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Editor's message

Cell phones, radiation, and population health

Much has changed in the 45 years since the world's first mobile phone call was made from a busy downtown New York sidewalk on a brick-sized device.[1] Gone are the days of bulky, costly devices limited to the wealthy as cell phone ownership has become ubiquitous; Canada alone had nearly 31 million wireless subscribers in 2016.[2] Advances in technology have revolutionized the mobile phone industry allowing expansion into social media, education, and entertainment. A recent poll found that 26% of Canadians under the age of 34 spend 3 hours or more on their phones per day.[3] Mobile device use among the pediatric population, including the very young, has also risen. United States data suggest that between 2011 and 2013, mobile media use by children aged 2-4 years old had increased from 39% to 80%.[4,5]

The social and health related impact of mobile phone use on users has been the topic of much research since its rapid uptake in the early 1990's. As a result, questions have been raised regarding the potential cancer risk associated with mobile phone use.[6] The radiation mobile phones emit is non-ionizing (radiofrequency) meaning it is low energy that is too weak to break atomic bonds, unlike ionizing radiation (x-rays, radon), which is a known carcinogen.[7-9] The amount of radiofrequency (RF) radiation emitted from mobile phones is carefully regulated by Industry Canada, ensuring manufacturers adhere to exposure guidelines prior to entering the Canadian market.[10] RF exposure is assessed using a measurement known as specific absorption rate (SAR), which quantifies the rate of RF radiation absorption into a defined human mass (W/kg).[11] During testing, the SAR is measured with the mobile phone transmitting at maximum output power "when the device is used near the head" and "when the device is used near or in contact with the body."[11]

In 2011, the World Health Organization (WHO) classified the RF electromagnetic fields associated with wireless phone use as 'possibly carcinogenic to humans' – "a category used when a causal association is considered credible, but when chance, bias or confounding cannot be ruled out with reasonable confidence."[12] Interestingly, as a point of reference, the WHO also places Aloe vera extract and talc body powder in this same risk category.[13] This recommendation was based on a series of studies commissioned by the WHO using international pooled analysis from 13 participating countries. The findings suggested there was no increased risk of glioma or meningioma with mobile phone use longer then 10 years, although there was a possible increased risk of glioma in participants who reported the highest 10% of cumulative hours of cell phone use.[14] Due to methodologic limitations, they concluded that this could not be inferred as a causal relationship.[15]

In past years, studies have predominantly focused on using animal models to assess the relationship of RF radiation with cancer risk, yet results across studies are inconsistent.[16,17] The U.S. National Toxicology Program recently released findings suggestive of increased risk of multiple cancers in lab rats exposed to RF radiation. However, investigators noted that radiation levels exceeded the standard upper limit placed on mobile phones, with a duration of exposure surpassing nine hours per day, 7 days per week, for two years.[17] Further analysis of this study data is pending. The release of the WHO advisory in 2011 prompted Health Canada (HC) to publish a statement outlining the differences between ionizing radiation and RF radiation while highlighting the rigorous regulatory requirements placed on cell phone manufacturers.[18] HC also developed guidelines on safe exposure to RF radiation emphasizing practical measures to reduce mobile phone exposure by;[19]

1) Limiting the length of cell phone calls
2) Using hands free devices
3) Replacing cell phone calls with text messages

Other agencies such as the California Department of Public Health have recently taken a more conservative approach by recommending users "use a speakerphone or a headset instead" of holding a phone to their head. They've also recommended against carrying a mobile phone directly on your person or using the phone when it is sending out high levels of RF energy (e.g., one or two bars are available, travelling in a fast-moving vehicle, or streaming audio or video).[20]

The American Academy of Pediatrics also has taken a conservative approach regarding the use of mobile phones despite acknowledging the limitations of the current evidence. These recommendations are based on differences in pediatric anatomy (head size, skull thickness, etc.) compared to adults and the fact that current radiation standards are based on adult data.[21] Their advice is to limit mobile phone exposure to children and teens by following a list of safety tips for families. This list includes suggestions such as holding mobile phones one inch or more from your head during a conversation, avoiding carrying your phone against your body, not using your phone when it has a weak signal, and avoiding making calls while in elevators, trains, buses, or cars.[21]

As physicians and future medical professionals, we are called to focus on the immediate health needs of our patients while advocating for preventative and population based practices that ensure the future

health of our communities. Despite the many questions and lack of evidence regarding the carcinogenicity of mobile phone use we must maintain vigilant as a profession to continue to provide accurate information to the concerned public. Considering the paucity of high quality evidence regarding mobile phone use and cancer, numerous population and animal based studies are currently underway to hopefully provide closure to this longstanding debate.

Joel Bergman
Editor-in-Chief

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Diagnose this

A 25-year-old female with papulopustular rash, arthritis, and retinal vasculitis

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Case: A 25-year-old Caucasian female was referred to ophthalmology with a three-week history of decreased vision in her left eye. Review of systems by history and physical exam was positive for dyspnea, a widespread papulopustular rash, heart palpitations, oral and genital ulcers, migratory arthralgia (especially in her knees), and fatigue. Her medical history was significant for past intravenous (IV) drug use. She had initially been seen by a community ophthalmologist and subsequently admitted to the internal medicine service for further investigations due to concerns of significant systemic illness. She was afebrile and her vital signs remained normal.

On ophthalmologic exam, her corrected visual acuity (VA) was measured at 6/6 right eye (OD) and 6/60 left eye (OS) and intraocular pressures were 14 mmHg OD and 15 mmHg OS. A subtle relative afferent pupillary defect was noted in the left eye. Slit lamp examination was unremarkable and no vitritis was noted. Extra-ocular movements were full. Fundoscopic examination revealed bilateral intra-retinal hemorrhages and perivascular sheathing (Figure 1). Roth spots (white centered hemorrhages), cotton-wool spots, and optic nerve edema were noted OS.

Systemic investigations were initiated and targeted towards a differential diagnosis including inflammatory (e.g., systemic lupus erythematosus, reactive arthritis, vasculitis, sarcoidosis, inflammatory bowel disease), infectious (e.g., human immunodeficiency virus, syphilis, tuberculosis, Lyme disease, infectious endocarditis, disseminated herpetic disease), and other (e.g., disseminated intravascular coagulation, coagulopathy) possible etiologies.

A chest x-ray demonstrated no evidence of granulomatous inflammation nor hilar adenopathy and a transthoracic echocardiogram was normal. Initial laboratory investigations showed a mild thrombocytosis (420 x 10^9/L, normal range 150-350 x 10^9/L) and elevated C-reactive protein (133 mg/L, normal range 0-8 mg/L). Urinalysis showed 8 RBC/HPF (normal range 0-5) and was positive for leukocyte esterase. Studies for anti-neutrophil cytoplasmic antibodies were negative. A knee joint aspiration was completed and noted inflammatory cells without bacterial growth. Dermatology obtained a skin biopsy of the rash and the resulting pathology showed a mixed perivascular infiltrate with leukocytoclasis (Figure 2).

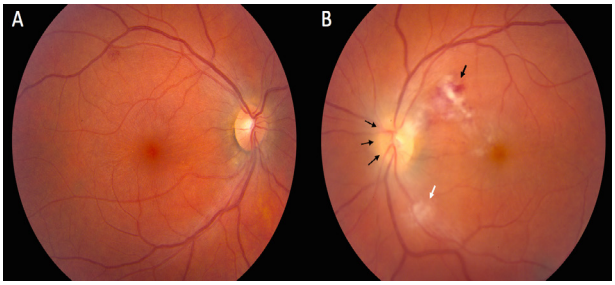

Figure 1. View of retina OD (A) and OS (B) with cotton wool spot (white arrow), intraretinal hemorrhage (black arrow), and optic disc edema (3 black arrows) noted OS.

Which of the following is the most likely diagnosis?

a) Eosinophilic granulomatosis with polyangiitis
b) Pustular psoriasis
d) Disseminated herpes zoster virus with acute retinal necrosis
d) Systemic lupus erythematosus
e) Behçet disease

The combination of retinal vasculitis, papulopustular rash, skin ulcerations, migratory arthritis, and supporting laboratory investigations suggest Behçet disease (e) to be at the top of the differential diagnosis. Subsequent genetic studies supported this diagnosis with a human leukocyte antigen (HLA) B51 positive genotype. Work-up for other diagnosis on the differential, including Lyme disease, syphilis, human immunodeficiency virus, systemic lupus, septicemia, and tuberculosis, were negative. Pustular psoriasis may also present with recurrent episodes of widespread, painful erythematous patches accompanied by fever, malaise, arthralgia, and mucosal involvement. However, the presence of retinal vasculitis suggests Behçet disease.

Background

Behçet disease was first described by Dr. Hulusi Behçet, a Turkish dermatologist in 1937.[1] He presented three cases of patients with uveitis, oral aphthous and genital ulceration, and skin lesions (erythema nodosum).[1,2] Behçet disease is characterized today as a systemic variable vessel vasculitis, with the potential to involve arteries and veins of all sizes.[2]

The prevalence of Behçet disease is greatest in Asian countries stretching from the Mediterranean to Japan. Behçet disease has been coined the "Silk Road disease",

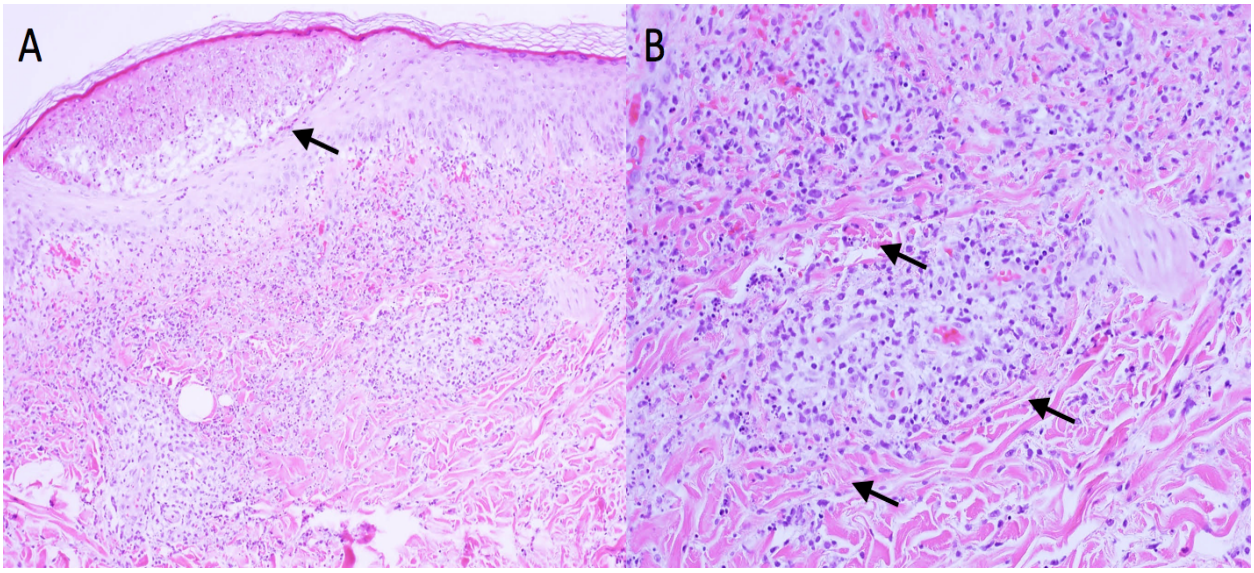

Figure 2. Pathology slides from skin biopsy. (A) Low power view demonstrating pustule. (B) High powered slide demonstrating mixed perivascular infiltrate and leukocytoclastic inflammation.

reflecting its geographic predominance in people with ancestors along the ancient trade route linking the Far East with Europe.[3] In Turkey the estimated prevalence is 80-420/100,000, while in Western countries it is 0.12-0.64/100,000.[4,5] Women are more commonly affected than men. The typical onset is between 30 to 40 years of age, and earlier onset is associated with greater severity of systemic symptoms and eye disease.[2]

Clinical Features

Behçet disease is not considered a chronic inflammatory disease; rather it is an autoinflammatory disease consisting of recurrent attacks of acute inflammation.[2] Oral ulcerations often represent one of the earliest disease manifestations. Renal involvement is less common and milder in Behçet disease compared to other vasculitides.[6] Table 1 provides an overview of systemic manifestations.[2,7-10]

Ocular Manifestations

While the most common manifestations of skin lesions and oral and genital ulceration are generally self-limiting, recurrent episodes of uveitis can lead to blindness.[2] Ocular manifestations involving the uvea and retina present in 30-70% of patients and lead to severe bilateral vision loss in about 25% of cases.[11] Signs and symptoms include decreased vision (with or without eye pain), photophobia, periglobal hyperemia, lacrimation, and floaters.[11,12] Cataract formation and glaucoma are additional common ophthalmologic complications.

Anterior uveitis refers to inflammation of the iris and ciliary body.[13] Episodes of anterior uveitis resolve and relapse spontaneously, but repeated attacks can lead to irreversible structural damage.[14]

Retinal manifestations, including retinal vasculitis, are the most significant ocular complications in Behçet disease.[2,12] Retinal vasculitis, can appear in several ways including perivascular sheathing (a collection of inflammatory cells around the affected blood vessels, Figure 3), cotton wool spots representing arteriolar infarcts (yellow-white, lesions with a cloud-like appearance, Figures 1 and 3), and white centered hemorrhages (Figure 3).[15] The consequences of prolonged retinal vasculitis include optic nerve disease from ischemia, which may present as a relative afferent pupillary defect on pupil exam. Fluorescein angiography is the most informative modality for diagnosing and monitoring retinal vasculitis activity.[2,15]

Diagnosis

There are no pathognomonic laboratory tests for Behçet disease and several diagnostic criteria have been developed, often for research purposes rather than clinical application.[16] The International Criteria for Behçet disease (ICBD) is the most recently developed clinical criteria which aims to improve on the sensitivity of prior criteria (Table 2).[8] A score of greater than 4 diagnoses Behçet disease with a sensitivity of 93.1% and specificity of 92.1%. A pathergy test is positive when a needle stick results in a sterile pustule at the sight of the induced trauma. While it does support the diagnosis, the presence of a positive HLA-B51 genetic marker is not useful as a screening test or as a sole marker of Behçet disease.[2,8]

Table 1. Summary of key systemic manifestations of Behçet disease.

Feature	Description
Oral ulcerations	These occur in 47-86% of patients. Oral ulcers can involve gingival and buccal mucosa, tongue, and lips but often heal with little scarring.
Genital ulcerations	Deep genital ulcerations occur in 57-93% of patients and can be painful. Unlike oral ulcers, these heal with white or pigmented scars. Perineal and perianal lesions are common.
Cutaneous lesions	Occur in 38-99% of patients. Papulopustular and acne-like lesions may be present on face, limbs, trunk, and buttocks. When biopsied, rashes display leukocytoclastic vasculitis—vascular damage caused by nuclear debris from infiltrating neutrophils. Cutaneous ulcers are rare.
Erythema nodosum-like lesions	Present in 57-93% of patients and more common in females. Typically involve the lower limbs.
Articular	Non-erosive, non-deforming oligoarthritis occurs in 45-60% of patients and can involve the knees, ankles, elbows, and wrists.
Gastrointestinal	Gastrointestinal symptoms affect 3-36% of patients overall and are more common in Japanese individuals. Can involve inflammation and ulceration of the entire gastrointestinal tract, resulting in abdominal pain, diarrhea, and bleeding.
Cardiovascular and respiratory	Thrombophlebitis, deep vein thrombosis, and pulmonary embolism occur in up to 40% of patients. Dilatation of the proximal aorta, interatrial septal aneurysm, and valve disease are findings of cardiac involvement.

Pathophysiology

The etiology of Behçet disease is thought to be multifactorial, including genetic (HLA and other genes), infectious, and immunologic factors.[2] While our understanding of Behçet disease etiology is evolving, the features of the disease suggest that it is an autoinflammatory disease associated with over-activation of the immune system resulting in vascular injuries and hyper-function of neutrophils.[17] Unlike autoimmune diseases in which the host adaptive immune system mistakenly attacks self-antigens, autoinflammatory diseases are characterised by an abnormally increased inflammatory response of the innate immune system.[18]

The presence of several HLAs are associated with an increased risk of developing Behçet syndrome. Various HLA-B5 alleles are thought to promote defective antigen presentation leading to activation of adaptive and innate immune responses.[19-21] Particular attention has been placed on HLA-B51, with carriers of this allele estimated to have 5.8 times the odds of developing Behçet disease compared to non-carriers.[22] The prevalence of the HLA-B51 allele is high among patients who live along the silk road (up to 81%) but not among Caucasian patients residing in Western countries (13%).[2] The allele also affects disease severity, since it is more common among patients with posterior uveitis or progressive central nervous system disease, compared to those with milder disease.

The trigger hypothesis of Behçet disease suggests that infection might promote recognition of host antigens via molecular mimicry.[19] Viral infections implicated include herpes simplex virus, hepatitis C, and parovirus B19. Bacterial infections with Streptococcus sanguis have also been suggested as a causative agent, because the bacteria and antibodies are frequently found in the oral flora and serum, respectively, of patients with Behçet disease.[19,23]

Management

The mainstay of treatment of Behçet disease is immunosuppressive therapy and is targeted towards body systems affected. Corticosteroids are the first line treatment, including both local (topical, periocular, and intravitreal) or systemic (IV or oral) therapy.[2,24] Adjunctive immunosuppressive therapies studied include azathioprine, methotrexate, cyclosporine, mycophenolate mofetil, cyclophosphamide, tumor necrosis factor (TNF) antagonists, colchicine, thalidomide, and interferon-alpha.[25]

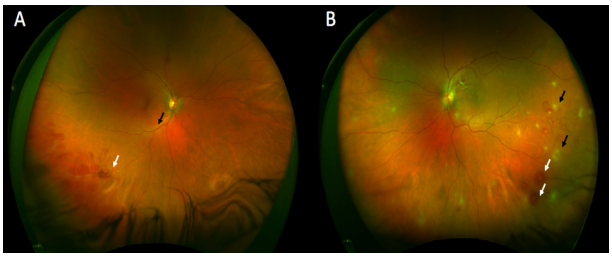

Figure 3. View of retina OD and OS. Intraretinal hemorrhage (white arrow) and perivascular sheathing (black arrow) are appreciated OD. Intraretinal hemorrhage (white centered hemorrhages, white arrows) and micro-infarcts are (cotton wool spots, black arrows) are noted OS.

Table 2. International Criteria for Behçet's Disease point score system; total score ≥4 indicates Behçet's diagnosis.[8]

Sign/Symptom	Points
Ocular lesions	2
Genital aphthosis	2
Oral aphthosis	2
Skin lesions	1
Neurological manifestations	1
Vascular manifestations	1
Positive pathergy test	1

Systemic corticosteroids effectively decrease the acute inflammation in eye disease, but do not prevent the recurrence of symptoms and can themselves lead to cataracts and glaucoma.[2] Therefore, for ocular disease affecting the posterior segment, treatment involves systemic corticosteroids in addition to azathioprine.[25] If eye disease is refractory, cyclosporine A, interferon-alpha, or infliximab may be added. Despite therapy, about 25% of patients with ocular symptoms eventually become legally blind (VA < 20/200) in their better seeing eye.[12,13]

Case Revisited

Behçet disease is a rare systemic vasculitis with severe ocular manifestations, requiring prompt treatment with systemic steroids and adjunct immunosuppression. In this case, the presenting patient scored 7 on the ICBD diagnostic criteria for Behçet disease. Treatment was initiated with methylprednisolone 1000 mg IV for 3 days, followed by oral prednisone 60 mg daily with a taper. Azathioprine 50 mg daily was added. At follow-up 15 days after initial presentation, corrected VA was measured at 6/6 OD and 6/30 OS. Ocular pressures were 8 mmHg OD, and 15 mmHg OS. A relative afferent pupillary defect persisted OS and anterior slit lamp examination remained normal.

Disclosure: The authors have no proprietary or commercial interest in any materials discussed in this article.

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Humanities

Sunday

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Ring ring. I drag myself out of bed and grab my phone. 6:05 am. It's a Sunday morning, but I don't feel rested at all. I need to get to the hospital early, while it is still quiet, so I can look through our general internal medicine patient list and plan out my day.

I step off the hospital elevator and head towards the nursing station. A group of nurses are sitting around the centre table quietly chatting. I sit down in front of the computer and nervously open up the list: 24 patients. The last time our team had 24 patients was three weeks ago. That was on a weekday when there was a full team including a staff physician, three residents, and several nursing and medical students. As the resident-on-call during the weekend, I am expected to round on every patient and write a progress note while carrying the team phone and responding to calls throughout the day. In the evenings, I am asked to see patients who have been referred to Medicine for new consultations usually in the Emergency Department. Today, I need to figure out how I am going to see all our team's patients on my own.

As I stop by the corner room, I see Mr. H is awake already. He is probably the most complex patient on our team. He was recently treated for an aggressive respiratory infection. Thankfully, he is stable and sitting up comfortably. I leave his room and open up his bloodwork results on the computer. His liver enzymes have been slowly creeping up over the last couple days. I scan over his medication list. He hasn't started anything new over the last few days. It's puzzling, but his levels are not high enough that I suspect he is in liver failure. I write a quick note and close his file.

Mr. C is next on my list. As I walk into his room, something does not seem right. Mr. C has an oxygen mask on and it looks like he is working hard to breathe. I had seen him a couple days ago and he did not look like this. "Mr. C?" I say. No response. "Mr. C?" I hear my voice growing louder. No response. I take another look at him. He looks like he is dying. I pace to the front desk and ask: "Can you please call his nurse?" The nurse comes over and tells me that Mr. C's breathing got worse last night. He has also been drowsier. I ask the nurse to repeat his vitals and let me know when he has them.

I speak with the on-call respiratory therapist. She tells me there's not much more that can be done at this point. He is already on high oxygen settings and expressed a wish to not be intubated. His chest x-ray does not look all that different from his previous ones. He tried a new medication recently which could be making him drowsier so I decide to hold that for now. I need to call our team's attending physician as this situation could go downhill very quickly. Staff physicians always say: call earlier rather than later. I do not want to call so early in the day, but I am grateful that he doesn't mind. "He looks very unwell," I say. I explain the sudden decline that I had noticed in Mr. C. "You could call CCRT," he suggests. The Critical Care Response Team provides 24/7 urgent support for sick patients. I let the nurse know that we are going to get CCRT involved and do more tests. His family should probably know what's going on, I think to myself. I contact the family then walk over to the team meeting room.

It's time for handover. The resident who was on-call last night reviews new patients who have been admitted and provides updates on other patients: Mr. E is a young man who has been admitted for a mysterious rash that no one has been able to figure out. Ms. A has a long list of medical issues. I am struggling to keep up as the resident rapidly reviews them. Mr. K is in acute renal failure and may need dialysis if things don't improve. Follow up on his bloodwork in the afternoon. I draw a checkbox beside his name on my patient list. Mr. A may be actively bleeding. Call Interventional Radiology today. Call Hematology today. Ms. S has been having fevers. Follow up with her blood cultures. Mr. Y had black stools yesterday. Call GI today if his hemoglobin is low and he is having more bleeding.

I scribble some notes and draw more checkboxes on my list. "I can take the phone from you," I tell the resident-on-call. She hands over the team phone to me. I scan down the list. Mr. Y and Mr. A probably should be seen next since they may be bleeding. I stop by Mr. Y's room. He has no new concerns. No dark stools. No bleeding. We are not entirely in the clear yet. His bloodwork was done earlier in the morning so I make a note for myself to follow up later in the day.

Mr. A is next. He got a blood transfusion a couple days ago. He has not noticed any new bleeding and his vitals are stable. Right now, I feel he is safe enough to go for a CT scan. I call Radiology to arrange a scan for him today to assess for active bleeding. "I'll make sure it's done today," the on-call radiologist says. I start to write a progress note for Mr. A.

Ring ring. "Hi it's Matthew, resident with Team Medicine," I say. Hematology on-call recommends more blood products for Mr. A and says they have left a

note on the chart. *Ring ring*. Respirology is calling. They want me to put in a chest CT for Mr. S. I look back to Mr. A's chart. I can't figure out what the Hematology team has written on the chart. I send another message asking them to clarify the orders. *Ring ring*. The Hematology team clarifies the order. I go back to Mr. A's chart to finish writing the progress note.

Ring ring. Urgent e-message: Ms. E with cancer is refusing bloodwork. In addition to phone calls and pages, I also get messages through the hospital's online messaging system. The message for Ms. E can wait so I close the message window. I need to figure out what to do for Mr. A. I remember the resident who was on-call last night suggested calling Interventional Radiology. I page Interventional Radiology. *Ring ring*. Ms. E's nurse calls to let me know that Ms. E is refusing bloodwork. "She doesn't want to be poked twice," she says. I can't force her to have bloodwork if she doesn't want it. "Can you explain to her that it's very important for her to get bloodwork today?" I ask. The nurse agrees to speak with Ms. E again. I look down at my list. I order Mr. S's CT chest before I forget. *Ring ring*. Mr. C's latest set of vitals are back and they don't look good. *Ring ring*. Mr. C's family is here and wants to speak with the doctor. *Ring ring*. Ms. E's nurse calls back. Ms. E doesn't want any bloodwork. I say to the nurse: "I guess we can only encourage her. I'll talk with her later."

Hanging up, I look at the clock. I know I'm in trouble as it's almost 11:00 am and I've only seen 4 patients. 20 more to go. I look at my list, then at the message from Mr. C's nurse. I'm already so behind but I know I need to go back to Mr. C's room to talk with his family. He could die today. I quickly walk back to his room. His family is by the bedside. I sense a mix of inquisitiveness and nervousness. They can clearly tell he is having difficulty breathing. I provide them with the facts I know. He has required more oxygen. We have ordered more tests to see if there is anything reversible that we can treat. He is not doing well. "I know this is a difficult time for your family," I say. Although they never directly ask the question, I can see in their eyes that they want to know how long he has left. "I know this is hard but he could pass away suddenly," I say softly. They seem appreciative even though the news is not good. "Let us know if there's anything you think we can do to help him feel more comfortable." They nod understandingly. I feel myself choking up a bit, holding back a tear as I leave the room. I don't have time to process it further and I know I need to move on.

I stop by Ms. E's room. She is feeling better but needs cancer treatment. I let her know that we're going to do everything to help her. At the end of our encounter, I ask her if she can provide us with some bloodwork later today and she agrees. I page the Oncology team and start writing her progress note. *Ring ring*. Oncology calls back. I ask them if they can follow up with Ms. E for cancer treatment and they inform me that they will arrange this. *Ring ring*. The x-ray results for Mr. R are back. *Ring ring*. Someone is paging me from the Emergency Department. I call back and am put on hold for a few minutes but no one comes to the phone. *Ring ring*. The Emergency Department calls. Mr. G is requiring more oxygen. I run downstairs to the Emergency Department. He looks worse than when I last saw him and he is already on multiple antibiotics. *Ring ring*. The senior internal medicine resident asks me when I am free to see new consults. The senior resident triages new consultations and delegates them to the junior members of the team. I let him know that I am way behind schedule and that I'll be free probably at 6:00 pm at the earliest. I know this is not what he wants to hear.

I look at the clock: 1:00 pm. I dart in and out of several rooms down the hall. Mr. D has a mysterious virus that has left him quite disabled. He seems cheerful as always and there haven't been any new changes. Mr. S is coughing less today. Mr. N was confused last week but he looks better today. Mr. F's cellulitis is resolving. As I haul their charts back to the computer, I get interrupted again. *Ring ring*. Ms. B's family wants her diuretic medication changed. I print off several notes and slap them onto the charts. I go back downstairs to see Mr. A. He is not bleeding from anywhere. *Ring ring*. Ms. E's nurse asks me if I want to take a look at a wound. I dart over to Ms. E's room to take a look. *Ring ring*. The senior internal medicine resident has a new consultation for me to see. "I'll try to get to it soon," I say. I look back at Mr. A's CT scan: no active bleeding. I breathe a sigh of relief. *Ring ring*. Mr. O has been out the whole day but is back in his room now. When I get to his room, he doesn't want to talk to me. "We can come by tomorrow," I say. I honestly don't have time to persuade him to talk to me.

Ring ring. My staff physician is asking if I want to review the patient list. I apologetically inform him that I'm not ready to review yet. He asks if he needs to come in to help out. I thank him for the offer but let him know I will call him after I see the remaining patients. He seems okay with this.

I'm exhausted. I need a break. I know there is a consult pending, but I need to eat something. I go back downstairs to the cafeteria. I stuff down a sandwich and head back to the ward to see Ms. K with endocarditis. She is on antibiotics and I don't see the need to make any changes to her medications today. I call back the staff physician and fill him in on all that's happened today.

By the time I see the new consult, it's almost 10:00 pm. The intensive care unit wants to transfer another patient to our team. I open up Mr. P's chart

and sift through a dizzying array of medications and investigations. After I see Mr. P, I go back downstairs to the Emergency Department to find the senior medicine resident. While we are reviewing the case, a nurse comes into the room asking: "Can we put restraints on Mr. T? He is very agitated." I'm hesitant, but it does not seem like we have another alternative so I say okay. When the senior resident and I finish reviewing, he mentions: "I have another one for you." It is a new consult for a patient with prostate cancer. I start looking through the patient's chart.

Ring ring. Mr. T is very agitated with the nurses. *Ring ring*. My girlfriend sends me a message wishing me a good night. I really wish I could talk with her right now. *Ring ring*. Mr. T is threatening one of the nurses. I walk over to his room. I try to talk with him but he is clearly confused and agitated. I order some medication to help him calm down. I look at the clock again: 5:00 am. If I finish off my notes, I might actually be able to lie down for half an hour. *Ring ring*. "I have another consult for you," the senior resident says, "DVT". As I sit back down, I realize the afternoon bloodwork for Mr. K who is in acute renal failure was never done. I put in an order for it to be done immediately. Panic sets in as I remember my staff physician saying that we would review at 6:30 am. That gives me about an hour to see the new consult, Mr. D, and wrap up all outstanding ward issues.

I pull up Mr. D's chart on the computer. My eyes start to close. I perk back up and look through his bloodwork. My eyes start to close again. Shaking myself out of the stupor, I start skimming through Mr. D's notes. I scurry over to his room. He is sound asleep. I hate waking him up, but we need to move the admission process along. Thankfully, the history and physical exam is straightforward. *Ring ring*. The attending physician is on his way to the hospital and wants me to contact him. I call him to discuss the new patients that I saw overnight. He only asks me a few questions and tells me that he can review with me in more detail when he gets to the hospital. I have about 15 minutes to wrap up notes and put in orders before he gets here. *Ring ring*. He is here now. I discuss the cases in more details with him in the Emergency Department conference room. After that, we head upstairs to meet with the rest of the team.

I pass along the team phone to the day team resident. My pocket feels a lot lighter now that I have handed over one phone. I go back downstairs to the Emergency Department to finish off my notes and makes some phone calls. I page Hematology to help us out with Mr. D who has a DVT. *Ring ring*. Hematology calls back. I ask for a new consultation.

When I head back upstairs, the nursing student tells me there's something going on with one of our new patients. His breathing is laboured and he looks like he is gasping for air. I review the case with the respiratory therapist and order a stat chest x-ray. We need to call the critical care response team to assess him. The senior resident comes by to our team and commands us to stop for lunch. Relieved, I go upstairs to see that our staff physician has gotten lunch for all of us. As I check in with him, he tells me that I've done a great job. I thank him for the encouragement but I don't think I've done a great job. I feel like there are still a lot of outstanding issues. I tell myself it's time for the day team to take over though. I look at my list one last time, checking off the remaining checkboxes. Interventional Radiology never called back but there's no urgency now. I look at Mr. K's bloodwork. His creatinine is rising and I ask one of the residents to follow up with Nephrology about this. I also ask another team member to follow up on Mr. A's blood product orders. I look at my list one last time then drop it into the garbage. I can barely keep my eyes open as I trek back home. I am finally able to put my phone down: 2:26 pm. I plop down on my bed. *Ring ring*.

Note: names have been changed in this article to protect patient identity.

Humanities

Medicine, Make-up, & Male Perspectives

How far did the patriarchal influence extend in a Roman woman's life?

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For scholars of Roman antiquity, the possible fields of study are seemingly endless. Information pertaining to Roman life course is plentiful with literary and archaeological evidence. Emperors, soldiers, and even freed slaves – all of these narratives and more are accessible to the historian. Yet even a superficial glance at the available material brings with it the realization that female voices are grossly underrepresented. Adding to this issue, almost all extant literary sources are from male authors writing in a patriarchal society – one in which women were largely assigned their place by men. Evidently, male perspectives colour much of present-day reconstruction of a woman's life in ancient Rome. How far, then, did the male influence actually extend over a woman's life?

Two sectors that have often been singled out for their decidedly feminine appeal are cosmetics and proto-gynaecology. Female-driven beautification and female-oriented medicine - of which there was much overlap in antiquity - are assumed by the modern historian to have been relatively unaffected by male prejudice or bias as the intended beneficiaries were women. However, one must question the actual validity of this assumption. In this paper, I argue that Roman patriarchal values extended into virtually all areas of a woman's life, including that of cosmetics and gynaecological medicine. With an exclusive focus on Roman female citizens, I will validate this claim by examining relevant literary and archaeological sources from the first two centuries of our era, illustrating how they indicate the importance of male opinion even in almost exclusively female aspects of life. Finally, I will establish a meaningful connection between makeup and medicine in antiquity and demonstrate that although seemingly unrelated to the modern reader, the two areas were, in Ancient Rome, intricately interwoven in a woman's life.

The field of medicine can serve as a reflection of contemporary ideas and practices. The many connections to Plato, Aristotle, and Hippocrates in Roman medical writings are a testament to the Greek influence in aspects of Roman culture. Similarly, medical texts relating specifically to women reveal much about the dominant attitudes regarding the female gender. While there are references to female physicians and medical writers in extant documents, as well as epigraphic evidence of their existence, there are no surviving texts written by the women themselves.[1] Consequently, as all existing medical writings are from male authors, the texts offer a first-hand glimpse at male opinion and shed light on the patriarchal influence in exclusively female features of life.

As a 'doctor' in ancient Rome, one could have been many things: male or female, astrologist or herbalist, surgeon or midwife, or any range of combinations.[2] The profession itself was unregulated, with a pervasiveness of superstition and magic in medical understanding. Additionally, many important and seemingly influential texts related to medicine were not written by practicing physicians per say. For example, in Pliny the Elder's Natural History (~AD 77-79) a common medical theory on the differences between male and female fetuses is presented:

A male fetus is always recognized by the good health and color of the pregnant woman, and movement in the womb from the fortieth day of pregnancy, whereas [with a female fetus] the load is burdensome, it is accompanied by some swelling, and movement only begins on the ninetieth day.

The idea that being male was superior to being female was widespread amongst medical writers. The renowned physician Galen (129-200 AD) writes that "just as mankind is the most perfect of all animals, so within mankind the man is more perfect than the woman […] so too the woman is less perfect than the man in respect to the generative parts." The female reproductive system seems to have been where most medical writers focused their attention and, not surprisingly, their criticism. The concept of the 'wandering womb' was quite popular within the Greek-Roman medical tradition for centuries. The 'wandering womb' was a description of the female reproductive system in which the uterus was prone to wander throughout the body, causing a wide range of problems, such as "suffocation".[4] The most common explanation offered for a wandering womb was the absence of a pregnancy; consequently, more sex with a woman's husband was recommended as a treatment option alongside fumigations, incantations, and amulets (see Figure 1).

In the Timaeus, Plato stresses the uterus' absolute need for pregnancy for the rest of the female body to function properly:

> *There being in [women] a living animal desirous of childbearing, whenever it is fruitless for a long time beyond its season, being distressed it carries on with difficulty and by wandering in every*

Figure 1. Incantations written on hematite gemstones from Imperial Rome reveal common features, such as commands for the uterus to "stop!" moving, as well as the common depiction of the uterus as an upside-down jug. From Faraone, 2011.

> *direction throughout the body [...] and provokes all other kinds of diseases.*

While not all physicians subscribed to this Hippocratic/Platonic model of an erratic, free-moving uterus, the general idea of a uterus capable of wreaking bodily havoc was sustained for centuries.[4] Even Galen, who rejected the idea of a wandering uterus, maintained that the organ could prove fatal if not preoccupied with menstruation, sex, and eventual pregnancy.[4] One can conclude that the patriarchal values of female worth being rooted in reproduction and sexual gratification offered to her husband were foundational to the concept of the wandering womb. Beyond that, however, another noteworthy aspect of the 'wandering womb' lies within its theurgic appeal. The womb was described as being more like an animal and less like a human organ, running wild throughout a woman's body and bringing chaos wherever it went. Aretaeus of Cappadocia, a prominent physician of Galen's time, writes that the womb is "entirely erratic. It delights, also, in fragrant smells and advances towards them. [...] On the whole, the womb is like an animal within an animal." This description, and others like it, is reminiscent of the ancients describing demons inside a person. In fact, many of the techniques used to 'treat' the wandering womb were a form of exorcism in nature, and often involved the healer using acrid fumigations in an attempt to lure or expel the uterus back towards its natural place.[4]

The parallel between medical depictions of a woman's uterus and those of errant demons or beasts was an important signifier of the patriarchal values pervasive in Ancient Rome. A woman who was not fulfilling the societal duties imposed on her - namely to produce heirs and to sleep with her husband, was an abnormality - a deviation away from that which was good and desirable. Thus, the association between an empty womb and an ill-boding spirit or beast would have made sense in the ancient world. Moreover, just as the dominant opinion of a woman's role was well known and pervasive in Roman antiquity, so too was the association of the female reproductive system with unpleasant matters. Take, for instance, the 10th century A.D. agricultural saga Geoponica; a passage detailing how to get rid of vineyard rodents casually explains that the same process works on curing a displaced womb.[4]

Finally, it is noteworthy that nowhere in recorded Roman history is there any mention of the male reproductive system willfully causing physiological problems in men.[4] This discrepancy further demonstrates that viewing the female body as inferior was an extension of the patriarchal values and biases that dominated in Roman society.

While the idea of a reproducing, married woman was undoubtedly praised within Roman culture, there is indication of another very prominent aspect of the idealized female. Attractiveness was of critical importance in the construction of the ideal woman, so much so that the message was conveyed to Roman girls at a very young age. Virtually all dolls discovered from the Roman era were modeled after fully-grown women displaying features of sexual maturity such as rounded hips, full breasts, and even outlined genitalia (Figure 2).[5]

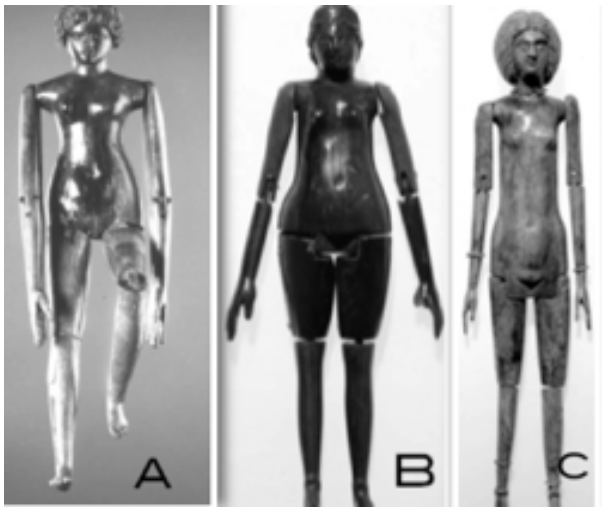

Figure 2. Ivory Roman dolls displaying jewelry, elaborate hairstyles, and the mature female form. A-from the tomb of Crepereia Tryphaena, along the Via Laurentina; B-from the tomb of an unknown girl along the Via Cassia road; C-from the tomb of the Vestal Virgin Cossinia, in Tivoli. From Dolansky, 2012.

Clearly, the dolls were meant to foster the gender normative expectation of reproduction, yet scholars have pointed out another important meaning of the Roman-type doll. Many of the dolls had elaborate hairstyles, delicate facial features, and elegantly draped clothing. This indicates that the dolls were used to expose young Roman girls to the idea of childbearing, and to encourage her to "identify with an ideal, attractive wife."[5]

Beyond childhood, men's voices continued to

assert cultural pressure on women to be attractive. While both inward and outward beauty were desirable, the extreme preoccupation with which male authors discussed cosmetics points to the elevated importance of physical beauty, not unlike in our society today. Yet, this common and simple method of modifying one's features in an effort to become more 'attractive' was often vehemently attacked by the dominant male voice.

While some uses of cosmetics were more or less accepted by the ancient writers, others were attacked with great vitriol. Galen distinguished between two types of make-up, that which was meant to preserve one's natural features, kosmetikon, and that which unnaturally embellishes or hides, kommotikon.[6] The majority of male criticism fell on kommotikon. The male voice quite frequently related the use of make-up to immoral traits such as promiscuity or deceit. Achilles Tatius (2.38) wrote that if a woman looks beautiful, it can only be because of her "fussy trickery" with cosmetics.[5] In ad Helviam, Seneca the younger praised his mother for being modest, attentive to her family, and for not wearing cosmetics – perpetuating the idea that a cosmetic-wearing woman was a threat to the Roman family life.[5] Pliny the Elder, in reference to mascara, complained that eyelashes "daily are dyed with cosmetic […] such is [women's] claiming of beauty that they color even their eyes."

More important than beautiful eyes, however, was a beautiful complexion. Almost all the extant cosmetic recipes, often given by the very same authors attacking make-up, sought the improvement of facial skin. Fair skin was most desirable, as the lack of tanned skin suggested a woman did not have to spend time working outdoors, and was thus of elevated social standing.[6] In addition to pallidity, a smooth complexion was also important – further indication that the ideal was unrealistic, especially for non-aristocratic women, considering the hygiene and living conditions in antiquity. Nonetheless, many recipes and descriptions of various facial creams, masks, and foundations were given. For example, in what remains of Ovid's Medicamina Faciei Femineae (c. 1st century BC), he presented through didactic poetry a series of arguments as to why kosmetikon can be justified as part of female cultus in Rome, and further provided five different recipes for skin-care.[7] He promised that by using his creams, a woman's face "will shine smoother than her own mirror." Interestingly, in spite of his extensive writings on physical beauty, Ovid ultimately concluded that a woman's inner heart is more important than her outward beauty.[7] He was not alone amongst the ancients in this conclusion. The Stoic philosopher Epictetus (55-135 A.D.), in his handbook Encheiridion, deplored the pressure put on young Roman girls to be sexually attractive:

> *So, seeing that the only thing they have got is to sleep with men, they begin to beautify themselves and put all their hopes in this. We ought to take pains, then, to make them understand that what they are really respected for is showing themselves well behaved and chaste.*[5]

The very fact that these writers felt the need to re-emphasize the importance of a woman's character in addition to beauty indicates how widespread the value of physical beauty had become.

Male writers exhibited many apparent contradictions in the patriarchal psyche towards the feminine, including the paradoxical obsession with cosmetics and remonstration with their uses. Take, for instance, the rather cavalier male attitude toward women's hairstyles. Upper-class Roman women had notoriously intricate and varied coiffures, styled to such an extreme that completion often took hours (Figure 3). Clearly, the popular Roman style of female hairdressing was the equivalent of kommotikon, meaning the hair was manipulated and styled in such a way as to not even closely resemble a woman's natural hair. Unlike kommotikon, however, intricate hairstyles seem to have been widely accepted by male writers, apart from deriding the excessive time spent on hairdressing.[6]

What does this inconsistency – that they would

Figure 3. Various busts of women from the Roman Empire demonstrating the wide range of elaborate hairstyles available to women.[6]

quite openly tie cosmetics to threats against the well-being of the family unit and in essence the Roman social infrastructure, yet have relatively little to say about hairstyles – say about the male writers?[5] Perhaps it is an indicator of the nonsensical intrusion of male opinion on exclusively female characteristics, or maybe it is simply a historical bias of texts that have survived versus texts that have not. Another possibility may be simply that the male writers were prone to exaggeration; artists of the same era did not paint Roman women with artificial-looking skin tones or exaggerated makeup, leaving one to wonder how much the male voice's diatribe on cosmetics was in reality simply an embellishment meant to reiterate the frivolousness of female adornment.[7] Nevertheless, even if these reasons prove true, there is no denying the importance of physical beauty and attractiveness in a Roman woman's life.

Exploring how far a Roman woman was willing to go to conform to beauty standards leads one to the surprisingly close association between makeup and medicine. No known cosmetic product existed for cosmetic reasons alone; in fact, the majority of cosmetics were either medicinal, toxic, or both.[7] Perhaps this is why so many of the male medical writers criticized cosmetics. One of the most popular ways to whiten the skin and achieve a fair, 'smooth' complexion was cerussa, a paste made from white lead and vinegar. To attain rosy cheeks, women would likely have applied red lead or red mercuric sulphide directly on to the skin, both of which were known poisons at the time.[7] Ovid discusses this aspect of cosmetics in Remedia amoris when he noted "she is painting her cheeks with poisonous concoctions".[7] These toxic compounds had the ironic double effect of both concealing a woman's so-called flaws while also greatly exacerbating them. The modern reader can interpret the 2nd century Roman poet Juvenal's declaration that a woman's face was a "wound", when she wore make-up in multiple ways: the patriarchal opinion considered a woman with obvious make-up as lesser and more unattractive; a woman was metaphorically wounded by the patriarchal values condemning cosmetic application; and finally, that certain poisonous cosmetics literally wounded a woman.[6,9]

Although some cosmetics were poisonous, others were in fact medicinal in nature. Oesypum, a grease-like substance, could be used as a cosmetic or as a treatment for a fissured anus.[7] Pliny the Elder in his Natural History relates how red ochre was used to form poultices or to aid in enemas in addition to coloring the cheeks.[7] The close association between make-up and medicine extends into the archaeological record as well. Roman jars that have survived into modern day, either empty or sealed with surviving creams and powders, could have served medical or cosmetic purposes – there is no certain way of knowing without the long-ago disintegrated labels.[7]

By commenting on and heavily criticizing women's usage of cosmetics, the dominant male voice in Rome was essentially exerting control over yet another aspect of the female life course. While certainly some of the cosmetics were a cause for concern, the male judgment was directed against the women who used the make-up, not towards the make-up itself. The word medicamentum most often translates to medicine, but can also refer to cosmetics or unnatural, even deceptive, enhancement.[6] Similar to the complexity of the word itself, the use of cosmetics in Ancient Rome seems to have been at once encouraged by the male authors and subsequently ridiculed by them. Women seem to have been placed in an unfair dichotomy by the patriarchal society in which they lived: on the one hand, beauty was one of the most desired aspects in a woman, and yet on the other a woman who made too much effort to conform to those standards of beauty was derided viciously by the dominant male voice. It is evident that ideas about make-up in Ancient Rome were heavily influenced by men who authored both the social stigmas and recipes for cosmetic use – sometimes within the same work.

The patriarchy of ancient Rome manifested itself in different ways. From the paterfamilias' almost unlimited household power, patria potestas, to gender-biased laws like the Oppian Law which sought to punish women who displayed their wealth, it is undisputable that politically and socially women in Rome were not full equals.[9] What is debated, however, is the extent to which the patriarchal influence reached primarily female aspects of life, such as proto-gynaecology and cosmetics. In this paper, I have demonstrated that the Roman patriarchy strongly shaped and influenced the ancient's understanding of the female reproductive system and their attitudes towards cosmetics. By seeking to shame a woman who did not fit the ideal of a sexually gratifying, childbearing, and naturally beautiful woman, the dominant male voice effectively sought control over the female body. In this way one can see the key connection to make-up and gynaecological medicine, beyond the shared authorship of texts or compounds: both were appropriated by the patriarchy to assert male-driven values in all areas of a woman's life. In conclusion, one can see that despite the female-oriented nature of cosmetics and proto-gynaecology, both were in fact driven by decidedly patriarchal ideas, such that a Roman woman's life was never truly free from male assessments of her worth.

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Humanities

Centracare: A history of the New Brunswick Provincial Lunatic Asylum

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The illusionist Harry Houdini visited Saint John in the summer of 1896, and claimed to have been invited to tour the asylum by then - medical superintendent Dr. James Steeves. According to his own apocryphal account, Houdini watched in rupture as a camisole de force (straitjacket) was used to restrain a violent patient, and he was later pleased to be gifted one of these devices by Steeves. The straitjacket would be used as an essential prop in Houdini's popular escape routines. Though this origin story that Houdini frequently told during his magic act was likely entirely fictional, the mysterious and foreboding allure of the asylum did provide a mesmerizing setting to capture the imagination of his audiences.[5,13]

The story of the New Brunswick Provincial Lunatic Asylum reflects the evolution of mental health care in the Maritime provinces and in developed countries in general. The origins of the asylum demonstrate a burgeoning awareness of mental health as a priority for the provincial government, and the institution's decline in the latter half of the twentieth century coincides with changing conceptions about the origins of mental illness, as well as its management.

This article summarizes the history of the facility now known as Centracare, beginning with its inauguration as the oldest mental health institution in British North America and following the changes brought on during the deinstitutionalization movement that reshaped mental health services in New Brunswick and beyond.

Early Years in the Provincial Lunatic Asylum

In early New Brunswick the care of mad persons, along with the unemployed, poor, and other indigents, was first outlined in the Poor Law of 1786.[1,2] Under this legislation, local parishes were responsible for dealing with their poor. Some jurisdictions operated special work-houses where paupers were confined to hard labour, others attempted to provide housing placements, while others yet traded paupers by public auction or bound their children to apprenticeship. Incarceration was a common fate for the destitute in New Brunswick, as well as those persons considered mad or dangerous.[2]

It was in this context that Dr. George Peters set about reforming New Brunswick's mental health care in the 1830s. Serving as the visiting medical officer of the Saint John county jail, he bore witness to squalid and overcrowded conditions for imprisoned lunatics, who were housed alongside otherwise sane criminals. He was first able to relocate about two dozen of these mentally ill people from the jail to the city almshouse, a structure which also quickly proved too small to treat or comfortably house them. With the help of fellow Saint Johner George Matthews, on November 14, 1835, Dr. Peters once again moved the lunatics to the basement of a former cholera hospital on Leinster St. in uptown Saint John. This temporary asylum marked the beginning of British North America's first mental institution.[3,4]

Unfortunately, the temporary asylum was immediately filled to overcapacity with the mentally ill. This development, along with general concerns over a rising population of mentally ill inmates in local jails, spurred the 1836 establishment of a provincial commission to plan for a permanent Provincial Lunatic Asylum in the Saint John area.[5] The commission conducted a thorough investigation into the organization of asylum care in Europe and the eastern United States, and was suitably impressed with the potential for these institutions to cure madness.[6] Briefly, there were discussions with the governments of Nova Scotia and Prince Edward Island to pool resources toward a single institution to service the Maritime provinces; however, the provinces opted instead to independently build and operate their own facilities.[5] In the face of an economic downturn in New Brunswick and competing public works projects, funding for constructing a provincial asylum was delayed for almost a decade.[3]

In 1846, the government of New Brunswick finally approved 2500£ toward erection of the permanent asylum. The 50-acre site was located in an area called Simms Corner, in the parish of Lancaster, about one mile outside of Saint John city limits. Overlooking the Reversing Falls, and enjoying a view of the harbour and city, this site provided a bucolic setting for housing the insane.[5] In accordance with mid-nineteenth century views that modernization, industrialization, and mental overstimulation were major causes of madness, isolation to such an idyllic rural locale was deemed ideal for these patients' recovery.[3,6] Incidentally, the remoteness of the site spared the Provincial Asylum from destruction during the Great Fire of Saint John in 1877, that destroyed over 1400 homes and rendered 6000 residents homeless.[5]

A cornerstone was laid on June 24, 1847, in a jubilant ceremony attended by the Lieutenant Governor, the

mayor, various municipal and provincial officials, and officers of the local Masonic lodge. Construction then began in earnest. In December 1848, residents of the temporary asylum were finally transferred to the new Provincial Lunatic Asylum, with Dr. Peters briefly serving as the first medical superintendent of the institution (Figure 1).[5]

From the start, there was a desire to provide vocational activities for patients. On the asylum's spacious grounds patients staffed a working farm with vegetable crops and housing for livestock. Likewise, clothing was made by female patients under the direction of a professional seamstress. The labour provided by patients was not only considered therapeutic, but also helped offset the costs associated with operating the asylum. Sadly, it was not long before the dream of a productive and therapeutic asylum farm were impeded by nearby infrastructure projects. First, the asylum grounds were transected by the construction of a suspension bridge across the Reversing Falls in 1853, and this was followed in 1885 by the addition of a nearby railway bridge, effectively reducing the asylum grounds to only four acres.[5]

To continue operating an asylum farm, an additional 210-acre plot of land was purchased over a mile away in 1885; this would become known as the "Annex."[5,7] Unfortunately, the remoteness of this site from the main building limited access to all but the most stable and functional of patients, so the Annex farm would never reach its full potential. Later requests to the provincial government to relocate the entire institution to a larger site went unheeded.[8] Nonetheless, agricultural activities at the Annex farm continued to provide a small source of revenue for the institution until it was phased out by the 1970s.[5]

Aside from providing supervised labour, occasional leisure opportunities, a quiet rural environment, and isolating patients from their friends and family, treatment options for the asylum's mentally ill were fairly limited. Common therapies tended to be physical in nature, and they included: cold water baths, phlebotomy, emetics, laxatives, and injectable sedatives.[3,6] By 1890, only about 3% of asylum patients were expected to be "restored to mental health." With these measures proven time and again to be ineffective, clinicians had little recourse than to suppose that a majority of patients simply were not brought to the asylum early enough in their condition to effect a cure.[3] Many patients, once admitted, spent the rest of their lives at the institution.

In practice, the asylum became a place to store people who did not fit in with society at large, and it cared for them in mostly a custodial role. This attitude is reflected in contemporaneous provincial legislation concerning disposition of the insane. For example, a 1852 law permitted an insane person to be forcibly admitted to the asylum, on the order of two Justices of the Peace, without requiring a physician's consultation or even the consent of the asylum superintendent. It would not be until 1883 that the asylum's medical superintendent would have the ability to refuse such an admission.[3] Unsurprisingly, the asylum's population continued to grow over the following decades: it housed an average of 194 patients in 1864,[9] 394 patients in 1885,[7] 888 in 1934,[10] 1308 in 1947,[8] and it peaked at 1697 patients in 1956.[10] As early as the first year after its opening, the medical superintendent had complained about overcrowding at the asylum.[3] The facility had to be expanded several times over its history, but would always become overcrowded again shortly afterward.[11] Each subsequent medical superintendent continued to beseech the provincial government, with varying degrees of success, for more funding and resources, competitive wages, and the construction of new facilities.[12]

Modernization in the Provincial Hospital

The Provincial Lunatic Asylum entered the twentieth century with a rechristening as the Provincial Hospital for Nervous Diseases, in 1903.[5] Despite this scientific-sounding appellation, treatment at the asylum remained much the same as in decades past, and successful patient rehabilitation was hardly any more likely. A sense of resignation is conveyed in the words of Dr. James Anglin, the longest serving medical superintendent of the hospital (1904-1934), and one-time president of the American Psychiatric Association (1917-1918), who wrote:

> "...for many persons that are admitted each year, nothing more can be done than to provide shelter - the aged, the paretic, the epileptic, the imbecile. There is no other haven for them in this province."[14]

However, under the administration of Dr. Anglin's successor, Dr. Ernest Menzies, advances in medicine and psychiatry would finally begin to effect change in the hospital. 1936 saw the purchase of an x-ray machine and establishment of a modern operating room, so that surgical conditions could be treated on-site, rather than requiring transfer into another hospital.[5] Dr. Menzies was also perhaps the first to introduce insulin treatment to a Canadian psychiatric hospital.[15] An electroshock (electroconvulsive) therapy program was introduced during the Second World War. In 1942, the Provincial Hospital was accredited by the American College of Surgeons.[5]

Figure 1. The Lunatic Asylum and suspension bridge. Photograph by M. McClure, c. 1870s.

Figure 2. Aerial view, demonstrating later additions to the oldest structures of the Provincial Hospital complex. Photographer unknown. 1965.

Unfortunately, during the Second World War, many experienced nurses and physicians were deployed in active service, leaving the hospital sparsely staffed.[15] Increasingly, these poor conditions became subject to very public scrutiny. Over three weeks in January and February 1945, Montreal's The Standard newspaper published an alarming exposé by investigative journalist Kenneth Johnstone, who briefly worked undercover in the hospital as an attendant supervising patients. His article illustrated foul living conditions, patient abuse at the hands of attendants or other patients, liberal use of injectable sedatives without doctors' orders, and a cavalier attitude toward employing physical restraints.[11,15]

These allegations spurred a Royal Commission Inquiry into the veracity of the newspaper's claims. The Baxter Inquiry, as it came to be known, was ultimately sympathetic to the hospital and its workers. It commended the four-member medical staff for continuing the daily administration of the hospital with severely strained and limited resources, and called for medical staff salaries to be raised. However, the inquiry did verify many shortcomings in patients' living conditions, and it recommended renovations to modernize the hospital, as well as development of occupational activities for patients, and creation of a Board of Governors to aid in administration of the hospital. The hospital slowly addressed some of these shortcomings over the next decade.[11,15]

The 1950s continued to bring medical advancements to the Provincial Hospital, including the addition of diagnostic electroencephalography. As in many other institutions, the hospital briefly trialed frontal lobotomy, carrying out 15 of these surgeries in 1953. Once-agitated patients were indeed rendered sedate, but the procedure fell out of favour as these patients unfortunately also became socially disinhibited, and were no better able to navigate interactions with other people. The introduction of chlorpromazine and antipsychotic medications during this decade was far more beneficial.[5]

Outside of the Provincial Hospital, the overall delivery of mental health services in New Brunswick was also starting to change, with the organization of the first outpatient mental health clinics in Saint John, Fredericton, and Moncton around 1950.[5] Inpatient psychiatric care also began to shift to other institutions. In 1953, 11 psychiatric beds were added to the Moncton Hospital, followed by the 1954 opening of a new 225-bed psychiatric hospital in Campbellton.[10] The hospital in Campbellton would address long-unmet needs within the Francophone community, since physicians at the Provincial Hospital were historically rarely fluent in French.[1] 1956 saw the largest patient census in the history of the Provincial Hospital but, from this point on, New Brunswick would continue to pursue mental health care decentralization, and the province would join other jurisdictions in moving away from institutionalizing the mentally ill or developmentally delayed.[10]

Centracare, and Process of Deinstitutionalization

With the provincial government balking at the high cost of running the psychiatric hospitals in Saint John and Campbellton, the 1970s heralded an acceleration in the process of deinstitutionalization.[16] During these years, foster homes and nursing homes increasingly

took more of the hospital's stable chronic patients into the community, while psychiatric services were improved at general hospitals throughout the province.[1] Despite ongoing requests from Provincial Hospital administrators for a brand new facility to replace the century-old complex, the provincial government did not act to do so (Figure 2).[17]

In 1978, the Provincial Hospital underwent a name change to Centracare, and thus came the introduction of a community board of directors to oversee hospital operations.[5] By the time of the renaming, the patient census at the institution had fallen below 500, and this continued to drop to around 300 over the next decade.[18] In 1979, the province embarked on the Southern New Brunswick Mental Health Planning Study, recognizing that further major changes to Centracare would result in widespread effects on the remainder of the mental health care system in the province.[14]

The study characterized chronic challenges at Centracare, including high rates of professional turnover, inadequate physical facilities, and poor communication with outpatient services. Additionally, the Planning Committee criticized a lack of active treatment for long-term patients and inadequate programmes for rehabilitation. Some patient groups admitted to Centracare (i.e., the "mentally retarded, psychogeriatric, drug abusers") had specific needs different from that of the general psychiatric patient population, and would likely benefit from separate treatment designed to meet their specific needs. Finally, contrary to the views of the asylum founders, the study concluded that acute and emergency psychiatric treatment would be better addressed in patients' home communities when possible, in order to avoiding disrupting patients' family ties.[19,20]

In 1988, the Frank McKenna government decisively halted preliminary planning for a new 250-bed psychiatric facility in the province, while it focused on the ongoing transfer of mental health care from institutional to community services.[21] To oversee this transition, the Mental Health Commission of New Brunswick was also formed in 1988. Comprising mental health professionals along with patients and families, the Mental Health Commission was organized into regional boards that oversaw delivery of mental health services, which in turn reported to a provincial board that ensured compliance with provincial policy.[22] As never before, consumers of mental health services in New Brunswick were increasingly seen as partners in determining the scope of their own care, and this they did enthusiastically.[11] Though the New Brunswick model garnered praise from observers of Canadian mental health policy for organizing a relatively smooth transition to community-based care, the Mental Health Commission was later disbanded in 1996 for budgetary reasons, and mental health was reintegrated into the provincial Department of Health and Community Services.[11,21-23]

The patient census at Centracare continued to decline so that by 1995, the facility housed only 125 patients.[5] As expected, the progressive closure of Centracare as a long-term institutional care facility was associated with a commensurate increase in need for group homes, shelters, and soup kitchens, and these community services initially struggled to keep up with demand.[24,25] February 23, 1998 saw the opening of a new, smaller facility in the community of South Bay to replace the original hospital.[26] Since then, Centracare has served as a 50-bed facility for longer term mental health services, specifically serving elderly patients, patients with concomitant developmental delay and a mental health disorder, and patients requiring intensive psychosocial rehabilitation. In contrast to the frenetic activity seen in decades gone by, the new Centracare no longer treats acutely unwell patients, and from 2016 to 2017 there were only 3 admissions.[27]

For two years following the 1998 relocation, the future of the old provincial hospital remained uncertain as the building lay vacant. Having been iteratively expanded in a piecemeal fashion over more than a century, the building had a jarring, disorienting appearance, inspiring this description:

"Today [in the 1990s], when you walk through the building there is a feeling that it doesn't quite fit together. You can see how various administrations tacked on new wings and rooms as the buildings filled to bursting with people. There are beautiful multi-panel windows set in wood looking out over a stairwell that seems to lead nowhere. There are rooms that can only be entered from a hallway one floor below. And there are walls that don't seem to serve a purpose."[10]

Nonetheless, the Saint John Preservation Review Board and local history enthusiasts advocated for preservation of the facility, citing the value of the institution to the city's history, as well as the impressive Italianate architecture of the original buildings.[28] The fate of the former asylum was decided November 21, 1998, after the province accepted a $1-million bid from J.D. Irving Ltd. to purchase the site and convert it into a park.[29] The complex was demolished the next year.[30]

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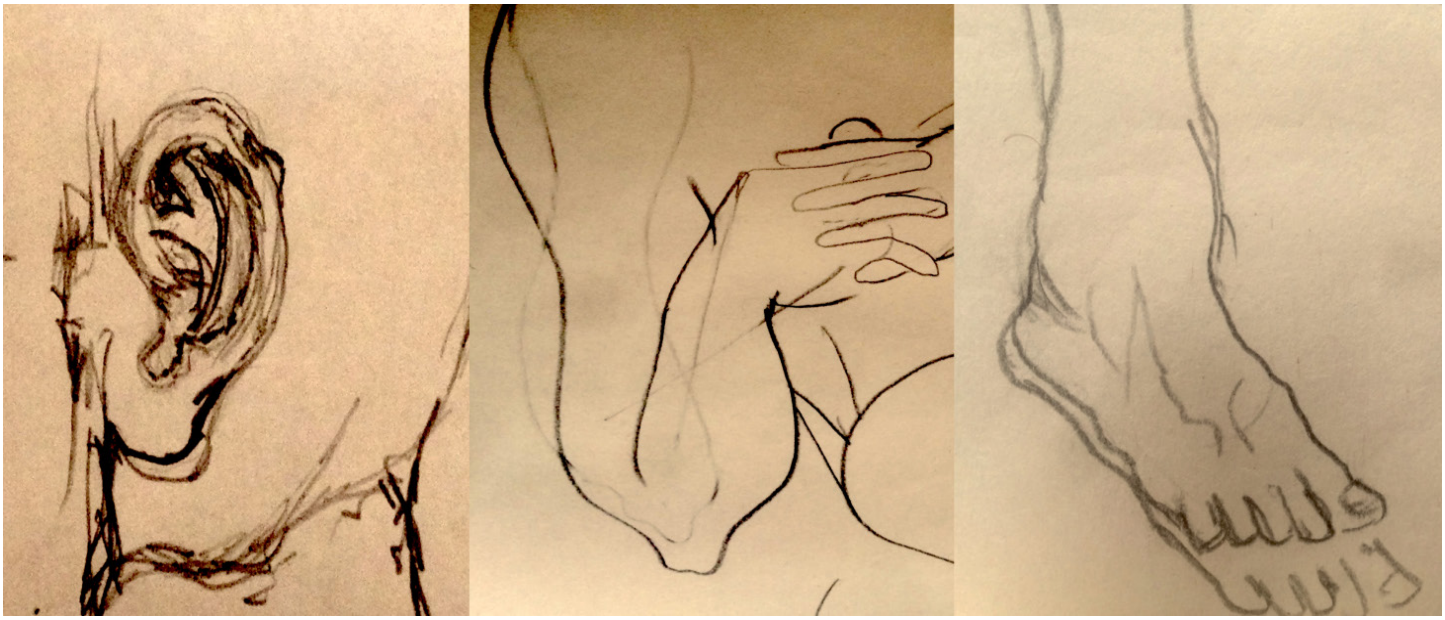

Contour Study of the Auricle, Forearm, and Sprained Ankle. Medium: charcoal on paper.
Jonathan Oore, Dalhousie Medicine - Class of 2019

SPOTLIGHT ON RESEARCH IN MEDICINE

Recognized abstracts from Dalhousie Medicine 2018 RIM Research Day

Evaluating the use of the Dalhousie Computerized Assessment Battery for detecting Post-Operative Cognitive Dysfunction in the perioperative setting

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Department of Anesthesia & Perioperative Medicine and Psychology & Neuroscience

Post-Operative Cognitive Dysfunction (POCD) is difficult to predict and diagnose, and can have potentially severe consequences in the long-term, particularly to the elderly. The purpose of our study was to examine the feasibility of using a new computerized test battery, the Dalhousie Computerized Assessment Battery (DalCAB) perioperatively to detect cognitive changes after surgery.

Methods: Fifty patients, ≥55 years, ASA scores of ≤ 3 undergoing major (>30 minutes) noncardiac surgery. The study used a repeated measures design. Patients completed the DalCAB and tests of general cognition, mood and pain (MoCA; HADS; VAS for pain severity) at baseline and at 3 months postoperatively. Univariate and Z-score analysis was used to evaluate differences.

Results: The pilot study had a screening rate (85.4%), participation rate (56.2%), testing time (87 minutes), attrition rate (12%) and complete datasets (93%). No cognitive deficits were present at baseline in the surgical group. One patient (2.3%) was classified as having POCD using the MoCA compared to 6 patients (13.6%) using the DalCAB. Visual working memory was most impaired. No statistical differences were present in anxiety, depression and pain scores in the POCD group.

Conclusions: This study found an incidence of POCD of 13.6% based on the DalCAB that aligns with previous quantitative battery reports suggesting increased sensitivity compared to the MoCA (2.3%). The incidence of POCD appears to be independent of pre- and post-operative anxiety, depression and pain levels. The future of the DalCAB's clinical utility is promising given the demonstrated feasibility of this computerized test.

Award winner: Platform Presentation Winner, RIM Research Day 2018

Exploring the role of pediatric medical camps in supporting adolescents with chronic illness in their readiness for adulthood

Emma Bartlett, Bhreaugh Castellani, Dr. Elizabeth Stringer, Dr. Robin Urquhart

Department: Pediatrics

Objectives: To explore adolescent perspectives around the impact of attendance at a pediatric medical camp on their readiness for adulthood.

Background: For adolescents living with a chronic illness, transitioning to adulthood involves psychosocial competencies that may be difficult to foster in a clinical environment. Socializing with peers with similar illnesses in a recreational environment may enhance development of these competencies and impact the adolescent's perception of their readiness for adulthood.

Methods: Adolescents age 14-17 from 4 pediatric medical camps were recruited for focus groups at their respective camps that utilized a semi-structured guide to gather information on their camp experience and perceptions on their readiness for adulthood. Sessions were recorded and transcribed verbatim. Analysis involved an open coding and inductive approach, with similar concepts iteratively collapsed into higher level themes.

Results: A total of 29 adolescents [19F; mean age 16.2(14-17)] participated. All participants felt there were aspects of the camp that enhanced their readiness for adulthood. The camp environment normalized their illness and allowed participants to bond with their peers and form a support system. Competencies learnt included confidence, independence, and skills to communicate about their illness. Though the education participants received prior to camp varied, many felt camp helped them become more comfortable transitioning to adulthood in terms of both medical and non-medical issues.

Conclusions: There are competencies adolescents can gain from participating in pediatric medical camps alongside peers with similar illnesses, which may address some of the psychosocial aspects of transitioning to adulthood.

Honourable mention for platform presentation

A novel t(6;22)(p21;q11.2) translocation in relapsed acute promyleocytic leukemia: a proposed marker of resistant disease

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Acute Promyelocytic Leukemia (APL) is a rare subtype of AML characterized by t(15;17). Treatment with all trans retinoic acid (ATRA) and arsenic trioxide (ATO) has been shown to be highly effective at inducing complete remission in the majority of patients. However, resistance and relapse still occurs in a subset of patients, and novel therapies that aim to cure resistant APL are limited. Here, we report a case of a 4-year-old boy that presented with relapsed APL while undergoing maintenance therapy and was found to have a chromosomal abnormality. Better risk-stratification for APL patients and markers of aggressive disease are needed moving forward.

Objectives: Characterize a unique translocation and establish a model of APL therapy response using zebrafish xenotransplantation.

We examined the patient sample using G-band karyotyping of bone marrow metaphases, FISH testing with whole chromosome paint and locus specific probes. To develop a model of APL for future drug screening, human cell line NB4 were xenografted into zebrafish embryos and treated with ATO and ATRA, and treatment response was assessed using flow cytometry.

FISH analysis confirmed a distinct t(6;22)(p21;q11.2) in our patient sample. To our knowledge, this is the first time a t(6;22) mutation in childhood APL has been reported. A zebrafish xenotransplantation model of APL was established and can be used to identify promising therapeutics.

The novel t(6;22) may represent a marker of resistant APL, and the zebrafish model of APL can be used to further characterize the role this translocation may play in resistance.

Honourable mention for platform presentation

The reduction of heterotopic ossification incidence following hip arthroscopy in patients treated with celecoxib

Todd Dow, John-Paul King, Swagata Ghosh, Ivan Wong

Department: Division of Orthopedics

Heterotopic ossification (HO) is a known complication following hip arthroscopy. Traditionally, surgical excision has been postponed until the formation is "matured". This can be an excessive delay for patients suffering from functional mobility issues. Therefore, a prophylactic treatment that reduces the formation of HO would be ideal.

Objectives: Our primary objective is to determine the rate of HO formation following hip arthroscopy in patients treated prophylactically with and without Celebrex. Our secondary objective is to assess the clinical outcome (iHOT score) and determine the relationship between patient's demographic

factors and outcome.
Methods: A retrospective chart review from prospectively collected data was performed. 516 patients who received hip arthroscopic surgery between 2012 and 2016 were identified. Among the patient population 280 patients received Celebrex and 236 patients did not. Post-operative radiographs were analyzed and quantified using the Brooker scoring system for assessing HO formation. iHOT scores at pre- and post-operative dates were compared and stratified by treatment and demographics.
Results: The treated group showed significantly less HO development post-operatively when compared to the non-treated group ($p < 0.001$). The change in iHOT score from pre-operative to most recent was significant when stratified by treatment ($p < .028$). Additionally, the formation of HO when the study population was stratified by sex was significant ($p < .0001$).
Conclusions: The findings of this study suggest that Celebrex significantly reduces the prevalence of HO formation following hip arthroscopic surgery. Furthermore, it appears to have a clinical correlation by significantly improving the patient outcome (iHOT score).

Honourable mention for platform presentation

Evaluation of a Freely Available Automatic Algorithm for the Calculation of Area-Based and Volumetric-Based Mammographic Breast Density

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Department: Department of Radiology

The BI-RADS lexicon for categorization of mammographic breast density has shown that women with dense breasts have an increased risk of developing breast cancer (BC). Recently, there has been an effort to develop automatic algorithms that reliably measure mammographic density.
Objectives: Compare estimates of cancer risk for women using area-based (AB) breast density measures versus volume-based (VB) breast density measures, and to evaluate validity of AB percent density (PD) measures from an automatic algorithm.
Methods: Case-controlled study, involving 1287 women aged 40-75, from the Nova Scotia Breast Cancer Screening Program. AB and VB PD were calculated using an automated algorithm, while AB PD was also estimated by three radiologists. Interclass correlation coefficients (ICCs) were used to assess algorithm internal reliability (IR) and validity. Inter-rater reliability (IRR) for BI-RADS categorization was evaluated using Cohen's Kappa. The relationship between PD and BC risk was assessed using multiple logistic regression, and reported as an adjusted odds ratio (AOR).
Results: Algorithm AB PD AOR for developing BC was 5.24 (BI-RADS 4 versus 1). Algorithm ICCs for IR and validity were 0.61 and 0.39, respectively. IRR Kappa was 0.02. The VB AOR for development of BC was 1.5 (BI-RADS 3 versus 1).
Conclusions: Women with extremely dense breasts based on algorithm AB PD, had an AOR of developing BC consistent with literature values. IR of algorithm AB PD was good, but validity and IRR between algorithm and radiologists BI-RADS categorization, were poor. Algorithm VB PD failed to identify any women with extremely dense breasts.

Honourable mention for platform presentation

Comparison of treatment outcomes between morphine and concomitant morphine and clonidine regimens for neonatal abstinence syndrome

Courtney Gullickson, Dr. Stefan Kuhle, Dr. Marsha Campbell-Yeo

Department: Faculty of Medicine, Department of Obstetrics and Gynecology, Department of Pediatrics, School of Nursing

Rationale: In 2010, the tertiary-care center involved in this study adjusted the treatment guidelines for neonatal abstinence syndrome (NAS) to include concomitant clonidine and morphine administration as first-line therapy. This study is the first evaluation of this practice change.
Objectives: To examine whether the addition of clonidine to the morphine regimen for treatment of NAS is associated with a shorter length of treatment compared to morphine alone. To determine the incidence of NAS in the study population from 2007-2015.
Methods: Using a retrospective cohort design, infants treated for NAS resulting from opioid exposure delivered between 2006-2015 (n=174), were identified using the Nova Scotia Atlee Perinatal Database (NSAPD). Maternal and infant characteristics were collected from the NSAPD. The database was augmented with chart review for treatment information.
Results: The incidence of NAS in the study population increased five-fold from 1.48/1000 live births in 2007 to 7.50/1000 live births in 2015. Of the 174 infants, 22 were treated with morphine and 100 were treated with morphine + clonidine. Longer length of treatment ($p=0.004$) and higher peak morphine dose ($p=0.045$) were observed in the combination group.
Conclusion: The increase in incidence of NAS is consistent with recent published reports. The increase in length of treatment and peak morphine dose seen in the morphine + clonidine group contrasts previous work on this treatment combination. Further study on the impact of clinical characteristics such as methadone and anti-depressant exposure on the association is warranted.

Honourable mention for platform presentation

Loss of cholinergic neurons in nucleus subputaminalis in neurodegenerative disorders presenting as Primary Progressive Aphasia

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Rationale: Primary Progressive Aphasia (PPA) is a syndrome characterized by isolated impairment in language function at disease onset. The cholinergic system has been implicated in language function, and cholinergic deficits have been seen in PPA. One major source of cholinergic neurons is the nucleus basalis of Meynert (nbM). A posterior subdivision of the nbM, the nucleus subputaminalis (NSP), is postulated to be specifically implicated with language.
Objectives: We aimed to confirm the involvement of the NSP in PPA, and to explore whether individuals who present with progressive aphasia and develop different clinical and neuropathological profiles, show a similar involvement of the NSP. This was done by comparing the abundance of choline acetyltransferase (ChAT), a marker of cholinergic neurons, in the nbM and NSP in normal and PPA cases.
Methods: Cytoarchitecture of the basal forebrain was studied using Nissl staining of cells in normal (n=5) and PPA (n=5) brains. ChAT immunohistochemical staining was used to label cholinergic neurons, which were quantified using Neurolucida software.
Results: PPA cases showed significant loss of cholinergic neurons in the NSP, compared to normal. Though there was a trend towards loss of cholinergic neurons overall in the nbM, this was not significant compared to normal.
Conclusion: Regardless of the underlying pathology, all cases with clinical language deficits characteristic of PPA showed marked loss of cholinergic neurons in the NSP. This provides evidence for the involvement of the NSP in language dysfunction and can have significant clinical implications in the medical management of patients with PPA.

Honourable mention for platform presentation

Factors affecting pain management and imaging practices of patients presenting to the Emergency Department with non-specific low back pain

Siwar Arda, Jill A. Hayden, Maria Wilson, Rachel Ogilvie, Samantha Jang-Stewart, Samuel Stewart, Kirk Magee

Department: Community Health and Epidemiology

Rationale: Low back pain (LBP) is a common and disabling problem and patients often present to the emergency department (ED) for management. There appears to be a wide variation in management of patients with LBP among emergency physicians and compared with practice guidelines. The relationship between patient characteristics, physician characteristics, and LBP management decisions in the ED has not been well studied.
Objectives: Describe the agreement between patient and provider ratings of LBP severity, and to explore the relationship between patient and physician pain ratings on LBP management practices in the ED, including analgesic use and diagnostic testing.
Methods: We conducted a prospective, single-centre observational study between June and November 2016. The study sample included 125 adult patients who presented to the QEII ED with non-specific LBP, and 43 physicians. Data was collected from patient and treating physician questionnaires, from the Emergency Department Information System database and from patient charts. Logistic regression models will be used to describe the association between patient and physician pain ratings and management practices.
Preliminary Results: Patient participants had a median age of 41 years and 69% were male. Mean self-reported low back pain severity (NRS, range 0-10) was 7.7 (SD 1.9). Mean physician assessment of patient pain was 5.7 (SD 2.1). Logistic regression models will be used to describe the association of analgesic use and imaging with patient and physician characteristics.
Conclusion and Relevance: Findings may guide development of an educational intervention to improve management of patients with low back pain in the ED.

Award winner: Poster Presentation

Constraint Programming and Column Generation for Automated Treatment Planning in Brachytherapy

Mark Mansera, Ron Slobodabc, John Doucetted, M. Ege Babadagliae

[1]Department of Industrial Engineering, Dalhousie University, [2]Department of Oncology, University of Alberta, [3]Cross Cancer Institute, Edmonton, Alberta, Canada, [4]Department of Mechanical Engineering, University of Alberta, [5]Faculty of Medicine, Dalhousie University

Rationale: Brachytherapy is a minimally invasive form of radiation therapy for prostate cancer that involves the permanent implantation of radioactive sources inside of the prostate gland. Treatment planning in brachytherapy consists of a decision making process for the placement of radioactive sources in order to deliver an effective dose of radiation to cancerous tissue while sparing the surrounding healthy tissues, such as the urethra and rectum. Although this decision making process may be automated, current automated planning methods, such as mixed-integer linear programming (MILP), prove to be undesirably slow when using high-resolution anatomical data sets to produce treatment plans.
Objectives: Develop a novel optimization modelling approach that integrates column generation and constraint programming to improve the solution time performance of a large-scale mathematical optimization model capable of producing clinically acceptable automated treatment plans for prostate brachytherapy. Column generation is an efficient algorithm used for locating pertinent solutions in highly combinatorial problems, while constraint programming is a suitable paradigm for seeking feasible clinical solutions.
Methods: We partitioned an established MILP model into a novel master problem and subproblem duo for the column generation process. While the master problem was similar in design to the original MILP model, the new subproblem sought out appropriate patterns of radioactive source loading in needles.
Results: We demonstrated the ability to produce automated treatment plans, using high-resolution data sets, with solution times suitable for pre-operative planning using column generation.
Conclusions: Column generation is an appropriate optimization modelling approach for producing automated treatment plans, using high-resolution anatomical data sets, with solution times suitable for pre-operative planning in interstitial low-dose rate prostate brachytherapy. The study will further incorporate constraint programming into the current model and investigate its treatment planning solution time performance for intra-operative planning.

Award winner: Poster Presentation

Patient-Controlled Analgesia versus Continuous Opioid Infusion for the Treatment of Mucositis Pain Following Hematopoietic Stem Cell Transplantation: A Retrospective Review

Matthew Foss, Mary Lynch

Department: Department of Anesthesia, Pain Management & Perioperative Medicine

Rationale: Myeloablative chemotherapy prior to hematopoietic stem cell transplantation (HSCT) often results in the development of painful oral mucositis. Treatment involves high levels of opioid consumption resulting in significant side effects. Prior studies have shown that, compared to continuous opioid infusion (COI), PCA results in less opioid consumption and shorter duration of therapy but no absolute reductions in pain scores.
Objectives: The goal of this study was to determine the success of PCA implementation in this patient population along these same measures.
Methods: This was a retrospective chart review of HSCT patients one year before and after the transition from COI to PCA at the QEII Health Sciences Centre in Halifax, Nova Scotia. Opioid doses were standardized between patients by converting to oral morphine equivalents (OME). Pain scores were calculated using a weighted average over therapy duration. Groups were compared using independent-samples t-tests.
Results: Twenty-three patients received COI with three requiring naloxone. Twenty-two patients received PCA. The PCA group had significantly less opioid use (M=506.0, SD=239.9) than the COI group (M=1181.5, SD=659.9), $t(36)=3.64$, $p<0.001$, $d=1.13$. Additionally, the PCA group required fewer days of intravenous opioid therapy (M=5.28, SD=3.29) than the COI group (M=7.67, SD=2.97), $t(40)$, $p=0.018$, $d=0.76$. There was no difference in average pain scores between groups.
Conclusions: This study demonstrates a successful transition from COI to PCA with reduced opioid consumption, decreased therapy duration, and fewer cases requiring naloxone. Consistent with the literature, there was no reduction seen in pain scores. Further work is needed to effectively reduce the pain experienced by patients undergoing HSCT.

Award winner: Poster Presentation

Impact of preoperative anemia on transfusion rates in primary and revision hip arthroplasty: a retrospective analysis

Oliver Poole, André Bernard, Paul Brousseau

Department: Department of Anesthesia, Pain Management & Perioperative Medicine

Rationale: Lower extremity joint arthroplasty can be lead to significant blood loss, and the need for blood transfusion. The use of blood products is associated with a variety of adverse outcomes including infection, circulatory overload, and transfusion reaction.
Objectives: The objective of this quality improvement study is to identify the prevalence of preoperative anemia at our institution, and elucidate its impact on perioperative transfusion in elective patients undergoing primary or revision hip arthroplasty.
Methods: Data for this study was collected from four databases at our institution. Elective patients undergoing primary or revision hip arthroplasty were selected. Transfusion was defined as the receipt of a red blood cell transfusion on the surgical day through to postoperative day five. The primary outcome was the effect of preoperative anemia on transfusion rates.
Results: The overall transfusion rate was 7.6%. Transfusion rates for primary

and revision arthroplasty were 5.8% and 18.7% respectively. Patients with a preoperative hemoglobin between 100 and 120 g/L were 4.5 times more likely to be transfused than those with a hemoglobin between 121 and 140 g/L, and 15.4 times more likely than those greater than 140 g/L. Preoperative anemia was common, with 11.5% of all patients having a preoperative hemoglobin of 120 g/L or less.
Conclusion: Preoperative anemia was common and was significantly associated with higher transfusion rates. These findings reinforce the need to optimize hip arthroplasty patients prior to surgery, where possible. As a quality control study, these findings may help direct policy regarding the deferral of elective hip arthroplasty patients who are anemic preoperatively.

Award winner: Poster Presentation

Evaluation of a Low-Threshold/High-Tolerance Methadone Maintenance Treatment Clinic in Saint John, New Brunswick, Canada: Seven Year Retention Rates

Sofija Rans[1], Timothy K.S. Christie[2], Kimberley Hennessey[3]

Department: [1]Dalhousie Medicine New Brunswick, Saint John, NB [2]Ethics Services, Horizon Health Network, Saint John, NB [3]Uptown Clinic, St. Joseph's Hospital, Saint John, NB

Rationale: Patients at Low-Threshold/High-Tolerance (LTHT) methadone maintenance treatment (MMT) clinics are not denied access to methadone due to lack of ancillary services, nor discharged involuntarily for continued illicit drug use. Studies suggest this has a positive impact on retention. Retention is a crucial outcome, as the potential benefits of treatment cannot be appreciated if programs cannot retain patients.
Objective: To report the retention rate in years one through seven of a LTHT MMT clinic in Saint John, NB
Methods: Data was collected on each patient who began MMT at the clinic between August 4, 2009 and August 4, 2010. Retention rates were determined by comparing the total number of patients enrolled in the clinic by August 4th, 2010 to the number of these patients still in the program after each of years one through seven. If a patient was no longer receiving methadone from the clinic, the reason for separation was determined.
Results: The one-year retention rate was 91%; two-year, 84%; three-year, 74%; four-year, 67%; five-year, 54%, six-year, 45%; and the seven-year retention rate was 39%. Of the 113 patients separated from the clinic after seven-years, 33 successfully weaned off methadone, 39 transferred to a different clinic to receive MMT, 9 were incarcerated, 2 died, and 25 voluntarily withdrew. Reason for separation unknown for 5.
Conclusion: Canada's Best Practice Guidelines for MMT advocate for the use of low-threshold programs, and non-punitive approaches to illicit drug use to both increase access to, and retention in MMT. We have identified the retention rates in years one through seven at an LTHT MMT clinic in Saint John, NB.

Award winner: Poster Presentation

Rapid clinical assessment of the sublingual microcirculation - visual scoring using microVAS in comparison to standard semi-automated analysis

Joel Sardinha and Christian Lehmann

Department: Department of Anesthesia, Pain Management and Perioperative Medicine, Dalhousie University, Halifax, Nova Scotia, Canada

Rationale: Alterations in human microcirculation occur in many disease states leading to morbidity and mortality, however assessing the microcirculation is not standard clinical practice. Standard microcirculation analysis using semi-automated analysis is expensive, time consuming, and expertise dependent making it unfeasible. We proposed a novel visual scoring system (microVAS) for the analysis of microcirculation videos that can be performed at the patient bedside in real time.
Objective: Validate our microVAS score by training health professionals unfamiliar with the microcirculation field to use our microVAS score and compare their scores to the standard method of semi-automated analysis using AVA3 software.
Methods: Using a prospective double-blind study design, we recruited and trained 20 participants to use our microVAS score. Participants scored 40 videos (from 22 healthy and 18 septic patients) for MFI and PPV. The same 40 videos were analyzed by an expert using the gold standard semi-automated method of analysis. The results of the participants and the expert were analyzed by Pearson's linear regression. Krippendorff's alpha was used to assess inter-rater reliability of the participants.
Results: Overall correlation of MFI was $r = 0.3283$ (95% CI 0.27 – 0.39), $p < 0.05$; overall correlation of PPV was $r = -0.1123$ (95% CI -0.18 to -0.04), $p < 0.05$. The Krippendorff's alpha for MFI was 0.56 (healthy videos: $\alpha = 0.34$, sepsis videos: $\alpha = 0.31$). For PPV Krippendorff's alpha was 0.43 (healthy videos: $\alpha = 0.56$, sepsis videos: $\alpha = 0.17$).
Conclusions: Overall for both MFI and PPV, there was a small correlation between our microVAS score and AVA 3 scores. Regarding inter-rater reliability both MFI and PPV showed fair agreement between raters. Going forward multiple improvements to the microVAS scoring system as well as the training program are suggested to improve reliability and consistency.

Award winner: Poster Presentation

Development a novel FI-Heart using cardiovascular risk factors to predict increased risk of mortality

Michael Sun, Dr. Susan Howlett, Dr. Kenneth Rockwood

Department: Department of Medicine; Department of Pharmacology, Dalhousie University

Rationale: The concept of frailty was developed to explain the heterogeneity in clinical outcomes for older adults. As cardiovascular disease (CVD) is the leading cause of death and hospitalizations in older adults, there is a growing interest in the link between frailty and CVD. A frailty index (FI-Heart) based on cardiovascular risk factors may offer valuable prognostic insights in decision-making and care.
Objective: Our objectives are to develop a FI-Heart; compare the FI-Heart to a standardized FI; and to investigate whether FI-Heart can predict mortality.
Methods: A FI-Heart was developed by secondary analysis of 2003-2004 and 2011-2012 cohorts from NHANES database. A 26-item FI-Heart was constructed in accordance to guidelines in creating frailty indices. The FI-Heart was compared to a standardized FI previously developed using the NHANES database.
Results: The FI-Heart showed non-linear increase with age (2003-2004: $R2=0.8718$, $p<0.0001$; 2011-2012: $R2=0.9244$, $p<0.0001$). There were no significant differences in age-matched FI scores between the FI-Heart and Standardized FI (2003-2004: $T=175$, $p=0.206$; 2011-2012: $T=209$, $p=0.091$). There was no significant difference in FI-Heart scores between the 2003-2004 and 2011-2012 cohorts ($T=155$, $p=0.198$). Higher FI-Heart scores were associated with higher risk of mortality.
Conclusion: The FI-Heart showed non-linear increase with age, typical characteristic of frailty indices. The was no significant difference in FI-Heart and standard FI scores in age-matched individuals. Additionally, the FI-Heart demonstrated an association with increased mortality risk. The FI-Heart can be a feasible tool for use in risk assessment of cardiovascular disease and may have significant value in decision-making and prognosis.

Award winner: Poster Presentation

Adolescent Traumatic Brain Injuries: Time of Occurrence and Links with Current Academic Performance and Physical Injuries

Michelle Trenholm, BSc, Gabriela Ilie, PhD, Robert Mann, PhD, Angela Boak, Ed Adlaf, PhD, Rob Rutledge, MD, FRCPC

Department: Community Health and Epidemiology

Rationale: Traumatic brain injuries (TBIs) during adolescence are associated with adverse outcomes, but if the age at which TBIs occur influences the degree of detriment is unknown.
Objectives: We evaluated the relationship between the age of adolescents at the time of their first and most recent TBI, and current academic performance and other physical injuries.

Methods: Data for this cross-sectional population-based study were derived from the 2015 Ontario Student Drug Use and Health Survey (OSDUHS) administered to adolescents in grades 7 to 12.
Results: One in 5 students reported a history of TBI. TBIs were more prevalent in males, compared to females, and males were 2-times as likely to had their first and most recent TBI in grades 5 to 8. Sports-related TBIs accounted for 41.1% of all TBIs. A history of TBI was associated with lower academic performance and more physical injuries. The first and most recent TBIs occurring in all grades assessed were associated with poorer academic performance, especially in older grades. Students with a history of TBI(s) that frequently sought treatment for other physical injuries, were more likely to have acquired TBIs in older grades.
Conclusions: The prevalence of TBIs among the adolescents reported here is higher than reported from emergency room data, but consistent with regional survey data. Results suggest that the adverse TBI outcomes observed are affected by the age at which TBIs occur. Greater effort to track the prevalence and correlates of TBIs in large-scale epidemiological data is needed.

Award winner: Poster Presentation

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