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Fertility treatment options after vasectomy

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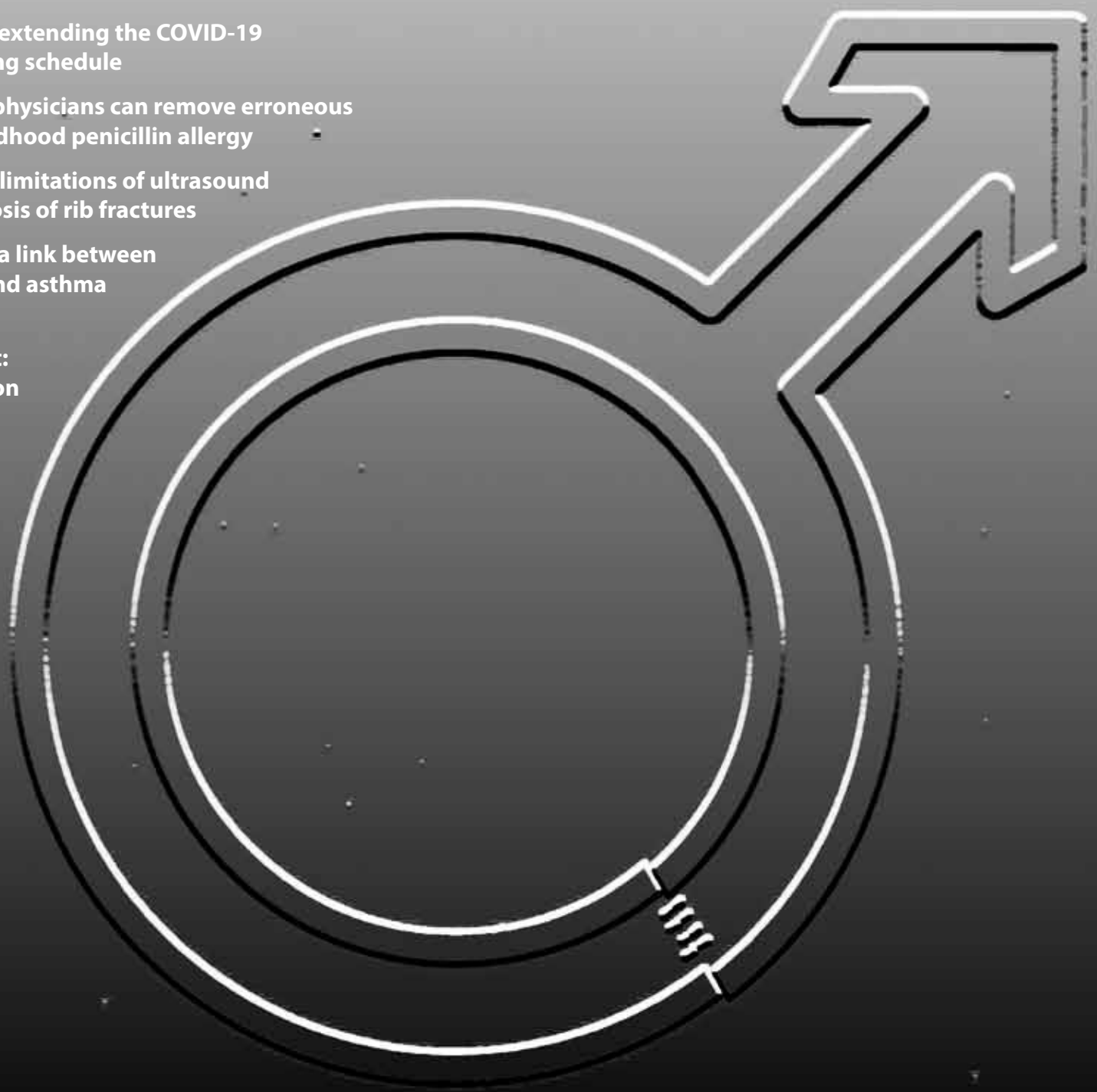

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There is increasing evidence that walking in nature can enhance immunity and improve chronic disease states. Read the Council on Health Promotion article on page 74.

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ON THE COVER
Fertility treatment options after vasectomy
Men who have had a vasectomy have numerous good options for achieving a pregnancy with their female partner. Article begins on page 62.

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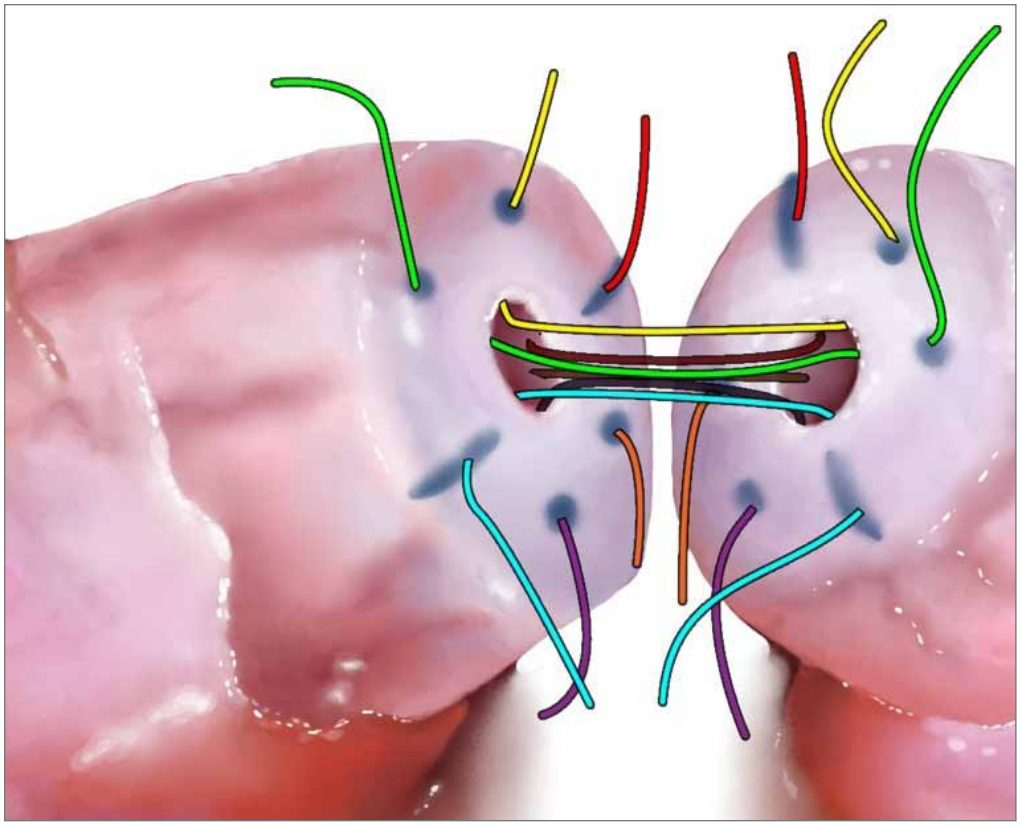

Although vasectomy is thought of as a permanent form of birth control, men who wish to attain fertility after having the procedure may undergo a vasectomy reversal to achieve pregnancy with their partner. The highest reported success rate for vasovasostomy is the Goldstein microdot multilayer anastomosis, illustrated here. Article begins on page 62.

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Vaccines

25 January 2021

I received my first dose of vaccine against COVID-19 last week. A fellow physician from another location injected me at a hospital vaccination clinic. For some reason he avoided the bulk of my deltoid and aimed for the acromion, causing him to hit bone. I do not think he gives many vaccines where he normally works. One of my younger office colleagues pointed out that sometimes it is difficult to find the atrophied deltoid muscle of the withered elderly.

It burned going in, which I attribute to it not being room temperature. The next day I wondered if the vaccine had made me achy, but then I remembered that I am always achy. Apart from feeling like I had been punched in the arm for a few days, all is well.

I can already feel my DNA being altered and am hoping for either the superpower of being able to fly or become invisible at will (which would you choose?). As an aside, when I ask patients this question, almost every child wants to be able to fly, while most adults want invisibility so they can go where they should not. Regardless, I am doing well and am making friends with my new microchip. I am so glad they don't have to monitor my cellphone anymore.

I was given the Pfizer vaccine, as were three of my office colleagues. My other three colleagues received the Moderna vaccine, so we are now divided into teams and are carefully watching each other. They must not have activated the chips yet because I still must speak out loud to converse with my fellow Pfizers.

In truth, I feel privileged to be in the first wave vaccinated against this horrible virus. I stand in awe of the science behind these vaccines and the collective effort that led to their speedy development. It is a testament to what can be accomplished when humankind works together.

I hope this spirit of collaboration continues throughout this vaccine rollout process. It will be March before this editorial is published, and I remain optimistic that by the publication date a mass vaccination program will have been outlined. There have been some missteps so far, such as wasted doses, supply issues, queue jumping, and lack of transparency. However, getting millions of doses into millions of arms on this scale is a challenge none of us has previously faced.

It is crucial that the vaccination process proceeds in an organized and speedy fashion if we are going to control this virus and allow life to return closer to normal. The longer the virus reigns free, the greater the chance there is for it to mutate and form a strain that is resistant to the current vaccines. Not only must the developed world be vaccinated, but efforts must be made to vaccinate poorer countries, both for humanitarian reasons and to ensure a large reservoir of potentially mutating virus does not exist.

There will likely be more bumps in the road as this mass vaccination program gathers speed. However, if we meet these adversities with patience and ingenuity, it is only a matter of time before this pandemic will be behind us.

Above all, remember to be kind, because I will receive my second dose in a few weeks and could be watching. ■

—David R. Richardson, MD

Searching for the silver lining

We've missed so much this year. The directly tragic stories are of families missing loved ones lost to or harmed by the virus, or those suffering from isolation: poverty, loneliness, addiction, and mental illness. Overlying everything is the "lessness" of our ability to give our patients and loved ones full attention and care.

I cannot emphasize enough how much respect and gratefulness I have for my colleagues who face risk directly, looking after very sick patients. We who remain healthy and privileged to have safety nets in our lives and jobs have lived what should be a perspective-changing year.

First, we must acknowledge that living in this province, with the particular leadership decisions that have been made, and the luck associated with the timing of spring break, has left us in a better position than most. When we have needed our neighbors to do their part for one another, we and our communities have, for the most part, politely complied. And when we haven't, the consequences have been frightening but, touch wood, not so catastrophic that we couldn't continue our steady course through them. Watching the devastation across a political border, our fortune is clearly spotlighted. That spotlight also illuminates glimmers of silver linings.

We have been able to spend more time with our families in our homes, and to be creative with our time and energy in new ways. By allowing ourselves to simply do the best we could in the situation, we became open to accepting things that were, maybe, not traditionally acceptable. It's now clear that supported, unfettered research can lead to successful results—novel vaccines have been developed with unprecedented speed and effectiveness. Having technology that offers us inexpensive face-to-face access to other people allows us to feel closer to those we can't be close to. Fewer patients have had to travel the highways for their follow-ups, and almost all of them are grateful for the reduced risk and cost. These silver linings will be long-term.

Many of us have taken time to be alone with ourselves. We made walking in the street a destination. Some learned to make bread or knit or write music or teach math. Partners have had the opportunity to appreciate each other's lives more fully. When we were publicly reminded to be kind, we didn't roll our eyes. We saw how others were affected and learned how to reach out even when we were locked in. We were collectively moved by and shared things happening all over the world that we might have previously found mawkish—apartment-window-singing in Italy, pot-banging and applause marking 7 p.m. everywhere. We realized that we were part of something affecting all of humanity, all with equal jeopardy. As independent humans we were forced to accept being reduced by an invisible force to the vagaries of biology that we all share.

Silver linings are personal touch points during a time of anxiety, for most of us. It's interesting to hear what people dream of doing when the pandemic is so-called over—eating inside a restaurant, enjoying a concert, taking a cruise, traveling in general, enjoying the breeze on an uncovered face. All of those sound wonderful, but for me, it's experiencing the joy of touch again.

I am, to the base of my soul, a hugger. I hadn't realized how much I rely on the warmth and security of closeness and touch. At work there was perhaps some privilege in being a woman of my generation to be able to socially touch patients. A hand on a shoulder, a shoulder for tears, the nest of our arms holding a baby. From seconds after we are born, we strive for skin-on-skin touch, and I see now that it never really left me. Touch feels warm, protective, and bonding. It can express grief, compassion, and care where words fail. People let into a circle of compassionate touch know that they are loved and cared for. The tacit exchange of vulnerabilities and comfort is otherwise difficult to express, outside of poetry.

Heartbreakingly, this year has made me touch-averse. I automatically widely avoid people on sidewalks and in hallways, move away in conversations, and even feel reflexively assaulted if someone comes too close or touches me. I wince during movies filmed pre-COVID-19 at what now stands out as absolutely reckless casualness in contact and unprotected faces. My brain feels completely rewired: I'm in some ways foreign to my basic nature.

The moment we can once again experience the joy of social touch will be the time that I define as things being back to right. It cannot come soon enough. ■

—Cynthia Verchere, MD

Great leadership during uncertain times

22 January 2021

It has now been a year since the COVID-19 pandemic reached our shores. During these uncertain times, we have seen first-hand how skillful leadership is more important than ever. And while there have been volumes written on what constitutes great leadership, the following three traits seem to be common to some of our most capable, effective, and trustworthy leaders.

Great leaders are great listeners. Listening seems to be a lost art at a time when everyone is blasting away with 280 characters or less. Listening takes time, focus, and intention. It means stopping to make sure what has been said has been heard and understood. Unfortunately, listening is one of the first casualties in a crisis, yet it is critical to successful leadership. There are some obvious advantages to listening, such as gaining important perspectives and becoming aware of emerging risks, but I think there is another reason why listening is so important. People do not want to follow people who don't listen. It's a fundamental human need to be heard. Great leaders know this. They take listening as seriously as any other skill, meaning they put in the time to become better listeners, they practise constantly, and they measure their progress.

While being great listeners, great leaders also know how to tune out noise. During a crisis, everything is urgent, and everything and everyone demands immediate attention, but as the saying goes, "when everything is a priority, nothing is." Noise seems to be particularly prevalent these days on social media. I was challenged to do an experiment where I significantly curtailed my consumption of social media for 2 weeks. Not only did I gain back time for self-care, I was no less informed about the issues that were important to me. I needed only 15 to 20 minutes per day to scan through the viewpoints of credible people, then I could get on with my life. I did have a good chuckle at some of the flame wars between people with contrary views, but it was liberating to not be involved. My little experiment also revealed how much social media warps people and complex issues into oversimplified caricatures—great for eliciting a highly charged emotional response but not conducive to effective debate. I often wonder how much more progress people would make if they sent each other a discrete direct message or fired up a video chat rather than exchanging volleys over Twitter.

Great leaders also show that they care about the people they lead. There are many ways to do this, as we have seen during the pandemic. Some leaders show their care through expressions of raw emotion, which break through their calm exterior—a little anger, a few tears, a departure from their speaking notes. Others demonstrate care through service, such as pinch hitting when staffing is short or volunteering for an undesirable task. And then there are those who express their care by how they address people, responding with respect when it would be easier to be dismissive, meeting anger with compassion, treating others as they would want to be treated. All this presumes that a leader cares about the people they are leading. Even children can tell the difference between someone who genuinely cares for them and someone who merely says they do. Great leaders genuinely care and they take pains to show it.

Anyone can learn and practise great listening skills, tune out the noise, demonstrate care for others, and become a great leader. Granted, it's more challenging to accomplish these days. The COVID-19 restrictions have limited the opportunities for face-to-face interaction that is so critical for thoughtful debate and effective leadership. The restrictions have made it difficult for leaders to listen, to avoid distraction, and to demonstrate genuine care when they are limited to news releases, emailed communications, and brief townhalls. And they have made it difficult for those who follow to stay engaged and connected. But we can overcome this by having more leaders who are closer to the people they serve and who can demonstrate these important traits. I have seen this in doctors stepping up in their communities to listen to their neighbors, filter through all the conflicting medical information, and show they care. Some of the most effective leaders I have seen have no formal title, they simply saw a gap and filled it.

When I think about the challenges this next stretch of the pandemic will bring, I'm aware that now more than ever we need more people to step up as leaders. We need to overcome a continuous onslaught of noise and outright misinformation. We need to convince more people to follow public health directions, even as high-risk and vulnerable people become protected by vaccination. We need to combat prejudice and tribalism that still rears its head despite our vigilance. And, we need to take care of each other by listening to one another, by freeing ourselves from the distractions that take us away from what's important, and by showing that we care. ■

—Matthew C. Chow, MD
Doctors of BC President

Letters to the editor

We welcome original letters of less than 300 words; we may edit them for clarity and length. Letters may be emailed to journal@doctorsofbc.ca, submitted online at bcmj.org/submit-letter, or sent through the post and must include your mailing address, telephone number, and email address. Please disclose any competing interests.

Re: Medical education during COVID-19

The COVID-19 pandemic is a global health threat that has challenged medical schools across the world to rapidly transition from conventional classroom training to virtual learning environments. As proposed by Dr Wong in his article (*BCMJ* 2020;62:170-171), the strategies posed to secure medical training during this pandemic should be principle-based, forward-looking, and compassionate.[1]

As medical students in the Dominican Republic, we have witnessed firsthand the effects of this pandemic in our professional formation. New obstacles—such as limited access to reliable Internet connections, faculty members and students without experience in virtual learning, and feelings of anxiety due to isolation and the unknown future—can affect the quality and delivery of medical education.

In low- and middle-income nations, available resources can be scarce, and medical schools should be creative when addressing the challenges experienced by faculty members and students. To ensure access to reliable Internet connections, some programs in the Dominican Republic have developed formal agreements with telecommunication companies.[2] Although the long-term impact of these agreements is unknown, they will surely offer valuable learning opportunities to students from urban and rural areas alike, while also providing faculty members with the tools to strengthen teachers' skills. By fostering intersectoral cooperation between medical schools and telecommunication companies, the One Health concept[3] can be applied in a practical setting.

Additionally, when virtual simulations are integrated into didactic coursework, medical students can enhance their problem-solving and decision-making abilities on essential clinical topics, and educators can provide feedback on their academic performance.[4] As faculty members must remain up-to-date on the use of virtual interfaces, quarterly training sessions can familiarize them to minimize anxiety due to technological complexities.[5]

In light of these challenging circumstances in virtual learning, medical education must take advantage of innovative technologies to improve student competitiveness and prepare them for emerging health threats.

—Vielka Fernandez

—Priscila Hernandez

Santo Domingo, Dominican Republic

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Acknowledgment of referral

As an old, retired specialist, I am driven nuts by a certain policy among some specialists! I am referring to the policy of making no contact with a patient who has been referred until an appointment can be arranged. As I understand this policy, each referral is filed, and when an appointment time becomes clear, the patient is contacted. This policy assumes that the referral process is infallible. It has been known for referrals to get lost in cyberspace. This means that the patient receives no recognition that a referral has been received. How long should a patient who hears nothing wait to discover that the referral got lost?

I believe that all specialists' offices should contact the patient as soon as they receive a referral. The patient should be informed of the office policy. They may be told that they should expect a call in N weeks, when they will be given an appointment, if this is how the office works.

—Ben R. Wilkinson, MB, FRCSC

Yellow Point

The BC College of Physicians and Surgeons has published a guideline addressing the above concern in detail (www.cpsbc.ca/files/pdf/PSG-Referral-Consultation-Process.pdf). Briefly stated, the College recommends that consulting physicians acknowledge receipt of referrals as soon as possible, at the same time indicating if the referral is being accepted or rejected. The College also expects that the consultant will promptly advise both the patient and referring physician of the date and time of the appointment. —ED

Sean Duke, MSc, Tiffany Wong, MD, FRCPC, Warda Toma, MDCM, FRCPC, MPH

Empowering community physicians to remove erroneous labels of childhood penicillin allergy

With adequate training and use of clinical guidelines, nonallergist health care providers can help reduce the consequences of unverified beta-lactam allergy and improve the capacity for allergy evaluation by safely implementing direct oral provocation testing in children at low risk of true allergy.

ABSTRACT: Childhood beta-lactam allergy is frequently reported, but most of the children in these cases can safely tolerate the antibiotics without adverse reaction. This discrepancy may be due to the attribution of viral exanthems and drug-virus interactions to beta-lactam hypersensitivity without reliable evaluation. Erroneous beta-lactam allergy labels confer substantial public health consequences, including longer hospital admissions, higher rates of antimicrobial resistance, and higher health care costs. These preventable outcomes, stemming from the unnecessary withholding of first-line antimicrobial therapy for several common infections, have prompted several large-scale initiatives that promote the widespread evaluation of beta-lactam allergy. Recent studies have generated a shift in the routine evaluation of beta-lactam allergy in a large proportion of children in favor of direct oral challenges that forgo traditional antecedent skin tests. A Canadian Paediatric Society statement from January 2020 recommends using a clinical algorithm to administer a test dose of amoxicillin to children deemed to be at low risk of true allergy, such that family physicians and general pediatricians may safely and reliably evaluate unverified beta-lactam allergy—as long as they are equipped to carefully select patients, interpret clinical findings, and manage adverse reactions, including anaphylaxis. The involvement of nonallergist physicians can dramatically expand the capacity for evaluating childhood beta-lactam allergy, a responsibility that has been shouldered exclusively by pediatric allergists, and subsequently permit the use of first-line antimicrobial therapy in a large group of patients.

Mr Duke is a medical student at the University of British Columbia. Dr Wong is a clinical assistant professor in the Faculty of Medicine, Department of Pediatrics, Division of Allergy & Immunology, University of British Columbia. Dr Toma is a clinical instructor in the Faculty of Medicine, Department of Pediatrics, University of British Columbia.

This article has been peer reviewed.

Beta-lactams, particularly penicillins and their derivatives, are among the most commonly prescribed medications for children globally,[1,2] with common indications for the ambulatory, inpatient, and perioperative settings. They are the antibiotics of choice for the treatment of many infectious illnesses due to their low toxicity, targeted spectra of activity, excellent distribution throughout the body, and low cost.[3,4] Acute otitis media, the most common cause of childhood visits to a physician, remains the most frequent indication for beta-lactam prescribing in children.[5] Beta-lactam allergy is commonly misdiagnosed in children, as over 90% of children with this label are able to tolerate the antibiotics upon evaluation.[6-8] Unverified beta-lactam allergy presents a major set of challenges related to patient safety, antimicrobial resistance, and health care costs. We discuss the consequences of unverified beta-lactam allergy, highlight the importance of beta-lactam allergy de-labeling, and make suggestions for confronting this issue.

Erroneous beta-lactam allergy labels in childhood

Drug allergy, a reproducible, immune-mediated response to a pharmaceutical in a sensitized person,[9] represents a minority of adverse drug reactions to beta-lactams.[10] Adverse drug reactions to beta-lactams are common in children, with maculopapular exanthems occurring in 5% to 10% of children prescribed amoxicillin or ampicillin.[9]

Pediatric beta-lactam allergy labels are frequently acquired due to rashes that are reported by parents.[10] Viruses are the most common cause of childhood maculopapular or urticarial eruptions **[Figure 1]**.[2] A Swiss study involving 88 children with nonimmediate cutaneous eruptions after beta-lactam exposure revealed,

after a complete evaluation, that only 7% were allergic to the antibiotics.[2] A drug-viral interaction can result in a cutaneous reaction that is misattributed to drug allergy,[10] an example being aminopenicillin-induced exanthema in children with Epstein-Barr virus infection.[2] Other signs and symptoms of illness, such as cough and tachypnea, or coincidental events unrelated to illness, such as headache, can also be mislabeled as an allergic reaction.[11] Predictable side effects of beta-lactams, such as gastrointestinal upset, may be misattributed to drug allergy **[Table 1]**.[11]

Despite the unverified status of most beta-lactam allergy labels, this diagnosis often persists into adulthood because many clinicians—fearing a severe allergic reaction—elect to use alternative antibiotics, often without referral for evaluation.[2] Individuals frequently outgrow true penicillin allergy through the loss of IgE-mediated sensitivity over time,[12,13] which highlights the importance of reassessment.

Consequences of erroneous beta-lactam allergy labeling

Mislabeling of beta-lactam allergy is associated with significant public health concerns, including health consequences to patients, antimicrobial resistance, and higher health costs.[3,9,14,15] Direct consequences to patients include the needless reliance on second-line, more toxic, broader spectrum antibiotics such as fluoroquinolones, clindamycin, and vancomycin;[14] higher rates of multiple and parenteral antimicrobial therapy;[14] and increased hospitalization.[14] A cohort study involving 51 582 participants revealed that patients with unverified penicillin allergy had nearly 10% longer stays in hospital and were 14.1% to 30.1% more likely to suffer from *Clostridium difficile*, methicillin-resistant *Staphylococcus aureus*, and vancomycin-resistant *Enterococcus* infections versus matched controls.[14] Alternative antibiotics tend to be more costly than penicillin derivatives[3,16] and place patients at risk of adverse events.[17]

More widespread and routine evaluation of unverified beta-lactam allergy has become a major public health goal and is recognized as an essential component of antimicrobial stewardship,[18] which is reflected in recent Canadian Paediatric Society statements,[19,20] in American

FIGURE 1. Viral exanthem in a child. Source: DermNet NZ (Creative Commons Licence: https://creativecommons.org/licenses/by-nc-nd/3.0/nz/legalcode).[40]

TABLE 1. Classification of drug allergy as it pertains to beta-lactams.

Gell-Coombs classification	Timing of onset	Clinical presentation	Comments
Type I (IgE-mediated)	Immediate: < 1 hour	Urticaria, angioedema, respiratory distress, hypotension, anaphylaxis	Penicillin is the most common cause of medication-induced anaphylaxis;[30] however, the incidence of anaphylaxis to beta-lactams is reported to be < 1%.[35]
Type II (cytotoxic)	Nonimmediate: 10 hours to weeks	Anemia, thrombocytopenia	
Type III (immune-complex mediated)	Nonimmediate: 1–3 weeks	Serum sickness, tissue injury	Beta-lactam antibiotics, particularly cefaclor, have been implicated in serum sickness-like reactions,[36] which present with fever, rash, and urticaria; however, unlike serum sickness, they do not involve immune complexes, vasculitis, or renal lesions.[37]
Type IV (cell-mediated)	Nonimmediate: 2–14 days	Mild cutaneous: Maculopapular exanthema Severe/systemic: Stevens-Johnson syndrome, toxic epidermal necrolysis, drug rash with eosinophilia and systemic symptoms (DRESS) syndrome, acute generalized exanthematous pustulosis	Nonimmediate reactions are the most common reactions to beta-lactams in children. They occur in 5%–10% of patients taking beta-lactams,[9] and typically present as mild, self-limited maculopapular or urticarial exanthemas;[31] however, most of these reactions are attributed to an infectious cause, while the remainder are thought to be cell-mediated.[9]

and Canadian Choosing Wisely initiatives,[21,22] and most notably in the Obama administration's National Action Plan for Combating Antibiotic-Resistance Bacteria.[23]

Economic projections have produced compelling data on the increased costs associated with erroneous beta-lactam allergy. In reviewing inpatient charts, an antimicrobial stewardship program at a US tertiary hospital estimated an annual savings of US$82 000 from the de-labeling of unverified penicillin allergy in just 145 patients, accounted for by obviating several unnecessary measures, including intravenous therapy where oral beta-lactams were deemed superior, PICC line insertion/removal, routine drug-level testing, laboratory costs, and pharmaceutical drug calibration costs.[15] Further, a case-control study of 118 randomly selected inpatients with unverified penicillin allergy, and the same number of matched controls, revealed a 63% greater mean cost of treatment in the penicillin-allergic group.[3]

Evaluation of beta-lactam allergy in children

The conventional evaluation of penicillin allergy incorporates clinical history with confirmatory testing, including skin testing and oral provocation challenge in skin test-negative individuals.[12] Traditionally, diagnostic pathways for children have been extrapolated from adult guidelines, under the assumption that general principles are applicable across age groups.[24] However, growing evidence over the past decade has influenced a shift in routine practice, which supports the use of direct—that is, without antecedent skin testing—oral challenges to beta-lactams in children with mild index reactions to the antibiotics.[2,6,7,25-29]

Skin testing

Despite longstanding use of tests adjunctive to oral challenges in the evaluation of adult penicillin allergy, the diagnostic utility of such tests is not well established in the pediatric population.[2,27] A recent systematic review revealed a lack of rigorous evidence to support the use of specific IgE determination, intradermal testing, or skin prick testing for evaluating pediatric beta-lactam allergy.[27] In comparing clinical pathways against oral testing, Caubet and colleagues demonstrated the limited sensitivity of specific IgE (0%), intradermal testing (67%), and patch testing (0%) in 88 children with histories of mild cutaneous reactions to beta-lactams.[2] International guidelines recommend skin testing as first-line investigations for penicillin allergy[9,13] by virtue of its low risk[11] and negative predictive value of nearly 100% with standardized reagents in adults;[30] however, recent studies suggest a substantial false-negative rate in the pediatric population. A Canadian study revealed that 94% of children with observed immediate reactions to an oral amoxicillin challenge had negative intradermal testing.[7] The positive predictive value of skin testing in the evaluation of pediatric beta-lactam allergy is reported as 36%,[2] indicating a tendency to "overcall" beta-lactam allergy when a positive skin test is deemed sufficient for diagnosis. Aside from bearing diagnostic ambiguity, skin testing is time- and resource-consuming, causes discomfort, and is exclusively performed by allergists, who have limited capacity for the increasing demand for beta-lactam allergy evaluation.

Beta-lactam allergy is commonly misdiagnosed in children, as over 90% of children with this label are able to tolerate the antibiotics upon evaluation.

Oral provocation testing

Oral provocation testing, the accepted gold standard for evaluation of suspected beta-lactam allergy,[1,7,20] is relied upon for the confirmation or exclusion of allergy in carefully selected individuals.[7] However, there is no international consensus on how direct oral challenges are best conducted. Investigations have employed a variety of methods ranging from single dose[2] to graded dosing regimens[7,25,28,29,31] in a single day[8] or with an extended course.[25,29,31] Amoxicillin is the recommended beta-lactam for oral challenge[14,20] because it contains the immunologically relevant penicillin core structure.[14] Individuals with histories consistent with anaphylaxis or severe delayed reactions are considered to be at high risk of true allergy and are not suitable candidates for direct oral provocation testing.[9,20] Given the limited role of adjunctive testing in pediatrics, direct oral provocation testing appears to be more reliable[20,27] in evaluating nonserious pediatric beta-lactam allergy than conventional clinical pathways, with recent evidence demonstrating a specificity of 100.0%, negative predictive value of 89.1%, and positive predictive value of 100.0%.[7]

In recent studies, the safety of direct oral provocation testing for beta-lactams has been demonstrated in children identified as low risk of true allergy.[6,7,25,27-29] A Montreal prospective study involving 818 children with suspected amoxicillin-induced rash with low-risk features employed a direct, graded two-step direct amoxicillin challenge, which revealed tolerance in 94% of participants.[7] Of the remaining 6% of participants, 17 children experienced mild immediate reactions (urticaria), while 31 children developed mild nonimmediate reactions.[7] A Winnipeg chart review of 306 predominantly pediatric patients with suspected beta-lactam allergy demonstrated tolerance to the culprit beta-lactam in 96% of patients via direct oral challenge in low-risk patients or by oral challenge following negative intradermal testing in those patients with vague histories or those suggestive of an IgE-mediated reaction.[6] Of those patients who had positive oral testing, one experienced a possible Type I reaction (acute onset abdominal pain and emesis), while the remainder experienced nonimmediate maculopapular exanthema. A prospective study that used a graded five-step method of direct oral testing with the culprit beta-lactam in 119 children with a history of nonimmediate mild cutaneous reactions, followed by a 5-day, twice-daily extended course demonstrated tolerance in 97% of children, and only mild cutaneous symptoms in the remaining children.[25]

Direct oral challenges can safely[27] preclude diagnostically unhelpful, uncomfortable, time-consuming, and costly skin testing practices in low-risk children. In light of growing evidence that supports direct oral challenges

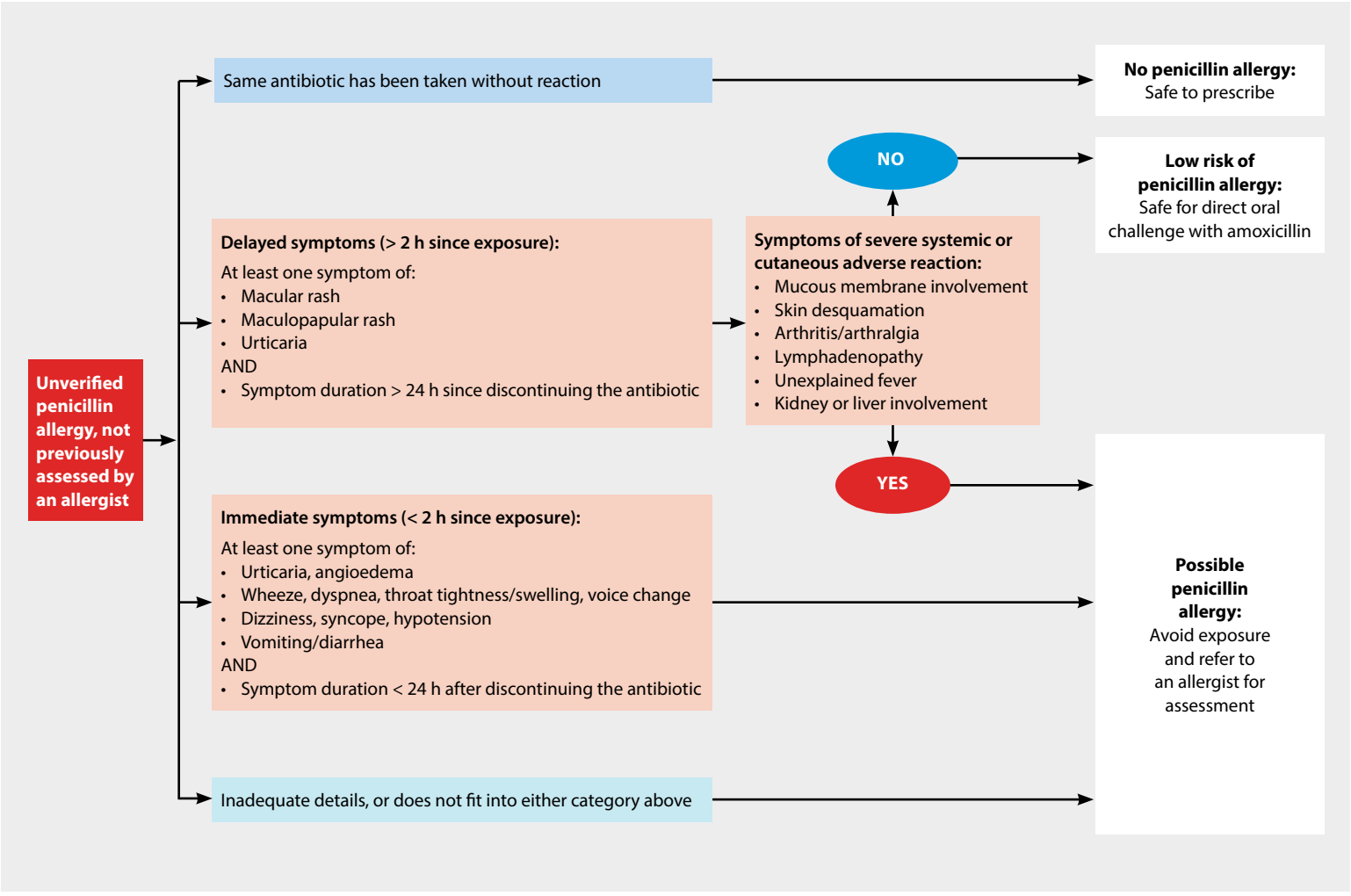

FIGURE 2. Algorithm for identifying pediatric patients at low risk of true penicillin allergy on the basis of history taking (adapted from Wong et al.[20]).

in this group, recent clinical guidelines have recommended direct oral testing in children with histories of mild nonimmediate reactions to beta-lactams.[20,24]

A new CPS Practice Point recommends an approach to the evaluation of suspected beta-lactam allergy in children, and provides guidance on patient selection (with reference to a succinct algorithm **[Figure 2]**), test dosing with amoxicillin, and in-office monitoring.[20] Although the risk of anaphylaxis is remote for carefully selected children, practitioners who perform direct oral challenges must be prepared to manage these life-threatening events. Proximity to a hospital is necessary to optimize successful outcomes in anaphylaxis. Stepwise recommendations for the evaluation of childhood beta-lactam allergy with direct oral challenges, including recommendations for in-office anaphylaxis preparedness, are outlined in **Table 2**.

Future directions

Pediatric allergists have limited capacity to meet the increasing demand for evaluating beta-lactam allergy. Given the high level of safety of direct oral provocation testing in children who are at low risk of true allergy, the burden of evaluating beta-lactam allergy in this group can be eased by the involvement of nonallergist physicians, such as general pediatricians and family physicians. In adhering to the recommendations outlined in the CPS Practice Point,[20] primary care providers can safely and reliably challenge a well-defined group of children to oral amoxicillin in the community, without referral to an allergist. That being said, given the remote but nevertheless important risk of anaphylaxis, it is critical for these physicians to possess the knowledge, training, and experience to select suitable patients, interpret clinical features associated with allergen exposure, and manage severe reactions should they arise in the office setting.[11] Regarding inpatients, one US hospital implemented a novel clinical guideline with associated educational sessions for various inpatient providers, including internal medicine specialists, surgical specialists, nurse practitioners, and physician assistants to aid in the prescription of antibiotics to inpatients with reported beta-lactam allergies.[32] The clinical pathway implemented direct two-step oral test doses for low-risk patients—a procedure that was previously ordered exclusively by

TABLE 2. Steps for evaluating suspected pediatric beta-lactam allergy in the community.

1. Prepare the clinic for anaphylaxis management.	Anaphylaxis protocol: • Clinic staff should be familiar with a printed, highly visible anaphylaxis protocol that has been tailored specifically for the office via input from multidisciplinary team members.[38] • The protocol should include medication dosages, flow sheets for managing respiratory distress and hypotension, and contact information for allied health services (e.g., ambulance, local emergency department).[38]
	In-office anaphylaxis simulation scenarios: • Regular rehearsal of the anaphylaxis protocol is strongly recommended in international guidelines.[39] • Roles for providing treatment, calling emergency services, and conducting treatment logging should be established. • Medical professionals who will be providing treatment should be able to quickly locate and assemble the necessary supplies (e.g., epinephrine, oxygen).
	Ensure certifications for medical professionals are up to date (e.g., Advanced Cardiovascular Life Support, Pediatric Advanced Life Support).
	Assemble an easily accessible, regularly maintained anaphylaxis cart. Essential components: • Injectable aqueous epinephrine (1:1000 solution) with needles and syringes, or epinephrine autoinjector (preferred) Consider including: • Personal protective equipment • Stethoscope • Blood pressure cuffs (pediatric and adult sizes) • Pulse oximeter • Oral second-generation antihistamine • Salbutamol metred-dose inhaler with spacer • Airway adjuncts (e.g., oral or laryngeal mask airway) • Oxygen and equipment for administration • One-way valve face mask with oxygen inlet port • Intravenous fluids and equipment for administration • Automatic electric defibrillator
2. Carefully select patients for direct oral challenge.	Figure 2 provides an algorithm for identifying pediatric patients who are at low risk of true penicillin allergy and are safe for direct oral challenge with amoxicillin.
3. Conduct direct oral challenge.	Low-risk individuals can safely undergo a single test dose of amoxicillin (15 mg/kg, max 500 mg), followed by a 1-hour observation period in the clinic to confirm tolerance.[20] Signs of immediate hypersensitivity should prompt urgent assessment and consideration for initiating the anaphylaxis protocol.
4. Document the outcome.	Medical records (e.g., community, pharmacy, and hospital records) should be updated.

allergists—which resulted in nearly a sevenfold increase in beta-lactam challenges, and thereby improved antimicrobial management with no increase in the rate of adverse drug reactions or consultation with allergy subspecialists.[32] The implementation of antimicrobial stewardship programs across Canadian centres that similarly empower nonallergist physicians to order test doses would improve rates of de-labeling among inpatients, and thereby improve patient safety, mitigate antimicrobial resistance, and reduce health care costs. Although the existing limited evidence of the safety and effectiveness of nonallergist-implemented direct oral challenges in children appears encouraging, further research is required.

Education for health care providers, patients, and families is critical in mitigating the ongoing misdiagnosis of beta-lactam allergy. Understanding drug hypersensitivity and how it differs from nonimmunological adverse drug reactions, how to interpret and accurately document index events, and how to properly obtain a drug allergy history will reduce erroneous allergy labels and prompt appropriate referrals.[10] Counseling for patients and their families on the implications of drug allergy test results, along with appropriate discharge paperwork and dissemination of results (e.g., pharmacy, primary care provider), are necessary components of the de-labeling process.[33] A Montreal study revealed that 18% of parents refused penicillins for their children despite negative skin testing and drug challenge within the past 4 years.[34] In following up with 88 families with children who had tolerated oral challenges to beta-lactams 1 year previously, Vyles and colleagues found that 52% of children retained a beta-lactam allergy label on their primary care provider's electronic medical record, while 28% of parents reported being less than "comfortable" with their children receiving beta-lactam antibiotics, mostly for fear of an allergic reaction.[33] De-labeling strategies must aim to provide succinct, clear messages to patients and their families to avoid erroneous re-labeling of drug allergy.

Summary

Unverified beta-lactam allergy in children is a major public health issue, conferring direct patient harm, administrative burdens for hospitals, and health care overspending as the result of the needless withholding of first-line treatment for a large group of patients. This has led to initiatives to encourage the widespread evaluation of patients with unverified beta-lactam allergy. Direct oral challenges are safe in a well-defined group of children comprising most cases of unverified beta-lactam allergy, which obviates the requirement for time- and resource-consuming—not to mention painful—antecedent skin testing in this group. With adequate training and use of clinical guidelines, nonallergist health care providers can safely implement direct oral challenges in low-risk patients and thereby improve capacity for beta-lactam allergy evaluation. This will permit the use of first-line antimicrobial therapy in a large group of patients, and subsequently improve patient safety, reduce contributions to antimicrobial resistance, and improve health care costs. ■

Competing interests
None declared.

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Primary care providers can safely and reliably challenge a well-defined group of children to oral amoxicillin in the community, without referral to an allergist.

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Fertility treatment options after vasectomy

Couples who wish to achieve a pregnancy following a vasectomy should discuss the various treatment options with their specialists and consider the differences in pregnancy rates, timing to pregnancy, cost, and invasiveness to patient and partner.

ABSTRACT: Canadian men and their female partners are increasingly turning to vasectomy as a means of birth control. Although vasectomy is thought of as a permanent form of birth control, men who wish to attain fertility after having the procedure may undergo a vasectomy reversal to achieve pregnancy with their partner or undergo sperm retrieval and in vitro fertilization/intracytoplasmic sperm injection (IVF/ICSI). Vasectomy reversal patency rates are typically 90.0% to 99.5% when gold standard surgical techniques, such as the Goldstein microdot multilayer anastomosis, are used. Cumulative pregnancy rates with IVF/ICSI range from 18.2% to 69.4%, depending on the female partner's age. However, sperm retrieval procedures and IVF/ICSI, or vasectomy reversal procedures can yield similar efficacy for appropriately selected couples.

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Men have been having vasectomies for more than 200 years.[1] Every year, approximately 6% of men (500 000) in the United States undergo a vasectomy.[2] In Canada, approximately 15% of men have the procedure, as the shift away from female sterilization continues.[3] However, the increase in vasectomy rates has led to an increased need for fertility options following vasectomy, as approximately 7.4% of men ultimately regret having a vasectomy and pursue some type of fertility assessment.[4] Four treatment options exist: vasectomy reversal; sperm retrieval and in vitro fertilization (IVF) with intracytoplasmic sperm injection (ICSI); acquisition of a sperm donor for intrauterine insemination or IVF/ICSI; or child adoption. Approximately 60% of men who request a vasectomy reversal are in a new relationship; the rest are in the same relationship they were in when they had a vasectomy.[5] We review the considerations, prognostic factors, and outcomes associated with vasectomy reversals and sperm retrieval with IVF/ICSI as potential fertility options for couples seeking fertility after a vasectomy.

Evaluation and considerations

Both partners who are proceeding with a fertility assessment after vasectomy should have a thorough history taken and undergo a physical examination to determine if additional causes of infertility may be present. In addition, the male partner's fertility history (previous associated pregnancies and children), inguinal surgery history (specifically, hernia repairs), time since vasectomy, and erectile and ejaculatory function should be assessed. His current and recent medication use should also be fully reviewed, with a focus on the use of any anabolic steroids or testosterone supplementation. Discussion about the couple's family planning is likely warranted, and should include the number of children desired and the future desire for sterility.[6]

A focused physical examination should include an exam of the inguinal region for surgical scars, and a full assessment of the testes and scrotal contents. The entire cord structure should be palpated, with the location of the vasectomy identified. The presence of granulomas on the testis side of the vas deferens should be noted, as it may reflect a positive prognosis.[6] Most men who undergo vasectomy reversal have a history of fertility,[7] but if a man has no documented fertility prior to undergoing a vasectomy, a formal fertility workup, including hormonal profile, may be undertaken.[8]

An assessment of the female partner is also required. Although there are no clear guidelines about which women require full fertility assessments, some guidelines suggest that all women over 35 years of age should be offered an expedited fertility evaluation.[9] Prior documented fertility, especially if it was within the same relationship in which they achieved a prior pregnancy, is a positive prognostic factor for pregnancy and live births in couples undergoing vasectomy reversal.[10]

Vasectomy reversal

Compared to historical vasectomy reversals, contemporary subspecialized reproductive microsurgery has evolved significantly and refined the procedure to provide excellent outcomes for patients. Although some practitioners still perform the procedure using surgical loupes,[11,12] most specialists use an operating microscope, which allows for a precise microscopic anastomosis. Should further surgical complexity be encountered intraoperatively, use of a microscopic approach is typically necessitated for epididymal reconstruction, thereby limiting the use of loupes.[11] The need for epididymal reconstruction on at least one side occurs in approximately 30% to 60% of vasectomy reversal procedures, and is not reliably predicted preoperatively; thus, the general standard of care is to perform reversals with an operating microscope.[13,14]

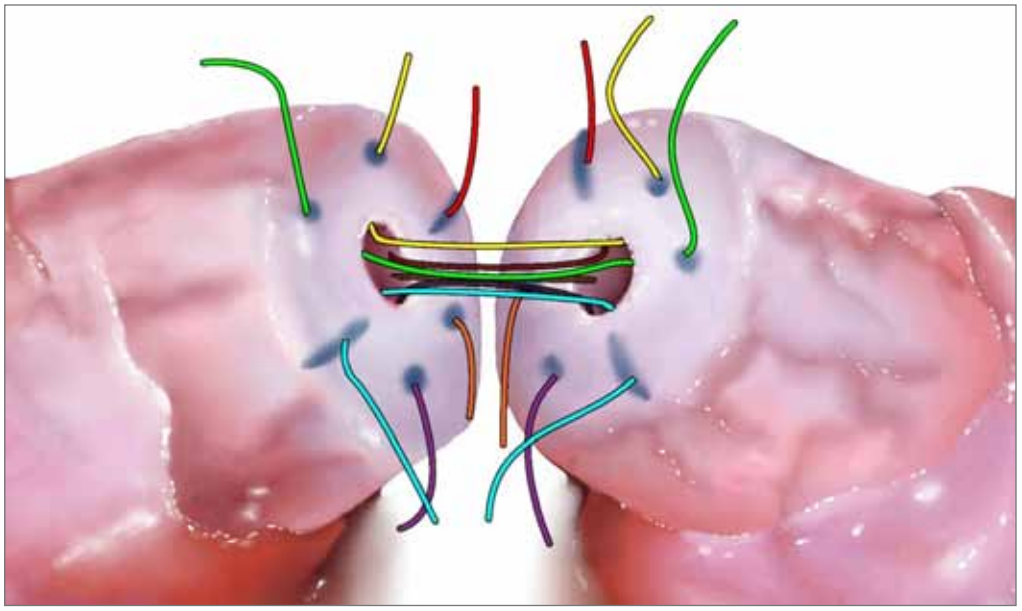

FIGURE 1. Goldstein microdot multilayer anastomosis. Six 10-0 mucosal anastamotic sutures are placed. Three additional layers of sutures are placed for a precise and watertight anastomosis.

Procedure

Vasectomy reversal procedures are typically performed through two small incisions in the scrotum, where the obstructed vas deferens is identified. The obstructed ends are then transected, and fluid is expressed from the testicular end of the vas deferens. Microscopic inspection of the fluid is vital because it dictates whether a vasovasostomy can be performed or a more complicated vasoepididymostomy must be carried out. If full sperm or sperm parts are identified, or if there is copious clear fluid, then a vasovasostomy is performed. Several techniques for performing vasectomy reversals have been described since the procedure's inception. An ongoing debate has centred on the use of either multilayered or single-layered closures for the connection between the ends of the vas deferens. Multilayer closures allow for precise mucosal approximation and ensure a leak-proof alignment. However, a potential disadvantage of this approach is that sutures are tied adjacent to the vas deferens mucosa, which may promote fibrosis and anastomotic stricture.[15] Single-layer approaches are technically easier, although there is some concern that a good mucosal approximation is less possible and may promote anastomotic misalignment or leak leading to failure.[15] A recent meta-analysis on this topic found no difference between the two techniques, although inconsistent reporting of outcome measures, exclusion of papers with highest patency rates using multilayer techniques, and suspected publication bias make meta-analyses of this topic difficult.[16] Reported patency rates following these procedures have been reported to range widely from 80.0% to 99.5% depending on the series reported.[16]

Gold standard technique

The highest reported success rate for vasovasostomy is the Goldstein microdot multilayer anastomosis (patency rate of 99.5%), where six ink dots are placed equidistantly beyond the mucosal-muscularis junction of the vas deferens **[Figure 1]**.[17] This allows for mapping of planned suture locations to ensure consistent suture spacing and to maximize lumen approximation and minimize the chance of leakage.[17] This technique has undergone continued improvement with the addition of a 15-degree angled cut of the vas deferens prior to anastomosis, contributing to a patency rate of 99.5%.[18] Furthermore, recent reports that have formalized tension-relieving suture techniques (e.g., ReVas) suggest that sperm counts and pregnancy rates improve following vasectomy reversal. The ReVas reduces anastomotic tension, a factor that may lead to anastomotic failure.[13]

Impact of time since vasectomy

Several prognostic factors for successful return of sperm, and ultimately pregnancy, have been highlighted within the fertility literature. One of the most discussed, but controversial, factors has been interval of obstruction. Early reports described reduced success with increasing time since vasectomy, particularly beyond 10 years postsurgery;[19] however, several articles have shown no differences 15 years following vasectomy.[20,21] The concept of reduced success rates following longer obstructive intervals is related to secondary obstruction of the epididymis. During the obstructive interval, the testis continues to make sperm and fluid. This results in increased epididymal tubule pressure and may lead to rupture and scarring. Thus, in the presence of an epididymal obstruction, a regular vasectomy reversal that connects the two ends of the vas deferens will not work, and an epididymal reconstruction will be necessary to achieve success. Upon intraoperative inspection of vasal fluid, epididymal obstruction can be confirmed if no sperm parts are identified, no fluid can be expressed, or thick toothpaste-like fluid is encountered.[22] Therefore, a discussion about reversal as a treatment option should be held with couples in which the male partner has had a prolonged obstructed interval, but they should be counseled on the

FIGURE 2. Longitudinal intussuscepted vasoepididymostomy (LIVE) technique for epididymal anastomosis. Two 10-0 sutures are used to anastomose the epididymal tubule to the vasal lumen. Additional 9-0 sutures are placed to secure the vas deferens to the tunical layer of the epididymis.

higher risks of needing more complicated, and possibly less efficacious, procedures such as a vasoepididymostomy.[23]

Epididymal reconstruction

The most widely used procedure for epididymal reconstruction is the longitudinal intussuscepted vasoepididymostomy (LIVE) technique **[Figure 2]**. It involves microscopic identification of an area above the suspected obstruction, where a small longitudinal incision is made into the epididymal tubule. The abdominal-oriented side of the vas deferens is then anastomosed to the tubules microscopically, typically with 10-0 and 9-0 sutures.[24] This is an intricate process and, in fact, the most technically demanding microsurgical procedure in male reproductive surgery. The success rate of LIVE depends largely on microsurgical expertise.[24] Reported patency rates of the procedure range from 48% to 92%, with a late failure rate of 0% to 4%.[24,25] Thirty-one percent of couples in which the male underwent the LIVE technique reported natural pregnancy at a median of 15.3 months; an additional 39% achieved pregnancy with IVF using ejaculated sperm.[24]

Outcomes and cost

Overall, a single vasectomy reversal procedure can provide the couple with the opportunity to have one or more children. Conventional vasectomy reversal patency rates are typically greater than 90.0% and up to 99.5% when a gold standard technique is used.[10,16,17] If epididymal reconstruction is required, determined intraoperatively, patency rates are highly variable depending on surgeon skill and technique, and range from 48% to 92%.[24,26,27] Men who undergo a vasectomy reversal can expect to have sperm return to ejaculate approximately 2 to 6 months following repair if it is successful,[28] and barring any female factor infertility concerns, pregnancy within approximately 1.0 to 1.5 years.[5,29] Pregnancy success rates can range from 42% to 94.2% depending on the female partner's age.[14,30] In British Columbia, based on the authors' current experience, the estimated cost of vasectomy reversal, anesthetic, and hospital charges ranges from $8000 to $10 000 when the procedure is performed by a reproductive microsurgeon.

In vitro fertilization and intracytoplasmic sperm injection

Sperm retrieval and IVF/ICSI

In the postvasectomy patient, sperm may be retrieved via percutaneous (i.e., percutaneous epididymal sperm aspiration; testicular sperm aspiration) or open sperm retrieval (i.e., testicular sperm extraction; microsurgical epididymal sperm aspiration) **[Figure 3]**. Retrieved sperm can then be used for IVF/ICSI. IVF/ICSI was first reported in 1992: Palermo and colleagues demonstrated that injection of a single sperm into an oocyte may result in successful fertilization, embryo development, and ultimately pregnancy and live birth following embryo transfer into the uterus.[31] This technique is not dependent on the sperm being motile or having normal acrosome function.[32] Reports of successful ICSI have been reported with as little as a single viable sperm, which makes even extremely oligozoospermic patients candidates for this technology.[33]

Outcomes and cost

According to the Canadian Fertility and Andrology Society, live birth rates per fresh IVF treatment cycle using the female partner's oocytes are 33.7% among women aged less than 35 years, 28.7% among women aged 35 to 39 years, and 21.9% among women aged 40 years and older.[34] Cumulative pregnancy rates with

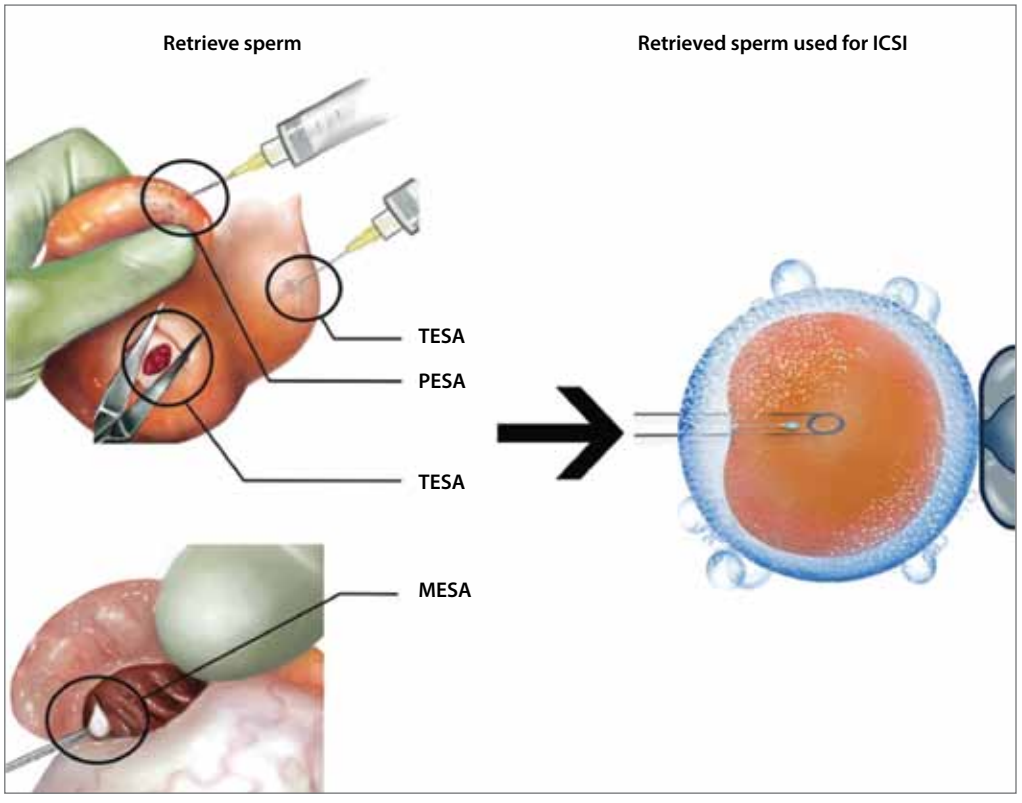

FIGURE 3. Surgical sperm retrieval option to acquire sperm for intracytoplasmic sperm injection (ICSI—intracytoplasmic sperm injection; TESA—testicular sperm aspiration; PESA—percutaneous epididymal sperm aspiration; TESE—testicular sperm extraction; MESA—microsurgical epididymal sperm aspiration).

IVF/ICSI, defined as performing one or more cycles of embryo transfer from a single egg retrieval, have higher rates of reported success. When performing between one and four embryo transfers, pregnancy rates are 46.9% to 69.4% among women aged less than 35 years, 35.5% to 62.0% among women aged 35 to 40 years, and 18.2% to 34.0% among women older than 40 years.[34]

The average duration from initiation of IVF/ICSI attempts and confirmed pregnancy is approximately 8 months.[5] In British Columbia, the cost of percutaneous sperm retrieval and a typical cycle of IVF/ICSI (egg retrieval, embryo transfer, medications, embryo freezing/storage ± genetic testing) can range from $13 000 to $22 000 depending on IVF medication insurance coverage and selection of genetic testing or screening, with additional frozen embryo transfers ranging from $1500 to $2000 per embryo.[35,36]

Impact of female age on IVF/ICSI and vasectomy reversal outcomes

The importance of female partner age has long been considered one of the deciding factors for pursuing either IVF or vasectomy reversal. It has been recommended that if the female partner is 40 years of age or older, the couple should pursue aspiration of sperm and IVF rather than undergo a vasectomy reversal and await natural conception.[37] However, this has been challenged in the last decade. Natural pregnancy rates based on maternal age have been reported to be 91% among women less than 30 years, 77% among women 31 to 35 years, and 53% among women by age 40 years.[38] Pregnancy rates among couples in which the male partner has had a vasectomy reversal and the female has no significant infertility factors are slightly higher when compared to a single IVF/ICSI cycle but are comparable to cumulative IVF/ICSI. Among female partners aged 30 to 35 years, vasectomy reversal cumulative pregnancy rates are 78.4%, whereas single-cycle IVF/ICSI pregnancy rates are 56.6%, and cumulative IVF/ICSI rates can be as high as 69.4%.[30,34] In women over 40 years of age, vasectomy reversal cumulative pregnancy rates are 42.0%, whereas single-cycle IVF/ICSI pregnancy rates are between 19.0% and 27.3% per cycle, and cumulative IVF/ICSI rates are reported to be as high as 34.0%.[30,34] Although no age-stratified studies that compare time to pregnancy between IVF/ICSI and vasectomy reversal have been reported, a study of female partners with a mean age of 34.8 years in the IVF/ICSI group and 33.8 years in the vasectomy reversal group showed a mean (standard deviation) time to pregnancy of 8.2 (13.0) months for IVF/ICSI compared to 16.3 (11.3) months for vasectomy reversal.[5]

There are multiple treatments that can produce excellent results and allow many patients to achieve pregnancy following a prior vasectomy.

Summary

Men and their female partners have several options for achieving a pregnancy following vasectomy. Counseling remains of critical importance in this patient population, given that success rates between either sperm retrieval procedures and IVF/ICSI, or vasectomy reversal procedures can yield similar efficacy for appropriately selected couples, such as those involving a female partner aged less than 40 years. However, some differences in the timing to pregnancy, cost, and invasiveness to patient and partner exist, so careful discussion about the pros and cons of each course of treatment should be undertaken with respective specialists. What can be emphasized to these patients, regardless of their choice, is that there are multiple treatments that can produce excellent results and allow many patients to achieve pregnancy following a prior vasectomy. ■

Competing interests

None declared.

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Tonia Tauh, MD, FRCPC, Michelle Mozel, MSc, Paula Meyler, MD, FRCPC, Susan M. Lee, MAS, MD, FRCPC

What is the evidence for extending the SARS-CoV-2 (COVID-19) vaccine dosing schedule?

With off-label COVID-19 vaccine dosing being widely used as a way to increase the number of people receiving their first dose, and hearing physicians' concerns about the safety of such a practice, a research group at Royal Columbian Hospital in British Columbia undertook an analysis of the data, published and unpublished, and conclude that a longer gap between doses is likely warranted given the circumstances.

ABSTRACT: Vaccine rollout for SARS-CoV-2 (COVID-19) in British Columbia is underway with two approved mRNA vaccines (Pfizer-BioNTech and Moderna). Traditionally, an inactivated or attenuated pathogen may have been used as a vaccine, whereas mRNA and DNA vaccines provide genetic material that instruct the body's cells to produce a viral spike protein antigen. Presently, both mRNA vaccines are approved for use as a two-dose schedule given either 21 days or 28 days apart. However, there is a relative scarcity of vaccine compared to the population of British Columbia. BC's public health officials have proposed a delay between the primary vaccination and booster to 35 days from the recommended 21 and 28 days. Based on unpublished data available to the National Advisory Committee on Immunization through Health Canada for both the Pfizer-BioNTech and Moderna vaccines, there was no difference in vaccine efficacy between the people who got their second dose at day 19 and the people who got it at day 42. Various jurisdictions around the world are permitting a prolonged second dosing interval. Despite the paucity of clinical trial data, it is likely that increasing the interval between the first and second doses of COVID-19 mRNA vaccines by Pfizer-BioNTech and Moderna is safe, both in the intervening period between doses and for long-term efficacy. Extending the vaccine schedule is likely warranted in order to allow the widest population to receive the first dose.

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This article has been peer reviewed.

A successful vaccination strategy against SARS-CoV-2 (COVID-19) may be a cornerstone in the resolution of the current pandemic. If it is to be effective, an efficient vaccination rollout is important as the epidemic puts extreme pressure on health services. A rapid vaccine rollout has many roadblocks, from some people's initial hesitancy to receive a novel vaccine to supply chain distribution challenges. If we are to contain and control the outbreak, we must establish from data that the vaccines are not only safe but also effective and widely available. With the current limitations on vaccine supply, our society must balance vaccinating as many people as possible in short order with the strict timing recommendations for the vaccines as they were designed and studied. As such, a question has arisen by patients and providers alike: to what degree can we alter the recommended dosing regimen without impacting effectiveness?

What are mRNA and DNA vaccines?

Traditionally, an inactivated or attenuated pathogen may have been used as a vaccine. In contrast, novel mRNA (Moderna and Pfizer-BioNTech) and DNA (Oxford-AstraZeneca) vaccines provide genetic material that instruct the body's cells to produce a viral spike protein antigen. This antigen, which cannot cause disease, will go on to elicit an immune response. As the cells produce the antigen, antibodies will neutralize the whole virus. Further, later infection may activate memory T cells to generate an early antibody response to attenuate infection.[1] While the COVID-19 mRNA vaccines are new, mRNA vaccines have been in development for many years. However, since the Moderna and Pfizer-BioNTech vaccines are the first mRNA vaccines to be widely used, little is known about their side effects, long-term efficacy, or the effect of off-label dosing schedules.

What dosing schedules for COVID-19 vaccines are approved based on clinical trial data?

Presently, both mRNA vaccines (Moderna and Pfizer-BioNTech) are approved for use as a two-dose schedule given either 21 days (Pfizer-BioNTech)[2,3] or 28 days (Moderna)[4] apart. Upon administration of the first dose of the Pfizer-BioNTech vaccine, partial immunity is acquired against severe COVID-19 symptoms, typically by 7 days, with 52.4% efficacy between 7 to 14 days and 89% between days 15 to 21 after dose 1. Protection continues to climb to 92.6% for the Pfizer-BioNTech vaccine after the second dose.[2] Of note, single-dose efficacy was not a primary outcome of the trial, but rather extrapolated by subgroup analysis and thus based on fewer data.[2,3] The Moderna vaccine showed 50.8% efficacy of the first dose on days 1 to 14 and 92.1% efficacy at 14 or more days after the first dose (80.2% overall after dose 1).[4,5] No clinical trials have been able to judge how long immunogenicity lasts following one dose, but we do know that efficacy after the first dose increases with time until the second dose is administered.

The Oxford-AstraZeneca vaccine, which is a DNA vaccine via an adenovirus vector, is still under review and is not approved for use in Canada. The first and second doses were scheduled 28 days apart in the Phase 2/3 clinical trial. A single-dose regimen was also included in the study, although it showed lower neutralizing antibody titres than the two-dose regimen.[6,7]

What data exist on deviations from approved dosing schedules?

Unpublished data from Pfizer-BioNTech and Moderna and published Oxford-AstraZeneca dosing interval trials demonstrate patient level data on longer dosing intervals. Based on unpublished data available to the National Advisory Committee on Immunization through Health Canada for both the Pfizer-BioNTech and Moderna vaccines, there was no difference in vaccine efficacy between the people who got their second dose at day 19 and the people who got it at day 42.[8,9] Importantly, there was no decrease in protection between the first dose and the second dose.

Trials of the Oxford-Astra-Zeneca vaccine did include different spacing between doses and found that a longer gap (2 to 3 months) led to a greater immune response.

Similarly, the trials of the Oxford-AstraZeneca vaccine did include different spacing between doses and found that a longer gap (2 to 3 months) led to a greater immune response, but the overall participant numbers were small.[6,7] In the UK study, 59% (1407 of 2377) of the participants who had two standard doses received the second dose between 9 and 12 weeks after the first. In the Brazilian study, only 18.6% (384 of 2063) received a second dose between 9 and 12 weeks after the first. The combined trial results found that vaccine efficacy at 14 days post–dose 2 was higher in the group with more than 6 weeks between doses than in the group with less than 6 weeks between doses (65.4% vs. 53.4%).[6,7]

What do governing bodies around the world recommend?

The unpublished data from Pfizer-BioNTech and Moderna and published data from Oxford-AstraZeneca on dosing intervals gave several consensus groups reason to advocate for a prolonged dosing interval up to 42 days (6 weeks). The British Society of Immunology stated that, "Most immunologists would agree that delaying a second 'booster' dose of a protein antigen vaccine (such as the two approved COVID-19 vaccines [Pfizer-BioNTech and Oxford-AstraZeneca]) by 8 weeks would be unlikely to have a negative effect on the overall immune response post-boost. We also would not expect any specific safety issues to arise for the individual due to delaying the second dose, other than an increased potential risk of disease during the extended period due to lowered protection."[10]

In an attempt to extend the initial phases of vaccination to a larger proportion of people, the Joint Committee on Vaccines and Immunization, along with the UK Chief Medical Officers have approved a prolonged second dosing interval up to 12 weeks for the Pfizer-BioNTech and Oxford-AstraZeneca vaccines.[11,12] The WHO has suggested that "…extending dose 2 up to 42 days may not be unreasonable."[13] The US CDC has stated that there is no maximum interval between first and second doses for either vaccine.[14]

The **Table** summarizes current recommendations from various regulating bodies. The US FDA and Pfizer-BioNTech have both maintained that the clinically tested dosing schedule should be followed.[2,15] The Government of Canada advocates for maintaining the recommended dosing schedule; however, it states, "If, due to logistical constraints, jurisdictions cannot complete the two-dose COVID-19 vaccine series as close as possible to the authorized or alternative schedules outlined in Table 2, they may refer to Appendix C for a summary of considerations and options on ethics, equity, feasibility and acceptability summarized in NACI's Core Ethical Dimensions Filter of the EEFA Framework and the accompanying ethics analysis."[16] BC Provincial Health Officer Dr Bonnie Henry has announced extending the second dosing of both vaccines (Pfizer-BioNTech and Moderna) to 35 days.[17]

TABLE. Dosing interval recommendations for mRNA COVID-19 vaccines from a variety of international and Canadian jurisdictions.

Organization	In favor of extending dosing interval	In favor of maintaining dosing as recommended by manufacturer
Pfizer-BioNTech[2]		"The safety and efficacy of the vaccine has not been evaluated on different dosing schedules as the majority of trial participants received the second dose within the window specified in the study design . . . There is no data to demonstrate that protection after the first dose is sustained after 21 days."
British Society of Immunology[10]	"…delaying a second 'booster' dose of a protein antigen vaccine (such as the two approved COVID-19 vaccines [Pfizer-BioNTech and AZN]) by 8 weeks would be unlikely to have a negative effect on the overall immune response post-boost."	
US FDA[15]		"The second dose should be administered as close to the recommended interval as possible," i.e., 21 days and 28 days respectively.
WHO[13]	"…the interval between doses may be extended up to 42 days (6 weeks), on the basis of currently available clinical trial data."	
European Medicines Agency[9]	"…the maximum interval of 42 days between the first and the second dose of the Pfizer-BioNtech vaccine should be respected to obtain full protection."	
US CDC[14]	"There is no maximum interval between the first and second doses for either vaccine. Therefore, if the second dose is administered >3 weeks after the first Pfizer-BioNTech vaccine dose or >1 month after the first Moderna vaccine dose, there is no need to restart the series."	
Government of Canada[16]		Pfizer-BioNTech minimum interval—19 days, authorized interval—21 days, alternate interval—28 days Moderna minimum interval—21 days, authorized interval—28 days, alternate interval—none
Government of Quebec[18]	"Les experts ont devoilé que la deuxième dose du vaccin soit administrée entre 42 et 90 jours après la première dose" *Experts have recommended that the second dose of the vaccine be administered between 42-90 days after the first dose.*	
Government of Ontario[19]	Extend doses up to 42 days for some recipients of Pfizer-BioNtech. • Long-term care residents, high-risk retirement home residents and their essential caregivers, and concurrently vaccinated staff: second dose of Pfizer-BioNtech vaccine in 21 to 27 days. · All other recipients of the Pfizer-BioNtech vaccine: second dose 21 - 42 days · Moderna vaccine: 28 days	
Government of Alberta[20]	Second doses of COVID-19 vaccine will be offered within 42 days of the first dose	
Government of British Columbia[17]	Extend second dose to 35 days. "A 35-day interval aligns with the operational reality that vaccine supplies will be back-end loaded with more vaccine scheduled to arrive in February and March 2021 than in December 2020 and January 2021 so everyone vaccinated will receive their second dose as scheduled in the coming weeks."	

Summary and recommendation

Upon learning that off-label vaccine dosing was being proposed in British Columbia, and hearing that physicians were concerned about the safety of such a practice, our research group at Royal Columbian Hospital in British Columbia undertook our own analysis of the data, published and unpublished. While new data may arise in the future that will challenge these conclusions, based on our analysis of currently available data, we support British Columbia's decision to extend the dosing interval of Pfizer-BioNTech and Moderna vaccines from 21/28 days to 35 days for the following reasons:

- There are inadequate vaccine supplies to maintain the maximum rate of primary vaccinations while adhering to strict approved dosing schedules for those who have already received the first dose.
- Partial immunity is granted after the first vaccine dose, as demonstrated in clinical trials.

- Immunity does not appear to wane for the duration studied (up to 42 days).
- There is no obvious biological basis to believe that the long-term efficacy of the booster dose will be negatively affected by a short delay in receiving it.

In an ideal world, there would be ample vaccine and adequate logistical machinery to mass vaccinate the entire population using approved, clinical-trial tested dosing intervals. Unfortunately, jurisdictions around the globe are facing shortages that require us to face the inequities of vaccine distribution, balance the ethical principles of beneficence, non-maleficence, and justice. While there are no large clinical trial published data to guide prolonged delays of the second dose, there are data to suggest that delaying the second dose likely preserves the long-term boost in immunity without an unacceptable decrease in immunity in the intervening period between doses. Therefore, delaying the second dose, which allows for wider primary vaccination (and therefore a faster route to immunizing the most vulnerable members of our population), seems a reasonable option in situations of vaccine shortage, such as what we are currently facing in BC, throughout Canada, and around the world. ■

Delaying the second dose, which allows for wider primary vaccination (and therefore faster route to immunizing the most vulnerable members of our population), seems a reasonable option in situations of vaccine shortage.

Competing interests

None declared.

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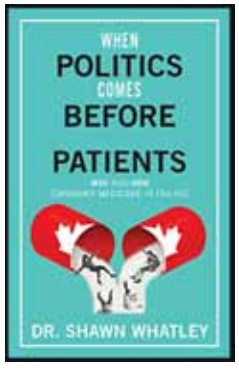
News

We welcome news items of less than 300 words; we may edit them for clarity and length. News items should be emailed to journal@doctorsofbc.ca and must include your mailing address, telephone number, and email address. All writers should disclose any competing interests.

Book review: *When Politics Comes Before Patients: Why and How Canadian Medicare Is Failing*



By Shawn Whatley, MD. Optimum Publishing International, 2020. ISBN: 978-0-88890-311-2.

This book, written by former Ontario Medical Association president Dr Shawn Whatley, is the second in what will be a trilogy of books focusing on different but overlapping aspects of Canada's health care system.

The book is extremely well written, and Dr Whatley's analysis is backed up by many carefully referenced sources. He demonstrates how political concerns and priorities have trumped patient priorities in Canada. When it comes to diagnosing the systemic problems that plague our health system, he pulls no punches.

In clear, simple language, he explains how Canada's system evolved, and describes the premises, promises, and broken promises. Politicians have repeatedly propagated myths about our system, and Dr Whatley exposes those myths.

Our flawed funding system, including that which disincentivizes hospital authorities when it comes to prioritizing and treating patients, is well explained. Canada stands alone among all developed countries in funding hospitals based on global budgets. Uniquely, our hospitals are penalized financially for every patient treated.

Dr Whatley analyzes the role of political action in creating Canada's shortage of doctors. This was a purposeful policy based on the premise that reducing the numbers of doctors would lower health costs by reducing the number of patients being treated.

Similarly, the lack of incentives to treat patients has resulted in Canadian politicians overseeing and implementing policies that have led to reluctance to innovate and embrace new technologies that benefit patient care. Our current ranking of 26th in the number of hospital beds on a per capita basis is yet another outcome of ineffective political control.

As Dr Whatley explains, perhaps the biggest myth surrounding our health system is that it is envied by other countries. Not a single country on Earth has ever considered embracing any of its features.

The book reveals that politicians have neglected their responsibility to the public. Yet those same politicians have no difficulty in gaining timely access to excellent care for themselves and their friends. They have the power to manipulate and influence the system when it suits them. This book should be a wake-up call for them and for the public that elects them. Every potential patient (that means everyone) and every politician should read it.

Dr Whatley describes the role of Tommy Douglas in introducing medicare to Canada some 60 years ago. I doubt that any politician of that era would have envisioned that the system they implemented then would be subjected to historical stagnation and inertia by their successors. Evolution requires that we continually adapt to change. There have been many changes in medicine, and in patients' needs and demands, yet politicians have not acted. Perhaps the most startling fact is that, as a result of political neglect, our government's own data reveal that in Canada, low-income groups suffer from the worst health access and the worst outcomes.

As one encounters the shenanigans described in this book, which epitomize governments' handling of our health system, the reader can come to only one conclusion: the phrase "politically correct" is a classic oxymoron as it pertains to medicare in Canada.

If politicians can assimilate the material in this book, perhaps Dr Whatley's final book in the trilogy will be titled, *When Patients Come Before Politics*.

—Brian Day, MB
Vancouver

COVID-19 recommendations from the BCCDC and Ministry of Health

The BC Centre for Disease Control and the BC Ministry of Health have produced the *BC Care Bundle for Supporting High-Risk Patients During COVID-19 Pandemic and Influenza Season.* This infographic provides recommendations for all care providers managing high-risk patients, including primary care practitioners (family physicians and nurse practitioners), for optimizing the comprehensive longitudinal care of these patients during the COVID-19 pandemic and influenza season. The key recommendations were developed with input from BC specialist physicians and family practice leaders. They include encouraging immunization uptake, creating care plans for intercurrent illness with underlying chronic disease, and optimizing chronic disease management. The infographic is available at www.bccdc.ca/Health-Professionals-Site/Documents/Care_Bundle_High_Risk_Patients.pdf.

A new GPSC one-time payment will support family physicians who are taking on the additional work of identifying and treating patients with care needs noted in the Care Bundle infographic. The GPSC emailed eligible family doctors in February 2021 with information about registering for the payment. Most eligible family doctors will each receive a

one-time payment between $1000 and $1500 based on the number and complexity of their Majority Source of Care (MSOC) patients. The GPSC is providing a total of $6 million for the payments, using unallocated funding from 2020. More information about the one-time payment is available on the GPSC website at https://gpscbc.ca/news/news/new-one-time-payment-bc-care-bundle.

To assist physicians in rapidly applying the Care Bundle guidance, the Pathways online resource now includes an easy-to-use algorithm with embedded links. To find the point-of-care algorithm, log in to www.pathwaysbc.ca and select the specialty of "COVID-19" from the blue "Select specialty" tab, or search the word *bundle* in the search bar. If you do not have Pathways access, send a message to contact-us@pathwaysbc.ca.

MIND and Mediterranean diets associated with delayed onset of Parkinson disease

A new study from UBC researchers suggests a strong correlation between following the MIND and Mediterranean diets and later onset of Parkinson disease. While researchers have long known of neuroprotective effects of the MIND diet for diseases like Alzheimer disease and dementia, this study is the first to suggest a link between this diet and brain health for Parkinson disease. The MIND diet combines aspects of two popular diets, the Mediterranean diet and the Dietary Approaches to Stop Hypertension (DASH) diet.

The study (176 participants) shows that individuals with Parkinson disease have a significantly later age of onset if their eating pattern closely aligns with the Mediterranean-type diet (up to 17 years later in women and 8 years later in men), according to Dr Silke Appel-Cresswell of the Pacific Parkinson's Research Centre, the Djavad Mowafaghian Centre for Brain Health, and the Division of Neurology in the UBC Faculty of Medicine.

Researchers looked at adherence to these types of diets, characterized by reduced meat intake and a focus on vegetables, fruits, whole grains, and healthy fats, and the age of Parkinson disease onset. The MIND diet showed a more significant impact on women's health, whereas the Mediterranean diet did for men. The differences in these two diets are subtle but could serve as clues to the impacts specific foods and micronutrients may have on brain health.

The different effects of diet adherence between sexes are noteworthy as approximately 60% of those diagnosed with Parkinson disease are men. These findings springboard to other research questions that could have significant impacts on the understanding of the disease, and drive home the connection between the gut and the brain for this disease. The research team plans to further examine the potential connection between the microbiome and its effect on the brain.

The study was published in *Movement Disorders* and is available online at https://movementdisorders.onlinelibrary.wiley.com/doi/10.1002/mds.28464.

New magazine from the JCCs featuring stories of physician-led innovations

The inaugural issue of *Collaborate on Health in BC* is available online at https://bit.ly/3aFnZib. The magazine curates stories about how doctors have worked with health care partners to champion and innovate ways to deliver the best care to patients across BC in 2020, all while navigating the challenges of a global health pandemic.

Featured stories include:

- Patient care toolbox expands with virtual care
- Hospital at Home: Physicians lead the way to bring program to BC
- COVID-19 and mental health: Advocating for children and youth

The magazine is presented by the Joint Collaborative Committees (JCCs), a partnership of Doctors of BC and the BC government. For nearly 20 years, doctors have been leading and advocating to improve BC's health care system through the four JCCs: Joint Standing Committee on Rural Issues, General Practice Services Committee, Shared Care Committee, and Specialist Services.

Occupational diseases and taking an occupational history

Many family physicians or primary care providers will see occupational diseases in their daily practice. Physicians can play an important role in the prevention and early recognition of occupational diseases. Recognizing these diseases can be challenging for a variety of reasons, including the long latency period between some exposures and disease onset and the multifactorial nature of these diseases.[1]

Occupational diseases can be caused or exacerbated by conditions in the workplace. Some examples of occupational diseases include noise-induced hearing loss, respiratory diseases (e.g., asbestosis, silicosis, occupational asthma or COPD, occupational allergic rhinitis), cancers (e.g., mesothelioma, lung cancer), chemical or heavy metal poisoning (e.g., carbon monoxide, lead, mercury, cadmium), skin conditions (e.g., allergic or irritant contact dermatitis, cancers), and infectious diseases (e.g., HBV from blood and body fluid exposures, TB, zoonotic diseases).

You can help your patients navigate through WorkSafeBC by incorporating occupational screening questions into your patient history. This helps identify potential exposures in the workplace that may be contributing to your patients' symptoms. Some useful questions include:[1]

1. What kind of work do you do? How do you do your work?
2. Are your symptoms better at home or worse when you are work?
3. Are you now or have you previously been exposed to dust, fumes, chemicals, radiation, infectious diseases, or loud noise at your workplace?
4. Do you think your health problems are related to your work? Why?
5. Do other workers have similar symptoms associated with the same exposure?

A more detailed occupational history should include:[1]

1. Documenting your patients' past and present employment history.
2. Identifying the types of exposures at workplaces, which may be biological, chemical, physical, or psychological.
3. Assessing exposure by asking:
   - For safety data sheets, what substances the patient works with.
   - About the frequency and quantity of exposures.
   - Where they were working in relation to the exposures and the duration of the exposures.
   - What types of controls are present at work (e.g., ventilation, personal protective equipment such as respirators or gloves, hand washing).
   - How they may be exposed at work (e.g., skin contact, inhalation, or ingestion while eating).
4. Documenting nonoccupational exposures (e.g., hobbies, pets, smoking, travel, home renovations).[2]

If a patient develops a disease and you or they are concerned that the disease may be work related, a claim can be initiated by submitting a Form 8 to WorkSafeBC. WorkSafeBC claims require a medical diagnosis submitted by a physician or other qualified practitioner. Your patient's claim will be reviewed by Occupational Disease Services, a specialized claims unit of WorkSafeBC. There are two main requirements for an occupational disease to be considered work related by WorkSafeBC: the disease must be recognized by WorkSafeBC as an occupational disease and the disease must be due to the nature of your patient's current or past employment.

If WorkSafeBC accepts your patient's claim as an occupational disease, then they may be eligible for benefits and services, which can include compensation for lost wages, coverage of health care costs, support with rehabilitation, or a permanent disability benefit. If your patient's disease is due to the nature of their employment but they have not lost time from work, they can still claim for medical costs and treatment for the occupational disease. If your patient has a terminal illness or passes away from an accepted occupational disease, your patient's spouse or dependants may be eligible for compensation benefits. ■

—Olivia Sampson, MPH, FRCPC, ABPM, CCFP

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

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Further information

1. If you or your patients are concerned about occupational exposures or safety in the workplace, contact WorkSafeBC Prevention at 604 276-3100.
2. If you or a patient has concerns about an exposure at their workplace but your patient is well, you or your patient can register the exposure on the Exposure Registry at combined-files.docwww.worksafebc.com/en/resources/health-care-providers/forms/exposure-registry-program-form-41m1?lang=en.
3. If you have questions about an occupational disease, call 604 231-8842 and request to speak to an occupational disease services medical advisor or visit www.worksafebc.com/en/claims/report-workplace-injury-illness/types-of-claims/occupational-diseases.

A walk in nature: The superfood of physical activities

Regular physical activity (e.g., a daily walk at a moderate pace for 30 minutes) can lessen the risk (by up to 30%) as well as improve the outcome in close to 40 chronic medical disorders.[1] This has led to a recommendation by the Canadian Medical Association and Doctors of BC to include a physical activity history in the vital signs section of all electronic medical record systems, encouraging physicians to regularly monitor and review their patients' physical activity levels and counsel them accordingly.[2]

We know that physicians can be effective at promoting behavioral change. Efforts that encourage smoking cessation have been very effective, and similarly, we can advance the health benefits of regular physical activity. However, matching the correct physical activity to the unique needs of an individual patient in the limited time of our doctor-patient encounters can be problematic.

When it comes to nutrition, some foods (i.e., so-called superfoods—blueberries, kale, etc.) give you more benefits than others. Similarly, as a physical activity, a 30-minute walk in nature offers several benefits that other activities do not.

The Japanese practice of *shinrin-yoku*, or forest bathing, has received recent attention in the lay press. There is increasing evidence that walking in nature can enhance immunity and improve chronic disease states (hypertension, coronary artery disease, diabetes, COPD, depression), and that the effects are greater than those gained from walks in an urban environment.[3]

A complete explanation of why walking in nature has such benefits is not clear. Humans have always been drawn to nature to relax, to find relief from everyday life stressors, to clear their head, and to experience beauty. Physiological studies indicate the lessening of sympathetic arousal and more parasympathetic activity in nature. Japanese research on phytoncides, natural wood oils emitted by plants and trees, suggests they have a number of positive effects on the immune system.[4]

As a physical activity, a 30-minute walk in nature offers several benefits that other activities do not.

The subgenual prefrontal cortex exhibits increased activity during sadness and when ruminating (negative self-reflection) in both healthy and depressed individuals. MRI data demonstrate a quieting of subgenual activity with a walk in nature compared to a walk of similar length and intensity in an urban area.[5]

While the physical benefits of walking in nature are the same as for an urban walk, studies from Austria and Iceland comparing a walk in the Alps or Icelandic forests versus a walk on a treadmill in a gym indicate the nature intervention resulted in a further improved mood, and the subjective effort of the physical activity was perceived to be easier with the green intervention.[6,7]

Locally, the BC Parks Foundation introduced a Parks Prescription program, which encourages physicians to prescribe nature to their patients (www.parkprescriptions.ca).

So when we counsel our patients to increase their physical activity (even more of a necessity during our current pandemic), a walk at a moderate pace is an inexpensive intervention that the majority could accomplish. When suggesting walking, why not encourage this superfood of exercise, a walk in nature, which will add something extra for their physical and mental health. ■

—Ronald A. Remick, MD, FRCPC

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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The benefits and limitations of ultrasound in the diagnosis of rib fractures from the emergency department to the sports field: A narrative review

Why have imaging guidelines stopped short of supporting ultrasound as a primary diagnostic modality for rib fractures?

Thomas S. Watson, MD, DPhil

ABSTRACT: Ultrasound promises to be a rapid, radiation-free alternative to chest X-ray for the diagnosis of rib fractures in blunt chest trauma, and this promise has been raised repeatedly over the last decade. Results have been encouraging, and reviews have consistently concluded that ultrasound appears to be the superior diagnostic modality. However, authors have stopped short of recommending changes in practice, and chest X-ray remains the recommended study in both Canadian and American radiology guidelines. In this narrative review, a search of three primary databases was performed to consider the current balance of evidence and discuss concerns that have, thus far, weighed against the broad application of ultrasound in this role. This review suggests that the potential applications for ultrasound in rib fracture diagnosis warrant its consideration for expanded use from emergency rooms to athletics venues.

Introduction

Rib fractures are common concerns across the scope of medicine, with cohort studies in America and Canada identifying rib fractures in 10% of all trauma presentations and over 30% of minor chest trauma presentations to emergency departments.[1,2]

The mainstay of rib fracture diagnosis has been the chest radiograph. Both the most recent Canadian Association of Radiologists' referral guidelines and American College of Radiology's guidelines indicate a chest X-ray as the most appropriate imaging modality in adults with suspected rib injuries from minor blunt trauma.[3,4] However, there has been growing evidence over the past 2 decades that ultrasound is superior to X-ray in the detection of chest wall fractures, including fractured ribs.[5,6]

There has been growing evidence over the past 2 decades that ultrasound is superior to X-ray in the detection of chest wall fractures, including fractured ribs.

While the weight of evidence has been in favor of ultrasound as the more sensitive technique in several previous reviews,[7-11] none has concluded that ultrasound should replace, or join, conventional chest X-ray as a first-line diagnostic study for rib fractures following minor chest trauma. Imaging guidelines also continue to indicate chest X-ray as the most appropriate investigation.[3,4] This review aims to examine why these analyses have stopped short of supporting any change in practice and if ultrasound's use as a primary diagnostic modality for rib fractures is worth further investigation and study. A search of three primary databases was performed to include an updated picture of original studies in a discussion of the balance of evidence on this topic and expand on whether the identified benefits and drawbacks of ultrasound in rib fracture imaging justify why imaging guidelines have not adopted ultrasound as a recommended modality.

Methods

Search terms and criteria were determined based on an initial literature search and on previous reviews in this subject area. PubMed, Embase (via Ovid), and Google Scholar were searched between 5 December 2017 and 16 January 2018, and the search was updated with all new studies to 25 June 2019 using the keywords "ultrasound" or "ultrasonography" or "sonography" or "chest film" or "chest X ray" and "rib fractures" or "chest wall fracture." All results were then reviewed for inclusion based on whether they met the criteria of being available online in English and represented original studies directly comparing the diagnostic ability of ultrasonography and chest X-ray in detection of human rib fractures. Reviews, editorial

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articles, case reports, and studies with patient populations of less than 10 were excluded from the main comparison between ultrasound and X-ray with regard to rib fracture diagnosis. Systematic reviews and meta-analyses were not included in the comparison table but were identified for consideration in the discussion.

Results

Of the total search results (PubMed: 338 results returned, Embase: 446 results, Google Scholar: 820 results), 13 studies were identified that matched the stated selection criteria. These are presented in the Table. Overall, 12 of the 13 studies that met our inclusion criteria support ultrasound as more sensitive than X-ray for the detection of rib fractures, with only one study (Hurley and colleagues[20]) concluding equivalent sensitivity exists between ultrasound and X-ray. All five studies that included a reference or gold standard to confirm the initial ultrasound fracture diagnosis found ultrasound to be superior to X-ray.[5,17-19,22]

Discussion

The results of the literature search support the view that ultrasound is a more sensitive and accurate modality for the diagnosis of rib fractures with 12 of the 13 included studies concluding ultrasound was superior to chest X-ray. Only Hurley and colleagues[20] concluded their results were not sufficient to support ultrasound over X-ray, and theirs was the smallest of any included study at only 14 participants.

In seven of the 12 studies that concluded in support of ultrasound, the study design allowed comparison of the number of fractures diagnosed by the two modalities, and in each case ultrasound identified at least twice the number of fractures as did X-ray.[12-14,18,19,22,23] In terms of formal pooled sensitivities, there has been only one completed meta-analysis (by Yousefifard and colleagues[8] in 2016), which found the sensitivity of ultrasound for rib fractures in the studies they examined was 0.97 (95% CI 0.93-1.00) with the sensitivity of chest X-ray at 0.77 (95% CI 0.57-0.97).[8] The remaining five of 12 studies presented in the Table supported ultrasound but did not allow for a comparison of true sensitivity as they included only participants with negative X-rays and examined them with ultrasound to identify missed fractures. The drawback of this study design is discussed below as a limitation in the evidence for ultrasound.

Despite the balance of evidence supporting the diagnostic superiority of ultrasound, both the Canadian Association of Radiologists and American College of Radiology guidelines continue to recommend chest X-ray as the most appropriate imaging in the case of suspected rib fracture from minor blunt trauma, with the American College listing chest ultrasound in the lowest appropriateness category and the Canadian Association not mentioning ultrasound at all.[3,4] This contrast between evidence and guidelines raises the question: are there significant limitations that undermine these presented results and explain why ultrasound should not be considered a first-line choice for rib fracture diagnosis? The four major limitations of ultrasound and its supporting evidence raised in previous literature reviews and guidelines are discussed below, along with potential counterarguments.

There exists recent evidence that ultrasound has greater sensitivity than chest X-ray for rib fracture diagnosis relative to CT.

1. Variability between patients and fracture sites

One potential limitation is that ultrasound is not equally sensitive in its ability to diagnose chest wall fractures in all areas of the rib cage. It has been noted that ultrasound has difficulty visualizing the subscapular and infraclavicular portions of the upper ribs.[21] The body habitus of the patient is also a factor as ultrasound is less sensitive in obese patients and those with large breasts.[13,16,21] Perhaps reflecting these limitations, the meta-analysis by Yousefifard and colleagues found that, contrary to the significant sensitivity superiority of ultrasound, the specificity of radiography was slightly higher than ultrasound (100% versus 94%).[8] The authors concluded that, based on the calculated likelihood ratios, a negative result on an ultrasound was more useful than a negative radiograph; however, visualizing a fracture on a radiograph is slightly more reliable than a positive ultrasound. They also noted, however, that it appeared that using a higher frequency of ultrasound was associated with narrowing of this specificity gap.[8]

2. Lack of appropriate gold standards

Lalande and Wylie of Laval University conducted a short review in 2014 and identified what they viewed as the most significant issue with existing studies supporting ultrasound: the frequent lack of a reference or gold standard modality for comparison and confirmation of identified fractures.[10] Consistent with this point, only five of the 13 studies identified in our search had any follow-up to confirm the initial ultrasound diagnosis of fracture. That is, the majority of studies assumed 100% specificity for ultrasound, which, as discussed in the previous section, has not been found to be true. Furthermore, five of the 13 studies identified in our search[5,15-17,21] included patients only on the basis of a negative X-ray and performed a subsequent ultrasound to look for missed fractures. In these cases, there is no way to compare the number of fractures missed by ultrasound to those missed by X-ray. However, while Lalande and Wylie reported that they did not identify any studies with reference standards, our search found two[5,18] that used uptake on bone scan to confirm the presence of ultrasound-identified fractures and three others[17,19,22] that used a repeated ultrasound at 1 to 3 weeks, after callus formation and remodeling had begun, to confirm the fractures identified at first presentation. Therefore, it appears that ultrasound has uniformly been found to be superior to radiograph in studies that included confirmatory reference standard imaging.

In their 2019 systematic review, Battle and colleagues also identified the variability in standards as an issue with existing evidence.[9] They concluded that further studies using CT as the gold standard were needed to fully assess ultrasound diagnostic accuracy. While a study directly comparing chest X-ray and ultrasound to a reference CT is lacking, and could be valuable, there have been four studies in the last

TABLE. Literature search results organized by publication date for comparison of diagnostic accuracy of ultrasound and chest radiography in the diagnosis of rib fractures.

Study	n	Modalities compared	Reference standard?	Modality comparison result	Key study conclusions
Pishbin and colleagues, 2017[12]	61	Chest X-ray (PA and oblique) and ultrasound	No	Ultrasound detected 98.3% of fractures found by any method, oblique X-ray 45.8%, PA chest 40.7%.	Ultrasound is more sensitive than radiography for rib fracture diagnosis.
Lalande and colleagues, 2017[13]	96	X-ray (oblique rib view) and ultrasound	No	27/96 (28%) of patients were diagnosed with rib fracture on point of care (POC) ultrasound but not on initial X-ray versus 11/96 patients (11%) with diagnosis on X-ray but not POC ultrasound.	Ultrasound is a feasible technique for rib facture diagnosis in an emergency department setting to complement radiography.
Hwang and Lee, 2016[14]	201	Chest X-ray and ultrasound	No	Rib fracture detected in 34.3% (69) of patients by radiography but 84.6% (160) by ultrasound.	Ultrasound offers greater accuracy than radiography for rib fracture diagnosis; larger RCT is needed.
Uzun and colleagues, 2013[15]	55	Chest X-ray (AP) and ultrasound	No	In 47/55 trauma patients agreed by three physicians to have negative chest X-rays had rib fractures diagnosed by ultrasound.	Ultrasound by an experienced radiologist is required for early diagnosis of rib fractures in trauma patients.
Lee and colleagues, 2012[16]	93	Chest and rib series X-ray, CT and ultrasound	No	64/93 patients (68.8%) found to be negative for fractures on both radiography and CT by two surgeons and two radiologists were found to have chondral fractures on ultrasound.	Chest ultrasound can help diagnose sternal and costal cartilage fractures missed by conventional radiology.
Turk and colleagues, 2010[17]	20	Chest X-ray (PA and oblique) and ultrasound	Repeat ultrasound at 1–3 weeks to confirm callus formation.	All 20 patients had clinical suspicion of fracture and normal X-ray, but ultrasound detected 26 fractures in 18/20 patients.	Ultrasound is more sensitive than radiography for chest wall fractures and should be routine in those with clinical suspicion but negative X-ray.
Paik and colleagues, 2005[18]	58	Chest X-ray (AP and oblique lateral views) and ultrasound	Bone scan uptake, biopsy and follow-up	Ultrasound revealed 36/37 (97%) of rib fractures as compared to 16/37 (43%) found by X-ray. Ultrasound also identified 94% of confirmed bone metastasis compared to 39% visible on X-ray.	Ultrasound is more reliable and accurate than X-ray for rib lesions. Ultrasound is recommended as a modality to evaluate patients with question of rib metastasis.
Rainer and colleagues, 2004[19]	88	Chest X-ray (PA and oblique), ultrasound and clinical judgment	Repeat ultrasound at 3 weeks to confirm fracture by callus/ remodeling	Ultrasound sensitivity for chest wall fractures was 80.3 (95% CI 69.5-88.5) compared to 23.7 (95% CI 14.7-34.8) for X-ray and 26.0 (95% CI 15.8-36.3) for clinical impression alone, meaning only one in five fractures seen on ultrasound was visible on X-ray.	Ultrasound at presentation to emergency is significantly more accurate than X-ray or clinical judgment at detecting rib and sternal fractures.
Hurley and colleagues, 2004[20]	14	Chest X-ray (PA and oblique rib) and ultrasound	No	Oblique X-ray identified 13/15 fractures found with any modality, PA chest 11/15 and ultrasound 14/15	Ultrasound use does not significantly increase the detection of rib fractures in trauma and does not justify its routine use.
Kara and colleagues, 2003[21]	37	Chest X-ray and ultrasound	No*	15/37 (40.5%) of patients with negative X-ray results had boney or chondral rib fracture on ultrasound.	Ultrasound is a useful modality to identify fractures missed by X-ray.
Griffith and colleagues, 1999[22]	50	Chest X-ray (PA and oblique) and ultrasound	Repeat ultrasound at 3 weeks to confirm remodeling	Chest radiograph revealed eight fractures in 6/50 patients (12%) while ultrasound identified 83 fractures in 39/50 (78%)—10 times as many fractures in 6 times as many patients. Repeat ultrasound at 3 weeks confirmed all identified fractures as well as 12 fractures not seen by either modality initially.	Ultrasound is able to reveal more fractures in patients than radiography, but further studies are needed to determine the appropriate role for ultrasound in medical practice.
Dubs-Kunz, 1996[23]	122	Chest X-ray and ultrasound	No	Diagnosis of rib fracture by ultrasound was twice as sensitive as radiography (75 rib fractures seen on ultrasound, 36 on X-ray, all X-ray findings also visible on ultrasound).	Though rib fracture diagnosis does not result in clinical change, psychological factors of correct diagnosis can be important for dealing with pain, and ultrasound is the more sensitive modality.
Wischhöfer, 1995[5]	21	Chest X-ray and ultrasound	Bone scan uptake to confirm lesion location	Rib fractures identified in 16/21 patients with clinical suspicion of fracture but normal X-ray. Confirmation of ultrasound identified lesions by bone scan revealed seven further likely fractures.	Ultrasound is more reliable for fracture diagnosis than X-ray, but can miss nondislocated fractures, likely due to patient respiration during the exam.

Abbreviations: CT—computed tomography, PA—posteroanterior, AP—anteroposterior

* Kara and colleagues state that most patients had a repeat chest X-ray after 2 to 4 weeks to monitor established fracture site healing, but as it is not clear the number of patients who underwent this repeat chest X-ray or the percentage of ultrasound-detected fractures that were confirmed by this process, we have not considered this to be a reference study in this review.

2 years comparing either CT and ultrasound or CT and chest X-ray that can shed light on whether a CT reference is likely to change the overall picture. Of the CT and ultrasound comparisons, ultrasound sensitivity varied from 100%[24] to 67%[25] (specificity 98.99% and 98% respectively) versus the CT standard. In X-ray and CT comparisons, sensitivity varied from 40%[26] to 48.8%[27] with specificity ranging from 99% to 100% respectively. Also of note, in their 2012 study, Lee and colleagues diagnosed 64 chondral rib fractures in 93 minor chest trauma patients who had both a negative CT and chest X-ray.[16] Thus, there exists recent evidence that ultrasound has greater sensitivity than chest X-ray for rib fracture diagnosis relative to CT and, based on the results of Lee and colleagues, it also seems that CT is not a definitive gold standard for this comparison if it misses chondral fractures visible on ultrasound.

3. Increased imaging time with ultrasound

Another issue raised by several studies has been that completing an ultrasound scan takes longer than a X-ray, thus delaying diagnosis.[16] X-ray views can be accomplished in a few minutes while the time for a formal ultrasound is reported to be anywhere from 10 to 30 minutes longer in the studies we identified.[16,20,22] This concern, however, compares the time to completion after the study has begun in the radiology department. As portability and quality of ultrasound improves,[28] its use by emergency physicians at initial presentation of minor blunt trauma may in fact speed up rib fracture diagnosis by helping triage in busy emergency departments where there is otherwise a significant wait for X-rays, not to mention X-ray interpretation.[7] Evidently, in cases of significant chest trauma, when the identification of underlying organ damage is time sensitive, the time to perform an ultrasound study for rib fractures could have significant implications compared to X-ray or CT.[29] However, in major trauma the clinical situation is very different and not the focus of our discussion. Similarly, our review does not address the evident impact of user training on speed or sensitivity as the focus is on whether existing evidence supports a potential benefit of ultrasound in this application. If the conclusion is that it does, then questions of provider training would be an area for further investigation.

4. Lack of impact on management

A final point frequently raised against recommending ultrasound over X-ray in the case of suspected rib fracture, including in both the Canadian and American radiology guidelines,[3,4] is that increased sensitivity in the diagnosis of rib fracture is in fact not necessary and would not change management. All that is required is to rule out any dangerous associated pathology, and an X-ray is sufficient for this in cases where the mechanism of injury is not severe enough to support immediate CT.[30]

The use of ultrasound for stress fracture injuries has the potential to help prevent misdiagnosis and convince motivated athletes to allow these fractures time to heal without exacerbation, shortening recoveries.

Several points counter the view that including ultrasound to diagnose a greater proportion of rib fractures correctly is of no benefit. First, a reliable assessment of fractures is important for educating a patient on the likely timeline and approach for resolution of their pain and ability to return to work.[7] As well, a correct diagnosis may have implications for legal claims and/or avoiding physician litigation.[14,15,19] Furthermore, it is not the case that missed rib fractures all resolve without complications, with evidence that rib fractures increase the risk for many pulmonary complications including delayed hemothorax, pneumothorax, and pneumonias.[1,31-33] It therefore follows that identifying any fractures is important to correctly risk stratify patients. Two populations that highlight the potential risks associated with missed rib fractures are the elderly and athletes. In geriatric populations, rib fractures are linked to increased mortality and morbidity.[21,34] One cohort study of trauma patients admitted to a Canadian tertiary centre found rib fractures were independently associated with a five times greater risk of death in those 65 or over compared to younger patients.[32] For athletes, reinjury following a premature return may result in a greater severity of damage and prolonged recovery.[22] Chest wall bony injuries are relatively common in contact sports such as rugby, where decisions on whether a player is safe to return to a match may need to be made quickly on pitch sidelines where ultrasound is the only accessible modality.[35] Rib fractures in noncontact sports may also significantly impair an athlete's ability to train and compete, for example in rowing where rib stress fractures have been identified as accounting for a greatest amount of training time lost by elite athletes.[36] The use of ultrasound for stress fracture injuries has the potential to help prevent misdiagnosis and convince motivated athletes to allow these fractures time to heal without exacerbation, shortening recoveries.[37] Given ultrasound has the advantage of not exposing a patient to ionizing radiation, as well as the decreasing cost and size of ultrasound machines, it is increasingly useful outside hospital settings for sports physicians at competition or training venues and emergency medical providers in rural settings.[28]

Conclusion

This narrative review supports ultrasound as the more sensitive diagnostic modality and considers the concerns raised by previous reviews on this topic. Examining the benefits and drawbacks to the use of ultrasound in rib fracture diagnosis highlights its potential for positive impact on patients and supports its continued consideration for practice guidelines and provider training. ■

Competing interests

None declared.

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Establishing a link between antibiotics and asthma in early life

A discussion of the current work in BC linking antibiotic use in early infancy with the risk of childhood asthma, what the next steps are for this work, and what role clinicians from diverse specialties can play in combating the asthma and allergy epidemic.

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Current research in BC

Over the past 20 years, BC physicians have been responsible for an exemplary decline in antibiotic use in children under 5 years of age, most dramatically evident in infants under 1 year. Between 1996 and 2016, BC saw a 77% reduction in antibiotic prescriptions for infants.[1] This has been mainly due to reductions in antibiotic use in upper respiratory tract infections (URTI) and acute otitis media. Alongside improved stewardship efforts, we have also seen the parallel rollout of conjugate pneumococcal vaccine 7 (in 2010) followed by conjugate pneumococcal vaccine 13 (in 2015). A resulting reduction in bacterial upper respiratory tract infections may be further reducing the need for antibiotics.[2]

Antibiotic stewardship programs in hospitals and communities carry a primary aim of reducing inappropriate use to slow microbial selection toward more resistant strains and infections. However, there is now growing evidence that good antibiotic stewardship might also contribute to the prevention of some common chronic diseases as well, starting with asthma.

It is perhaps less well known that between 2000 and 2014 the incidence of asthma in children under 5 years declined by 26%, from 27.3 to 20.2 diagnoses per 1000 children.[3] This represents the first major reversal in the late 20th century trend of increasing incidence and prevalence. Collaborative work from the BCCDC, BC Children's Hospital, and UBC recently published in the *Lancet Respiratory Medicine*, demonstrated an association between antibiotic prescribing in infants under 1 year and incidence of asthma in children under 5 years at the provincial population level, with a projected 24% increase in asthma incidence for every 10% increase in antibiotic prescribing, after adjusting for year, sex, material and social deprivation indices, and ambient air quality indicators (PM2.5).[3] When this relationship was examined at the patient-level in a cohort of 2644 children through the CHILD study (a national prospective birth cohort), children who were

Key messages:

- Reducing early-life exposure to antibiotics may decrease the risk of childhood asthma by preserving the gut microflora responsible for training the immune system.
- Ongoing work in BC investigates this association in a retrospective provincial birth cohort using linked data to build a causal argument.
- Pediatricians, infectious disease specialists, pharmacists, allergists, and family physicians all have a role to play in promoting good antibiotic stewardship to potentially reduce the risk of childhood atopic disease.

exposed to antibiotics in infancy were 2.5 times more likely to develop asthma in childhood than children who weren't exposed. This remained true after adjusting for possible confounders such as ethnicity, mode of delivery, exposure to air pollution, sex, and parental atopic history. Interestingly, after excluding children who had received antibiotics for respiratory symptoms, to eliminate a concern that the relationship was confounded by the indication driving prescribing, this association remained and there was a significant dose-dependent response—namely, 5.2% of children not exposed to antibiotics in their first year of life developed asthma, compared with 8.1% of children who received one course, 10.2% of children who received two courses, and 17.6% of children who received three or more courses.

Making the link

How are antibiotics in infancy connected to childhood asthma? Increasing evidence points to the gut microflora, namely, perturbances to the initial seeding and colonization of the infant gut, otherwise known as microbial dysbiosis. Typically, the neonatal gut is seeded with commensal or beneficial bacterial species in a well-established series of ecological succession. These commensal bacterial species serve a number of functions in the first few months of life: their occupation of the gut helps prevent pathogenic bacteria from establishing a foothold, thereby helping to protect against infection, and their production of metabolites such as short-chain fatty acids (SCFAs) are considered to be a key driver of immunologic T cell activity alongside acting as a down-regulator of proinflammatory responses. In this way, a diverse commensal bacterial ecology in the neonatal gut not only protects against colonization with harmful bacteria but also helps to train a robust immune system and promote homeostasis, protecting against hyperallergic responses in the future.[4] The perturbance of this relationship is commonly referred to as the "microflora hypothesis."[5]

Neonatal gut seeding begins in utero through the placenta and cord blood, and continues with seeding during vaginal birth and through breastfeeding, skin contact, and interaction with the built and natural environment. Perturbances in these natural sources of microbial exposure can change the delicate ecology of the infant gut by altering microbial diversity at this crucial time of immune system development. Specifically, cesarean section, a lack of breastfeeding, and intrapartum and postpartum antibiotic use all effect this microbial exposure and have independently been associated with altered gut microbial ecology and subsequent allergic sensitization.[6-8]

Going forward for BC

Following publication of this BC study,[3] there is still much that we don't know. First, the provincewide element of the whole population study was ecological (the data were analyzed at the level of the local health authority), meaning individual differences related to the children, which might affect their likelihood of being prescribed antibiotics and/or developing asthma, could not be accounted for. Second, the patient-level element of the study was conducted within the CHILD Study birth cohort, and while patient-level factors could be accounted for, it involved a much smaller group (2644 infants) across Canada, raising questions about generalizability of the findings to BC. Additionally, allergic asthma is only one form of atopic disease; other markers of allergic sensitization were not investigated. This is important because allergic asthma is not the only atopic disease common in childhood; allergic rhinitis (hay fever), food allergies, and atopic dermatitis (eczema) are also immune-regulated allergic diseases mediated by IgE, which frequently present together alongside asthma (or in succession), otherwise known as "the atopic march."[9] Lastly, wider evaluations of the safety of large reductions in antibiotic use in BC infants need to be conducted to determine whether a floor exists, below which further reducing prescribing could cause harm.

For these reasons our Community Antimicrobial Stewardship team at the BCCDC and UBC School of Population and Public Health, with collaborators at BC Children's Hospital, have developed an in-depth research protocol to follow on from this work. The study outlines a patient-level, province-wide investigation designed to 1) validate the findings of the patient-level analysis in a much larger cohort, 2) expand the outcomes to include other markers of allergic sensitization, 3) perform a series of sensitivity analyses to interrogate the association between antibiotic use and atopic outcomes to work toward further building a causal argument, and 4) investigate whether there are patient safety concerns about infection related to reduced pediatric antibiotic use. This work will involve building a retrospective provincial birth cohort using anonymized data from all infants born in BC over a 10-year period (approximately 460 000), with follow-up from birth to age 7, along with data related to their parents. In BC we are able to take advantage of the data linkage capacity of Population Data BC, collecting relevant clinical, sociodemographic, and environmental information for each infant and their family across multiple linked datasets, namely Perinatal Services BC, MSP, DAD, PharmaNet, Vital Statistics (Births and Deaths), CANUE Air Quality, BCCDC Immunizations, and Citizenship and Immigration Canada. This will allow for our findings to be completely generalizable to BC children as our focus is the entire BC child population. We are also building collaborations to study this relationship in other provinces and countries to assure its generalizability.

One potential source of bias in studies investigating causation is confounding by indication. This occurs when it is not possible to determine whether it is the treatment (i.e., antibiotics) or the underlying condition being treated (i.e., URTI) that is putting the patient at risk of the outcome (i.e., asthma). In the *Lancet Respiratory Medicine* article, we addressed this by conducting an analysis where respiratory indications were removed. Our population-based cohort study will include several sensitivity analyses looking at atopic outcomes in children receiving antibiotics only for nonrespiratory tract infections, as well as in infants with respiratory tract infections who did and did not receive antibiotics. In this way we hope to tease apart the individual effects of infection versus treatment on atopy risk.

It takes a village

How can practising physicians continue to play a role? If antibiotic exposure is a modifiable risk factor for resistant infections and for asthma,

there are many ways to reduce the risk for our patients. These include:

- Widespread vaccine coverage (particularly the pneumococcal vaccine).
- Beta-lactam allergy de-labeling to interrogate allergy labels and encourage the use of viable first-line treatments.[10]
- Keeping up-to-date with antibiotic prescribing guidance (Bugs and Drugs www.bugsanddrugs.org).
- Emphasizing symptomatic treatment for self-limiting infections (most otitis media).
- Providing strong follow-up if initial management does not include antibiotics.

These practices not only contribute to preserving this precious resource and reducing the risk of antibiotic resistance, they are also cost effective. For example, after the introduction of the Do Bugs Need Drugs? program in BC, average monthly costs of antibiotics decreased by $18.9 per 1000 population, resulting in an annual savings for the province in 2014 of $83.6 million,[11] and this was taking only direct drug costs into account; savings to the wider health care economy were not considered. Once the association between antibiotic stewardship and the reduction of asthma risk has been more clearly articulated in the entire provincial pediatric population, the attributable cost savings will be amplified. We also need to communicate the importance of the connection between asthma and antibiotic prescribing to patients and the public. For example, a plain language social media graphic has been used in BC by the Antibiotic Wise program to explain the results of the study **[Figure]**.[3]

This ongoing work highlights the impact that successful antibiotic stewardship practices can have, not only on reducing the potential for antibiotic-related side effects, opportunistic *C. difficile* infection following antibiotic treatment, and selection of antibiotic-resistant bacteria, but also for reducing the risk of childhood asthma and possibly other immune-regulated conditions. The potential for mitigating long-term morbidity and increasing cost savings to global health care systems is enormous. To realize this potential, however, a concerted effort will be required across many clinical communities, including pediatrics, respiratory medicine, immunology, infectious disease, and general practice, to turn the tide on the asthma and allergy epidemic and begin to shift toward a future where asthma and other atopic diseases are substantially preventable, not just manageable. ■

Competing interests

None declared.

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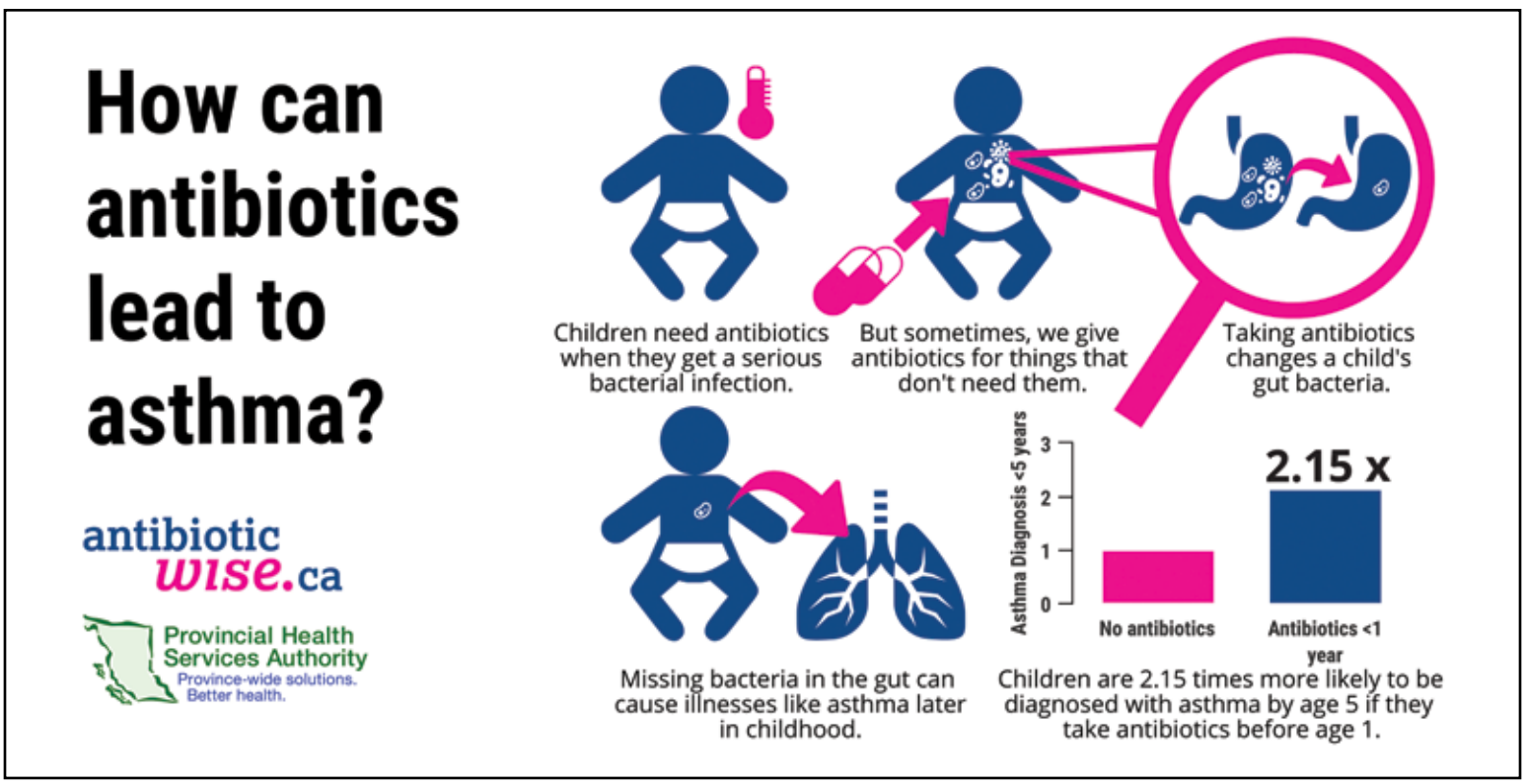

FIGURE. Graphic used in BC by the Antibiotic Wise program to explain the results of the Lancet Respiratory Medicine study.

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In Plain Sight: Elaboration on the review

Authors discuss the review on Indigenous-specific racism and discrimination in BC health care.

Mary Ellen Turpel-Lafond (Aki-kwe), JD, LLM, SJD, Laurel Lemchuk-Favel, MHA, Harmony Johnson (sɛƛakəs), MHA

Dr Turpel-Lafond, Aki-kwe, was appointed as the independent reviewer by Minister of Health Adrian Dix. Dr Turpel-Lafond is a member of the Muskeg Lake Cree Nation. She is a former Saskatchewan provincial court judge and BC representative for children and youth, and is currently professor of law at the University of British Columbia's Peter Allard Hall Law School, the director of UBC's Indian Residential School Centre For History and Dialogue, and senior associate counsel at the legal firm Woodward and Company.

Ms Lemchuk-Favel was the director of data and analytics for the review. She has been involved in Indigenous health and wellness in various capacities with national and regional Indigenous organizations, including most recently at the BC First Nations Health Authority, and for the past 28 years through her own consulting firm. Ms Johnson, sɛƛakəs, is of the Tla'amin Nation and served as executive director of the review. She has served in senior policy, advisor, and executive roles in BC First Nations organizations and provincial and national health organizations, and authored a range of publications on the history and teachings of the Tla'amin people, issues of racism and cultural safety, and First Nations self-determination.

This article has been peer reviewed.

In June 2020, the BC Minister of Health commissioned an independent review to examine systemic Indigenous-specific racism in the provincial health care system after allegations were made of a guessing game in BC emergency departments in relation to the blood alcohol levels of Indigenous patients. The review examined this allegation and the health system more comprehensively in relation to the experience of Indigenous patients at the point of care, and Indigenous health workers within care delivery settings in BC. The resulting reports are available online:

- Summary report (https://engage.gov.bc.ca/app/uploads/sites/613/2020/11/In-Plain-Sight-Summary-Report.pdf)
- Full report (https://engage.gov.bc.ca/app/uploads/sites/613/2020/11/In-Plain-Sight-Full-Report.pdf)
- Data report (https://engage.gov.bc.ca/app/uploads/sites/121/2020/11/In-Plain-Sight-Data-Report_Dec2020.pdf1_.pdf)

The review was met with full cooperation by all organizations and entities in the health system, including delegated authority from the Minister of Health, enabling access to all required data, comprehensive submissions from Indigenous peoples and health care organizations and practitioners, and timely and frank key informant interviews. This cooperation, in part, reflects a unique environment in BC resulting from decades of work by Indigenous peoples to compel recognition of their human rights. While serious reconciliation work remains to be done, there has been some promising progress in recent years. This includes the adoption in November 2019 of the Declaration on the Rights of Indigenous Peoples Act (Declaration Act), legislation that requires the implementation of the United Nations Declaration on the Rights of Indigenous Peoples in BC. As well, specific to the health care sector, there has been adoption of declarations of commitment to advance cultural safety and humility by the leaders of all major health organizations, and the establishment of a First Nation health governance structure to advance inclusion of First Nations people in health care design and decision making.*

Despite this unique context in which some efforts toward transformative change in relations with Indigenous peoples have been welcomed, the review clearly confirmed that the problem of Indigenous-specific racism persists, and is in fact pervasive across all regions and health care settings. But the review sought to do more than demonstrate that the problem exists. It sought to undertake a comprehensive approach that would allow for full critical analysis of what needs to be done. Over a 6-month period, a small team administered surveys among Indigenous peoples and BC health care professionals (Indigenous Peoples' Survey [IPS] and Health Workers'

** See the following tripartite evaluation report for a comprehensive overview of the unique efforts in BC. These efforts have included previous major studies on the health and wellness of Indigenous peoples issued by the BC Provincial Health Officer since 2001. Former Provincial Health Officer Dr Perry Kendall was instrumental in these efforts and also provided advice and leadership to this review. First Nations Health Authority, Province of British Columbia, Indigenous Services Canada. Evaluation of the British Columbia tripartite framework agreement on First Nation health governance. 2019. Accessed 27 December 2020. www.fnha.ca/Documents/Evaluation-of-the-BC-Tripartite-Framework-Agreement-on-First-Nations-Health-Governance.pdf*

Survey [HWS]), received submissions from Indigenous peoples and the general public about incidents of Indigenous-specific racism, conducted key informant interviews, and undertook extensive qualitative and quantitative analysis of data regarding health system performance for Indigenous peoples and their health outcomes. Taken together, almost 9000 individuals directly shared their perspectives with the review, and approximately 185 000 Indigenous individuals were reflected in the analysis of health sector data.

As the data and information were compiled, a systematic effort was made to assess and analyze the long-standing, pervasive reality of Indigenous-specific racism, including exploring origins and causes, assessing how racism continues to be transmitted and/or held in place, and understanding the impact of racism on Indigenous peoples' access to care and health and well-being. Approaching the problem in a systematic way, using a methodology of engagement, case review, and assessment of data, permitted the reviewers to craft recommendations arising from the sources with a more definitive goal to disrupt the cycle of racism that continues to limit health care access and services for Indigenous peoples in BC.

Core concepts

A key observation of the review was that, despite strong leadership acknowledgment of Indigenous-specific racism and cultural safety and humility, a shared understanding of critical terms and concepts across the health system is lacking. This lack of shared understanding is a major impediment to change at individual and systemic levels; without it, efforts to address racism commonly elicit reactions marked by discomfort, resistance, and fear. Terms such as *diversity*, *inclusion*, and *cultural safety and humility* are repeated as mantras with very limited understanding—and therefore application—of what they mean in a practice setting. Essentially, the review found that the growing focus on professionalism and/or grouping together of human resource concerns such as bullying, harassment, and workplace culture and discrimination into broad-based strategies cast a net too wide and, therefore, insufficiently address racism against Indigenous peoples.

The clear and standardized articulation of core concepts and standardized language describing the problem, desired outcomes, and the conditions and interventions required to achieve the necessary change are among the first critical steps in facilitating effective dialogue and action on the pressing and difficult problem of

Only 16% of all Indigenous respondents reported never having been discriminated against while receiving health care.

Indigenous-specific racism. The review developed and implemented the following understandings in its work, as part of an effort to build shared understanding throughout the health care sector (see the In Plain Sight full report for a more comprehensive set of key terms, p. 8).

The problem

- Racism is the belief that a group of people are inferior based on the color of their skin or their culture. It leads to both a) prejudice—a negative way of thinking and attitude toward a socially defined group and toward any person perceived to be a member of the group, and b) profiling—a preset negative idea of a group in society applied to individuals who are members of that group.
- Racism, prejudice, and profiling lead to discriminatory behaviors and policies that oppress, ignore, or treat racialized groups as less than nonracialized groups.
- Indigenous-specific racism refers to the unique nature of stereotyping, bias, and prejudice about Indigenous peoples in Canada that is rooted in the history of settler colonialism. Stereotyping and profiling of Indigenous peoples springs from the historic beliefs cultivated about Indigenous peoples' genetic, cultural, and intellectual inferiority that enabled settlers and their governments to expropriate Indigenous lands and resources.
- Systemic racism is enacted through routine and societal systems, structures, and institutions such as requirements, policies, legislation, and practices that perpetuate and maintain avoidable and unfair inequalities across racial groups.

Solutions: mindsets and tools

- Antiracism is the practice of actively identifying, challenging, preventing, eliminating, and changing the values, structures, policies, programs, practices, and behaviors that perpetuate racism. It is more than just being "not racist" but involves taking action to create conditions of greater inclusion, equality, and justice. As related to anti-Indigenous racism, the tools must be grounded in clearer understanding of the main areas of prejudice impairing health services and communication at the clinical level and active measures to address these.
- Cultural humility is a lifelong process of self-reflection and self-critique. Cultural humility begins with an in-depth examination of the provider's assumptions, beliefs, and privilege embedded in their own understanding and practice. It requires curiosity and a commitment to lifelong learning about oneself, as well as the equally legitimate worldviews and practices of those of other cultures.

Desired outcomes

- A culturally safe environment is a physically, socially, emotionally, and spiritually safe environment, as defined by the patient, without challenge, ignorance, or denial of their identity. A culturally safe environment upholds the unique human rights of Indigenous peoples—including the right to access care free of racism and discrimination, the right to one's language and identity, and the right to traditional medicine and cultural practice.
- Substantive equality refers to the requirement to achieve equality in opportunities and outcomes, and is advanced through equitable access, equal opportunity, and the provision of services and benefits in a manner and according to standards that meet any unique needs and circumstances,

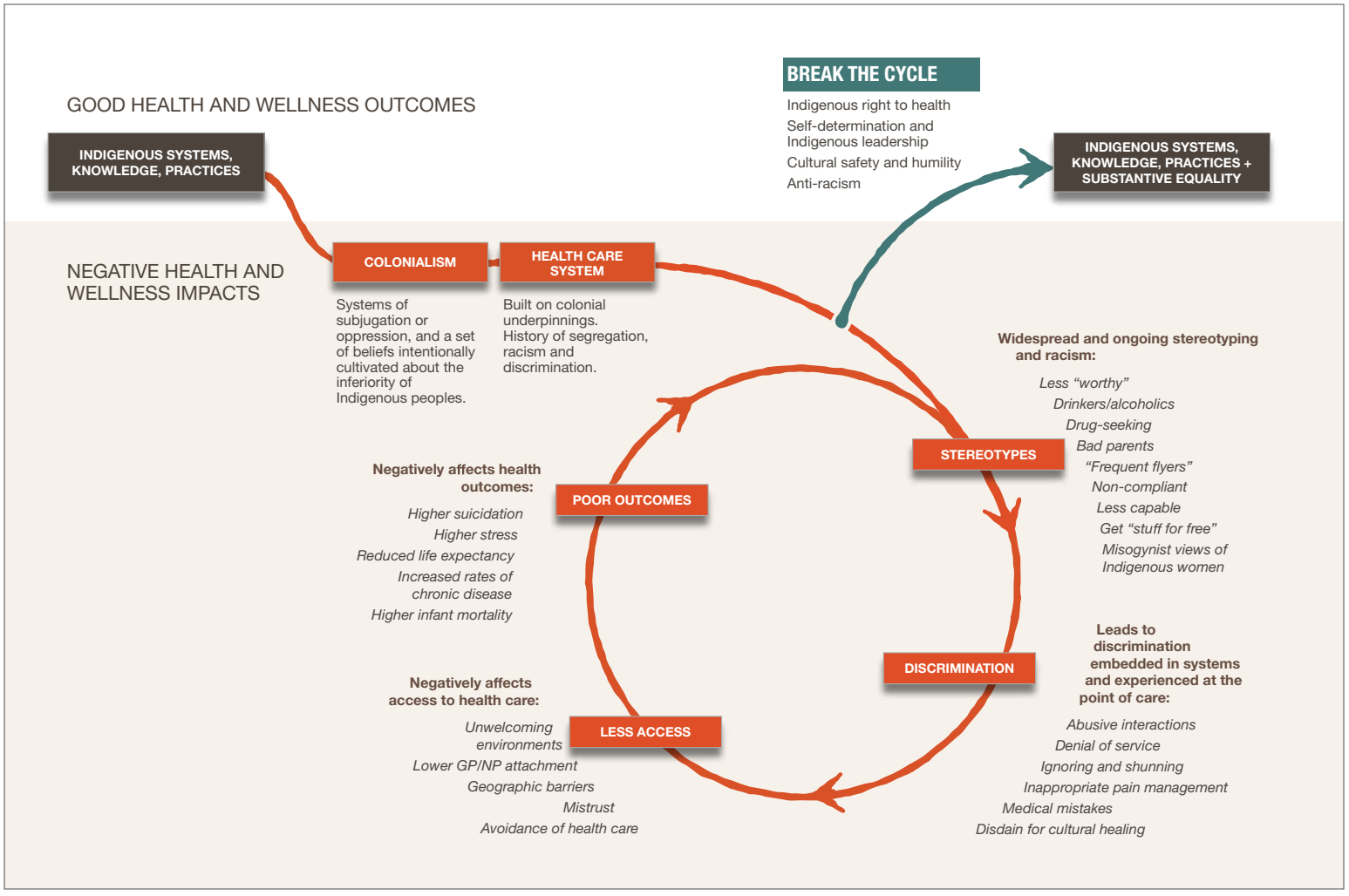

Figure. Infographic depicting what Indigenous-specific racism looks like, how it operates, and the impacts it has on Indigenous peoples' health and wellness.

Source: *In Plain Sight: Addressing Indigenous-specific Racism and Discrimination in BC Health Care*, full report, November 2020.

such as cultural, social, economic, and historical disadvantage.

- Indigenous human rights refer to the specific requirement to ensure that Indigenous peoples enjoy protection of human rights in BC in keeping with the minimal standards for the protection and survival of Indigenous peoples as provided in the United Nations Declaration on the Rights of Indigenous Peoples. UN Declaration Article 24 is of particular relevance as it provides that Indigenous peoples must access health and social services without discrimination.[†]

As the province of BC has adopted the UN Declaration by provincial legislation in November 2019, the health care system must shift to align with the standards in the Declaration.

Review findings

The review found widespread anti-Indigenous racism in health care in BC. In the IPS, only 16% of all Indigenous respondents reported never having been discriminated against while receiving health care. In another survey targeted to all health care workers in BC, 35% of respondents indicated that they had witnessed interpersonal racism or discrimination directed to Indigenous patients or their family and friends, and 84% of White respondents reported this racism in health care to be "somewhat," "very," or "extremely" prevalent, or were unsure. The existence of Indigenous-specific racism is clear and incontrovertible.

Beyond simply "proving" the existence of the problem, the review articulated what this racism looks like, how it operates, and the impacts it has on Indigenous peoples' health and wellness (see Figure for a visual summary). Indigenous

[†] *Article 24 of the UN Declaration on the Rights of Indigenous Peoples states: "1. Indigenous peoples have the right to their traditional medicines and to maintain their health practices, including the conservation of their vital medicinal plants, animals and minerals. Indigenous individuals also have the right to access, without any discrimination, to all social and health services. 2. Indigenous individuals have an equal right to the enjoyment of the highest attainable standard of physical and mental health. States shall take the necessary steps with a view to achieving progressively the full realization of this right." United Nations General Assembly. United Nations declaration on the rights of Indigenous Peoples. 2007. Accessed 27 December 2020. www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf.*

peoples have a long and rich history of health and wellness, guided by a wholistic understanding of well-being supported by physical, emotional, spiritual, and mental health, healing, and medicinal practices. These practices were intentionally undermined through colonialism, including measures such as segregated residential schools, Indian hospitals, and the Indian Act, designed to eliminate Indigenous peoples and cultures and make way for European settlement. To enable these measures, colonial beliefs were promoted about Indigenous peoples as morally and culturally inferior, dying off, and incapable of managing their societies, lands, and resources. Without much public education in Canada on the history of colonialism and the concept of racism and bias, those beliefs have continued, evolved, and exist in a widespread way across Canadian society, including in health care. The assumptions take the form of stereotypes about Indigenous peoples that are at the core of Indigenous-specific racism existing today, in health care and other sectors. Analysis of submissions and multiple data sources gathered by the review revealed that the most prevalent stereotypes about Indigenous peoples in BC's health care system relate to the concepts of inferiority and incapability—that Indigenous peoples are therefore "less worthy" of care, are alcoholics or drug seeking, and are "bad parents," to name a few (see Finding 1 of the full report, p. 36).

These widespread stereotypes result, often unconsciously, in health care workers profiling Indigenous patients. Subconsciously predetermining that Indigenous peoples are less worthy, less capable, and substance-dependent results in discriminatory treatment of Indigenous patients. Again across multiple data sources, the review found that discriminatory treatment of Indigenous patients most commonly takes the form of improper personal interactions, misdiagnoses, inappropriate pain management, and denial of service. It is unsurprising that Indigenous peoples consistently report poorer experience of care in all data examined by the review. In fact, the experience of racism leads many Indigenous peoples to avoid health care. For example, when compared to other patients, First Nations were more than twice as likely to leave BC hospitals against medical advice in the years 2015 to 2018.[1]

It must be noted that interpersonal racism is only one aspect of the problem. Canada's institutions, systems, and laws are founded upon and reflect its settler colonial origins, and create systemic barriers to access to health care for Indigenous peoples. These include the results of relocation of many First Nations communities far away from urban centres, the fact that health care does not consider, reflect, or respect Indigenous health practices and medicine, and continuing jurisdictional barriers related to on- and off-reserve funding of health care services, and provision of health services on-reserve. Key policies and practices of colonialism, including residential schools and Indian hospitals, have lineage today, triggering intergenerational trauma response in health care interactions and settings.

As human beings, it means adopting a cultural humility mindset, approaching relationships with curiosity and meaningfully self-interrogating one's own biases and privilege.

The intersection of interpersonal and systemic racism shapes inequitable and inadequate health system performance for Indigenous peoples across a range of measures (see Finding 2 of the full report, p. 55).[‡] In examining attachment to general practitioners/nurse practitioners, First Nations of all age groups had significantly lower rates compared to other residents (the residual BC population that remains after a data linkage using the First Nations Client File has identified and extracted all First Nations who have Indian status and are registered in the BC Medical Services Plan). For example, for First Nations in the 65-and-older age group, the First Nations rate for nonattachment was 88.5% higher than that of non-Indigenous people.[1] The review also examined avoidable hospitalizations for ambulatory care sensitive conditions among First Nations residents as a barometer of inadequate access to primary health services. The hospitalization rate for these conditions among First Nations was over 2 times higher than among other residents in 2017/18.[1] Lack of attachment to primary care could potentially impact equitable access to preventive screening. For example, when examining Pap testing, in all age groups First Nations women's rates were approximately 70% of those of non–First Nations women, despite First Nations having a 1.6-times higher prevalence rate of cervical cancer.[1] This lesser access to preventive and primary care appears to contribute to a disproportionately high reliance on emergency services—First Nations were 1.8 times more likely to visit the emergency department in 2017/18 than non–First Nations people, and the First Nations rates were significantly higher among those who were not attached to a general practitioner/nurse practitioner.[1]

Cumulatively, this poor health system performance results in inequitable health outcomes for Indigenous people including a life expectancy for First Nations persons 9 years less than non–First Nations people,[2] a twofold higher rate of infant mortality,[2] and increased rates and earlier progression and complexity of chronic disease.[1] Additionally, first-of-its-kind examination of data gathered through the most recent round of the First Nations Regional Health Survey found that the very experience of racism is associated with self-reported negative health outcomes—those who report having experienced racism also report much higher rates of distress and stress, suicidal ideation, and use of mood-altering substances.[1] This affirms other research demonstrating that racism tends to precede ill health rather than vice versa, and does so in both mental ill health and physical disease.[3]

[‡] *Health system performance was examined in the review generally through analysis of First Nations quantitative data. The comparatively low numbers of Métis in BC resulted in an inability to report on many health service utilization and health outcome measures, or in other cases, to show statistically significant differences between Métis measures and those of the non-Indigenous population.*

The impacts of the two current public health emergencies in BC serve to magnify the issues, particularly when compounded by the determinants of ill health (e.g., poverty, inadequate housing) that too are disproportionately experienced by Indigenous people (see Finding 4 of the full report, p. 80). To 31 October 2020, First Nations died from overdoses at a 5.5 times higher rate than other residents, with the gap between the rate of First Nations dying from opioid overdose and that of other residents increasing annually from 2016 to the present. In the first 7½ months of the COVID-19 pandemic, First Nations in BC experienced a 56% higher rate of infections than non-Indigenous population.[1]

It was also important for the review to examine the experiences and outcomes of various subpopulations of Indigenous peoples, including those based on gender, age, and region. Two groups were starkly evident. Indigenous women shoulder a particularly disproportionate burden of these harms, a situation brought into sharp focus during the course of the review with the broad media coverage of the treatment of Joyce Echaquan. Indigenous women in BC experience the intersection of gender and race discrimination, involving misogynist stereotypes, deep feelings of unsafety in accessing health services, and the most acute gaps in health outcomes of any population segment examined in the review (see Finding 3 of the full report, p. 72). Additionally, Indigenous health care workers experience racism and discrimination that is tolerated in their professional and learning environments (see Finding 5 of the full report, p. 91). In the HWS, 42% of White respondents reported witnessing racial discrimination toward racialized health workers, and 52% of Indigenous respondents reported personally experiencing racial prejudice at work, most commonly in the form of discriminatory comments by colleagues or superiors. Indigenous respondents indicated that the racial prejudice or discrimination they experienced negatively impacted their emotional health (95%), mental health (92%), self-esteem (81%), job satisfaction (80%), and spiritual health (80%), demonstrating both the personal and professional toll that racism exacts from Indigenous health workers.

Understanding the findings

The review sought to understand why this problem persists in an environment very publicly committed to reconciliation and cultural safety. HWS respondents most commonly reported the following reasons why systemic or organizational racism exists:

1. Staff not willing to stand up and call out racially prejudiced behavior.
2. Staff not regularly reminded of the many ways discriminatory behavior can occur.
3. Underrepresentation of Indigenous personnel at all levels of the organization.

In both the IPS and HWS, respondents called most strongly for interventions focused on leadership, policies and practices, and training or education for staff.

Interestingly, there are interventions in place ostensibly to address these concerns, and these existing policies and processes were examined by the review. Complaints processes were shown to be largely unused by Indigenous peoples, and when they were used, did not have capability to examine allegations of racism, in part because quality in health services has not been adequately defined as requiring an antiracism standard or dimension (see Finding 7 of the full report, p. 110). The review was overwhelmingly advised of the many barriers for health professionals in accessing cultural safety and antiracism training, and that these programs lack practical strategies and tools (see Finding 6 of the full report, p. 102). Established commitments and targets to Indigenous (particularly BC First Nations) health professional education, recruitment, and retention are lagging. There are many promising and, in fact, positive initiatives underway across the entire health system, yet these are not supported by the necessary legislative, policy, or regulatory underpinning that would truly hardwire cultural safety as a desired outcome of BC's health care system (see Finding 9 of the full report, p. 125). There is also no routine measurement of health system performance on this issue, serving to mask a problem that this review has demonstrated is "in plain sight" (see Finding 11 of the full report, p. 143).

Ultimately, the review's critical examination of the "solutions" in place to address Indigenous-specific racism reveals that, perhaps unsurprisingly, the lack of a shared understanding of core concepts as earlier described is intimately connected with a lack of integrated strategy to address Indigenous-specific racism, the proliferation of well-meaning but disconnected initiatives, and an inability to assess results at a systemic level. In other words, there is work that has been done, but its effectiveness is not measurable or meaningful, and of greatest concern, it does not adequately operate to inform or improve practice at the clinical setting or point of care.

Moving forward

The review identified 24 recommendations designed to disrupt the cycle of racism, improve health system performance, and enable substantive equality, consistent with the obligation to uphold Indigenous human rights in accordance with the new Declaration Act. A systemic problem requires a systemic solution. The recommendations are structured in three interlocking categories—systems, behaviors, and beliefs—reflecting the complex nature of the change, and the need for changes both by individuals and the structures they operate within. In considering implementation of these recommendations, Indigenous peoples shared a clear and consistent message with the review: while those who experience the problem of racism must be involved in developing and evaluating solutions, the primary responsibility and burden of this work lies with non-Indigenous individuals, organizations, and governments.

Recognition that the problems in health care today are deeply rooted in an enduring legacy of colonialism means that confronting that legacy requires substantive, transformative change. It is not adequate to suggest that these problems in health care are merely a reflection of broader societal issues. Health care can and must lead the way in confronting the ongoing legacy and responding to anti-Indigenous racism, in part by removing the responsibility to address it from Indigenous advocates and patients, and taking full ownership of and accountability for the problem.

Physician leadership will be critical in confronting this historic legacy and in creating positive change. As leaders, this means championing required legislative and policy change, including an antiracism act, a cultural safety

accreditation standard, and fostering organizational culture that encourages employees to speak up against racism. As practitioners, this means a commitment to further education and training, and the application of antiracism tools. As colleagues, it means creating a welcoming environment for Indigenous health care professionals. And as human beings, it means adopting a cultural humility mindset, approaching relationships with curiosity, and meaningfully self-interrogating one's own biases and privilege. Collectively, these efforts will move us beyond awareness-raising and oft-repeated mantras to genuine cultural safety and reconciliation, and to building a stronger health care system for all British Columbians. Having a set of antiracism tools in BC health care to better support the access, services, and outcomes for Indigenous peoples is long overdue, but certainly within reach. ■

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Suggested reading

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McGibbon EA, Etowa JB. Anti-racist health care practice. Toronto: Canadian Scholars Press, Inc.; 2009.

Obituaries

We welcome original tributes of less than 300 words; we may edit them for clarity and length. Obituaries may be emailed to journal@doctorsofbc.ca. Include birth and death dates, full name and name deceased was best known by, key hospital and professional affiliations, relevant biographical data, and a high-resolution head-and-shoulders photo.

Dr Peter Coy

1932–2020

It is with deep sadness that we announce the passing of Dr Peter Coy on 17 October 2020. He died peacefully at home with his family by his side.

Peter graduated in medicine from the University of Wales in Cardiff in 1956. His radiotherapy training was at the renowned Christie Hospital in Manchester. The family immigrated to Canada in 1963 when he was appointed staff radiotherapist at the BC Cancer Agency in Vancouver. In 1976 he was appointed director of the Victoria Cancer Clinic. Peter was instrumental in the establishment of the Victoria Hospice and was on the board for many years. In 1997 he was made an honorary life member.

After his retirement in 1993, Peter volunteered for numerous organizations and, as chair of the Capital Regional District Tobacco Free Task Force, he was an important activist in developing the first antismoking bylaws in Canada. His main hobbies were gardening, sailing, painting, and lawn bowling, and he loved music.

A man of strength, dignity, and compassion, Peter was an ongoing ambassador of public health and a seeker of knowledge. He is fondly remembered as a lovely, kind man with a great sense of humor. Peter was devoted to his family and is survived by his wife of 63 years, Jenny; three daughters; and four granddaughters. Peter was predeceased by one daughter in 2016.

—Jennifer Coy
Victoria

Recently deceased physicians

If a BC physician you knew well is recently deceased, please consider submitting an obituary. Include the deceased's dates of birth and death, full name and the name the deceased was best known by, key hospital and professional affiliations, relevant biographical data, and a high-resolution photo. Please limit your submission to a maximum of 500 words. Send the content and photo by e-mail to journal@doctorsofbc.ca.

CME calendar

Rates: $75 for up to 1000 characters (maximum) plus GST per month; there is no partial rate. If the course or event is over before an issue of the *BCMJ* comes out, there is no discount. **Deadlines:** ONLINE: Every Thursday (listings are posted every Friday). PRINT: The first of the month 1 month prior to the issue in which you want your notice to appear; e.g., 1 February for the March issue. The *BCMJ* is distributed by second-class mail in the second week of each month except January and August. **Planning your CME listing:** Advertising your CME event several months in advance can help improve attendance; we suggest that your ad be posted 2 to 4 months prior to the event. **Ordering:** Place your ad at www.bcmj.org/cme-advertising. You will be invoiced upon publication. Payment is accepted by Visa or MasterCard on our secure online payment site.

PSYCHOLOGICAL PPE, PEER SUPPORT BEYOND COVID-19

Online (Wednesdays)

In response to physician feedback, the Physician Health Program's online drop-in peer support sessions, established 7 April, are now permanently scheduled for Wednesdays at 12 noon. The weekly sessions are cofacilitated by psychiatrist, Dr Jennifer Russel, and manager of clinical services, Roxanne Joyce, and are drop-in with no commitment required. The focus is on peer support, not psychiatric care. All participants have the option to join anonymously. To learn more about the sessions and the program, visit www.bcmj.org/news-covid-19/psychological-ppe-peer-support-beyond-covid-19. Email peersupport@physicianhealth.com for the link to join by phone or video.

GP IN ONCOLOGY EDUCATION

Vancouver, 1–12 Feb and 13–24 Sept 2021 (Mon–Fri)

BC Cancer's Family Practice Oncology Network offers an 8-week General Practitioner in Oncology education program beginning with a 2-week introductory session every spring and fall at BC Cancer–Vancouver. This program provides an opportunity for rural family physicians, with the support of their community, to strengthen their oncology skills so that they can provide enhanced care for local cancer patients and their families. Following the introductory session, participants complete a further 30 days of clinic experience at the cancer centre where their patients are referred. These are 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.

CME ON THE RUN

Online, 2 October 2020 – 4 June 2021 (Fridays)

The CME on the Run sessions are offered online. Registrants will receive links to go online before each session. Each program runs on Friday afternoons from 1 p.m. to 5 p.m. and includes great speakers and learning materials. Topics and dates: 5 Mar 2021 (Ophthalmology/ENT). Topics include Tinnitus: When the Ringing Never Ends, When to Call 911—Eye Emergencies in the Office, When the Sniffles Do Not Stop—Chronic Sinusitis Management, Not Your Average Cancer Sore—Diagnosis and Management of Oral Lesions, Ocular Findings of Common Systemic Conditions, When You Can't Sing Anymore—Management of Hoarse Voice, Common Eye Surgeries: What the GP Needs to Know, The Aging Eye: It is More Than Just Getting New Glasses. The next sessions are 7 May (Geriatrics) and 4 Jun (Internal Medicine). To register and for more information visit https://ubccpd.ca/course/cme-on-the-run-2020-2021 or email cpd.info@ubc.ca.

MINDFULNESS IN MEDICINE WORKSHOPS AND RETREAT

Various locations, 12–14 March, 23–26 April, and 21–26 May 2021

Please join us for one of these workshops/retreats focusing on the theory and practice of mindfulness-based stress management for physicians and other health professionals. These powerful and popular programs offer practical skills to navigate the stresses and challenges of our work in order to prevent burnout and build resilience and wellness into our personal and professional lives. All of the programs will take place in person with protocols respecting current public health recommendations. Mindfulness in Health Care, for health professionals and partners, will be held at Kingfisher Resort in Courtenay, BC, from 12–14 March 2021. Mindfulness in Medicine, Foundations of theory and practice for physicians and partners, will be held at Long Beach Resort in Tofino from 23–36 April. Mindfulness in Medicine, a meditation retreat for physicians, will be held at Hollyhock on Cortes Island from 21–26 May. To find out more, or to register, please contact Dr Mark Sherman at mark@livingthismoment.ca or go to www.livingthismoment.ca/events.

6th ANNUAL BC INFECTIOUS DISEASES SYMPOSIUM

Online, 30 April 2021 – 1 May 2021

Join us for this 6th annual conference, brought to you by Fraser Health, UBC, Surrey Memorial Hospital, and Vancouver Fraser Medical Program. Sessions start at 8 a.m. 30 Apr. Day 1 topics include H. pylori: Who We Should Treat and Who We Shouldn't; Pitfalls in Ordering Microbiology Tests; Updates in the Management of Community-Acquired Pneumonia in the Time of COVID; Updates on COVID-19; Update on HIV and Prep and PEP; Non-Pulmonary Tuberculosis; COVID-19 in Children. Day 2 topics include in-depth case discussions of the topics presented on Day 1, and runs from 8:00 a.m. to 12:30 p.m. Accredited by UBC CPD. To register and for more information visit: https://ubccpd.ca/idupdate2021 or email cpd.info@ubc.ca.

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Dr Matthew Chow

Dr Chow answers the Proust Questionnaire, telling us about his heroes, his fears, and what he values in his colleagues.

What profession might you have pursued, if not medicine?
I considered a career in the Canadian Armed Forces. My family has a multigenerational tradition of fighting against oppression and defending our shared values. I realize that I'm still doing those things and will continue to do so, just in a different way and in a different forum.

Which talent would you most like to have?
Being able to sing or play a musical instrument at a high level. I can do both passably, but excellence has eluded me.

Who are your heroes?
My dad, for personifying what it means to be honorable. My mom, for taking the difficult hand dealt to her and making the most out of it.

Dr Chow is a child and adolescent psychiatrist in Vancouver and the current president of Doctors of BC.

What do you consider your greatest achievement?
Teaching my daughter to ride a bike during the pandemic. The moment she took her feet off the ground and started pedaling on her own made me forget that we were in the middle of a global crisis.

What is your idea of perfect happiness?
The experience of people coming together in mutual understanding and respect.

What is your greatest fear?
Being unheard.

What is the trait you most deplore in yourself?
It's hard for me to let go sometimes.

What characteristic do your favorite patients share?
They believe in themselves and what they have to offer to the world. They don't always come to me that way, but it's my sincere desire to move my patients closer to that critical belief in themselves.

Which living physician do you most admire?
Since we are living through such extraordinary times, I'll give you two: Dr Bonnie Henry for her leadership of the pandemic response in BC, and Dr Lawrence Loh for providing a glimpse of what it is like to be a public health officer during a global crisis.

Which words or phrases do you most overuse?
I use the word *colleague* a lot. It's intentional: I want people to understand that we are working toward something together. We are not just random acquaintances.

What is your favorite place?
Any place where I can close my eyes and feel the thrum of humanity, or conversely a place where we can look up in the sky and realize how small our problems really are.

What is your favorite activity?
I love to learn. Seems like a pretty good pastime given how fast things are changing these days.

On what occasion do you lie?
My daughter still believes in the tooth fairy. I hope she doesn't read this.

What medical advance do you most anticipate?
Personalized medicine based on genomics. We've been making shots in the dark for far too long.

What is your most marked characteristic?
I can bring laughter to even the most tense situation.

What do you most value in your colleagues?
Courage. The kind of courage that speaks truth to power and uplifts the oppressed and vulnerable.

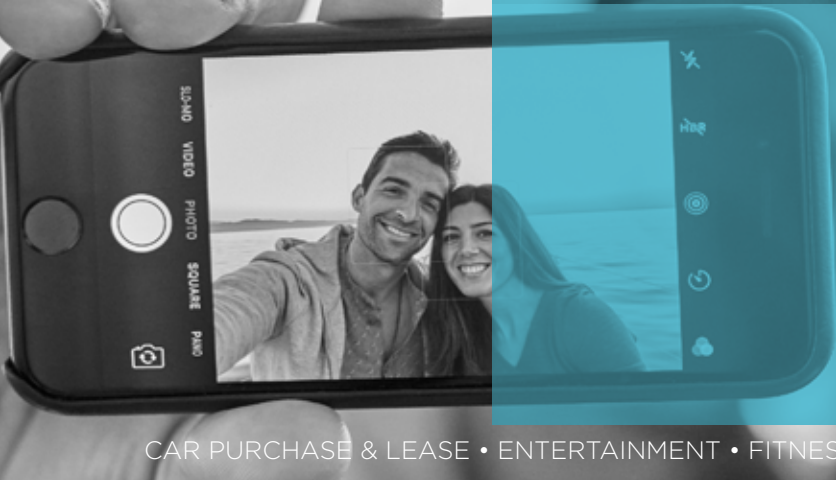
What are your favorite books?
I've enjoyed reading the stories in *Extraordinary Canadians* (by Peter Mansbridge, with Mark Bulgutch) and *Everyday Heroes* (edited by Jody Mitic). I've also been reading a lot of Brené Brown's work.

What is your greatest regret?
Not taking enough care of my body. You only get one.

What is the proudest moment of your career?
Every moment when I can support my colleagues as we respond to the pandemic.

How would you like to die?
Defending something or someone worthwhile.

What is your motto?
Try to leave a place in better shape than when you arrived. Even better yet, leave a person in better shape than when you first met them. ■



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