT/PT GP post also available. Contact drianbridger@gmail.com.

WILLIAMS LAKE—FAMILY PRACTITIONER WITH ANESTHESIA
Fantastic opportunity for a general practitioner with GPA residency year to join our team at Cariboo Memorial Hospital in Williams Lake. In addition to your GP practice you will provide GP anesthesia services 2 days a week, with only 1 night of call/week, and 1:5 weekend call. Our group supports complex surgical and OB/GYN cases, as well as airway management of critical care patients in the ER, and does scope sedation for colonoscopies gastroscopies. Enjoy working in a stimulating environment alongside other dedicated health care providers in a prosperous community with abundant recreational opportunities at your doorstep. Apply today! Email CV to PhysicianRecruitment@InteriorHealth.ca.

WILLIAMS LAKE—FAMILY PRACTITIONER WITH EMERGENCY
Opportunity for FP physicians with ER experience to practise emergency medicine, CCFP-EM is not required. Join our team at Cariboo Memorial Hospital in Williams Lake and practise in a welcoming setting where the lifestyle opportunities are endless. We see a broad range of interesting cases involving numerous procedures and we are well supported by specialists in internal medicine, OB/GYN, general surgery, pediatrics, and psychiatry. Emergency experience would be an asset but we have the capacity to mentor new Canadian graduates or international graduates. Apply today! Email CV to PhysicianRecruitment@InteriorHealth.ca.

medical office space

CUMBERLAND (VANCOUVER ISLAND)—OFFICE SPACE FOR GENERAL PRACTICE
Office space available for a family medical practice in Cumberland, BC. If you desire an incredible work-life balance, Cumberland is the perfect community in which to work and raise a family. This office space is currently used as a family medical practice, so setting up can be very easy, along with a captive and growing patient population. Please contact sean@blueoceandentalgroup.com or 250 622-4290 for more details.

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doctors of bc

Proust questionnaire: Dr Judith Hall

Where do you live?
Vancouver, on UBC Campus.

What profession might you have pursued, if not medicine?
Anthropology/archaeology, because the differences in societies and cultures are so interesting.

Which talent would you most like to have?
Extrasensory perception, so I could actually know what others are thinking, instead of just guessing.

What do you consider your greatest achievement?
Surviving and thriving in a patriarchal profession (which has been changing over my career).

Who are your heroes?
Women physicians who listen to their patients and take the time needed.

What is your idea of perfect happiness?
Being active, alert, engaged, and regularly close to nature.

What is your greatest fear?
Having a preventable accident.

What is the trait you most deplore in yourself?
Allowing myself to become too busy to listen and be empathetic.

What characteristic do your favorite patients share?
Wanting what's best for their kids and providing tough love for themselves and their children.

Which living physician do you most admire?
Dr Cynthia Curry, a clinical geneticist working in a difficult situation, providing exemplary care in spite of horrendous systemic and financial barriers, and working hard to make a diagnosis in the ever-changing landscape of clinical genetics.

What is your favorite activity?
Pulling diverse concepts together, exploring unchartered territory, and providing new concepts or options to trainees, patients, and peers.

On what occasion do you lie?
It's not really lying, it's just not bringing up or taking up subjects and topics that lead to conflict.

Which words or phrases do you most overuse?
Fantastic, fabulous, appalling, and pathetic.

What is your favorite place?
The Pacific Northwest.

What medical advance do you most anticipate?
Finding ways to alter epigenetic programming; in other words, to break the cycle of three-generational poverty, abuse, and illness.

What is your most marked characteristic?
Curiosity, along with gratitude and generosity.

What do you most value in your colleagues?
Sharing their curiosity and kindness.

What are your favorite books?
Aging Well by George Vaillant, and *The Lacuna* by Barbara Kingsolver.

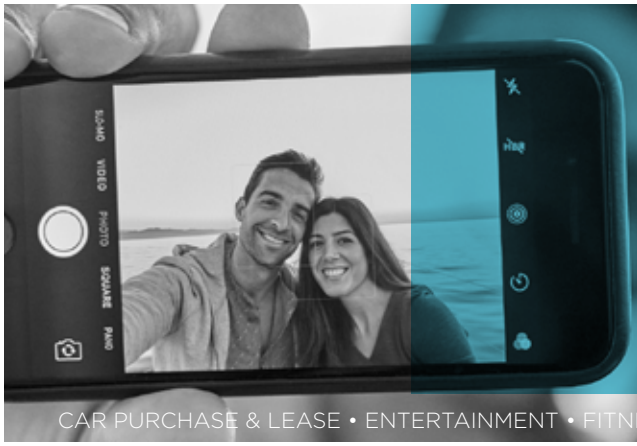
What is your greatest regret?
Not understanding the role of elders in our society until I became one.

What is the proudest moment of your career?
Having my whole family come when I was inducted into the Canadian Medical Hall of Fame.

What is your motto?
There are always three possible solutions.

How would you like to die?
At over 100, healthy and vigorous, in my sleep.

Dr Hall is a clinical geneticist and pediatrician. She is currently a professor emerita and is active in the new UBC Emeritus College. Dr Hall was head of the Clinical Genetics Unit and chair of pediatrics at BC Children's Hospital, and has published extensively on congenital anomalies.



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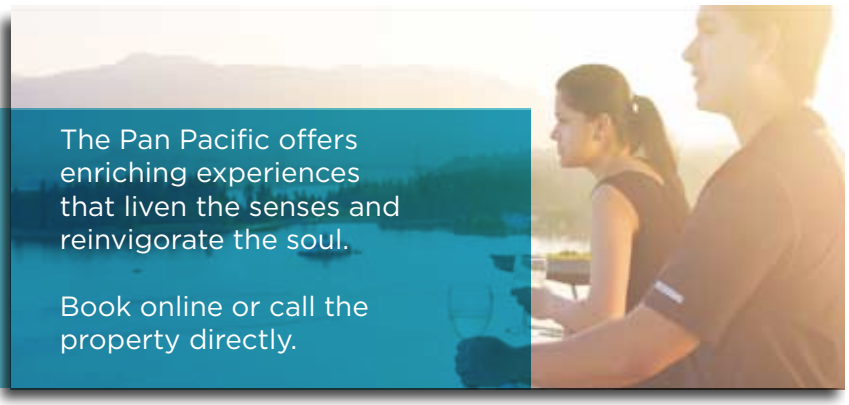

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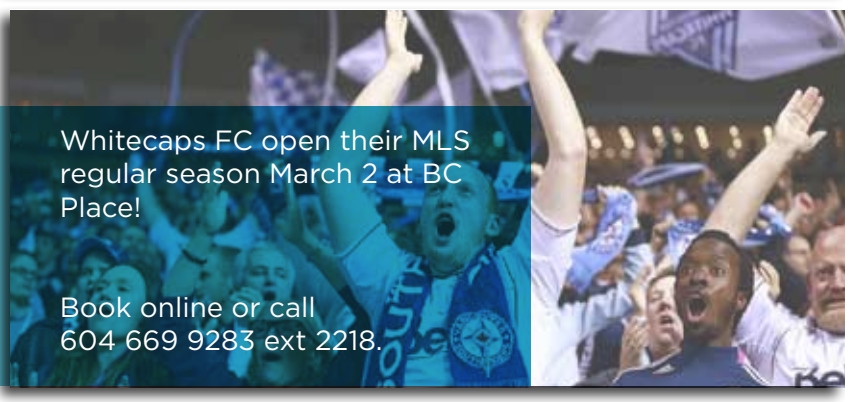

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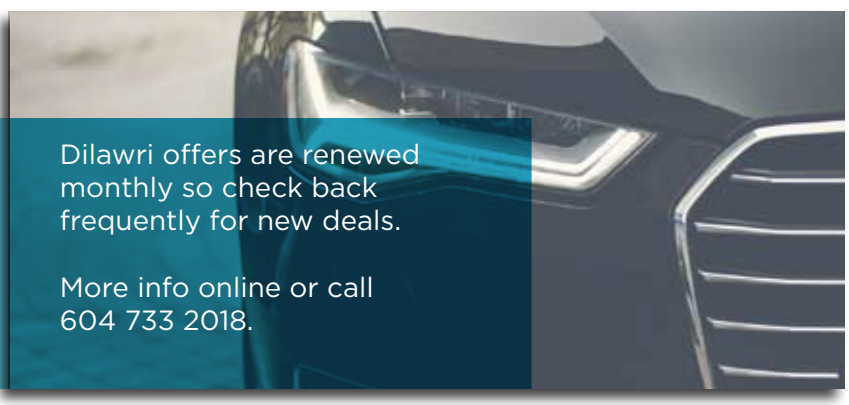

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