

# QMR

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# CONTENTS

## RECENT EVENTS

- 4 Letter from the Editors  
5 Health Human Resources Planning and  
CFMS Lobby Day

EDITORS-IN-CHIEF  
HOLLIS ROTH

## POINT/COUNTERPOINT

- 7 Why WebMD and Related Sites are Good for Patients  
9 Dr. Google is Bad for Patient Care

MARK BROUSSENKO  
ALLISON ROSEN

## FEATURES

- 10 Annual Physical  
11 Senior Friendly Design and the Hospitals of the Future  
13 The Cutting Edge: Innovations in Robotic Surgery  
15 Cancer Genetics  
17 The Future In Your Hands: Recent Advances in  
Prenatal Screening  
20 FAQs: A Medical Students' Guide to Social Media

SARAH-TAÏSSIR BENCHARIF  
AMANDA LEPP  
ALYSSA S. LOUIS  
BRANDEN DESCHAMBAULT  
TETYANA ROGALSKA  
EVE PURDY

## INTERVIEW

- 22 Insidermedicine with Dr. Sanjay Sharma  
24 Social Media with Dr. Anne Ellis

JENNIFER SIU AND CODY LI  
HOLLIS ROTH

## BOOK REVIEW

- 26 Health Care in the True North: Not So Strong  
and Not So Free?

HEATHER JOHNSON

## OPINION

- 28 Healthcare Is Not a Driver of Economic Growth  
30 Talking Heads

YAN XU  
SARAH-TAÏSSIR BENCHARIF

## INTRADERMAL COLUMN

- 31 IntraDermal Column

BRANDON WORLEY

## CREATIVE SUBMISSIONS

- 33 Marching Orders for Sad Days  
33 Directions

ANONYMOUS  
BRANDON WORLEY

## FFQM CONTEST WINNER

- 34 The (Medical) French Revolution

TETYANA ROGALSKA

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# Letter From the Editors

Dear Readers,

The future, finally, has arrived. Not the future of hovercars and moon resorts – we are still waiting for those. No, this is the future of robotic surgery (Alyssa Louis, 2016), cures for cancer (Branden Deschambault, 2016), and live-Tweeting from the classroom (Eve Purdy, 2015). In this issue, we explore the long-anticipated, the unforeseen and the inevitable, all within the context of medical education and practice.

Regardless of whether you are interested in economics (Yan Xu, 2015), prenatal screening (Tetyana Rogalska, 2016) or the view from the street (Sarah-Taïssir Bencharif, 2016) the future has you covered. Inside this issue, you will have the opportunity to arm yourself to handle the debate over online diagnostic resources (Broussenko vs Rosen, Point-Counterpoint, 2016), dealing with Insidermedicine (Jenn Siu, 2016), or what it is like to simply stroll through a hospital of the future (see Amanda Lepp, 2015). If your future holds some free time for reading, check out Chronic Condition, reviewed by Heather Johnson (2015) or Hollis Roth's (2016) recap of the CFMS lobby day! All this and more is inside – you never know what the future holds.

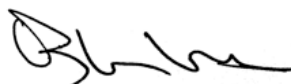
Before we set you loose, we would like to extend our sincere gratitude to our fantastic team of writers and contributors, the editors who worked tirelessly to proofread their work, and our incredible faculty advisor, Dr. Duffin, who makes the impossible seem routine. But most of all, we would like to thank you, our readers. Without your interest and enthusiasm, there really would be no future.

Thank you, and we hope that you enjoy this issue!

Live long and prosper,

Mark Broussenko

Allison Rosen



# Health Human Resources Planning and CFMS Lobby Day

HOLLIS ROTH, CLASS OF 2016

Health human resources planning was a key focus at the Canadian Federation of Medical Students' (CFMS) annual Lobby Day in Ottawa in early February. Queen's Medicine sent a small but strong contingent of students led by William Reginold (CFMS Political Advocacy Committee Representative), Branden Deschambault (Aesculapian Society VP Junior External), and Ontario Medical Students Association Political Advocacy Committee members Christine Le and Hollis Roth.

Lobby Day officially began with the National Political Advocacy Committee Meeting on Saturday, February 2. CFMS committee members from each medical school presented on ongoing advocacy projects ranging from student retention policies to local surveillance of determinants of health by geospatial information system mapping. Other student delegates arrived in Ottawa on Sunday February 3 and spent the afternoon and evening immersed in an intensive training day. Students were fortunate to receive a keynote address from Dr. Joshua Tepper (VP Education of Sunnybrook Hospital, former CFMS President, and former Assistant Deputy Health Minister for Ontario). Student delegates also received briefings outlining politics on Parliament Hill and a detailed discussion of the issues the CFMS had decided to address.

Lobby Day has traditionally focussed on one or two issues, referred to as 'asks', to achieve maximum impact. This year the first ask dealt with improving federal government incentives for residents and physicians who practice medicine in remote and rural areas across Canada. The second ask requested the federal government take a leading role in establishing a pan-Canadian study on health human resources planning.

On Monday February 4, medical student delegates, led by CFMS President Robin Clouston (Memorial University, '13) and CFMS Vice-President Advocacy Thomas McLaughlin (University of Toronto, '13), met with Members of Parliament and Senators from across Canada. Between meetings, students reconvened at an established headquarters to de-



Hollis Roth (Queen's), Darrin Wiebe (UBC – Island Medical Program), and Jimmy Yan (Western) meet with Elizabeth May (Green Party MP – Saanich-Gulf Islands).

brief and follow up with MPs or Senators who had requested further information. Students also had the opportunity to tour Parliament, observe Question Period, and network with colleagues from different medical schools.

Health human resources planning proved to be the star of the day, with many MPs flummoxed to learn that Canada has no system for tracking physician demand. Currently, only physician supply is tracked by the Canadian Institute for Health Information and no information is available to predict what specialties will be in demand in different areas of the country as the population changes. The CFMS believes that this prevents graduating medical students from making fully informed decisions about their futures when selecting residency programs and stressed that without such a centralized system in place, the growing and alarming trend of unemployment amongst highly qualified physicians will continue [1-3].

Students also requested an improvement to a loan forgiveness program for new family physicians practicing in remote and rural communities that was announced in 2011[4] and amended to include medical residents in 2012. The CFMS has heard from medical students that the higher



Branden Deschambault (Queen's), Christine Le (Queen's), and Stephanie Kwolek (McMaster) meet with Wayne Marsten (NDP MP – Hamilton East-Stoney Creek).

interest charged on Canada Student Loans upon graduation compared to that on private bank lines of credit means that many students will have paid off their Canada Student Loans using their lines of credit before they become eligible for loan forgiveness, which they believe limits the impact of this program. The CFMS proposed that repayment on the interest and principal of the federal portion of Canada Student Loans be deferred until the completion of residency training for all residents, regardless of their area of specialization. This change would enable residents and new physicians to take advantage of the government's loan forgiveness program if they practice in remote or rural areas and would not restrict this program solely to family physicians.

These two ideas were generally well-received. Interested MPs and Senators were encouraged to send letters of support to the Health Minister, the Honorable Leona Aglukkaq (regarding human health resources planning) and to the Minister of Human Resources and Skills Development, the Honorable Diane Finley (regarding changes to the Canada Student Loans Program). Several MPs requested more information in preparation for raising these issues in Question Period at the House of Commons. A significant media

presence resulted in two articles on Lobby Day appearing in *The Hill Times* [5-6]. Many MPs and Senators tweeted about their meetings under the hashtag #cfmslobby, and Thomas McLaughlin spoke about health human resources planning on the CBC's *The Current* [7].

Overall, the consensus was that this year's Lobby Day was successful. Health human resources planning was the most well-received, while requesting changes to repayment of the federal portion of Canada Student Loans proved to be more complicated than anticipated, as many MPs brought up Return of Service agreements, which the CFMS does not support. The importance of health human resources planning to graduating medical students, combined with the fact that all Canadians, regardless of their geographical location, should have access to the health care services they require, will ensure that health human resources stays in the federal spotlight for years to come.

#### References

1. Royal College of Canada. *Royal College Speaks Out about Unemployed Specialist Doctors in Canada*, 2012. Print.
2. Amy Dempsey. "Health Care Checkup: Why can't Newly Graduated Specialist Doctors in Canada Find Jobs?" *The Star*, sec. News: GTA: 2012. Print.
3. Dr. Brian Goldman. *Will Operate for Food? The Unemployed Doc Paradox*. CBC, 2012. Audio.
- Canada's Economic Action Plan. *Government of Canada Announces Student Loan Forgiveness for Family Doctors and Nurses in Rural Communities*. Ed. Federal Government of Canada, 2012. Print.
4. Plecash, Chris. "Med students call for federal action on health human resources management." *The Hill Times Policy Briefing*, sec. Health: 22. 2013. Print.
5. Fry, Hedy. "A sustainable 'supply and needs-based' HHR strategy is not just a numbers game." *The Hill Times Policy Briefing*, sec. Health: 28. 2013. Print.
6. Canadian Broadcasting Corporation. *Patients without Doctors and Doctors without Jobs*. *The Current*, 2013. Audio.
7. Canadian Federation of Medical Students. *The Right Physicians in the Right Places: A Plan to Improve Access to Health Human Resources in Canada*, 2013. Print.

#### Summary of CFMS Lobby Day 2013 Asks:

##### Ask #18:

The CFMS calls upon the Government of Canada to defer repayment of the principal and interest accrued on the federal portion of medical graduates' Canada Student Loans until the completion of their residency training, so that physicians may take full advantage of existing government incentive programs for rural practice.

##### Ask #28:

The CFMS calls on the federal government, in conjunction with provincial and medical organizations, to create a Pan-Canadian study on Health Human Resources, including needs-based projections of physician supply and demand.

# Point: Why WebMD and Related Sites are Good for Patients

MARK BROUSSENKO, CLASS OF 2016

*Patients in healthcare suffer from what economists call an information gap. Essentially, the gap between the information available or understandable to a provider and a patient is nearly insurmountable – physicians train for years, if not decades, and have to continue learning about their fields for the duration of their practice in order to stay current.*

A patient coming to terms with a novel diagnosis is entering a market where he or she faces a mountain of diagnoses, terms, and barriers. Any sort of catch up mechanism is going to be a bare bones affair; it isn't reasonable to expect that decades of medical science can be distilled into a paragraph long blurb. But, for a patient who has been just recently diagnosed, even a cursory summary can be better than nothing.

*“sites like Dr. Google and WebMD do more to frighten and confuse patients than they help...”*

The common argument is that sites like Dr. Google and WebMD do more to frighten and confuse patients than they help. Very often, physicians will dismiss these sites as offering completely implausible differentials, or completely incongruous suggestions (i.e. either a fractured femur or lung cancer). But is this really the case? Perhaps early version of these sites may have been a little rough around the edges, but the year is 2013 and surely we've learned to Google influenza without also contracting a case of incurable breast cancer. I wanted to check if our fears about patient-oriented online resources are as well-founded as the we would like to believe.

*“Very often, physicians will dismiss these sites as offering completely implausible differentials...”*

As a test, I picked a condition that is difficult to diagnose symptomatically (mild hypothyroidism) but one with a large list of possible findings. I then picked something else almost completely unrelated (colorectal cancer) and tried to come up with a list of symptoms that might give that differential on WebMD. Sure enough, it was possible to come up with a presentation where those two were the most likely candidates – after about an hour of trying. Even the most hypochondriac patients would be hard pressed to come up with enough symptoms to produce a very clearly wrong differential. In general, the things that came up were very consistent with what medical students learn as possible alternatives; it even gave me some things that I hadn't heard about, but, on further research, ended up being correct. In this case, WebMD came up with a better differential than an admittedly green medical student.

*“WebMD came up with a better differential than an admittedly green medical student...”*

What about something easier; could I turn my headache into a brain tumor? One of the first things that you learn in medical school is how difficult it is to narrow down a single diagnosis based on just history and physical symptoms – after all, that's why we come up with differentials, not diagnoses. Could I trick WebMD into telling me that I had brain cancer? The answer, in short,

*“...we come up with differentials, not diagnoses...”*

was no. No matter how many things I said “Yes” to, the most serious thing I got was a warning to consult a physician immediately; I had answered yes to a question that indicated that I was potentially in need of urgent medical care (for reference, the question was “are you currently bleeding from your eyes?”). I suspect that, on the balance, that would constitute a fair reason to consult a medical professional with some sense of urgency.

*“...it tells you to go elsewhere far too often...”*

This hedging is, perhaps, the most poignant criticism of WebMD; rather than definitively suggesting outlandish diagnoses, it tells you to go elsewhere far too often. Almost half of the stems lead to some variant of “see a doctor.” Certainly, some of these

are triggered by very obvious warning signs (such as chest pain with radiation for MIs, severe, sudden migraines with aphasia, and so forth) but many others seem a bit more subjective. Given the issue of emergency room overcrowding and wait times, it may not be particularly prudent to urge every concerned citizen to run to their nearest hospital and wait for hours, especially if all they complain about is soreness in their leg after going for a run (compartment syndrome this is not).

That said, there are certainly very many advantages to having searchable, interactive resources available for patients. The diagnoses suggested by WebMD cover the common presentations of the most common diseases – there aren't very many things that come up that are particularly rare – which fits well with the primary care ideology of 'common things are common'. Other similar sites,

*“While they aren't perfect, these sites offer patients a better sense of agency and give some level of preparation for navigating the complexity of the healthcare system...”*

such as Dr. Google and MedLine Plus, also have searchable glossaries of common medical terms (useful for everyone) as well as guides to walk patients through their symptoms and checklists for things to prepare ahead of time for medical appointments. While they aren't perfect, these sites offer patients a better sense of agency and give some level of preparation for navigating the complexity of the healthcare system, two benefits that easily outweigh the rare suspicion of Shy-Drager or what have you (not that, I bet).



# Counterpoint:

## Dr. Google is Bad for Patient Care

ALLISON ROSEN, CLASS OF 2016

*Imagine you are a new parent returning home after an appointment with your family doctor. You have been told that you are due for a booster vaccine, but you want to make sure you do what is best for your child, so you try to find out more on your own. You turn to Google, and on the first page of results, half of the ten websites make the alarming claim that not only do vaccines not work, but they are dangerous, and your doctor is pressured by drug companies to encourage you to take this dangerous drug. How do you deal with this information?*

### Authority Masked

This situation is one of many reasons why the ability of patients to access unlimited information on the internet can have highly negative consequences. On the internet, all information can be published, regardless of validity. Questionable claims can seem valid under the guise of a flashy website containing pictures of attractive doctors and stirring patient testimonials. Alarmist newspaper headlines shout claims that may have long been disproved, but which endure online. The anonymizing and equalizing power of the internet can sometimes make it difficult for even the most erudite investigator to spot a valid source of information.

### The Snowball Effect

One of the important benefits of the internet is the way it brings patients together. Those suffering from rare diseases can find others in the same situation online, which can be a huge source of emotional support. Physician-vetted sites can provide clear, accurate information to patients, as well as links to a myriad of support groups. However, the same reason this tool is so positive can also lead patients down dangerous paths.

A group of patients suffering from skin conditions that have remained undiagnosed by physicians have found solace in online communities and forums, where many claim to have Morgellon's disease. This is an unrecognized condition, yet while most doctors view it as a delusional parasitosis, it is not inconceivable to imagine that patients with undiagnosed symptoms may eagerly latch on to the diagnosis and the large, supportive communities that exist online, perpetuating the belief that doctors are hiding this disease from public recognition.

### Empowered, but not Engaged

The internet, notes physician Jeff Benabio, contains a wealth of information, but a dearth of knowledge. More and more, physicians are no longer expected to internalize the wealth of medical information in its entirety. Rather, physicians have received years of training that equip them to assess treatment modalities and evidence. When primary evidence is placed in the hands of the consumer, the information can easily overwhelm. Placing trust and authority in the physician by virtue of the specialized training he or she has received removes the burden placed on the patient to engage with knowledge outside his or her skill set. Just as we trust car repair people to fix our cars, patients, too, are well advised to consider the advice of their physicians.

*"...tools for effective, informed advocacy are not – and indeed cannot – be provided by the internet alone"*

A core competency we learn as future physicians is Health Advocate. We encourage patients to take control over their own health and to partake in decisions that affect them. Dr. Google and the infrastructure the internet provides for access to resources certainly empowers the patient to advocate on his or her own behalf. But the tools for effective, informed advocacy are not – and indeed cannot – be provided by the internet alone. If a patient is directed by his physician to specific online resources, they are more likely to be helpful and accurate than websites the patient may find through independent browsing. While paternalism is a fading concept in medicine, it is important not to lose the recognition of the important skill and knowledge set the physician brings to the table. Importantly, this perspective is, in the end, better for the patient's health.

# Annual Physical

SARAH-TAÏSSIR BENCHARIF, CLASS OF 2016

Steve France's upcoming 50th birthday signalled a long-standing need: a visit to his family doctor for a complete physical exam.

It was time to screen for prostate cancer.

France, now 53, got the works: every system was examined. His thorough family doctor even checked his knee reflexes.

Instead of any prostate anomaly, the blood drawn during the 40-minute physical exam revealed an underactive thyroid.

The annual physical examination France received is on-hold, after a cash-strapped Ontario government reached a reforms agreement, effective January 2013, with the province's doctors. The agreement includes a savings of \$100 million over two years from physician-influenced services, like annual physical exams. Until March 2014, healthy patients between the ages of 18 and 64 will receive a "periodic health visit," billable at \$50, instead of the annual health exam, priced at \$72.20. It is a shorter exam tailored to the patient's health, slated to replace the head-to-toe physical.

This change is driven by evidence as well as dollars, says Dr. Chris Simpson, President-Elect Nominee for the Canadian Medical Association and Chief of Cardiology at Queen's University.

"The annual physical exam doesn't reduce rates of cardiac disease and cancer," says Dr. Simpson. "It's a low-yield exam in every single patient."

Chance findings—like France's underactive thyroid—during an annual physical exam are rare, he says. That alarm was sounded over 30 years ago in the first report by the Canadian Task Force on Preventive Health, known then as the Canadian Task Force on the Periodic Health Examination, which was established to examine the periodic health exam.

"Whereas the value of immunization in health protection has been established for many conditions, the value of the routine check-up in preventing disease is uncertain," wrote the authors of the 1979 report published in the Canadian Medical Association Journal. "We recommend that the annual check-up, as practised almost ritualistically for several

decades in North America, be abandoned."

The response amongst family doctors to the OMA's change is mixed, says Dr. Simpson. Some family doctors have said they will continue to do the full physical exam and incur any associated financial loss, he said.

For other family doctors, these official changes are a reflection of what they have already been doing for years.

"Annual physical' means a whole pile of different things," says Dr. Walter Emrich (Meds '76), a family doctor who has been in private practice for over 30 years. He says his physical exams have always been patient-focused, akin to the periodic health exam, and that each physician develops their own approach.

"I've done thousands of physicals in my life. I think I found one thyroid cancer by doing a thyroid examination," says Dr. Emrich. "Examining the thyroid hasn't been something that's given me a lot of return, so I remember that (case) quite distinctly."

*"That patient was grateful for the exam..."*

That patient was grateful for the exam, says Dr. Emrich.

For France, an underactive thyroid means he takes a thyroid hormone pill every day, which he says has significantly improved his energy levels. Despite this finding from a full exam, he approves of the targeted approach—that family doctors can do preventative medicine hinges on the wrongful assumption that every patient has a family doctor to see, he says, listing lifestyle changes as being more important.

Though this reform is based on current available evidence, Dr. Simpson stressed that it's important for the medical community to remain vigilant about measures imposed due to fiscal priorities. He adds that it's important to continue assessing the effectiveness of the periodic health exam during its stint to determine the future form of annual visits.

"This is an area where it will be better, yes," he says, of the targeted visits. "This doesn't mean that every time the government wants to make a change we just accept it."

# Senior Friendly Design and the Hospitals of the Future

AMANDA LEPP, CLASS OF 2015

*“We shape our buildings; thereafter they shape us.” –Winston Churchill*

A building reflects the cultural values of its times. A hundred years ago, hospitals were built as grand structures designed to convey the ideals of charity and hygiene, and to provide a home for scientific medicine. The hospitals of today are similarly challenged to create and renovate physical environments to meet a number of requirements, reflecting key issues of the present day. Examples of these include infection control, efficiency and accessible health care. The last of these requirements, accessibility, has been pushed to the forefront by the ever increasing segment of the population who are frail and elderly. Statistics Canada estimates that, by 2050, twenty-five percent of the population will be above the age of 65 [1]. Going by present values, approximately a third to half of this population will experience some form of disability [2]. Hospitals of the future will need to be able to accommodate the physical and cognitive needs of this population.

*“...accessibility has been pushed to the forefront by the ever increasing segment of the population who are frail and elderly...”*

A change in the way hospital buildings look and function is already being set in motion. The Senior Friendly Hospital Care report, published by the province of Ontario, notes that “many older structures were constructed at a time when building codes placed little emphasis on universal access” [3]. The report makes recommendations for hospitals in the province to help promote the safety, independence and functional well-being of frail patients. In particular, it suggests that hospitals make use of existing senior-friendly design resources when planning their physical environments, and that they conduct regular audits by personnel trained in this area.

St. Michael’s Hospital in Toronto is one hospital that has taken these recommendations to heart and has started transforming its space to become more senior friendly. Over the past year, the hospital, affectionately known as St. Mike’s,

*“Waiting rooms, clinic space, hallways, reception, common space, and both patient and public washrooms were all scrutinized.”*

has carried out senior friendly physical environment audits in over 80 areas across the hospital and identified opportunities to make the building more accessible. Waiting rooms, clinic space, hallways, reception, common space, and both patient and public washrooms were all scrutinized. Robert Fox, Vice President of Planning at St. Mike’s, reports that many areas where improvement can be made were identified in the audit. “We have been looking at all of our public spaces and clinical areas, and identifying a list of opportunities that we can work on over time as a priority.” Many of the changes that were recommended in the audit are already being put into place. “We have worked with our facility’s management team to begin to refinish floors in patient areas in a matte, non-glare finish. This change helps seniors with visual impairments, as glare on flooring can be distracting and lead to falls. We have provided ‘senior focused’ input to a recent project that designed new signage and wayfinding cues in of one our hospital wings. A recent renovation in the CIBC Breast Centre used a number of the design principles to enhance the waiting room for seniors.”

*“Many of the changes that were recommended in the audit are already being put into place.”*

The audit of the physical space has enhanced more general initiatives to address the health care needs of the frail elderly. Mr. Fox is enthusiastic about the positive change that is being stimulated by the evolving physical space. “We have been actively engaged in this work this past year, and are finding that these standards provide excellent ideas about how to enhance the environment for seniors, beyond accessibility considerations. Conducting audits... has helped raise awareness of all of our teams too.” Looking at the physical environment through the lens of senior friendly care

has been beneficial in stimulating the staff at St. Mike's to recognize the particular vulnerabilities of frail patients in the hospital.

*"...adaptations that are being made throughout the hospital will be of use to other individuals who use the space..."*

Mr. Fox anticipates that adaptations that are being made throughout the hospital will be of use to other individuals who use the space. "Many of the changes will make a difference for, and enhance the comfort and experience of, all patients and visitors to the hospital. Similarly, the improvements will assist our staff, physicians and volunteers to conduct their duties and for those with disabilities themselves." It is easy to see that many of the changes that have been recommended as a result of applying senior friendly design principles will benefit users of the hospital who are not part of this population as well. Some of the changes that have universal applicability include the addition of built-in visual clues to highlight exit doors and handrails, signage that is uncluttered, logical and contains simple language, and regularly-spaced seating areas.

The initiatives underway today to make changes to the physical environment of Ontario's hospitals may, in the end, help to make hospitals of the future a safer and more comfortable place for all.

#### References

1. Canadians in Context –Aging Populations. Human Resources and Skills Development Canada. <http://www4.hrsdc.gc.ca/.3ndic.1t.4r@-eng.jsp?iid=33> (accessed March 19, 2013).
2. Canadians in Context –People with Disabilities. Human Resources and Skills Development Canada. <http://www4.hrsdc.gc.ca/.3ndic.1t.4r@-eng.jsp?iid=40> (accessed March 19, 2013).
3. Senior Friendly Hospital Care across Ontario: Summary Report and Recommendations.

# The Cutting Edge: Innovations in Robotic Surgery

ALYSSA S. LOUIS, CLASS OF 2016

Fellow Sci-Fi enthusiasts - or really anyone who has seen an episode of *The Jetsons*, *Futurama*, or *Dr. Who* - would agree that there is an undeniable relationship between robots and the future. However, robots are no longer a far-fetched idea for fiction, and are currently infiltrating operating suites in a revolutionary way. It is estimated that there are more than 2,500 robots operating in 42 countries worldwide [1]. These robots, unlike the sentient humanoids of pop-culture, are actually robot-assistive devices and must be fully controlled by an operator. The aspiring surgeons among us need not worry about job prospects.

The most advanced generation of surgical robots, the DaVinci Surgical System, can be found in major academic centres in cities around the globe. This includes about a dozen here in Canada and over a thousand more in the US, where the technology was rapidly adopted after FDA approval in 2000 [1]. The most common procedure performed with the DaVinci is radical prostatectomy, but it has been cleared to perform a wide variety of urological, general laparoscopic, gynecologic, transoral otolaryngeal, thoracoscopic and cardiovascular surgeries [1].

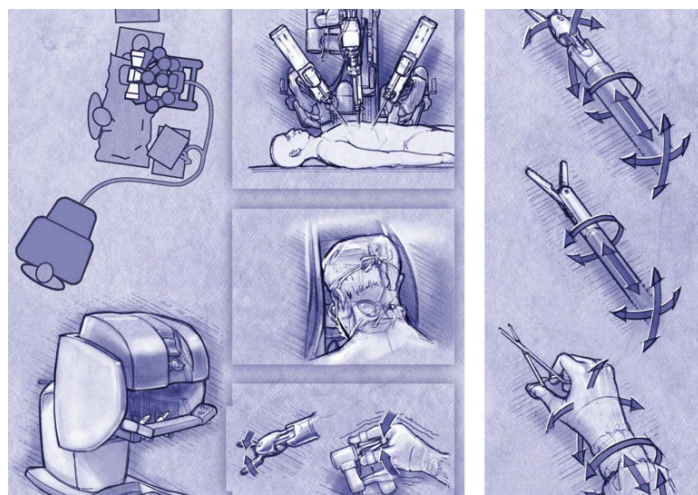


Figure 1: Schematic of DaVinci Surgical System. The robotic arms are placed at the bedside while the surgeon sits at the console controlling the arms (left). Degrees of freedom offered by DaVinci's "endowrist" instruments top right compared to laparoscopy and a human arm (right)[2].

*"[the DaVinci] has been cleared to perform a wide variety of urological, general laparoscopic, gynecologic, transoral otolaryngeal, thoracoscopic and cardiovascular surgeries [1]."*

Compared to traditional laparoscopic instruments, which offer only 4 degrees of freedom, each of the three manipulator arms of the DaVinci has 7 degrees of freedom, with larger range of motion than offered by human hands (Figure 1) [2]. The fourth arm of the DaVinci houses a high definition camera with two lenses to offer 3D vision with up to 12x magnification of the surgical field. The arms are controlled by the surgeon, who remains seated comfortably in front of a binocular display at a nearby console with hand controlled manipulators and foot pedals for changing arms and moving the camera. The commands are intuitive and the responses precise. To pick up a suture, the surgeon must simply make a pinching motion with their index and forefinger, and the forceps will mimic that motion seamlessly. To retract a portion of tissue, the surgeon can use one of the arms, then lock it into position and still have two additional arms to perform the operation. Perhaps the two most novel features are the ability to scale the surgeon's motion smaller for delicate tasks, and built-in tremor filtration.

*"...the three manipulator arms of the DaVinci has 7 degrees of freedom, with larger range of motion than offered by human hands..."*

Though it has dominated the market, Intuitive Surgical's DaVinci Surgical System is just one of many robotic-assist devices that has been developed. Similar features were developed in the AESOP and ZEUS, but production has since been stopped due to a merge between parent company Computer Motion and Intuitive Surgical. The Raven, a two-armed robot that runs with open source software is currently found only in a handful of academic centers and has not yet gained FDA approval, but would cost just a fraction of the DaVinci's 1.8 million dollar price tag.

There have been a number of robotic devices developed with the intention of use for a single procedure. For example, the PROBOT was developed specifically for prostatic resection, and is semi-autonomous, requiring only a target volume and position to be input by the surgeon. An orthopedic robot, the ROBODOC uses pre-treatment CT image registration and pre-operative planning software to maximize range of motion and alignment for joint replacement surgery. The Acrobot system has similar features [3].

*“The NeuroArm is a magnetic resonance compatible robot that is able to function within the bore of the MRI...”*

One prime example of the potential for revolutionary application of robotics in surgery is the NeuroArm, which was developed here in Canada. The NeuroArm is a magnetic resonance compatible robot that is able to function within the bore of the MRI, allowing for real-time intra-operative imaging during neurosurgery. Similar MRI-compatible robotics have been developed for percutaneous prostate cancer treatments.

*“...force-reflecting feedback [allows] the surgeon to gauge the amount of resistance offered by the tissue...”*

A pervasive criticism of robotic-assist devices is that they are not capable of touch sensation, and as a result, might not be suitable for surgery on delicate tissues where the surgeon's ability to feel resistance is critical to avoid damage. However, two recently developed devices - the Sofie and the MicroSurge - include force-reflecting feedback to allow the surgeon to gauge the amount of resistance offered by the tissue. The haptic feedback developed to communicate tissue resistance might also be applied as a safety feature in order to prevent entry of the robot into a predetermined region (ie. to avoid delicate structures like nerves).

A possible application of robotic devices is tele-surgery. Since the current robotic systems are remotely controlled, there is the possibility for the surgeon to operate from a different room, in a different city, perhaps even on a different continent. Operating from a different continent was demonstrated in the “Lindbergh Operation”, a trans-Atlantic cholecystectomy performed in 2001. These long-distance operations echo some of the original motivations behind the development of robotics by NASA, but could have implications in difficult to reach communities [4].

*“...the jury is still out on whether or not robotic procedures provide superior patient outcomes...”*

The allure of cutting-edge, technologically advanced surgery is not lost on patients, who currently face a three-month wait for a robotic prostatectomy in Ontario. However, the jury is still out on whether or not robotic procedures provide superior patient outcomes, making it difficult to assume the costs of operating and maintaining the robots, not to mention the steep learning curve for surgeons. Robotic surgery has infiltrated only a handful of residency programs across the country, and survey data suggests that residents view the presence of robotics as an unfavourable addition to their surgical education [5]. On the topic of robotic surgery and training, Dr. Joel Nelson, a urologist at the University of Pittsburgh Medical Center, offers an eloquent analogy: “The difference between Tiger Woods and the local club champion is not the putter, the irons, or the woods, it is in skill and consistency.” This could serve as a caution for those seeking the newest, rather than the best, treatment [6]. Nevertheless, as sales continue to increase and new procedures are being developed with robotics, we may expect to see more robots in Canadian operating rooms as we enter post-graduate training.

#### References

1. Intuitive Surgical - da Vinci products [http://www.intuitivesurgical.com/products/products\\_faq.html](http://www.intuitivesurgical.com/products/products_faq.html). Accessed May 2, 2013.
2. Talamini MA, Hanly EJ. Technology in the operating suite. JAMA : the journal of the American Medical Association. Feb 16 2005;293(7):863-866.
3. Camarillo DB, Krummel TM, Salisbury JK, Jr. Robotic technology in surgery: past, present, and future. American journal of surgery. Oct 2004;188(4A Suppl):2S-15S.
4. Berlinger NT. Robotic surgery--squeezing into tight places. The New England journal of medicine. May 18 2006;354(20):2099-2101.
5. Robinson M, Macneily A, Goldenberg L, Black P. Status of robotic-assisted surgery among Canadian urology residents. Canadian Urological Association journal. Jun 2012;6(3):160-167.
6. Nelson JB. Debate: Open radical prostatectomy vs. laparoscopic vs. robotic. Urologic oncology. Nov-Dec 2007;25(6):490-493.

# Cancer Genetics

BRANDEN DESCHAMBAULT, CLASS OF 2016

*It truly is an exciting time to be a medical oncologist. Researchers are discovering candidate molecular targets faster than the targets can be investigated. Genetic counseling for the prevention of hereditary breast and ovarian cancer (BRCA1/2 mutations) has become an established component of comprehensive cancer risk management in Ontario. Furthermore, targeted therapies have already demonstrated real clinical benefit for specific populations. The success stories include erlotinib (Tarceva; Genentech) and gefitinib (Iressa; AstraZeneca) for patients with epidermal growth factor (EGFR) mutations in non-small cell lung cancer (NSCLC), as well as cetuximab (Erbix; Bristol-Myers Squibb-Eli Lilly) and panitumumab (Vectibix; Amgen) for the treatment of refractory metastatic colorectal cancer (CRC) that is EGFR-expressing, but Kirsten rat sarcoma viral oncogene homolog (KRAS) wildtype. These therapeutic advances have necessitated the development of companion diagnostic tests, so as to ensure those treated are most likely to benefit. The floodgates for targeted cancer prophylaxis and treatment – using the insights afforded through genetic profiling – seem primed to swing open. Indeed, discussing the highly anticipated Integrated Molecular Profiling in Advanced Cancers Trial (IMPACT), Dr. Lilian Siu, Senior Staff Physician in Drug Development Program at Princess Margaret Hospital recently conveyed, “Most importantly, we are tracking to ensure all these profiling efforts ultimately translate into higher clinical trial accrual rates and better cancer outcomes due to target-drug matching”. In this optimistic and forward thinking research environment, it is a useful thought experiment to look back at the accessibility of those genetic services already in clinical use, so as to ensure they are being delivered according to the standards of the Canada Health Act.*

*This article will briefly explore the current clinical use of oncology genetic profiling services in Ontario and Canada. As we continue to discover and commercialize knowledge of cancer susceptibility genotypes, along with mutations that promote tumor formation, applying the lessons learned in the early clinical applications of targeted molecular therapies will help ensure equitable access for patients and effective use by Canadian physicians.*

Introduced in 2000 by the Ministry of Health and Long Term Care (MOHLTC), genetic services intended to screen Ontarians for hereditary breast/ovarian cancers have been widely adopted and used. Identification and referral of patients suitable for genetic screening (based on family history) is meant to utilize criteria published by the Predictive Cancer Genetics Steering Committee in 2001 [1]. Once identified as a carrier of a BRCA mutation, women and men can participate in genetic counseling programs with special attention to surveillance and prevention. Regular mammograms or magnetic resonance imaging, as well as prophylactic bilateral mastectomy or salpingo-oophorectomy markedly reduce the risk for malignancy in these populations [2]. These programs are widely available. Carroll et al. in 2008 found that awareness of the program exceeded 90% among family physicians, gynecologists and oncologists in Ontario (n=1427) [3]. Use of the services varied based on a number of intriguing factors such that older, urban physicians with greater knowledge of the referral criteria were more likely to refer [3]. Moreover, nearly half of the physician respondents were unsatisfied with the notification provided by the MOHLTC [3]. The next question becomes, how does this

bias in referrals translate into patient outcomes? A hint may emerge from 2012 data published by Vanstone et al. from the London Regional Cancer Program. Among patients diagnosed with breast cancer before the age of 52, after 1997, and referred to their Cancer Genetics Clinic (n=1017), the authors identified 63 women with BRCA1 and BRCA2 mutations detected after diagnosis. Of these, a remarkable 41 (or 65%) had family histories that made them eligible for genetic screening for hereditary breast cancer prior to diagnosis, as per the MOHLTC criteria [2]. For example, 24 had three or more cases of breast or ovarian cancer in their family [2]. The knee jerk reaction is to blame the family physician for missing the referral criteria. However, the authors astutely point out a number of contributory factors for this unfortunate situation, including women without primary care providers, time constraints, out-of-date knowledge of the referral criteria, and incomplete family histories provided to primary care providers [2]. To remove these barriers to genetic services access they suggest the development of patient-centered, computerized family history collection tools, which are not without precedent [4], and have been shown to increase referral to cancer genetic specialists [5].

*“It can take weeks to obtain results of mutation testing, fraying patient nerves and in the face of potential clinical deterioration...”*

Beyond prophylaxis, it is also worthwhile to examine the current clinical use and effectiveness of genetic testing for targeted molecular therapies. Health Technology Assessments done by the MOHLTC have previously recognized the cost-effectiveness of EGFR mutation testing for predicting which patients with advanced or metastatic NSCLC will respond to gefitinib (first-line) or erlotinib (second- or third-line) [6]. Similar conclusions were reached for the value of determining KRAS status in predicting response to cetuximab and panitumumab monotherapy, as well as cetuximab-plus-irinotecan combination therapy in patients with advanced CRC [7]. Only a handful of provinces actually offer patients with NSCLC routine EGFR mutation testing and funding for first-line gefitinib [8]. It can take weeks to obtain results of mutation testing, fraying patient nerves and in the face of potential clinical deterioration, possibly necessitating initiation of chemotherapy during the delay [9]. Despite this, there are indications that the situation may be improving. Results from a recent pan-Canadian study involving five regional diagnostic centres indicated that the median time for the testing centers to receive samples for EGFR mutation testing was 7 days and the median time for reporting of results was 11 days [10]. This demonstrates the feasibility of the regional testing model and provides rationale to continue enhancing efficiency. In the case of EGFR mutations in NSCLC, this could include funding for in-house testing, upstream involvement of respirologists and thoracic surgeons in the testing process, thereby ensuring adequate tumor tissue is collected at biopsy, or the implementation of more sensitive and less time-intensive detection modalities [9].

Access to personalized cancer prevention and treatment has undoubtedly progressed in leaps and bounds in the last 10–15 years. Ongoing Canadian research initiatives, such as the aforementioned IMPACT trial, will continue to enhance the knowledge and tools available to physicians, inevitably necessitating a scaling up of the currently-available clinical genetic services in Ontario and Canada. As we go forward into this new frontier of personalized cancer care, we should proactively apply the lessons learned to clinical practice, so as to ensure maximum benefit for all Canadians.

## References

1. Predictive Cancer Genetics Steering Committee. Ontario physicians' guide to referral of patients with family history of cancer to a familial cancer genetics clinic or genetics clinic. *Ont Med Rev* 2001;68(10):24–30.
2. Vanstone M, Chow W, Lester L, Ainsworth P, Nisker J, Brackstone M. Recognizing BRCA gene mutation risk subsequent to breast cancer diagnosis in southwestern Ontario. *Can Fam Physician* 2012;58:e258–66.
3. Carroll JC, Cappelli M, Miller F, Wilson BJ, Grunfeld E, Peeters C, Hunter AG, Gilpin C, Prakash P. Genetic services for hereditary breast/ovarian and colorectal cancers - physicians' awareness, use and satisfaction. *Community Genet.* 2008;11(1):43–51.
4. Carmona RH, Wattendorf DJ. Personalizing prevention: the US Surgeon General's Family History Initiative. *Am Fam Physician* 2005;71(1):36.
5. Vig HS, Armstrong J, Egleston BL, Mazar C, Toscano M, Bradbury AR, et al. Cancer genetic risk assessment and referral patterns in primary care. *Gen Test Mol Biomarker* 2009;13(6):735.
6. Medical Advisory Secretariat. Epidermal growth factor receptor (EGFR) genetic testing for prediction of response to EGFR-targeted (TKI) drugs in patients with advanced non-small-cell lung cancer: an evidence based analysis. *Ont Health Technol Assess Ser [Internet]*. 2010 Dec [cited 2013 02 27];10(24) 1–48. Available from: [http://www.health.gov.on.ca/english/providers/program/mas/tech/reviews/pdf/EGFR\\_20101209.pdf](http://www.health.gov.on.ca/english/providers/program/mas/tech/reviews/pdf/EGFR_20101209.pdf)
7. Medical Advisory Secretariat. KRAS testing for anti-EGFR therapy in advanced colorectal cancer: an evidence-based and economic analysis. *Ont Health Technol Assess Ser [Internet]*. 2010 Dec [cited 2013 02 27]; 10(25) 1–49. Available from: [http://www.health.gov.on.ca/english/providers/program/mas/tech/reviews/pdf/kras\\_20101213.pdf](http://www.health.gov.on.ca/english/providers/program/mas/tech/reviews/pdf/kras_20101213.pdf)
8. BC Cancer Agency (bccca). BCCA Protocol Summary for First-Line Treatment of Epidermal Growth Factor Receptor (EGFR) Mutation-Positive Advanced Non-Small Cell Lung Cancer (NSCLC) with Gefitinib. Vancouver, BC: BCCA; 2010.
9. Hirsch V, Melosky B, Goss G, Morris D, Morzycki W. A personalized approach to treatment: use of EGFR tyrosine kinase inhibitors for the treatment of non-small-cell lung cancer in Canada. *Curr Oncol* 2012;19(2):78–90.
10. Tsao MS, Ionescu G, Chong D, et al. Population-based pan-Canadian EGFR-mutation testing program [abstract e18017]. *J Clin Oncol [Internet]*. 2011 [cited 2013 02 27];29. Available from: [http://www.asco.org/ASCOv2/Meetings/Abstracts?&vmview=abst\\_detail\\_view&confID=102&abstractID=82932](http://www.asco.org/ASCOv2/Meetings/Abstracts?&vmview=abst_detail_view&confID=102&abstractID=82932)



# The Future In Your Hands: Recent Advances in Prenatal Screening

TETYANA ROGALSKA, CLASS OF 2016

The ability to obtain genetic information from the human fetus during pregnancy is a relatively recent innovation, with technological advances continuing to increase the resolution and ease of prenatal diagnosis at a remarkable rate. The first prenatal diagnosis of an abnormal karyotype was reported in 1967 [1], with trisomy 21 (Down syndrome) being diagnosed for the first time a year later [2]. Since then, the development and refinement of genome-wide molecular tests, as well as the introduction of non-invasive methods, has broadened the scope of prenatal screening. Now, pregnant mothers have increased accessibility to informed and meaningful reproductive choice. While technological progress holds great promise for comprehensive and safer prenatal diagnosis, more research is still required to understand the clinical relevance and applicability of many genetic findings achieved by these methods.

*“In Ontario, prenatal screening is currently used to detect three types of aneuploidy: trisomy 21, trisomy 18, and open spina bifida...”*

Aneuploidy, an abnormality of the number of chromosomes in an individual's genome, is a major focus of prenatal screening as it is a significant cause of perinatal morbidity, mortality, and developmental delay. In Ontario, prenatal screening is currently used to detect three types of aneuploidy: trisomy 21, trisomy 18, and open spina bifida [3]. Of these, trisomy 21, also known as Down syndrome, is the most common chromosomal abnormality worldwide, with a prevalence of 14.3 cases per 10,000 births in Canada [4]. Screening for chromosomal abnormalities is accessible to pregnant women of all ages and is typically performed in the first trimester. It involves both ultrasonographic tests that examine fetal nuchal translucency as well as maternal serum screening for markers such as free beta-human chorionic gonadotropin (hCG) and pregnancy-associated plasma protein A; together, these tests detect 85-90% of trisomy 21s [5]. A definitive diagnosis can then be made through an invasive procedure such as chorionic villus sampling (CVS) at 11-14 weeks' gestation or amniocentesis after 15 weeks.

*“Despite their usefulness in diagnosis... invasive techniques involve a significant procedure-related risk of miscarriage...”*

The collected fetal cells are cultured and the karyotype is determined either by microscopic examination of banded metaphase chromosomes or (more frequently) by quantitative-fluorescent (qf)-PCR, a rapid test targeting the most commonly involved chromosomes. Despite their usefulness in diagnosis, however, both of the above invasive techniques involve a significant procedure-related risk of miscarriage – approximately one in three hundred cases [6]. Consequently, only women with a positive screening result, a history of affected pregnancies, or advanced age are recommended for amniocentesis or CVS. In addition, classical cytogenetic analysis by metaphase karyotyping or qf-PCR can take up to two weeks due to the requirement for cell culturing [7]. Together, these limitations have led to the innovation of novel methods that address both the safety and timeliness of diagnosis.

*“...it is controversial whether prenatal use of CMAs are an effective prenatal test...”*

One of the techniques approaching the forefront of prenatal genetic testing is array genomic hybridization, which uses chromosome microarrays (CMAs) to detect genomic gains and losses. CMAs have been very successful in postnatal diagnosis, with the Canadian College of Medical Geneticists endorsing it as a first-line laboratory investigation for patients with various cognitive abnormalities [8]. However it is controversial whether prenatal use of CMAs are an effective prenatal test. In fact, both the Society of Obstetricians and Gynecologists of Canada and the American College of Obstetricians and Gynecologists recommend against its use as a universal method of prenatal diagnosis but rather in a much more selective subset of pregnancies where fetal structural abnormalities have been detected on ultrasound or fetal magnetic imaging [9-10].

*“...[CMA’s] dramatically increase the resolution of genetic analysis...”*

In CMA, fluorescently labeled sample DNA from the patient is hybridized onto known DNA targets and the relative signal intensity ratio of the DNA is compared to a reference sample to detect genomic gains and losses [11]. In addition to being able to detect large, chromosomal gains or losses, CMAs are also able to detect genomic imbalances in the range of 50-100 kb – as opposed to 5-10 Mb by standard karyotyping – and thus dramatically increase the resolution of genetic analysis [12]. Studies have shown array genomic hybridization detecting pathogenic abnormalities in 4-16% of fetuses with an abnormal ultrasound but normal karyotype [13-14]. With no requirement for cell culture, these tests also have a much shorter turnaround time. Yet despite their efficiency and the additional capacity for information, chromosome microarrays have not yet superseded the use of qf-PCR as the principal cytogenetic tool in prenatal testing.

*“...further research is required to understand the physiological implications of copy number variants across gene regions...”*

The greatest obstacle to the wider application of array genomic hybridization technology is distinguishing between benign and pathogenic copy number variants. In any given population there is variation in copy number variants amongst normal individuals. The use of CMAs in pregnancies at low risk for structural abnormalities would likely over-estimate the risk of disease in the fetus [11]. As such, while array genomic hybridization holds great promise as a genome-wide, high-resolution platform for prenatal testing, further research is required to understand the physiological implications of copy number variants across gene regions.

In addition to more sensitive testing, considerable successes have been reached in the collection of fetal DNA itself. The 1997 discovery of cell-free fetal (cff) DNA in maternal blood [15] has opened possibilities for non-invasive access to fetal genetic material for the assessment of single gene mutations, fetal chromosome abnormalities, and even the entire fetal genome. While conventional methods of obtaining fetal samples, such as amniocentesis or CVS, put the fetus at risk for injury or death, collection of cff is performed through a simple blood draw from the mother. The use of circulating cff DNA is already an established option for the

diagnosis of fetal sex and Rhesus (Rh) D antigen status by quantitative PCR. A reliable determination of fetal sex can be made as early as 7 weeks gestation (much earlier than is possible by ultrasound) while diagnosis for Rh blood group allows for the identification of fetuses at risk for hemolytic disease. Moreover, current research on mutations associated with hemoglobinopathies [16], fetal alloimmune thrombocytopenia [17], and beta-thalassemia [18] suggest upcoming possibilities for the diagnosis of these disorders from maternal blood.

*“...the detection of fetal Down syndrome from cff DNA has reached an overall sensitivity and specificity of 99%...”*

Detection of aneuploidy from cell-free fetal DNA in maternal blood has also achieved remarkable success in the short, sixteen-year span since its discovery. While fetal sequences from chromosome 21 are indistinguishable from that of maternal origin, the detection of fetal trisomy 21 has become possible simply on the basis that a woman carrying a fetus with Down syndrome will have a higher proportion of chromosome 21 DNA fragments in her total plasma cell-free DNA than a pregnant woman carrying a fetus with the normal number of chromosomes [11]. With the use of massive parallel sequencing (MPS) techniques (a high throughput approach to DNA sequencing), the detection of fetal Down syndrome from cff DNA has reached an overall sensitivity and specificity of 99% [19]. Furthermore, 2012 marked the year that researchers first reported being able to determine the whole-genome sequence of a fetus from cell-free DNA in maternal plasma [20]. This discovery, along with those described previously, suggests exciting possibilities for the future of prenatal genetic testing. The detection of chromosomal abnormalities, single gene mutations, as well as genetic polymorphisms from an early maternal blood test are increasingly tangible prospects for the near future, with the use of cell-free fetal DNA for the routine screening of aneuploidies expected to be introduced in the next two to five years [21].

Certainly, these advances in prenatal diagnosis pose important ethical challenges concerning the autonomy rights of future children, the discovery of unintended genetic anomalies, as well as equity of access to new standards of care. It is clear that the potential as well as the complexity of prenatal testing is continually increasing, and while we can’t yet pick and choose genes for rock-stardom or mathematical aptitude, we have certainly entered the arena.

## References

- Jacobson, C.B. and Barter, R.H. (1967) Intrauterine diagnosis and management of genetic defects. *American Journal of Obstetrics and Gynecology*, 99: 796–807.
- Valenti, C. et al. (1968) Prenatal diagnosis of Down's syndrome. *Lancet*, 2: 220.
- Ontario Ministry of Health and Long Term Care. Prenatal Screening Ontario: Conditions screened. Available at: <http://www.prenatalscreeningontario.ca/Default.aspx?cid=14&lang=1>. Accessed February 26, 2013.
- Institute of Health Economics. Alberta STE Report: First and second trimester prenatal screening for trisomies 13, 18, 21 and open neural tube defects. September 2012.
- Wald, N.J. et al. (2003) First and second trimester antenatal screening for Down's syndrome: the results of the Serum, Urine and Ultrasound Screening Study (SURUSS). *Health Technology Assessment*, 7: 1–77.
- Evans, M.I. and Andriole, S. (2008) Chorionic villus sampling and amniocentesis in 2008. *Current Opinions in Obstetrics and Gynecology*, 20: 164–168.
- Shaffer, L.G. and Bui, T.H. (2007) Molecular cytogenetic and rapid aneuploidy detection methods in prenatal diagnosis. *American Journal in Medical Genetics Part C: Seminars in Medical Genetics*, 145C: 87–98.
- Canadian College of Medical Geneticists. CCMG Position Statement: use of array genomic hybridization technology in constitutional genetic diagnosis in Canada. January 2010.
- Society of Obstetricians and Gynecologists of Canada. (2011). SOGC-CCMG Joint Technical Update: Use of array genomic hybridization technology in prenatal diagnosis in Canada. *Journal of Obstetrics and Gynecology of Canada*, 33 (12): 1256-1259.
- American College of Obstetricians and Gynecologists. (2009) ACOG Committee Opinion No. 446: Array comparative genomic hybridization in prenatal diagnosis. *Obstetrics and Gynecology*, 114: 1161–1163.
- Hui, L. and Bianchi, D.W. (2013) Recent advances in the prenatal interrogation of the human fetal genome. *Trends in Genetics*, 29 (2): 84–91.
- Friedman, J.M. (2009) High-resolution array genomic hybridization in prenatal diagnosis. *Prenatal Diagnosis*, 29: 20–28.
- Kuehn, B.M. (2008) Prenatal genome testing sparks the debate. *The Journal of the American Medical Association*, 300:1637–1639.
- Tyreman M. et al. (2009) High resolution array analysis: diagnosing pregnancies with abnormal ultrasound findings. *Journal of Medical Genetics*, 46: 531–541.
- Lo, Y.M. et al. (1997) Presence of fetal DNA in maternal plasma and serum. *Lancet*, 350: 485–487.
- Traeger-Synodinos, J. et al. (2011) Prenatal, noninvasive and pre-implantation genetic diagnosis of inherited disorders: hemoglobinopathies. *Expert Review of Molecular Diagnostics*, 11: 299–312.
- Scheffer, P.G. et al. (2011) Noninvasive fetal genotyping of human platelet antigen-1a. *British Journal of Obstetrics and Gynecology*, 118: 1392–1395.
- Shammas, C. et al. (2010) ThalassoChip, an array mutation and single nucleotide polymorphism detection tool for the diagnosis of beta-thalassaemia. *Clinical Chemistry and Laboratory Medicine*, 48: 1713–1718.
- Chiu, R.W. and Lo, Y.M. (2012) Noninvasive prenatal diagnosis empowered by high-throughput sequencing. *Prenatal Diagnosis*, 32: 401–406.
- Kitzman, J.O. et al. (2012) Noninvasive whole-genome sequencing of a human fetus. *Science Translational Medicine*, 4:137ra76.
- Jong, A. et al. (2011) Advances in prenatal screening: the ethical dimension. *Nature Reviews*, 12: 657–663.

# FAQs: A Medical Students' Guide to Social Media

EVE PURDY, CLASS OF 2015 | Twitter: @purdy\_eve | Blog: manuetcorde.wordpress.com

Social media use in the medical field is on the rise. When used appropriately, it is a way to educate, learn and engage with individuals and communities in new and exciting ways. According to the 2011 CMA member's survey, 50% of Canadian physicians have a Facebook page, 43% have contributed to an online forum and over 6% of physicians in BC write a regular blog [1-2]. The bottom line is that social media is not going away. Medical students and medical educators should recognize that this technology is, and will continue to be, a reality of our practice environment. Now is

as good a time as any to prepare for that inevitability.

Like many of my classmates, I keep a Facebook profile. I am also active on Twitter, read blogs and write my own blog. In spare time, I find myself reading articles about social media in medical education. When I share this enthusiasm with classmates, I am asked a number of great questions by those interested in learning more. This article is a compilation of those questions and my answers, with much integration from lessons learned from some social media gurus.

*DISCLAIMER: The only qualifications I have to write this article are a new but keen interest in social media in medical education, time spent on a number of social media outlets and some extracurricular reading on the subject.*

## The Basics

**What is social media?** Social media is more than just status updates about what you ate for dinner. It is any form of electronic communication through which users create online communities to share information, ideas, personal messages, and other content (i.e. videos). This broad definition includes popular sites such as YouTube, Facebook, Twitter and LinkedIn, but also less high profile modes of communication such as blogs, slidesharing sites, podcasts etc.

**What is the fundamental difference between Facebook and Twitter?** Facebook is a profile site designed to function as an online portfolio of personal current events whereas Twitter is a vehicle designed to share "nuggets of information" (<140 characters) to generate conversation and share ideas. The conversational and information sharing aspect of twitter make it par-

ticularly well suited to medical education [3].

### **Which social media outlet is for me?**

This is a personal question with an answer that hinges on what you hope to get and contribute to social media. If you are most interested in sharing personal content then Facebook is great. For sharing information about your professional career then LinkedIn might be the place to start. If you are looking for engaging conversation and idea sharing then Twitter or blogging may be for you. See Dr. Ellis's grand rounds presentation [4] or shortcoat-sinem.blogspot.ca [5] for more information about where to start.

## Education

**How can I use social media to augment my learning?** Social media breaks the traditional hierarchy of medicine by allowing medical students, residents, attendings, educators and experts to

communicate openly and equally. There are an endless number of ways that social media can be used to augment learning including:

*Learning around cases:* Social media makes learning around cases easy. After seeing a patient, jot down a brief question that you have about the presentation or condition. At a later time, you can return to those cases and find a blog or podcast to further your learning. Since these social media outlets are linked to primary articles you can also easily access the more traditional literature. You might even consider writing a blog post on the topic to cement your learning. The requirement to critically appraise all these sources still stands! Put your CARL skills to the test.

*Asking questions:* When you don't understand a concept and cannot find an answer in the already existing resources, you have direct access to experts

who are willing and able to answer questions. For example, this is a twitter conversation I had with Dr. Leverage days before our urology exam.

**Eve Purdy** @purdy\_eve 2 Mar  
@\_TheUrologist\_ why do we use topical corticosteroids (+ abx) for balanitis if it is usually an infection? Steroids don't make sense to me  
Expand

**Mike Leverage** @\_TheUrologist\_ 2 Mar  
@purdy\_eve for acute, abx are mainstay - roids used to decr inflam/ scarring (-> phimosis), 1st line in chronic (see [medicine.medscape.com/article/107405...](http://medicine.medscape.com/article/107405...))

Another excerpt of an interaction with a nephrologist about an FSGL case

**Eve Purdy** @purdy\_eve 20 Feb  
@kidney\_boy any tips for distinguishing hypertensive nephropathy vs. diabetic nephropathy in a patient with diabetes?  
Expand

**Joel Topf** @kidney\_boy 21 Feb  
@purdy\_eve proteinuria. Over a gram and its going to be diabetic disease.  
Expand

**Eve Purdy** @purdy\_eve 21 Feb  
@kidney\_boy nice thanks! Debating over a case study...with 2.5g protein in the urine. Didn't know if HTN could make it go so high  
Expand

**Joel Topf** @kidney\_boy 21 Feb  
@purdy\_eve htn emergency can, but not chronic htn.

*Following conferences:* As medical students it is near impossible to find the time or money to attend academic conferences. The good news is that these conferences are now being live cast through Twitter and live feed websites. For example, the International Conference on Emergency Medicine saw 400 individuals engaging in conversation related to conference content through more than 4500 tweets [6]. This means that we can follow along in class! Erm...outside of class time, I mean.

**What is FOAM?** FOAM stands for Free Open Access Meducation. It is the result of the continuously growing collection of online resources related to medical education. You will see this buzzword thrown around in the social media world but just know that it is a catchall phrase for the online sophisticated, cutting edge learning resources available to clinicians and students

[7]. It can be accessed by anyone, any-time, anywhere. Some even argue that FOAM is the future of medical education and lifelong learning [7].

**Doesn't it waste time?** There is no doubt that using social media for education takes time, particularly at the outset when there is a steep learning curve but it absolutely does not have to waste time. When used appropriately, social media tools can be used to bring together resources to help learn efficiently. Setting time limits for social media use, being aware of the amount of time you spend logged in and having an objective for your time on social media are ways to avoid wasting time.

### Professionalism

**Can I get into trouble?** Yes.

**How do I avoid getting into trouble?**

The same way you avoid getting in trouble in all other public domains of your life. Think carefully about what you say, how you say it and be hyper-vigilant about breaching patient confidentiality. Think before you hit send. If you are wondering if you should post, don't. Pass it along to a friend or colleague to get feedback before sharing your thoughts with the world. You are accountable.

**Should I use my real name or have a social media alter ego?** Real name.

You are accountable regardless of the name you choose. Using a social media alter ego can allow you to distance yourself too much from that accountability. If you don't feel comfortable putting your name to a post, then the bottom line is you shouldn't be posting it.

**Should I wear a stethoscope in my Facebook profile picture?** ≠≠≠ Like everything social media, it is a personal choice. Before making any social media decision it is key to ask, "Why am I doing this?" If the answer to that question is constructive (i.e. to improve my learning, to help my peers, to add to the body of knowledge on a topic) then go for it. If the answer to that question is selfish (to show off to friends and family) then think twice. To me the picture is less important than the sum total of how professionally we engage with others online because - stethoscope in the profile pic or not - we are still medical students with an obligation to represent the profession well.

### References

1. CMA. (Feb 2011). Social media use by physicians. Canadian Medical Association. Retrieved March 17, 2013. <http://www.cma.ca/advocacy/social-media-use-physicians>
2. Budd, L. (2013). Physician tweet thyself: a guide for integrating social media into medical practice. *British Columbia Medical Journal*. 55(1): 38-40.
3. Forgie, S. E., Duff, J. P., & Ross, S. (2012). Twelve tips for using Twitter as a learning tool in medical education. *Medical teacher*, (0), 1-7.
4. Ellis, A. (2013). The power of social media in academic medicine and health care. Queen's Department of Medicine. Retrieved March 17, 2013. <http://deptmed.queensu.ca/announcements?id=33>
5. Westafer, L. (2012). FOAM party! The Short Coat. Retrieved March 17, 2013. <http://shortcoatsinem.blogspot.ca/2012/09/foam-party-future-of-medical-education.html>
6. Neill, A., Cronin, JJ., Brannigan D., O'Sullivan R., & Cadogan, M. (2013). The impact of social media on a major international emergency medicine conference. *Emerg Med J*. online ahead of press.
7. Cadogan M. (2013). FOAM. Life in the Fast Lane. Retrieved March 17, 2013. <http://lifeinthefastlane.com/foam/>

# Insidermedicine with Dr. Sanjay Sharma

JENNIFER SIU AND CODY LI, CLASS OF 2016

*The Insidermedicine Project is a medical news, content, knowledge-translation, and communications company that provides services to educational, government, research, and commercial organizations. It is a physician-led initiative with a vision of reaching patients, medical doctors, and students world-wide with daily evidence-based health and medical news. We sat down with Dr. Sanjay Sharma, founder of Insidermedicine and a Professor of Ophthalmology and Epidemiology at Queen's University, to learn more about his company and its role in the future of medicine.*

## What are some of the features of Insidermedicine?

Insidermedicine acts as the platform of all of our evidence-based information. On the website, we publish daily medical evidence-based news and research in video and text. The website is divided into sections useful for patients, students, and doctors. There are several resources including, "If I had..." which features leading medical experts suggesting what they would do if they had a certain condition, and "If I knew...", which features physicians from around the world providing career and personal advice to medical students and trainees. The website also includes video interviews featuring leading researchers and their new discoveries.

## Where did the inspiration to start this company come from?

This whole project began 6 or 7 years ago when I realized that many patients don't get a lot of great patient information; [and when they] go online, there are many different sources available or people trying to sell them things. So I asked myself if there was a better way of creating information. Around this time, there was a TV show based out

of New York that created political satire clips every day and this served as an inspiration for what the vehicle for knowledge dissemination might look like. Our next goal was to create digital content on a daily basis and get online and disseminate it. With any start up business, it begins with support from friends and family. I recruited my wife, Susan, who became the on-air personality. Every day we would come home from clinic, I'd sit down and write the content and Susan would memorize it. We'd go to the basement and create the videos, then upload them to the website.

Since then we have grown tremendously with over 6,000 videos and many in multiple languages. Our YouTube channel has over 1.5 million views. We still create online content everyday, but now we have 3D and whiteboard animation to enhance the stories and between 10-12 people working full time for Insidermedicine. Our staff includes doctors, animators, graphic artists, videographers, programmers, IT specialists and medical writers. The MedSkool platform is in 10-15 universities now and about 3-4,000 optometrists come to us for Continuing Medical Education courses in the form of Optocase.

## Other resources provided through Insidermedicine

### Optocase.com:

A continuing education program for optometrists featuring multimedia video modules with on-line Q&As.

### SuwenMD:

An iPhone app to teach English to Chinese medical students. Contains 1,000 videos in English and Chinese.

### MedSkool 2.0:

A focused project for medical students based on the LMCC objectives.

### IMTouch Eye:

An iPad app featuring 3D animations used to enhance patient education for Optometrists and Ophthalmologists.

**Researcher Services:** Provides researchers with assistance in writing grants and encourages knowledge translation through resources and assistance with press releases, explanatory videos, animations, and custom websites.

One branch of Insidermedicine is MedSkool 2.0, a multimedia resource for educating medical students.

***How does such a resource enhance a medical student's education?***

For the past few years, a lot of my research has focused on knowledge translation and patient education. Many studies have shown that students retain more information when topics are presented in a way that stimulates multiple senses. A person is able to integrate knowledge in their working memory more efficiently and more permanently through the summative effects of multiple sense stimulation compared to information given in the traditional format of text or audio. We did a randomized study [1] on medical students who used MedSkool 2.0. We randomized medical students to either the digital content or the traditional text and we were able to show that the people who were randomized to the video content performed about 10% better on their scores, and their efficiency was incredible. They spent about 80% less time on the material. Additionally, about 90% preferred the digital content over traditional text.

***In what ways do you hope that Insidermedicine will play a role in the future of the relationship between physicians and their patients?***

In health care there is a pent up demand from patients who are empowered and want to learn more about their conditions. The question is how to create a solution that not only empowers patients, but can also be implemented into the medical system. At Insidermedicine, we've focused on creating distribution channels that will

disseminate the content and infuse the evidence-based message into the doctor-patient discussion. We aim to do this at 3 different time points: 1) in the waiting room - we have IPTV (Internet Protocol Television) networks, similar to the news screens seen at the airport, where patients can view material as they are waiting to see their doctor, 2) while in the doctor's office - an iPad platform with 3D animation and media content that the local doctor can play, 3) when a patient goes home, they often forget or might misunderstand what was said at the office; we have repackaged the content onto websites that are available for patients to replay the content. Right now we have created an iPad app with 30-40 animations, and this is growing. The more people embrace these technologies, the faster we will see the transition into the medical field.

***There are many medical information resources available online. What makes Insidermedicine unique from other medical social media websites? How do you decide which articles to cover in your news segments?***

The voice that we occupy is evidence based. We look at peer-reviewed literature every day. Because we are established as a news and knowledge translation organization, we have access to embargoed information from journals such as NEJM and JAMA a few weeks or days before they are published. All of the articles we receive are reviewed by members of our editorial board, which consists of expert medical doctors, researchers, and qualified biostatisticians and epidemiologists, who decide whether the research is topical, important, and scientifically sound. We have also built a strong relationship with many of the big, re-

search-intensive universities around North America, who we help to get their messages out to the public.

***How do you maintain balance in your life? Do you have any advice for medical students?***

Ultimately, you have to ask yourself what you want to do with your life and this comes from two things: 1) strong passion for what you want to do, and 2) being very efficient with your time to do it. For me, I came from an arts community where I played in lots of bands and had many opportunities to be creative. I have always enjoyed creating new things. I have a background in medicine and epidemiology. So what I am doing now allows me to combine my areas of expertise in terms of medicine, education, business, and art all in one place.

We live in interesting and almost daunting times. You have invested a lot of time, effort, and dollars into your medical education to enter a system where the model is always changing. Health care might look dramatically different in 5 to 10 years, so it is important for you to start thinking about what things are potentially going to look like and what skill sets you are going to need. The more you can equip yourself with different tools, the more you will be prepared for the changes that come.

**References:**

1. Steedman M., Abouammoh M., Sharma S. Multimedia learning tools for teaching undergraduate ophthalmology: results of a randomized clinical study. Canadian Journal of Ophthalmology/Journal Canadien d'Ophtalmologie. Volume 47 Issue 1. February 2012 Pages 66-71.

# Interview with Dr. Anne Ellis

HOLLIS ROTH, CLASS OF 2016 (@HOLLIS\_ROTH)

*Dr. Anne Ellis (@DrAnneEllis) is an Associate Professor and Division Chair of Allergy and Immunology in the Department of Medicine at Queen's University. She is also the Director of the Environmental Exposure Unit and a clinician scientist (Meds '99, MSc. McMaster University, 2008). A prolific user of social media, Dr. Ellis was kind enough to meet with the QMR to discuss the increasing role of social media in medical education and medical practice.*

**QMR:** How did you get involved in social media?

**Ellis:** I was getting ready to go to a major international conference and it had been suggested to me, repeatedly over the years, that being involved in social media from a professional point of view would be a helpful thing. I was very reluctant at first, but it became apparent as I started looking around that there are a lot of health care professionals who have professional Twitter and Facebook pages. I actually fully thought that one of my research assistants would be the main person populating my Twitter feed, but I was pleasantly surprised. For me, it's just been a great way to not only keep up my own knowledge base, but also to pass along information to other researchers, colleagues, and patients.

*"...there are a lot of health care professionals who have professional Twitter and Facebook pages..."*

**QMR:** Is there one form of social media that you prefer?

**Ellis:** The one that I really suggest that everybody (if you're going to do one thing) do is LinkedIn, but if you want to be more active and engaged with social media, it really is a bit of a personal preference. For me, Twitter has worked, but a lot of my colleagues strongly prefer Facebook.

**QMR:** Did your employer give you any guidelines when you first started using social media?

**Ellis:** No, I figured it all out on my own. KGH now has a social media policy that is fairly clear-cut. There is a whole lot of common sense involved. If you wouldn't want your patient, your next-door neighbor, or your colleague to read what you just said, then don't post it.

**QMR:** In terms of medical students and their social media presence, we've all heard stories of people having their Facebook pages looked at when applying to residency – how do you feel about that?

**Ellis:** I'm of two minds, because I do value the role of social media and I don't think we should send the message that it's a bad thing. But I don't think it's ever too early to start using social media responsibly. If you're showing the poor judgement of displaying your worst as well as your best online, then I don't know that necessarily you deserve to be called to task for that, but I think it's something you should always be cautious about.

*"I don't think it's ever too early to start using social media responsibly..."*

**QMR:** What advice would you give to colleagues who haven't dipped their toes yet in the water of social media?

**Ellis:** I think that the very easiest and simplest way is to join Twitter and lurk. You don't need to commit to posting tweets all the time. You join, you figure out the people you want to follow, and you just start logging in and seeing what's out there. I think, of all the [different forms of] social media that is the most controllable, it's Twitter. Alternatively, if you just want to have an online presence, then LinkedIn can be used very interactively, but it works just fine as a static picture. It just depends on what you're trying to get out of it, but if you're actually trying to be engaged, I think Twitter's the easiest.

*"...if you're actually trying to be engaged, I think Twitter's the easiest..."*

**QMR:** Do you find that you're using social media often when you teach?

**Ellis:** I just started this year: this year's class is a bit of an experiment to see how well that would work. I think it would work better if we had a universal hashtag for the undergraduate medical students, rather than just the allergy/immunology subspecialty part of it.



**QMR:** *How do you interact with patients using social media?*

**Ellis:** Sometimes I will get very specific questions tweeted at me, and that's harder to deal with, because it is hard to give sound medical advice in 140 characters. I try to be correct in what I say, and keep it relatively general, and good patients will say in their tweet to me that they realize that tweets aren't medical advice - they just want my opinion. But if I get the feeling that there's going to be any negative consequences of trying to feedback that way, it's easy enough to ignore [the tweets]. When I get Twitter feedback that implies that the patient didn't understand what I was saying, I make sure I follow up on those because I definitely don't want them miscommunicating to other people.

**QMR:** *How do you see social media affecting the practice of medicine in the future?*

**Ellis:** It's not going away and it's being increasingly used by patients, practitioners, and academics alike, so I think the sooner you realize it's part of the fabric and start to adapt from the perspective of a medical student, the better. We do a lot of teaching on critical appraisal of literature articles [in medical school], but we don't yet teach critical appraisal of Internet sites or social media. That's harder, but I think if you aren't even starting off with guidelines, you'll never be able to effectively use it. I don't think social media is a fad in any way.

**QMR:** *You've talked about how useful you've found Twitter and Facebook - in the future do you want to change or expand how you're using social media?*

**Ellis:** Right now I'm happy with what I'm doing. If things ever slowed down in my life, I think it'd be great to experiment with blogging (it's been requested of me several times). I've compromised by doing guest editorials for other sites, but blogging looks like a really neat way to engage people.

# Health Care in the True North: Not So Strong and Not So Free?

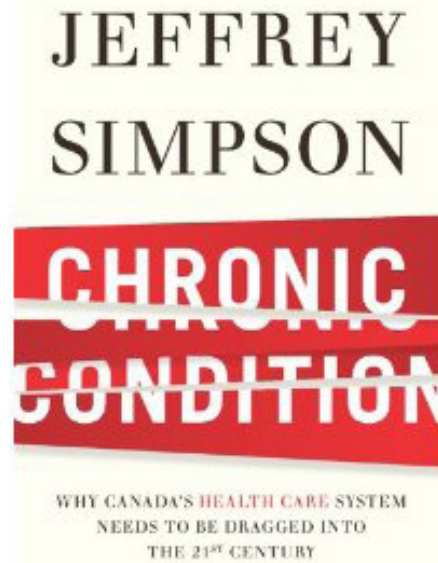
HEATHER JOHNSON, CLASS OF 2015

*“Medicare is the third rail of Canadian politics...”*

“Medicare is the third rail of Canadian politics,” writes Jeffery Simpson, “Touch it and you die.” Indeed, the publicly funded single-payer health care system is so intrinsic to the Canadian identity that 85% of Canadians believe it to be the most important national symbol. We may complain about wait times, poor access to primary care, and paltry funding for drugs and “non-medically essential” services, but any attempt to substantially change the system has traditionally been met with fierce resistance. In *Chronic Condition*, Globe and Mail columnist Jeffery Simpson takes us on a sprawling tour of the Canadian health care system in which he provides compelling arguments for the need to reform.

*“We have a Chevrolet health-care system by international comparative standards, but the Canadian public thinks we have a Cadillac...”*

Canadians spend an above-average amount of money on health care, without seeing above-average results. “We have a Chevrolet health-care system by international comparative standards, but the Canadian public thinks we have a Cadillac,” says Simpson. Not only are we receiving a comparatively poor return on our investment, but



*Chronic Condition: Why Canada's Health-Care System Needs to be Dragged into the 21st Century.* By Jeffery Simpson. Allen Lane: 392 pages; \$32.

the investment is only going to become more costly with time. Health care spending currently accounts for 42 to 45 percent of provincial budgets; in twenty years, it will account for an estimated 55 to 65 percent. Without a concomitant increase in revenue, health care will soon begin to squeeze out other programs as it takes up a greater share of government spending.

*“Health care spending currently accounts for 42 to 45 percent of provincial budget...”*

*“Canadians must recognize that we cannot afford to continue blindly down the path we are on...”*

Given the choice between cutting services, introducing private delivery of services, and raising tax revenue, most Canadians would (albeit reluctantly) choose the last and thereby maintain the status quo. It has also been suggested that “efficiency gains” could help to curb rising costs. Simpson argues that these strategies alone cannot save our system. Efficiency gains are often difficult to achieve, and could actually increase costs. Pouring more government money into the system following Roy Romanow’s entreaty to “buy change” did more for physician incomes than it did for patient outcomes. According to Simpson, Canadians must recognize that we cannot afford to continue blindly down the path we are on; hard choices must be made and new options must be explored, though these need not necessarily compromise our core values.

*“Canada’s system is “deep but narrow,” covering hospital and physician services but little else...”*

Though we love to compare ourselves to the United States since it makes us look good, Simpson correctly identifies the futility in doing so – there are too few lessons to be learned. Early on

in the book he alludes to how Medicare compares to publically funded health care systems in other countries; his expansion on the subject (nearly 300 pages in) is arguably the best part of the book. Canada's system is "deep but narrow," covering hospital and physician services but little else, while other systems offer more comprehensive coverage for far less money. Sweden, whose public health care system has undergone dramatic reform in recent decades, is discussed at length. Though their reforms are not wholly applicable to the Canadian context, Simpson believes that certain measures such as rewarding high-performing regions, introducing privately delivered services, and implementing user fees are worth considering.

*"...there is little to stop [patients] from clogging the system with frivolous complaints..."*

These last two ideas are not new in Canada, but they remain controversial. In a system where patients experience no direct economic penalty for seeing

their physician, there is little to stop them from clogging the system with frivolous complaints. A small user fee, Simpson argues, would decrease such wastefulness and instill Canadians with a greater sense of accountability for their use of the system. It is difficult to predict, however, how much waste we can reasonably hope to avoid, and with the exemptions that would have to be made for low-income individuals so as to preserve equality of access, implementing user fees would lead to only a marginal increase in revenue.

*"When discussing health care in Canada, "private" can feel like a dirty word..."*

When discussing health care in Canada, "private" can feel like a dirty word, but it is not always clear what the term represents. It may refer to services being paid for out-of-pocket, yet may also refer to services that are privately administered but still publically funded. Despite popular belief, it is not synonymous with "for-profit". Simpson's treatment of the subject, the discussion

of which has a tendency to devolve into heated rhetoric, is measured and thorough. He neatly summarizes the Chaoulli decision and its implications, and proposes ways in which privately delivered services might be integrated into our system without weakening Medicare.

For anyone interested in the future our health care system, health professional or patient, *Chronic Condition* is worth the read – if you have the time. Simpson's lengthy description of the history of Medicare in the first half of the book is convoluted, confusing, and mostly unnecessary. It is in the second half that Simpson hits his stride, and though still redundant at times, he gives a clear picture of where we are and where we might go. *Chronic Condition* is not a prescription for Medicare, though many of Simpson's suggestions are worth exploring, but rather a call for Canadians to wake up and realize that the patient is not doing as well as we would like to believe – and is only going to get worse.

# Health Care Is Not a Driver of Economic Growth

YAN XU, CLASS OF 2015

I see them in lecture halls and on the wards: they are swung around necks, tagged to hips or clipped to bags. I count at least 25 on my daily walk from Tindall Field parking lot to the New Medical Building. I speak, of course, of KGH employee badges.

According to the Canadian Institute for Health Information, annual health care costs in Canada now exceed \$200 billion, representing 11.6% of the national GDP [1]. Health care and social assistance has become the second largest service-producing industry after the financial sector [2]. When one considers the medical devices and pharmaceutical industries that are also intimately involved in the provision of health care, the enormity of the entire enterprise becomes readily apparent.

*“...annual health care costs in Canada now exceed \$200 billion, representing 11.6% of the national GDP...”*

In many towns and cities, health care has become the main (if not the only) industry, with the hospital standing tall as the bastion of growth and employment. This was summarized by a recent report from the Conference Board of Canada, which positioned health care as an industry with an enormous economic footprint. Roughly 1.4 million Canadians are employed directly by the health care system across 1,200 hospitals, 93,000 ambulatory health establishments and 11,000 residential facilities spread across this country, while another 45,000 jobs are maintained by the pharmaceutical and medical equipment sectors [3].

*“To consider health care as an economic driver is to ignore the uncomfortable truth that its prosperity comes directly at the expense of public or private sectors...”*

The Conference Board shines a positive light on these statistics, but one must wonder about this economic mandate of health care; should we sit comfortably in the locomotive of economic growth increasingly driven by this sector?

*“Unfortunately, health care is a zero-sum game; when it grows, we pay for it...”*

To consider health care as an economic driver is to ignore the uncomfortable truth that its prosperity comes directly at the expense of public or private sectors that inject revenue into the industry. These come as public funding or employee health plan premiums, which divert resources from the financial bottom lines of their respective organizations otherwise available for growth. Unfortunately, health care is a zero-sum game; when it grows, we pay for it - and we are paying dearly. Lacking Canadian data, employer-sponsored family health insurance premiums in the United States have grown 62% between 2003 and 2011; if current trends do not abate, the Commonwealth Fund estimates premiums to reach \$25,000 per worker by 2020 [4]. Small businesses are especially burdened; adjusted costs are reported to be 18% higher among the smallest firms compared to the largest, leading to many businesses unable to provide insurance to their workers [5]. In Canada, this issue is particularly prevalent. The Workplace and Employee Survey reports that only 40% of workers are offered health-related benefits; among the smallest employers, only one-third of staff have insurance [6]. In the public sector, health care consumed 37.7% of the provincial and territorial program expenditures in 2011 [1], with Ontario taking the lead at 46% [3]. Accounting for inflation, public-sector health care spending grew at an annual rate of 3.7% between 1998 and 2009, more than triple the government revenue increases [1]. During the same period, social services grew at 0.7% in funding per year, stifling programs aimed at improving the socioeconomic determinants that may pay larger dividends in health outcomes.

*“The unyielding growth of health care has become a financial burden to the stakeholders it was intended to serve...”*

The unyielding growth of health care has become a financial burden to the stakeholders it was intended to serve, but critics may be quick to point out the mission of health care goes beyond its economic role in society; it fulfills our commitment of providing health as a human right. Indeed, one would loathe to be born to a world that places access to health care as a mere commodity, distributed based on one's potential productivity and contribution. However, one would find equally abominable a society where health care overshadows equally important universal rights such as education, social security or cultural life.

Is this to say that one ought to dismantle the medical establishment? Of course, the answer is an unequivocal “no.” But let there be no distraction from the fact that existence of the health care system is to serve as a compass that guides us to the shared goal of improving quality of life. When we are focused on making the world's greatest compass but are losing sight of our destination, when our calls for increased commitment to health care become the end of our societal pursuits, one must wonder in our collective conscience whether medicine has become “too big to heal.”

#### References

1. Canadian Institute for Health Information. National health expenditure trends, 1975 to 2012. Ottawa, Ontario: Canadian Institute for Health Information; 2012.
2. Canadian industry statistics: GDP by sector of the canadian economy.[homepage on the Internet]. 2011 Nov 22, 2011 Available from: [http://www.ic.gc.ca/eic/site/cis-sic.nsf/eng/h\\_00013.html#v1a2b](http://www.ic.gc.ca/eic/site/cis-sic.nsf/eng/h_00013.html#v1a2b).
3. Conference Board of Canada. Health care in canada: An economic growth engine (briefing 1)—The economic footprint of health care delivery in canada. Ottawa, ON: Conference Board of Canada; 2013.
4. Schoen C, Lippa J, Collins S, Radley D. State trends in premiums and deductibles, 2003-2011: Eroding protection and rising costs underscore need for action. Issue Brief (Commonw Fund). 2012 Dec;31:1-39.
5. Gabel J, McDevitt R, Gandolfo L, Pickreign J, Hawkins S, Fahlman C. Generosity and adjusted premiums in job-based insurance: Hawaii is up, wyoming is down. Health Aff (Millwood). 2006 May-Jun;25(3):832-43.
6. Workplace and employee survey compendium: Section 4 compensation practices.[homepage on the Internet]. 2009 Sep 21, 2009 [cited February 10, 2013] Available from: <http://www.statcan.gc.ca/pub/71-585-x/2008001/sec4-eng.htm>.

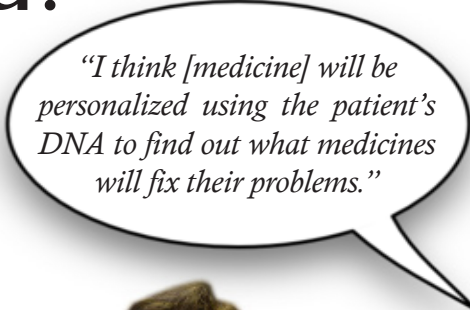
# What do you think the future of medicine will hold?

SARAH-TAÏSSIR BENCHARIF, CLASS OF 2016



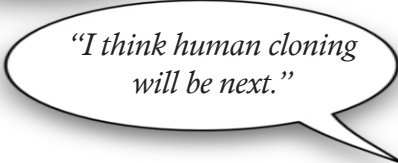
Xinghui Che, ArtSci 2014

*"I think it will go into more computerized methods of diagnosing and treating patients."*



Shadi Khalifa, PhD'16, computer science

*"I think [medicine] will be personalized using the patient's DNA to find out what medicines will fix their problems."*



Greg Stafford, 50, sells automotive parts

*"I think human cloning will be next."*



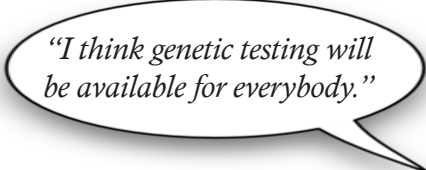
Phillip Tompkins, 83, retired farmer

*"We need more work on cancer."*



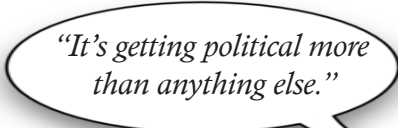
Jack Alblas, 65, ArtSci '74

*"There will be an increase in the use of robotics, which will result in reduced manpower in the operating room. That will allow more operations to be performed."*



Michele Alblas, 63, retired administrative assistant at Stratford General Hospital

*"I think genetic testing will be available for everybody."*



Roger Lemieux, 65, retired

*"It's getting political more than anything else."*



Layan Nahlawi, PhD'14, computer science (bioinformatics)

*"Medications won't be standard for all patients - they will be tailored for the genetics of each patient."*



Yvonne Taugher, 77, retired housewife

*"It will be about better quality of life, especially for the old."*

# IntraDermal: A Queen's University Dermatology Column

BRANDON WORLEY, CLASS OF 2014

Welcome to the inaugural entry for "IntraDermal", a place for Queen's Medical Students to read about ideas, updates, and clinical cases that relate to cutaneous disease. For the first entry, I wanted to bring you two interesting updates on melanoma.

## Attacking the Mutants

The National Cancer Institute's Surveillance Epidemiology and End Results (SEER) reports that in 2009 approximately 900 000 US citizens were afflicted with melanoma. Of those, 84% had local disease with a good prognosis while 4% had metastatic disease with a 15% rate of survival [1].

Striving to overcome this grim statistic, researchers have demonstrated that we can use molecular targets to reduce the growth and spread of advanced melanoma. BRAF1, a MAP kinase or proliferation-related oncogene, has received a lot of attention as 50% of melanomas carry a BRAF1 mutation [2]. Melanomas with a BRAF1 mutation have a higher association with younger age, nevi hyperpigmentation, skin on the torso, and European or North American ancestry. [3, 4] This last association makes BRAF1 of particular interest for melanoma treatment in Canada.

In a 2011 Phase III clinical trial, patients with advanced disease treated with a BRAF-1 inhibitor (vemurafenib) versus standard chemotherapy had a 20% greater survival rate at six months. BRAF-1 inhibition allowed five months of progression-free survival and reduced tumor size, compared to one month of halted progression and negligible tu-

mor size reduction afforded with standard chemotherapy [2]. The amount of disease free progression with therapy remains small. This results from tumor resistance to BRAF-1 inhibition that develops after a short period of use. In February, Dr. Stephen Hodi at Harvard Medical School built on a 2012 paper by an Austrian group that demonstrated that an alternate signaling pathway becomes active when you inhibit BRAF-1 [5]. Dr. Hodi's group demonstrated that an immune-mediated cell death-triggering molecule (PDL-1) is suppressed, allowing reactivation of cyclin/MAPK pathways responsible for cell division [6]. Melanoma adapts!

Many strategies have tried to get around this, including using combination therapy with BRAF-1 inhibitors to turn off the alternate pathway. Canadian research has used other molecular targets. Regulating the formation of microtubules (Stathmin-1) or activation of apoptosis through the Bcl-2 family (Mcl-1) [7, 8] has shown benefit in vitro. Similar to BRAF1, inhibition of a second target was needed to prevent activation of an alternate survival pathway [8]. Advances are coming quickly, but a cure is elusive. Prevention and active surveillance for early lesions remain the cornerstones of management.

## iMelanoma

What is the latest tool in surveillance? The Smartphone. High-risk individuals, such as those who have a family history of melanoma, a skin type that predisposes them to skin cancer, or a prior melanoma can benefit from taking pictures of their moles. It allows for easier tracking of new lesions to answer the common question from doctors, "Have you had any change in your moles?" In one cohort study of high-risk patients, 618 patients were evaluated using full body photography and digital photos of certain moles to determine if it improved prognosis. Most moles removed were ones found to have grown over successive visits and were not typically suspicious at the time of removal. These were found to be slow growing melanoma in-situ. Though this study [9] had no control group using conventional detection methods, it suggests that documenting moles can be important to prevent advanced disease from occurring.

Many companies have created smartphone apps to assist with diagnosis of melanoma. Some cost money, while some do not. Some have dermatologist consultants reviewing the submitted digital images that you take of your moles. What is consistent about all of these is that they are inaccurate. A University of Pittsburgh review examined the diagnostic ability of these

apps compared to a pathologic diagnosis by a dermatopathologist. They reported that the sensitivity of the four best applications for detecting melanoma ranged from 6.8% to 98.1% and the specificity ranged from 30.4% to 93.7%. Not surprisingly, the best application was one that takes advantage of image review by a dermatologist while the least effective app used an algorithm. Most alarming is that three of the apps misclassified 30% of melanomas as un concerning [10]. This is hardly what you want from your iPhone. The moral of the story is that we will all still have jobs - sorry, Siri. A physician diagnosis and repeated surveillance using the ABCDE scheme is the best way to prevent melanoma from significantly impacting a patient's life. Well, that and sunscreen.

*I hope you enjoyed the first article. In future I will be including some cases featuring common and not-so-common skin diseases. If you want to suggest a subject or have any feedback, my e-mail is 9btw@queensu.ca. I will always try to keep it topical (a little dermatology joke).*

*Until next time,  
Brandon Worley, Meds 2014*

#### References

1. Howlader N, Noone AM, Krapcho M, Neyman N, Aminou R, Altekruse SF, Kosary CL, Ruhl J, Tatalovich Z, Cho H, Mariotto A, Eisner MP, Lewis DR, Chen HS, Feuer EJ, Cronin KA. "SEER Cancer Statistics Review, 1975-2009 (Vintage 2009 Populations)." SEER. National Cancer Institute, 2012. Web. 15 Mar. 2013.
2. Chapman PB, Hauschild A, Robert C, Larkin JM, Haanen JB, Ribas A, et al. "Phase III randomized open label, multicenter trial (BRIM3) comparing BRAF inhibitor vemurafenib with dacarbazine (DTIC) in patients with V600EBRAF-mutated melanoma." *J Clin Oncol.* 29.S (2011):LBA4.
3. Whiteman DC, Pavan WJ, Bastian BC. "The melanomas: a synthesis of epidemiological, clinical, histopathological, genetic, and biological aspects, supporting distinct subtypes, causal pathways, and cells of origin." *Pigment Cell Melanoma Res.* 24.5 (2011):879-897.
4. Bauer J, Büttner P, Murali R, Okamoto I, Kolaitis NA, Landi MT, Scolyer RA, Bastian BC. "BRAF mutations in cutaneous melanoma are independently associated with age, anatomic site of the primary tumor, and the degree of solar elastosis at the primary tumor site." *Pigment Cell Melanoma Res.* 24.2 (2011):345-351.
5. Jalili A, Wagner C, Pashenkov M, Pathria G, Mertz KD, Widlund HR, Lupien M, Brunet JP, Golub TR, Stingl G, Fisher DE, Ramaswamy S, Wagner SN. "Dual suppression of the cyclin-dependent kinase inhibitors CDKN2C and CDKN1A in human melanoma." *J Natl Cancer Inst.* 104.21 (2012):1673-1679.
6. Jiang X, Zhou J, Giobbie-Hurder A, Wargo J, Hodi FS. "The activation of MAPK in melanoma cells resistant to BRAF inhibition promotes PD-L1 expression that is reversible by MEK and PI3K inhibition." *Clin Cancer Res.* 19.3 (2013):598-609.
7. Chen J, Abi-Daoud M, Wang A, Yang X, Zhang X, Feilotter HE, Tron VA. "Stathmin 1 is a potential novel oncogene in melanoma." *Oncogene.* 32.10 (2013):1330-1337.
8. Keuling AM, Felton KE, Parker AA, Akbari M, Andrew SE, Tron VA. "RNA silencing of Mcl-1 enhances ABT-737-mediated apoptosis in melanoma: role for a caspase-8-dependent pathway." *PLoS One.* 4.8 (2009):e6651.
9. Salerni G, Carrera C, Lovatto L, Puig-Butlle JA, Badenas C, Plana E, Puig S, Malvey J. Benefits of total body photography and digital dermatoscopy ("two-step method of digital follow-up") in the early diagnosis of melanoma in patients at high risk for melanoma. *J Am Acad Dermatol.* 67.1 (2012):e17-27.
10. Wolf JA, Moreau J, Akilov O, Patton T, English JC, Ho J, Ferris LK. "Diagnostic Inaccuracy of Smartphone Applications for Melanoma Detection." *JAMA Dermatol.* 16 (2013):1-4.



# Marching Orders for Sad Days

ANONYMOUS

Heart: beat.

Your tasks today are  
 to push blood through leaden limbs,  
 to bring sustenance to tissues that ache with a deeper lack,  
 to replenish reservoirs that spill a steady stream  
 irrigating skin with salt and regret.

Lungs: breathe.

Your tasks today are  
 to trade old air for new,  
 to expand past bands of constriction compressing the chest,  
 to sustain a steady cycling of stretch and recoil, resilience embodied,  
 incorporating even errant sobs.

Soul: wait.

Your tasks today are  
 to make time for recovery to take root,  
 to endure until breakers subside into ripples, spasms into twinges,  
 to hope, nevertheless, tenaciously; kindling a quiet fire,  
 eschewing brittle cynicism and cold despair alike  
 until the day when this too shall pass  
 and be eclipsed  
 by joy.

## Directions

BRANDON WORLEY, CLASS OF 2014

I look at my feet to see where I am going  
 Yet, I am standing still and never knowing  
 I look behind to find my direction, my trail  
 Hoping some semblance of my past can unveil  
 I see those who have come this way before  
 Holding me up, making me not ignore  
 Signs and posts we often forget to see  
 "Mentors all, mistakes, and shadows we"  
 Faced forward I see those yet to pass this way  
 It will be my hands that show them one day  
 But what kind of compass can I be?  
 If I have no North by which to see  
 Many roads can be in my path ahead  
 Which stone to lay with the sweat I shed?  
 I can heal, sow life, counsel and invent  
 Give more to my art, than I have spent  
 Maybe then – I travel without knowing  
 But it matters not where I am going  
 For as long as I can see far behind and ahead  
 I will always find where I am to tread.

# The (Medical) French Revolution

TETYANA ROGALSKA CLASS OF 2016

**L**iberté. Égalité. Fraternité. Together, these ideals define the national motto of France, which serves as a testament to the principles of individual sovereignty and the natural rights of man that were shaped by the French Revolution and that continue to be actively defended today. The motto is not only incorporated into the French constitution, but also serves as a foundation for the First Article of the Universal Declaration of Human Rights. And while the mantra united and inspired an oppressed people in 1789, the principles continue to play an integral role in moulding the policies, regulations, and laws that shape contemporary French society. The tradition of civic advocacy and engagement is not restricted to national borders, however; even within a diverse and multicultural Canada, the province of Quebec stands out for the emphasis its citizens place on challenging the status quo. And nowhere is the status quo more engrained than in the fabric of medical training.

*“...the extent to which the machismo of post-graduate medical training contributes to building competency is questionable...”*

The structure of physician training in Canada includes a rigorous residency period that provides medical graduates with the practical experience and theoretical expertise they require to develop competency in independent practice. Yet while proficiency and skillfulness is an expectation of all licensed physicians, the extent to which the machismo of post-graduate medical training contributes to building competency is questionable. The 24-hour on-call shift is a testament to the philosophy of stamina-building and dedication that characterizes most residency training programs. The physical and mental consequences experienced by residents, as well as the increased propensity for medical errors, have long been recognized outcomes of such scheduling

*“...long shifts pose a danger to the health of both patients and residents...”*

pressures, yet little has been done to address these issues of ‘traditional education.’ That is, until a complaint was filed in 2007 against the McGill University Health Centre by the Fédération médecins résidents du Québec – the union that represents the province’s medical residents – which argued that the long shifts pose a danger to the health of both patients and residents. In June 2011, a Quebec arbitrator ruled that the 24-hour shifts were a violation of Section 7 of the Canadian Charter of Rights and Freedoms, which ensures security of the person, and Section 46 of the Quebec Charter of Rights and Freedoms, which requires fair and reasonable employment conditions. As of July 1 2012, all Quebec hospitals were required to limit residents’ shifts to 16 hours, which is reflective of similar caps in Britain, France, Denmark, and New Zealand.

*“As of July 1 2012, all Quebec hospitals were required to limit residents’ shifts to 16 hours...”*

Certainly, this is a hallmark judgement with important implications for current Canadian medical training programs, and will likely serve as a precedent for other provinces. However, it is also important to recognize that the advocacy behind these policy changes is not unique to the long-standing French tradition of social engagement; serving as an advocate for patients is an integral CanMEDS role for all physicians. Its application in the broader professional domain is equally as important for all Canadian medical students, residents, and physicians in order to build a health care system that best equips doctors to provide the highest quality care for their patients.

**Future Features:**

No issue about the future would be complete without mentioning what's coming up for everyone's favourite publication. Grab a copy of our upcoming issue, "Medical Education and You", and discover exciting articles about international electives, IMGs, study and retention strategies and more!

We might not be at liberty to disclose exactly what the future holds, but we are positive that you will enjoy it! The next issue of the QMR is slated to arrive in March, 2014.

