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eHealth

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Volume 4 Issue 2

CLINICAL PRACTICE

COMMENTARY

INTERVIEWS

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ABOUT US

UOJM is an international peer-reviewed journal led and published by the students of the Faculty of Medicine. We welcome submissions in a variety of areas in biomedical research and feature original research, review articles, news and commentaries, case reports and opinion pieces. Our articles are written in both English and French, and represent the only bilingual medical journal in Canada.

Le JMUO est un journal revu, édité et publié par les étudiants de la Faculté de Médecine. Nous encourageons les soumissions d'une variété de différents domaines en recherche biomédicale et publions des articles de recherche originale, des articles de revue, des nouvelles et commentaires, des rapports de cas et des pièces d'opinion. Nos articles sont écrits en Français et en Anglais et représentent le seul journal médical bilingue au Canada.

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UOJM: Preface

UOJM Volume 4 Issue 2 marks a significant milestone for UOJM. For the first time, UOJM has sustained activity over the summer due to increased interest and submissions, which has resulted in the release of multiple issues in a year. Our second issue reflects an increase in awareness and support for UOJM both internally at the University of Ottawa and externally. We have made several infrastructure upgrades to accommodate the high volume of submissions, including the implementation of the Open Journal Systems platform hosted through the University of Ottawa Library as a peer review management platform, content manager, and digital archive. We have also expanded our effort to use social media platforms such as Facebook, Twitter, LinkedIn and Google+ to provide day-to-day communication to our followers around the world.

UOJM owes its success to the efforts of the University of Ottawa medical and graduate students who have volunteered their time to contribute as editors, reviewers, and publishers, as well as helping with fundraising and promotion. We would also like to thank our faculty advisors, Dr. Phil Wells, Dr. Melissa Forgie and Dr. David Moher for providing us with guidance in developing the journal and editor training. Furthermore, we continue to thank our sponsors at the University of Ottawa's Faculty of Medicine, VP Research and Department of Cellular and Molecular medicine, The Ottawa Hospital (TOH), The Children's Eastern Ontario Hospital (CHEO), and the Royal Mental Health Centre (ROMHC) for their financial contributions. As we approach our fifth year, UOJM has established itself as an open-access, open-to-all medical journal that reflects on current topics in health and research. These topics are relevant not only to students, but speak to all individuals at all levels of health care and biomedical research. Moving forward, we aim to improve the impact UOJM has on our medical community by providing more practical training workshops and resources targeted towards improving peer review quality and research writing.

This issue is centered on the topic of eHealth, which is the implementation of information technology to support health care practice and communication. In today's digital landscape, information is widely available through electronic means facilitated by the Internet, mobile computing, and the evolution of social media. This digital evolution is taking place in medicine and there is no better time than now to discuss effective implementation of digital tools such as mobile applications, medical networks or hubs, and electronic health records. In this issue of UOJM, we feature articles which address eHealth topics such as patient portals, mobile health applications, as well as the debate on e-cigarettes. In total, we have 13 fantastic articles, including two clinical case reports, several reviews and commentaries, and a humanities article.
We hope that you enjoy reading UOJM Volume 4 Issue 2!

Sincerely,

Colin Suen
Ariana Noel
Loretta Cheung
Nischal Ranganath

Editors-in-Chief

JMUO: Préface

JMUO, volume 4, numéro 2, marque une étape importante pour la publication. Pour la première fois, le JMUO a poursuivi ses activités au cours de l'été en raison de l'intérêt accru et des mémoires présentés, ce qui a abouti à la publication de plusieurs numéros en un an. Notre deuxième numéro reflète une plus grande reconnaissance et un plus grand soutien envers le JMUO, tant à l'Université d'Ottawa qu'à l'extérieur. Nous avons fait plusieurs améliorations de l'infrastructure pour accueillir le volume plus élevé de soumissions, y compris la mise en œuvre de la plate-forme Open Journal System hébergée par la bibliothèque de l'Université d'Ottawa comme plate-forme pour la gestion de l'examen par les pairs, la gestion de contenu et l'archivage numérique. Nous avons également élargi nos efforts pour utiliser les plates-formes de médias sociaux tels que Facebook, Twitter, LinkedIn et Google+ pour assurer la communication au jour le jour avec nos adeptes à travers le monde.

Le JMUO doit son succès aux efforts des étudiants en médecine et aux étudiants diplômés de l'Université d'Ottawa qui ont donné de leur temps pour contribuer à titre de rédacteurs, de réviseurs et d'éditeurs, ainsi que pour aider à la collecte de fonds et à la promotion. En outre, nous continuons de remercier nos commanditaires à la Faculté de médecine de l'Université d'Ottawa, à L'Hôpital d'Ottawa (L'HO), au Centre hospitalier pour enfants de l'Est ontarien (CHEO) et aux Services de santé Royal Ottawa pour leurs contributions financières. Alors que nous nous approchons de notre cinquième année d'existence, le JMUO s'est imposé comme publication en libre accès, une revue médicale ouverte à tous qui réfléchit sur des sujets d'actualité en matière de santé et de recherche. Ces sujets sont pertinents non seulement pour les étudiants, mais s'adressent aussi à des personnes de tous les niveaux du système de santé et de la recherche biomédicale. De plus, pour l'avenir, nous visons à améliorer l'impact du JMUO a sur notre communauté médicale en offrant des ateliers et des ressources plus pratiques en vue d'améliorer la qualité examen par les pairs et la rédaction scientifique.

Le présent numéro est axé sur le thème de la santé en ligne, c'est-à-dire l'utilisation des technologies de l'information pour soutenir la pratique et de la communication dans le milieu de la santé. Dans le paysage numérique actuel, l'information est largement disponible par voie électronique grâce à Internet, à l'informatique mobile et à l'évolution des médias sociaux. Cette évolution numérique touche aussi la médecine et il n'y a pas de meilleur moment pour discuter de la mise en œuvre efficace des outils numériques tels que les applications mobiles, les réseaux ou les carrefours médicaux, de même que les dossiers de santé électroniques. Dans le présent numéro du JMUO, nous vous proposons des articles qui traitent de sujets tels que les portails pour les patients, les applications mobiles en santé et le débat sur les cigarettes électroniques. Au total, nous avons 13 superbes articles, y compris deux rapports de cas cliniques, plusieurs critiques et de commentaires, de même qu'un article sur les humanités. Nous espérons que vous apprécierez le volume 4, numéro 2 du JMUO!

Cordialement,

Colin Suen
Ariana Noel
Loretta Cheung
Nischal Ranganath

Rédacteurs en chef

Development of a Mobile Application, ImmunizeCA, for the Management of Patient Immunization Records: A Discussion With Dr. Kumanan Wilson and Katherine Atkinson

Ariana Noel, MSc[1], Nischal Ranganath, BHSc[1,2]

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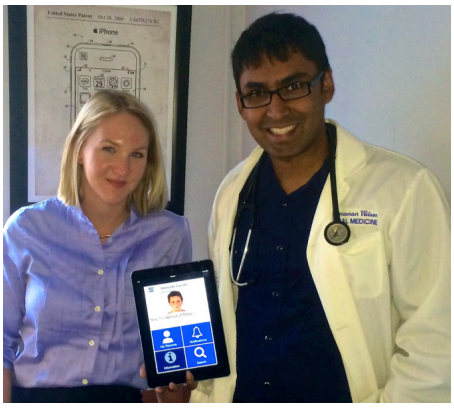

ABSTRACT

Vaccinations have "saved more lives than any other health measure" over the past 50 years [1]. Currently, patient immunization records are managed using the yellow immunization card; however, a team of researchers at the Ottawa Hospital Research Institute (OHRI) has recently created a mobile application for all operating systems, inclusive of all provinces and territories, that conveniently stores patient data for every vaccination schedule [2]. The UOJM 2014 – 2015 Editor-in-Chief Team met with Dr. Kumanan Wilson (General Internist, The Ottawa Hospital) and Katherine Atkinson (Research Coordinator, OHRI) to discuss the development of the ImmunizeCA app [3], the first national immunization app to be endorsed by the Minister of Health, Rona Ambrose [4].

RÉSUMÉ

Au cours des 50 dernières années, la vaccination a « sauvé plus de vies que toute autre mesure de santé » [1]. Actuellement, les dossiers d'immunisation sont gérés à l'aide de la fiche jaune d'immunisation. Or, une équipe de chercheurs de l'Institut de recherche de l'Hôpital d'Ottawa (IRHO) a récemment créé une application utilisable sur tous les types de téléphone mobile et couvrant toutes les provinces et territoires. Cette application permet de sauvegarder facilement les données du patient pour tous les calendriers de vaccination [2]. L'équipe de rédaction en chef du JMUO pour 2014-2015 a rencontré Dr Kumanan Wilson, interniste général à l'Hôpital d'Ottawa, et madame Katherine Atkinson, coordonnatrice de la recherche à l'IRHO, pour discuter du développement de l'application ImmunizeCA [3], la première application nationale sur la vaccination qui a été approuvée par madame Rona Ambrose, ministre de la Santé [4].

What is ImmunizeCA and what was the rationale in developing the app?

Dr. Wilson:
This all started back in 2012. I was at the park and one of the moms expressed frustration with the yellow card for her kids, which she could never find [when] they needed to go to school. She asked me why we [could] do banking on our phones, but she couldn't have her yellow card on her phone. I thought that was a great idea. That summer a [family friend's] son, who was a first year engineering student, needed a summer job. So I said, "hey, here's an idea" and he said, "sure". I didn't hear [back] from him for three months and then he sent me an email that he had it done. I took a look at it [and] I said, "wow this is pretty cool". He did a really cool job with it, with a nice user-interface, and then we realized you could do way more than this. You could use [this app] as a way to communicate with patients [and] parents. We could notify people of outbreaks of vaccine preventable diseases and remind people of appointments, so we iteratively developed it from there. Then, [in] November 2012 we released [ImmunizeON for iOS] and there was a lot of interest by [both] the media and public health.

Keywords: ImmunizeCA, e-health, immunization

Can you tell us about the process of having ImmunizeCA accepted and endorsed by decision makers?

Dr. Wilson:
[Following the interest from users, media and public health regarding ImmunizeON], we approached the Public Health Agency of Canada (PHAC) in partnership with the Canadian Public Health Association (CPHA) [to see] if they would be interested in funding [the development of] a national version. They agreed as long as we made it for every province, [each one having] its own schedule; we also had to build it for three platforms and [make it] bilingual. That was a big challenge because ImmunizeON was only designed for parents of children born after August 2011 and it only

had the pediatric immunization schedule for Ontario in it. Now [in ImmunizeCA], we have both pediatric and adult schedules as well as some travel guidelines for all 13 provinces and territories. We launched [the app] in March [for iOS, Android and compatible Blackberry devices] and we have [had] a lot of support. The federal minister of health [has] endorsed it. I think it's the first government endorsed, national immunization app (to the best of our knowledge). We've had a good response with 55,000 downloads since its launch [and] no major issues with [the ImmunizeCA app]. It was a relatively easy sell because everybody knows the current system isn't great.

How did you design the interface of ImmunizeCA to be user-friendly? Who were the partners involved in the development of the app interface (i.e. patients, physicians, nurses etc.)?

Design of the ImmunizeCA Interface:

Katherine:
As Dr. Wilson said, it was a mom's idea and one of the big things [that contributed to the user-friendly interface] was taking into consideration user feedback. We get so many emails from moms saying, "this is great, but I'd love it if you could add this, or tweak this", or we get a medical student asking "could we add in a field for TB tests?"

Dr. Wilson:
It was different in the old days when you'd have software that was less than optimal. You'd have a problem fixing it. You can't ever release the perfect product because you don't really know what the perfect product is; but the beauty of this is that you can release a product and get feedback. That's the key - listening and then iterating based on that. In particular, with the new [operating systems] (OS), they'll push the updates through and the user doesn't even see it.

We're also trying to create [a sense of] warmth to the app. One of the features of the app is rolling banners on the front page to get messages out that can be changed real-time. We [currently] have a story in there about a mom whose child had a heart transplant and can't be vaccinated. She's thanking parents for vaccinating their child and protecting her child. That's the type of messaging we can do there.

Disaggregation of medical information:

Katherine:
For healthcare professionals, it's relatively easy to manage the abundance of information. However, when working with the general public, such as new moms and parents, just imagine how incredibly difficult it would be to have your entire medical record on one app. With the ImmunizeCA app, we have received significant positive feedback that the app is focused specifically on immunization. It is easy [for people] to know when to access the app and what information they'll find.

What do you have planned for future developments and additions to the ImmunizeCA app?

Dr. Wilson:
The ImmunizeCA app is not an official record, but providing information on [the app] is not a whole lot different [than] going on a website and filling in your [immunization] information. We are working through what it would take to make it an official record and we actually think that we can make this a central component to an immunization information system. The data filled in [the app] could be authenticated (through mechanisms such as a signature function) and that can be sent to a centralized system. It is not there [yet], but we would love if [the app] can move on to that next step.

[Several potential future developments to the app include:]

1. HealthMap
We are currently using data from the Council on Foreign Relations (CFR) for the outbreak alert feature in the app. The next update will feature HealthMap data instead of CFR. HealthMap is a digital surveillance system developed at Harvard University by John Brownstein's group [5]. It updates every hour, thereby providing users with more timely and accurate information. You will also be able to filter the alerts by infectious disease. With this update we'll also be changing where you can find the outbreak feature. This was based on analytics that shows us what information is being viewed most often and tells us how users flow through the app. It's a good way to help inform changes to make the product more user friendly.

2. Barcode scanning
We are exploring the capacity for smartphones to scan 2d barcodes [on vaccines] and upload the embedded information into an app. This [feature] could be helpful if Health Canada notices that a lot you received has a problem, [thereby allowing] a notification [to] be sent to your device to inform you to revaccinate or visit a physician. Barcode scanning may also assist in adverse event reporting.

How can the ImmunizeCA app and data pulled from app usage be used to study population health?

Katherine:
The app addresses several reasons why people tend not to vaccinate including: logistical challenges, misinformation (believing that vaccines are not necessary and that outbreaks are rare), and concerns about safety. Logistical [coordination is challenging because] the schedules are complicated, and presenting them to users chronologically might be easier [to understand]. [The app]

can also sync with your OS calendar, so you can create an event to let you know about upcoming appointments. The app also answers many frequently asked questions about vaccines (i.e. is it safe to vaccinate while pregnant? Do vaccines cause autism?).

Based on this, we hypothesized that the app may be able to impact people's beliefs and attitudes toward immunization. To test this, we recruited a group of pregnant women, administered a pre-survey examining their vaccination attitudes, information sources as well as mobile usage. Then they have their child and use the app for 6 months. Now, we're doing a follow-up survey to see if using the app has any impact. We're not sure what the results are going to look like, but it should be interesting.
We're also currently doing a study evaluating the app launch and the effect of different promotional strategies on uptake and usage. This will provide insight on what dissemination strategies are most effective in driving awareness and uptake of new apps.

What are some challenges associated with implementing the immunizeCA app?

Dr. Wilson:
You build an app, that's one thing, but then you have to get people aware of it. The other is, even if you're aware of it, are you going to download it? That's why we study the pregnant moms – to get a mobile readiness index. Who is more likely to download an app (early adopters)? That's part of it as well – the psychology of who will actually use this stuff, so it's been interesting.

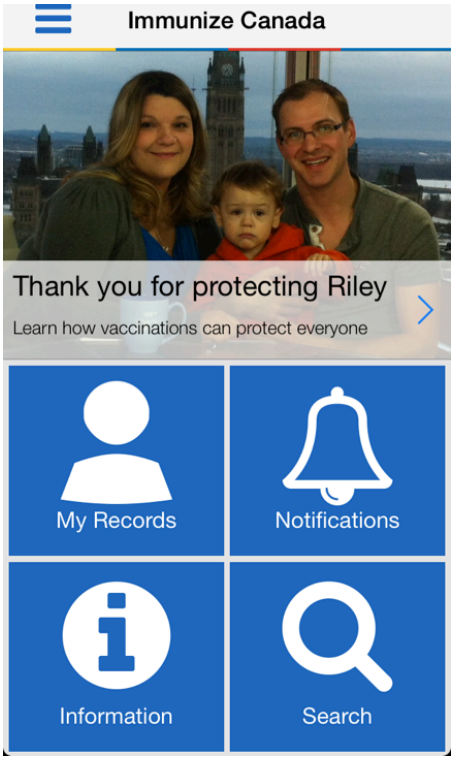

Figure 1. Screenshot of the Immunize Canada mobile application interface

What next steps would you like to see regarding patient access to health information and decision support?

Dr. Wilson:
One of the reasons the app is important is that the vaccines are no longer administered at one source. There are now multiple providers such as flu clinics, pharmacies, schools, etc. There is no single source [of immunization] at the health provider level. The app allows you, as a patient, to be empowered to manage your own health information. The app makes this feasible at the push of a button and the patient can share that information with the healthcare provider. Feedback that has been received is that there is often a discrepancy between patient's knowledge of the vaccines they have received and what is presented in the yellow card. If the health information can flow between patient and healthcare providers, be validated, and reside in a registry or source of record – it would be an ideal way for the app to evolve.

Do you have any other recommendations of patient-centered apps for decision support or disease management?

Dr. Wilson:
An interesting idea would be a blood donor app [that can] empower individuals to get the right information by [entering their] blood type and receiving notification on when you can donate. [The app can also help target individuals on] a personal level, by including stories on those individuals who have benefited from the transfusion within the community. The focus is on public health and not healthcare. The focus is on a community level, rather than a personal health level. As a result, it creates a sense of community by empowering individuals and allowing for feedback within the system.

What direction would you like to see Canada take with regards to patient portals and EMRs?

Dr. Wilson:
[The] big picture is to empower individuals to manage their own health information. [For example], when a patient comes to the ER from another hospital, information such as their medication [and] their medical history is significantly lacking and can result in delay of care. If you can control your own health information in a simple manner, it would enhance the quality of care tremendously.

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"There's an App for That": An Interview with Dr. Jennifer Stinson, an M-Health Expert

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ABSTRACT

Increased adoption of smartphone technology by the general public has opened up an exciting new means by which healthcare professionals can interact with their patients [1]. The smartphone's unique ability to combine mobile communication and computation offers a novel modality by which physicians can deliver healthcare interventions to their patients. Thus, it is no wonder that the use of smartphones in healthcare settings (so called "m-health") has become the focus of widespread interest amongst healthcare professionals, with many smartphone-based medical applications already in widespread use amongst physicians and patients [2].

Leading the charge in this m-health revolution is Dr. Jennifer Stinson, a nurse clinician scientist based at The Hospital for Sick Children in Toronto, who aims to capitalize on the popularity of smartphones among adolescents [3]. Dr. Stinson is a pioneer in the field of m-health, creating one of the first electronic pain diaries using the Palm Tungsten PDA to help adolescents with juvenile idiopathic arthritis (JIA) related pain [4]. More recently, she has created the "Pain Squad" smartphone-based app, a multiple award-winning pain measurement tool for children and adolescents with cancer [5].

I was able to speak with Dr. Stinson about her experience with m-health, her views about the future of m-health, and her advice for interested healthcare professionals and trainees who want to integrate mobile technology into their own patient care. The following is an edited version of that conversation.

RÉSUMÉ

L'utilisation accrue de la technologie des téléphones intelligents par les membres du public a ouvert une toute nouvelle façon pour les professionnels de la santé d'interagir avec leurs patients [1]. La capacité unique du téléphone intelligent de combiner la communication sans fil et l'informatique offre aux médecins un nouveau modèle pour fournir de services de santé à leurs patients. Il n'est donc pas surprenant que l'utilisation des téléphones intelligents dans le milieu de la santé (connu sous le nom de santé mobile ou m-santé) soit devenue le point central d'un intérêt toujours grandissant chez les professionnels de la santé. De nombreuses nouvelles applications médicales pour téléphones intelligents sont de plus en plus utilisées par les patients et les médecins [2].

Mme Jennifer Stinson, une infirmière clinicienne-chercheuse au Hospital for Sick Children de Toronto, mène la marche dans la révolution de la santé mobile. Elle cherche à tirer profit de l'engouement des adolescents et adolescentes pour les téléphones intelligents [3]. Madame Stinson fait figure de pionnière dans le domaine de la santé mobile, ayant créé le premier journal électronique de la douleur en utilisant l'assistant numérique personnel (ANP) Palm Tungsten afin de venir en aide aux adolescents qui souffrent de douleur causée par l'arthrite juvénile (AJ) [4]. Plus récemment, elle a créé l'application « escouade de la douleur » (Pain Squad) pour téléphone intelligent, un outil pour mesurer la douleur chez les enfants et les adolescents atteints d'un cancer. Cette application a remporté de nombreux prix [5].

J'ai eu le plaisir de discuter avec Madame Stinson au sujet de son expérience avec la santé mobile, ses points de vue sur l'avenir de la santé mobile et ses conseils pour les professionnels de la santé et les apprenants qui aimeraient intégrer la technologie mobile dans leur propre pratique. L'article qui suit est une version abrégée de cette conversation.

Can you please tell us a bit about yourself, your background in healthcare, and your current research interests?

I am a nurse clinician scientist and nurse practitioner in the chronic pain program at SickKids as well as an Associate Professor in the Lawrence S. Bloomberg Faculty of Nursing, Institute of Medical Sciences and Institute for Health Policy and Management at the University of Toronto. The aim of my program of research is to improve the way healthcare is delivered to children with life threatening and chronic illnesses and their families in Canada using the latest in information and communications technolo-

Keywords: m-health, e-health

gies (ICTs). More specifically, my research focuses on the use of ICTs (the Internet and smartphones) to (a) assess and manage disease-related pain and other symptoms and (b) deliver innovative disease self-management and transitional care programs to these at-risk populations.

How did you initially become interested and involved in e-health and, more specifically, m-health?

I became interested in e- and m-health during my doctoral and post-doctoral training in which I developed and tested a pain e-diary and an internet-based disease self-management program using juvenile idiopathic arthritis (JIA) as a prototypical model of childhood chronic illness. This model of care delivery (symptom monitoring e-diary and web-based disease management program) is now being applied to youth with cancer, hemophilia, and solid organ transplants, as well as children (aged 8-11 years) with JIA and their parents. More recently, I became interested in mobile health since the teens I was working with in the chronic pain clinic were all using smartphones, so I thought that I could harness the potential of this technology to help them better cope with their pain.

Can you give us a brief overview of the projects that you are currently working on?

My research lab is currently conducting a number of studies focusing on developing and testing new mobile health applications. The first is "Pain Squad", an iPhone-based pain tracking tool for children and youth ages 8-18 years with cancer. We are just finishing a multi-centered study that is determining the validity and responsiveness (see the glossary for an explanation of these terms) of this tool (funded by Children's Cancer and Blood Disorder Centres). A doctoral student in my lab is now developing "Pain Squad+" which builds upon the tracking features of the original Pain Squad app to provide in-the-moment advice to help children with cancer better manage their pain in hospital and home-based settings. In the Fall, she will be conducting a pilot pre- and post-test study to determine the feasibility (see the glossary for an explanation of this term) of the program and obtain preliminary estimates of the app's impact on pain and other health outcomes (funded by CIHR and Alex's Lemonade Stand). Another post-doctoral student in my lab is developing and testing the usability and feasibility of an integrated smartphone and web-based app for youth and young adults with chronic pain (Funded by CIHR). We are also conducting a pilot randomized controlled

trial to evaluate the feasibility and effectiveness of a Skype-based peer-to-peer support program for youth with arthritis and chronic pain (Funded by CIHR). Finally, we are developing a health game for school-age children with arthritis to learn how to jointly manage their chronic health condition with their parents. We are partnering with Algoma Gaming for Health to develop this new game (Funded by CIHR).

What is the current state of m-health in terms of clinical utilization?

M-health has recently been described as the "wild west" of healthcare since there are over 40,000 health apps on the market, but very little regulation. For example, our lab recently conducted a review of the patient focused pain apps across the various app stores (iTunes, Google Play, Windows Store, and BlackBerry World) and found over 224 apps [6]. However, the vast majority (86%) did not include health care providers in their development and only one had any evidence of being evaluated in terms of its impact on health outcomes. There is a movement to develop app formularies so that clinicians will know which health apps they should recommend to their patients.

How would you recommend that interested healthcare practitioners and trainees go about integrating m-health strategies into their patient care?

Consumers are driving much of the demand for mobile health and other technologies. Mobile apps are enhancing overall consumer engagement in health care by increasing the flow of information; lowering costs through better decision-making, fewer in-person visits, and greater adherence to treatment plans, and improving satisfaction with the service experience. The difficulty is that clinicians are busy and don't have the time to review all the apps that are available for various health problems. A mechanism to certify health apps would go a long way towards helping clinicians determine which apps have evidence of clinical impact and data security. For example, the formation of a review organization, much like the Health On the Net Foundation (HON), to create a set of guidelines and standardized approaches for developing mHealth apps that incorporate safety, accuracy, and security from the get-go, would be very helpful [7]. Furthermore, the organization could implement a certification process to address privacy vulnerabilities and potential harms of the m-Health app.

How would you recommend that interested healthcare practitioners and trainees go about getting involved in m-health development?

At SickKids we have developed several ways to engage clinicians in the development of mobile health applications. We have held several "Hacking Health" events that bring together experts in mobile app development (e.g., designers and programmers) and clinicians to innovate new health apps. We also recently held a "Taking SickKids Mobile" competition where clinicians submitted ideas for health apps. Six app ideas were chosen and the teams are partnering with colleges and universities in Toronto,

as well as business partners, to develop minimal viable products

What role do you see m-health and e-health, in general, occupying in the future of clinical practice?

Digital technologies, including ubiquitous mobile devices, will play a key role in transforming health care into a more-efficient, patient-centered system of care in which individuals have instant, on-demand access to their medical records and powerful clinical decision support tools that empower them to actively participate in their treatment plans. The vast amount of data (called "big data") collected from these devices, as well as wearable sensors that capture physiologic data, will also help enable clinicians to provide more personalized medicine.

GLOSSARY

Feasibility – how easily a pain measure can be scored and interpreted.

Responsiveness – ability of a pain measure to identify changes in pain over time that is clinically important to patients.

Validity – assesses whether the scale is measuring what it is intending to measure.

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A New Approach: Patient Portals for Primary Intervention

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ABSTRACT

Patient portal use in Canada is still quite new, and there has been little research conducted on its effectiveness within the Canadian healthcare system. However, by observing current portals in use internationally, as well as analyzing pilot studies, we can anticipate many benefits to patient health. Increasing evidence shows that portals have the potential to make a significant impact on patient health. Current portal functions, as well as functions yet to be implemented, have the capacity to increase the overall efficiency of the healthcare system.

RÉSUMÉ

L'utilisation de portails est encore assez récente chez les patients au Canada et peu de recherche n'a été effectuée sur leur efficacité dans le système de santé canadien. Or, l'observation des portails actuellement utilisés sur le plan international et l'analyse d'études pilotes nous permettent d'anticiper de nombreux avantages pour la santé des patients. Il apparaît de plus en plus clairement que les portails pourraient avoir des répercussions importantes sur la santé des patients. Les fonctions que l'on retrouve actuellement sur les portails, de même que celles à venir, ont la capacité d'accroître l'efficacité globale du système de santé.

Many healthcare professionals believe that for the Canadian healthcare system to remain fiscally viable, there needs to be a greater focus on both intervention before disease-onset, and on keeping patients from unnecessarily using expensive healthcare resources [1]. In terms of cost-effectiveness and maintenance of patient quality of life, the significance of primary intervention cannot be overstated.

There are several approaches that help family physicians prevent exacerbations and disease progression. One such method that intervenes early on, but is not currently well-utilized, is online patient portals. A patient portal is an electronic medium accessible via the Internet, similar to a website, which is connected to family physician electronic medical records (EMRs). There are defining traits that distinguish patient portals from EMRs. EMRs simply allow a patient's personal medical record and the entirety of their medical history to be recorded digitally. These records may remain solely within medical centres or institutions, but also have the capacity to be shared externally. The records are not usually readily accessible to patients. Conversely, portals allow patients to track their health, connect to physician-recommended resources, access physician instructions, see their list of prescriptions and advice, book appointments and take advantage of countless other functionalities [2]. For physicians, portals have the ability to improve the management of medical offices by increasing patient contact and easing workflow.

There has been some recent advancement in the field of patient portals, particularly in the United States. Some patients in the United States have access to versions of patient portals, mainly through their health insurance providers, wherein they can log certain health information, book appointments and perform some other services online [3]. Within Canada, there are limited examples of fully developed portals in widespread use, while worldwide there has been relatively little study of them [4,5]. Due to the lack of research on patient portals, discussion on this topic is largely speculative. Systems such as McMaster's MyOSCAR and Sunnybrook Hospital's MyChart have taken the first steps towards making patient portals and personal health records a standard for the Canadian healthcare system, but there are still many functions with great potential that are currently not in use [6,7]. This paper will provide a general overview of the purpose of patient portals, and provide an editorial on some functions that are already in use by the portals developed today and other functions that are yet to be implemented. However, many of the specific technical details as well as how these portals will eventually be implemented will not be addressed.

Patient portals do not provide new information, nor do they change treatments or guidelines for patients; they are simply a new mechanism of communication and education. While only 11% of patients report that their first line of inquiry is their primary care physician, a noteworthy 49% state that the Internet is their first resource [8]. Portals have shown the capacity to reduce adverse events in patients who require chronic care. For example, a study conducted at the University of Washington General Internal Medicine Clinic found that type II diabetes patients receiving portal benefits such as web-based care management and a shared EMR had overall better glycemic control [9].

Portals also enable physicians to become better health

Keywords: patient portals, EMR, primary intervention

advocates by tapping into a medium that most patients are already using, and by encouraging patients to get involved in maintaining their own health. According to a recent health informatics study in the U.S., health information is sought online by 81% of Internet users and 66% of all adults. Even more significant is that among these users, 78.5% indicate that the health information they find online has changed the way they think about health [10].

Web-based portals could be immensely helpful to patients with chronic disease and those with complicated medical histories [9,11]. Portals would enable patients to monitor their blood pressure, caloric intake, weight, blood glucose, symptom frequency, lipid levels, and more, showing health trends and potentially providing better motivation to manage needs [12]. Portals have the potential to be used by doctors to recommend specific dietary and exercise regimes and to link patients to approved health resources and frequently asked questions. Some current systems allow patients to contact nurses and physicians via portal mail for quick questions not requiring an office visit and to book appointments online, easing their frustration at trying to reach someone during set hours. This new tool also allows patients to input notes before their appointment, which would then be available in office, and to have easy access to a list of their medication names, symptoms and questions [6,7].

It would be interesting to further study portals and their effect on patient-doctor communication with sensitive information. Portals may prove to be a more comfortable means of communication for patients who may be reluctant to bring up sensitive information, such as weight, abuse or sexual issues, in person, by allowing patients to electronically send concerns to their physician. These functions may allow patients to better address their medical problems autonomously and permit healthy patients to observe negative trends in their health so they are able to intervene before disease onset [13]. Portals could also help patients recognize the signs of drug misuse and poor chronic disease control by providing a resource that outlines possible warning signs.

One of the most significant possible benefits of patient portals could be the ability to help patients distinguish between symptoms needing medical attention and those simply needing conservative treatment at home. Often those with chronic disease are unsure of “red flag” symptoms, which can even be painless in the case of lower limb ulcer infections in diabetics. This information dissemination could be accomplished by having a section, divided by disease/system, showing symptoms that should elicit a physician visit versus those that can be treated symptomatically. This would not only spare the healthcare system from unnecessary visits, but promote early intervention to prevent disease progression. It also has the potential to reduce the frequency of disease exacerbations by ensuring that patients are knowledgeable about potential preventative measures and are alert to warning signs. According to a study conducted in Virginia family practices, the increase in the percentage of patients who were up-to-date on preventative services was double among those with portal access compared to a control group without access [14]. Not only do portals have the potential to help those with established disease, but they can help healthy patients monitor their health and prevent the onset of disease by providing them with knowledge of preventative services and resources, such as health guidelines and recommended lifestyle goals.

Patient portals allow all of this information to be in one easily found and frequently visited location. Another immensely useful function is the ability for other family physicians or specialists to access patient health information with the permission of the patient. Currently the transfer of information from hospital to family clinic and specialist to general practitioner is normally limited to a single letter or a scanned handwritten hospital note that is often illegible [15]. Current medications, past procedures, clinical findings, notes, lab reports, differentials and other medical information, all have the potential to be shared by simply accessing a website (portal), with patient consent. Better information sharing can create a more cohesive interdisciplinary health team where each physician, healthcare worker and patient is better informed of the relevant health information and where communication between staff is facilitated [16].

One of the major challenges of implementing change to any healthcare system is that one must overcome skepticisms and concerns. The introduction of patient portals is no exception to this. As one would expect, younger patients seem to be more comfortable with patient portals, which may be attributed to better computer literacy and familiarity with technology [17]. Fortunately, portals have the potential to include functions such as text-to-read and font size modification which may increase the ease of use for older users and those with hearing or vision impairments. Another potential problem with patient portals is that they will allow patients to receive much more information than they are accustomed to, via the portal, which may create unnecessary anxiety and worry among patients. What must be stressed, however, is that the portal is not necessarily a continuation of the physician’s EMR, but a derivative of it; only information that has been approved by the physician will be available on the portal. Similarly, specific notes and lab tests could be set up to only be accessible to certain accounts such as that of the primary care physician or another healthcare worker. This would prevent certain information from being read by patients before their physician has had time to discuss it with them. This would also allow the doctor to control which notes are seen by the patient, in cases where the physician believes his personal notes may cause harm, such as with mental health patients [18]. Along with these concerns, issues of confidentiality must always be addressed when personal information is stored online. Surprisingly, this has shown to be a minor concern amongst patients using portals. During one study, a group of outpatients were given online access to their medical records. After surveying the patients, it was shown that only 3% were concerned about patient confidentiality [19]. Most portals currently in use have a username and password protection system that limits user access

to confidential patient information to the patient, as well as to others the patients chooses to share their information with, including family members and other doctors [6,7]. With regards to use by other physicians, one feasible system not currently in use to increase security is one in which all physicians have access to a central patient portal system but cannot access specific patient files unless given a patient-controlled personal access code.

Ultimately, portal use could have diverse and wide-ranging effects, with the goal of improving patient health literacy and communication. Portals also work to improve cooperation between physicians, and between physicians and their patients, as well as reducing patient over-reliance on costly healthcare resources. The Canadian healthcare system needs to focus on primary intervention to reduce burden on the system, and this is where patient portals are most effective. Patient portals have the potential to both advance patients' understanding of their own health needs, and improve their therapeutic relationship with their physician. The result of incorporation of portals will be a more efficient and cost-effective healthcare system.

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E-cigarettes: The Holy Grail of Smoking Cessation or a New Addiction?

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ABSTRACT

Since its introduction, Electronic Cigarettes (E-cigarettes) have evoked strongly opposed views and much passion from both proponents and opponents. The proponents of e-cigarettes view the product as an effective smoking cessation tool and a potential savior for millions of smokers. They argue that the vapor based system in e-cigarettes is a much safer mode of nicotine delivery than the combustion system in conventional cigarettes. Opponents view E-cigarettes as a product that, at best, introduces new bad habits, renormalizes smoking and may even serve as a gateway to smoking in non-smokers.

The existing body of literature on the issue, while impressive, is far from conclusive. Much more needs to be determined about e-cigarettes before informed decisions can be made about their safety and effectiveness. This article intends to summarize and analyze the scientific arguments raised from both perspectives on E-cigarettes.

RÉSUMÉ

Depuis leur introduction, les cigarettes électroniques suscitent des opinions fortement opposées et beaucoup de passion, tant de la part des adeptes que des opposants. Les adeptes de la cigarette électronique considèrent le produit comme un outil efficace de sevrage du tabac et un moyen potentiel de sauver des milliers de fumeurs. Ils font valoir que le système à la vapeur des cigarettes électroniques est un dispositif beaucoup plus sécuritaire de libération de nicotine que le système à combustion traditionnel des cigarettes. Les opposants, quant à eux, perçoivent ce produit comme une source de nouvelles mauvaises habitudes, qui renormalise l'usage du tabac et peut même devenir une porte d'entrée au tabagisme chez les non-fumeurs.

Bien qu'imposante, la littérature sur le sujet est loin d'être concluante. Il y a beaucoup de réponses à trouver au sujet des cigarettes électroniques avant que l'on puisse prendre des décisions éclairées relativement à leur sécurité et leur efficacité. Le présent article vise à résumer et à analyser les arguments scientifiques soulevés par les deux perspectives de la cigarette électronique.

INTRODUCTION

Have you ever been at a bar and thought you saw someone smoking inside even though it's been banned for the past 10 years in Ontario? Ever wondered what those plastic cigarettes sold at corner stores were? Well if you've ever been in either of those situations, then you have probably been wondering about what is known as an Electronic Cigarette (E-cigarette). In simple terms, an E-cigarette allows a user to simulate smoking without "actually smoking". More technically, the E-cigarette contains a battery operated heating element, known as an atomizer (Figure 1), which allows the user to vaporize liquid containing flavouring and propylene glycol, with or without the addition of nicotine. Upon inhalation, the vaporization of the liquid delivers flavour/nicotine to the user while also producing vapour to simulate smoke. This technology is then wrapped in a sleek package commonly resembling an E-cigarette or a pen [1]. E-cigarettes are available with or without nicotine, but for the purposes of this article we will be focussing on nicotine containing devices as this is where most of the debate is centered. In Canada, nicotine containing E-cigarettes are not authorized for sale, however this is not strictly regulated or enforced; this leaves the device in a legal purgatory, allowing users to easily find and purchase nicotine containing products.

Worldwide, the E-cigarette industry is a booming operation, earning 3 billion dollars of sales revenue in 2013 [2]. E-cigarette use is also becoming increasing popular in Canada, with almost 1/5 of Canadians having tried the product [3]. Despite the popularity, there is strong ongoing debate between advocates and critics, arguing whether or not these products are benign as advertised, or if they could have serious consequences. From one side of the argument, advocates of E-cigarettes claim the product can be a healthier alternative to traditional smoking and that they could be used effectively for smoking cessation. On the other hand, critics cite that not enough is known about the health effects of E-cigarettes. Of particular concern is the possible effects on youths who utilize these vaporizers. The current

Keywords: e-cigarettes, smoking cessation, addiction

Figure 1: Schematic of an e-cigarette [35]

state of affairs has some health officials in Ontario calling for a ban on E-cigarette use in public places, similar to tobacco use, and a ban on E-cigarette sales to youths [4].

In this article, the debate on E-cigarettes will be summarized and analyzed from both perspectives, providing a holistic and balanced view of the discussion (see Figure 2).

Figure 2: An image depicting cigarettes vs. e-cigarettes (http://greenecigarettes.wordpress.com)

HEALTH EFFECTS

The proponents of E-cigarettes claim that this innovative product has a considerable theoretical health advantage over conventional cigarettes. E-cigarettes function using a vapor based system and are battery operated, significantly reducing the toxic chemicals that are generated as a result of tobacco combustion. There are more than 4000 chemicals in tobacco smoke, many of which are known carcinogens and toxins [5]. Furthermore each puff contains millions of dangerous free radicals [6]. Opponents have raised issues with proximity of the E-cigarettes' metal body to the vapour and its potential contaminating effect. Analysis of E-cigarette vapour has revealed the presence of trace metals, such as nickel, lead and cadmium [7].

In a recent review of the existing data on the chemistry of aerosols and the liquids of E-cigarettes, the authors concluded that the contaminants were not significant enough to warrant any real health concerns [8]. Similarly, toxicological studies have shown significantly lower index of concern with regard to E-cigarettes' vapor compared to cigarette smoke [9]. The results suggest that the vapour based system utilized in E-cigarettes is in fact a better mode of nicotine delivery compared to the combustion system of conventional cigarettes.

Mode of delivery aside, the common substance between conventional and E-cigarettes that raises health concerns is nicotine. While nicotine is in fact an addictive substance, research suggests that nicotine's health effects may not be as alarming as it was once believed. The effects of nicotine on atherosclerotic heart disease, coronary circulation, platelet aggregation and lipid profile are minimal at best [10,11,12,13]. Research in other fields has suggested that nicotine use in adolescents can have a substantial negative impact on their developing brain [1]. Nicotine has also been implicated in many of the fetal development issues related to maternal smoking, including diabetes and obesity [14].

Even if E-cigarettes were proven to be safer than conventional cigarettes, is that really the right question to be asking? Perhaps it would be more appropriate to ask whether or not E-cigarettes are safe at all. It is important to understand the potential health effects of E-cigarettes, as at the moment they are poorly standardized, barely regulated and contain no warning label to alert potential users of their effects. Even though the focus of the arguments in the literature and the media has been on the relative safety of E-cigarettes to conventional cigarettes, there is a need for a shift of focus on the absolute safety of E-cigarettes.

In addition to nicotine, E-cigarette users can be exposed to various toxic chemicals, including diethylene glycol (anti-freeze), tobacco specific nitrosamines (carcinogens) and potentially harmful chemicals including, anabasine, myosmine, and β-nicotyrine [15]. It is true that these chemicals are present in much smaller quantities than in cigarette smoke and that their effects at lower doses are unknown. However, this should not detract from their potential harm until more data is available in the future. What we can be certain of for the time being is that many E-cigarette users report adverse events such as mouth irritation, cough, nausea and vomiting after only a short period of smoking [16]. Overall, the jury is still out on the health effects of E-cigarettes, particularly in the long run. Perhaps for now it would be wise to tighten regulation on these products and hold off on promoting them as healthier options until we have more concrete evidence.

SMOKING CESSATION

In the current Austerity era, psychiatrists represent One of the main marketing points of E-cigarettes is that they allow smokers to transition to a product that is very similar to cigarettes but without the harm of toxic chemicals. In effect, it is claimed that E-cigarettes can act as a smoking cessation tool. A few studies have been done and, for the most part, the results

either show no effect or minimal benefit for individuals wanting to quit [1]. In fact, only one randomized control trial (RCT) has been done to examine this issue and it reported that E-cigarettes were no better than traditional nicotine replacement therapies [17]. Aside from the question of whether E-cigarettes can effectively help smokers quit, it is also important to examine if users are actually using the product to quit smoking. In a recent British study, only about 1/3 of E-cigarette users intended on quitting smoking, the other 2/3 either used E-cigarettes to cut down on cigarettes, or to have a product which allowed them smoke in public places [18]. While using an E-cigarette to cut down may seem beneficial, it is anticipated these health gains would be insignificant compared to the ones achieved from quitting altogether [2]. Currently, there does not seem to be enough evidence for E-cigarette manufacturers to make this claim, a view point which is also shared by the Canadian Medical Association (CMA), The World Health Organization (WHO) and British Medical Association (BMA).

While the RCT data is unimpressive, it is important to keep in mind that anecdotal evidence and surveys point to the success of E-cigarettes as cessation devices. One such survey demonstrated a cessation success rate of 31% with former smokers using E-cigarettes to quit [19]. Based on the results, the authors concluded that E-cigarettes hold promise as a tool for smoking-cessation and deemed it worthy of further research with more-rigorous design protocols. Furthermore, the existing body of literature suggests that certain patient populations may benefit from using E-cigarettes. This is particularly true in cases where traditional smoking cessation methods fail or are proven ineffective. First line oral medications for treatment of nicotine addiction are contraindicated in some conditions. For example, Varenicline and Bupropion carry a 'black-box' warning for some psychiatric conditions. Another population that potentially benefits from E-cigarettes are patients with Chronic Obstructive Pulmonary Disease (COPD). COPD is a progressive respiratory disease due to an inflammatory response to chronic tobacco smoke. Medical research to date suggests that COPD patients do not tend to respond well to traditional smoking cessation efforts and E-cigarettes may be beneficial [20]. Therefore E-cigarettes may be particularly worth considering for special populations.

GATEWAY

In countries where the treatment gap between mental As mentioned earlier, major proponents of E-cigarettes are advertising these products as the newest aid in smoking cessation. However, what is now being uncovered is that E-cigarettes may act as a gateway to cigarette use, specifically among adolescents. A recent study showed in a cross sectional analysis of almost 40,000 adolescents, that E-cigarette use did not discourage smoking and potentially encouraged cigarette use with a higher odds ratio of ever or current smoking [21]. Adolescents, who have tried E-cigarettes, were twice as likely to have intentions of smoking traditional cigarettes [22].

This concern is also compounded by the fact that the manufactures of E-cigarettes, many of which are traditional tobacco companies, can subvert traditional bans on tobacco advertising and market their products towards teenagers. This marketing is accomplished through television and online ads, as well as flavours and colours which are appealing to teenagers [23]. The amount of marketing has exploded in the last few years with the campaigns reaching an audience of 24 million adolescents in the United States alone [24]. This strategy has been proven to be effective as the number of American adolescents smoking E-cigarettes has doubled during 2011-2012 to 1.8 million [25]. There is also the concern that the widespread use of E-cigarettes will undermine efforts which have taken years to denormalize/ shun smoking, allowing the use of cigarettes to become socially acceptable again and possibly re-glamorize smoking for teenagers [26]. While more studies are needed to further assess these theories, it is very worrisome given the widespread use of E-cigarettes, and the lack of regulation surrounding the sales and marketing of these products.

The possibility of a gateway effect is clearly alarming, however, the research and statistics suggesting E-cigarettes as a gateway to smoking are far from conclusive and association not should be confused with causality. It is important to keep in mind that smoking statistics are highly dependent on geography and sociodemographic factors, and are thus limited in their representativeness of other countries, nationalities and socioeconomic backgrounds. In a recent study by Lee et al., 2014, the authors suggested that after adjusting for demographics, current cigarette smokers were much more likely to use E-cigarettes compared to non-smokers [27]. In fact, E-cigarette use was correlated with heavier and more recent smoking. Therefore, it is arguable that the response of adolescents to the marketing advertisements of E-cigarettes is not necessarily an undesirable outcome given that they are switching to a healthier mode of delivery. Additionally, the studies which have documented a possible gateway effect are retrospective in design and should be analysed with caution as they can only show association, not causation. While it has been reported that there is a significant increase in the number of adolescents who smoke e- cigarettes in the recent years, many of these studies do not account for teenagers who were already smokers of conventional cigarettes. Accounting for this baseline smoking status may mean that many of the reported alarming statistics are at least partially explained by the number of teenagers who are simply switching the mode of delivery. This would make it difficult to conclude that the E-cigarettes marketing advertisements are in fact causing non-smoking teenagers to smoke.

ENVIRONMENTAL EFFECTS

From an environmental perspective, conventional smoking is a major cause of residential fires. A recent survey estimated an annual average of 7600 smoking-related fires in residential buildings in the United States [28]. With smoking related fires accounting for 14% of fire deaths, and considering the thousands of residential fires every year, this issue has substantial safety and

economic loss concerns associated with it. E-cigarettes are mostly operated with lithium batteries, which significantly reduce the risk of residential fires. There have been the occasional reports of battery explosions but they are often caused by improper use of the device or design defects and rarely result in serious injury. Similar to any other battery operated device, including cell phones, E-cigarettes have minimal risks associated with battery malfunctions and mishaps. These issues can be adequately addressed with better education of users on the proper use of this electronic device and increasing the standards of production and ensuring evidence based regulations.

Furthermore, discarding cigarette butts are currently a form of non-biodegradable litter. Cigarette butts thrown from sidewalks and moving cars end up in rivers and eventually oceans. The annual Ocean Conservancy's International Coastal Cleanup (ICC) reports that "cigarette butts have been the single most recovered item" with more than 1,684,183 cigarette butts collected in 2007 in US alone [29]. It is important to keep in mind that many of these products are toxic and degrade slowly, if at all, and thus will be diluted in the water and soil and potentially pose serious risk to the environment and the wild life. As more smokers transition to E-cigarettes, this environmental impact may be diminished [29].

While E-cigarettes have promising environmental implications, some questions remain to be answered. These concerns include the impact of E-cigarette battery disposal, the disposal of cartridges containing nicotine and the impact of factories dedicated to nicotine extraction and purification [30]. Before these concerns are addressed, it is premature to deem E-cigarettes as the safer environmental choice. On a smaller environmental scale, one of the common concerns of E-cigarettes is the effect of their vapor on indoor air quality. When an E-cigarette is used indoors, the vapor released has been found to contain not only nicotine, but also many other chemicals and additives, some of which may be possible carcinogens such as polycyclic hydrocarbons [31]. Though the levels of nicotine observed were ten times less than from conventional cigarettes, there are still possible health implications for adolescents and pregnant woman who are passively exposed [2,32]. Other then the gasses released, ultrafine particles (100-200 nm) have been documented in E-cigarette vapour. Exposure to these particles is worrisome as similar particulate matter has been associated with respiratory and cardiac illness [1]. Together, these effects on environmental air quality are prompting health officials to consider banning E-cigarette use in public establishments.

CONCLUSION

Research to date, for the most part, suggests that E-cigarettes are theoretically safer than conventional cigarettes and a possible alternative to the existing low efficacy methods available for smoking cessation [33,34]. However, by the virtue of the fact that E-cigarettes are relatively new products, long-term studies on their chronic health consequences are in effect non-existent. More studies are needed to uncover the true health effects of E-cigarettes and their efficiency in achieving the ultimate goal of cessation in smokers. Furthermore, the safety of the hundreds of additives and flavors used in various E-cigarette products, their dose related risks and potential interactions with one another need to be better outlined by further research.

Concerns regarding E-cigarettes being a gateway to smoking in non-smokers, particularly young individuals, are alarming but not fully supported by the existing literature. The concerns stem from the marketing practices of tobacco companies who often advertise E-cigarettes as a glamorous and new cultural trend promoting the product as "what all the cool kids are doing these days" as opposed to a smoking cessation device (Figure 3). Even if E-cigarettes were to be promoted as a "safe" and "effective" therapeutic smoking cessation device, we are still a long way from knowing the true efficacy of E-cigarettes in long-term smoking cessation or the longitudinal effects of E-cigarettes on the health of its users.

There is no doubt that smoking cessation is the best option for every one of the countless smokers in the world. While noble, this may just be an unrealistic expectation to have of every patient you see in your clinic. It is important to empathize with the patient in their journey of smoking cessation. It is also essential and perhaps therapeutic to recognize that smoking cessation is a difficult task and that the current state of approved smoking cessation aids are far from ideal. By reducing some of the significant adverse health effects associated with the use of conventional cigarettes, E-cigarettes may just be the answer in saving the lives of millions of smokers worldwide and everyone they would be exposing to second hand smoke by extension. At least until we find better alternatives to aid smoking cessation. Further research in the area is needed before scientifically supported claims and informed decisions can be made regarding the safety of E-cigarettes use.

Figure 3: An example of an e-cigarette advertisement (http://ecigs-marketing.blogspot.ca/2014/01/why-quit-ad-brought-to-by-blu-ecig.html)

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Harm Reduction at its Best: A case for Promoting Safe Injection Facilities

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ABSTRACT

Injection Drug Users (IDU) represent less than 1% of Canada's total population. Nevertheless, they bare a disproportionate burden of disease with health and law enforcement costs for controlling the drug problem in Canada estimated at $5 billion annually. The current strategies targeting IDU have limited efficacy in reducing emergency department visits, limiting Human Immunodeficiency Virus (HIV) and Hepatitis C Virus (HCV) transmission and providing accessible health care. This paper makes the case for safe injection facilities (SIF) as a means to improve IDU health outcomes, while reducing health care expenditures, and decreasing public injecting without increasing crime rates. This topic is of particular concern now that the Conservative government is in the process of trying to pass bill C-2 to modify the Controlled Drugs and Substances Act, making exemptions for SIF inaccessible. This is occurring while leading researchers in the field are applying for an exemption for such a facility in Ottawa.

RÉSUMÉ

Les utilisateurs de drogues injectables représentent moins de 1 % de la population globale du Canada. Ils sont néanmoins responsables d'une part disproportionnée du fardeau de la maladie. Il est estimé que les coûts des soins de santé et d'application de la loi pour la maîtrise du problème de toxicomanie s'élèvent à 5 milliards de dollars au Canada. Les stratégies actuellement utilisées auprès des utilisateurs de drogues injectables ne réussissent pas à réduire le nombre de visites dans les services d'urgence, à limiter la transmission du virus de l'immunodéficience humaine (VIH) et de l'hépatite C (VHC) ni à fournir des soins de santé adéquats. Cet article établit le bien-fondé des sites d'injection supervisés (SIS) comme moyen d'améliorer les résultats sur la santé des toxicomanes tout en réduisant les dépenses en soins de santé, les injections de drogue dans des lieux publics, et ce, sans hausser le taux de criminalité. Ce sujet est particulièrement d'actualité, car le gouvernement conservateur est en voie de faire adopter le projet de loi C-2 qui modifiera la Loi réglementant certaines drogues et autres substances, rendant inaccessibles les exceptions qui permettent la création de sites d'injection supervisés. Cela se produit au moment même où des chercheurs de pointe dans le domaine sont en voie de déposer une demande pour la création d'un SIS à Ottawa.

Over the last century, there has been a paradigm shift in the way society manages the health of injection drug users, moving public health strategies from an abstinence model to a harm reduction model. Despite the large body of literature supporting their efficacy, the implementation of harm reduction strategies such as needle exchange programs and safe injection fa-cilities continue to encounter significant resistance. Safe injection facilities (SIFs) are the most recent addition to the Canadian harm reduction landscape and are by far the most controversial. The evidence that has emerged following the opening of Canada's first SIF, Insite in Vancouver, BC, has attested to its economic viability, its reduction of the burden of disease, and its positive impact on public safety [1]. This topic is of particular concern at the moment because the current Conservative government is in the process of passing bill C-2 to modify the laws surrounding the Controlled Drugs and Substances Act [2]. This will create insurmountable barriers for the attainment of the legal exemption for the use of controlled substances necessary for the operation of SIFs. Given that harm reduction strategies have an important impact on public health, it is important for the medical community to stay up to date on these political and legal changes in order to advocate for measures that improve the health of all Canadians and reduce the burden on our healthcare system. The current patchwork system of harm reduction efforts has not done enough to curb the financial and human health impacts of injection drug use and it is essential to implement a comprehensive harm reduction strategy to have any noticeable impact. There is compelling evidence from around the world that SIFs should be part of that strategy, and could make a positive impact here in Ottawa.

Keywords: safe injection facilities, harm reduction

Although the IDU population in Canada is small, representing less than 1% of the total population, it bares a disproportionate burden of disease [3]. Many complications can arise from injection drug use such as, HIV, HCV, abscesses, cellulitis, overdoses resulting in hospitalization or death, accidental injury while under the influence, drug addiction, and withdrawal [4]. In addition to these increased health risks, IDUs often face barriers to accessing primary healthcare services due to stigma, discrimination, lack of financial resources, lack of transportation, and an unstable lifestyle that makes it difficult to keep appointments [5,

6]. Due to these challenges, the IDU population incurs significant healthcare costs through frequent emergency department visits, costly acute care, and inadequate treatment of chronic illnesses [7]. Palepu et al. found that in a sample of 440 IDUs, 2763 visits were made to the emergency department over the three year study period [8]. The provision of inpatient care for this population is also substantial with approximately 15% of admissions in one Vancouver based hospital attributed to injection drug use [9]. Injection drug use is considered a major risk factor for transmission of HIV, and it also leads to worst health outcomes for those living with the infection [10]. A 2011, survey of new diagnoses of HIV in the United States showed that of the 24.9% found to have stage 3 disease (AIDS) at the time of diagnosis, 39.2% were IDUs [11]. Studies have also shown that IDUs are far more likely than their non drug using counterparts to be lost to follow-up and not receive adequate outpatient care after an HIV diagnosis [12]. With the continued existence of infectious disease transmission through needle sharing, and the rates of overdose rising rapidly according to data from Office of the Chief Coroner of Ontario (there is 1 overdose a day in Ottawa alone and a 240% increase in oxycodone-related death between 2002 and 2006 across the province), much more needs to be done to limit these negative impacts and address the healthcare needs of this population [13, 14].

Harm reduction strategies seek to minimize the harmful consequences of drug use while recognizing that abstinence is not always possible in the short term. Different strategies may target drug users at different stages of their addiction, with the hope that continued engagement with the healthcare system may encourage a progression towards a level of stability that could allow abstinence to be maintained. While current harm reduction strategies, including law enforcement, needle exchange programs, rehabilitation and treatment programs, are a positive first step, more comprehensive strategies need to be explored to better address the problems associated with IDUs. Traditionally, politicians respond to public health crises related to drug use by allocating resources primarily to law enforcement based initiatives [9]. Data from Vancouver showed no changes in crime rates, addiction or infectious disease incidence, when 82% of the drug related budget was allocated to law enforcement, suggesting that this is not an effective strategy [9]. On the other hand, drug treatment services such as methadone clinics, are a highly effective way to combat the harm of drugs and significantly reduce HIV risk behaviours [15]. Their impact is, however, limited by the fact that they retain only one third of patients [16]. Needle exchange programs can help address this gap by reducing needle sharing among IDUs who are not ready to engage in treatment, and their effectiveness is supported by extensive evidence. However, ongoing problems with HIV and HCV infections in cities where these programs are widely available indicates that needle exchange programs alone are not sufficient to address diseases transmission [9]. Moreover, they do not address other harms associated with drug use such as overdose, injury, and public nuisance. Each of these strategies has its role to play in reducing the negative impacts of drug use and improving health outcomes. However, in order to stop the transmission of HIV and HCV, address overdose rates, and improve the health of those unable to commit to a methadone treatment program, a more accessible and comprehensive strategy must be put in place.

Conclusive evidence has emerged around the world in support of safe injection facilities (SIF). Though this approach remains controversial, it seems to be the most effective way of targeting high risk drug users while reducing the health and financial burden of drug addiction. SIFs provide IDUs with a safe location to inject illicit drugs using sterile supplies, with nurses on site to intervene in the event of an overdose or injury. Nurses can also provide primary care services and addiction treatment referrals [1]. A study published by Andresen and Boyd using mathematical models to estimate the number of prevented HIV infections following the establishment of the Insite SIF in Vancouver in 2003, estimated that 19 to 57 infections are prevented per year [17]. Pinkerton estimates that if Insite were closed, the annual rate of HIV infections would increase by 83.5 cases which would be associated with $17.6 million in lifetime HIV-related medical costs, greatly exceeding Insite's operating costs of approximately $3 million per year [18]. It should be noted that these cost savings estimates do not account for savings associ-ated with a reduction in HCV infections, which are also common among IDUs. SIF users report reduced needle sharing, which reduces blood born infection transmission [1]. This corroborates with findings from European facilities that report the improvement of general health and social functioning of clients, as well as a reduction in blood born virus transmission risk behaviours [19]. Studies in Europe report a behaviour shift from public drug use to using injecting facilities, thereby decreasing the visibility of drug use significantly and leading to public safety improvements [19]. In Australia, the number of publicly discarded needles in the surrounding area dropped by half when a safe injection facility was opened in Sydney in 2001 [20]. Canadian evidence also shows reduced overdose mortality, with the rate of overdose in proximity to Vancouver's Insite facility decreasing by 35% after the site was opened [21]. These results indicate a concrete reduction of harm and health care costs as a result the implementation of SIFs. Therefore, SIFs can contribute greatly to the reduction in drug related harms and should be integrated with existing harm reduction services in cities with significant drug problems.

A comprehensive SIF in the Ottawa region could effectively target the needs of IDUs while reducing overdose rates, infectious disease transmission, and total healthcare costs. Although the polished government buildings in Ottawa's downtown could lead one to believe otherwise, Ottawa's drug problem is far from negligible. There were an estimated 1200-5600 injection drug users in Ottawa in 2008 and, in 2011, 7.7% of the adult population of Ottawa was estimated to have used crack or cocaine in their lifetime [22]. Drug overdose accounts for 115 hospitalizations and 40 deaths annually in Ottawa [22]. Although the rates of HIV infection among drug users in Ottawa has remained relatively stable around 9.5% during the period between

2006 and 2012, HCV prevalence has increased to 70.5% of drug users in Ottawa in 2012 [22]. Meanwhile the sharing of injection and inhalation equipment remains an important public health issue with 14% and 60% of drug users reporting having used another person's injection or inhalation equipment respectively within the last 6 months [22]. Both doctors and policy makers should be paying attention to this situation and looking for ways to address the gaps in the programs currently offered to drug users in Ottawa.

Safe injection sites could be the critical element needed to complete Ottawa's continuum of harm reduction services. Since they target drug users who are homeless, public injectors and at high risk for overdose, SIFs could effectively lower overdose rates and reduce equipment sharing among drug users in Ottawa, where other programs have fallen short [1]. The most effective way to address this problem in Ottawa could be by strategically choosing a high consumption area and installing a standalone safe injection facility run by public health. Jozagihi et al. used mathematic models to evaluate the potential cost effectiveness of an SIF in Ottawa, given its rates of HIV, HCV and estimated equipment sharing. They concluded that « serious consideration should be given to the establishment of SIFs in Ottawa » and that the evidence supported opening two such sites [23]. The literature shows that these types of facilities are also associated with high rates of satisfaction among drug users, which in turn increases the usage of primary health care services within the facility to treat wounds and potential complications, therefore reducing potential hospital admissions [1]. Gaining the trust of this population would allow the SIF in Ottawa to offer many other services such as safer injection education, wound care, and referrals to community resources such as treatment and housing services, as has been done in other jurisdictions [1, 20]. Not only does this improve the quality of life for the users, but it also supports the ultimate goal of abstinence. Studies evaluating other SIFs, show that more than 40% of referrals are for various forms of addiction treatment [1]. Supplementary to the sterile and safe environment to inject, the presence of medical personnel, such as nurses and addiction counsellors, offers a comprehensive intervention. Such services have an impact on reducing rates of HIV and HCV infections, overdose mortality and hospital utilization, while increasing referrals to addiction treatment centres. Furthermore, although the public often cites concerns of increased crime rates as a reason not to support establishing such facilities in their neighbourhoods, SIFs have proven to decrease measures of public disorder, and have no other influence on crime rates [1].

The population of IDUs may be relatively small, but it bares a disproportionate burden of disease. With the right intervention strategies, this population could benefit from an improved quality of life, which in turn would reduce the burden on our health care system. The literature demonstrates that individually, many harm reduction and treatment strategies can be effective. However, they fail to reach the most vulnerable population of drug users and therefore alone do not completely solve the problem. Currently the intervention which proves to be the most effective for those most at risk is safe injection facilities. SIFs have seen extensive success in reducing needle sharing and overdose mortality, while increasing drug treatment referrals, and having no impact on overall crime rates. Considered together, the evidence shows that in major metropolitan areas with significant drug problems, such as Ottawa, comprehensive safe injection sites should be opened. The next challenge is getting the support of citizens and politicians.

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Low Cost Community Health Interventions to Address the Mental Health Crisis Arising From Greece's Financial Austerity Measures

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ABSTRACT

In response to the European financial crisis of 2008-2009, Greece reduced funding for social spending as part of its austerity program, which may have reversed past progress in Greece's mental health system. Significant increases in depression and suicide rates coincided with the start of the crisis. A slower economic recovery may result from the combination of a less productive work force and out-migration of mental health professionals. In order to alleviate the detrimental effects of this crisis, mental health crisis training, as well as low cost community-based programs should be prioritized in Greece.

RÉSUMÉ

Dans le cadre du programme d'austérité qu'elle a mis sur pied en réaction à la crise économique européenne de 2008-2009, la Grèce a réduit ses dépenses dans les programmes sociaux. Or, ce geste peut avoir renversé les progrès qui avaient été réalisés dans le passé dans le système de santé mentale du pays. Une reprise économique plus lente pourrait découler de la combinaison d'une main d'œuvre moins productive et de l'exode des professionnels de la santé mentale. Afin d'alléger les effets nuisibles de la crise, la formation en gestion des crises de santé mentale, de même que l'offre de programmes communautaires peu coûteux devraient être priorisées en Grèce.

INTRODUCTION

At the epicenter of Europe's financial crisis, Greece has been greatly affected by austerity measures. Although designed to assuage financial distress, there is unsurprising evidence that these measures are negatively affecting several aspects of Greek society, which are dependent upon high levels of sustained public financing. Greece's social spending has declined dramatically since the crisis began in 2008, from almost 20% of GDP in 2007 to about 10% in 2012, the largest decrease among OECD countries documented [1].

The country's mental health system is one of the sectors affected by the decline in spending, reflected in declines in funding of both direct psychiatric care and general sectoral support. This is particularly disappointing, as the system was working efficiently under Greece's so-called Psychiatric Reform, prior to the austerity measures [2]. Indeed, the new austerity measures are likely reversing many of the positive advancements made in Greece's mental health care in the past few decades. Since the start of the financial crisis, there have been significant increases in both depression and suicide rates, which is troubling for a society that is trying to recover economically.

This paper outlines a strategy to help assuage a slow decline in Greece's mental health structure, while remaining faithful to the ideals of the previously successful Greek Psychiatric Reform. These recommendations include: (1) enhancing mental illness prevention programs at the personal, familial, and social level; (2) investing in workplace engagement to improve diagnosis and rapid response; and (3) leveraging advances in telecommunication technologies to lower health delivery costs and expand access to services.

Keywords: Greece, financial crisis, mental health, psychiatric reform, suicide

THE PSYCHIATRIC REFORM IN THE MID-1980s

In the 1980s, Greece implemented Psychiatric Reform to de-institutionalize psychiatric care from asylum-like institutions, establish numerous community services, create psychiatric departments in general hospitals, increase rural psychiatric care, and to ensure sufficient funding and access to care. The Psychiatric Reform was established to make care more efficient, and to reach populations outside of Greece's main urban areas through sectorization. Mental health services were carried out by Greece's public and private sectors, and non-profit units, and were supported with assistance from the European Union. The Reform had successful effects; however, full sectorization was not achieved, as a decided retreat from the progressive policies of the Reform had arisen due to Austerity [2, 3].

THE EFFECTS OF AUSTERITY MEASURES ON MENTAL HEALTH

In the current Austerity era, psychiatrists represent only

3.8% of all specialties in Greece, with less care offered in rural settings. The island of Samos, for example, has only 2 psychiatrists to service its population of 35,000 inhabitants [4]. Clearly, the dearth of relevant psychiatric professionals is a primary indicator of the system's vulnerability.

Data on the direct effects of Austerity on Greece's mental health profile is sparse. However, one recent study found that the prevalence of major depressive disorder (MDD) has increased by over 50% in one year [2]. In addition, official surveillance suggests that there was an increase in the overall suicide rate of 26.5% between 2010 and 2011, and a 43% increase compared to 2007, which was when the first signs of the economic downturn began [5]. In 2011, the Greek Health Minister, Andreas Loverdos, admitted that most studies were showing an increase in suicides of approximately 40% [6]. Two Greek nationwide telephone surveys conducted by Madianos et al., in samples of 2,197 and 2,192 respectively, found a 36% increase in suicide attempts from 2009 to 2011 [7]. Point estimates of Greece's suicide and depression rates may be comparable to the EU norm, but the rapid acceleration of these rates since the financial crisis distinguishes Greece's situation [8].

The situation in Greece is troubling for several reasons: the upward trajectory of its rates of mental health morbidity, the temporal connection of this increase with the specific experience of Austerity, the loss of measurable progress achieved through the Psychiatric Reform, and the possibility that this trend may in fact undermine the very purpose for Austerity itself. The latter point is perhaps the most noteworthy. While no data yet exist to substantiate this suggestion, there remains the risk that underfunding a vital social pillar will reap several unintended negative consequences, including the out-migration of medical professionals, and a less productive workforce.

LOW COST SUPPORTS FOR GREECE'S MENTAL HEALTH SYSTEM

In countries where the treatment gap between mental health burden and care is growing, such as India (9), and increasingly in Canada (10), the World Health Organization recommends integrating mental health into primary care, presumably offering an affordable solution to an increasing need [11]. In concert with the shift of responsibility to primary care, several additional steps may be taken, as we describe below, addressing concerns in prevention, response, and sustainability.

1. Addressing Prevention Needs - Awareness Meetings, Family Education & Public Engagement

Community Mental Health Programs can offer many services, including outpatient psychiatric care, community preparation workshops, health promotion, rehabilitation, and other similar resources. A successful example is Paripurnata, a Non-Governmental Organization located in Habra, West Bengal, India, which primarily provides outpatient psychiatric care, but also anti-stigma workshops and informational sessions, preventing mental health crises leading to a hospital admission or suicide. A recent evaluation of these programs found increased awareness, increased care to patients, and a decrease in negative viewpoints, and concluded that the program should be sustained. Similar programs would be worthwhile, so long as the community is willing and stakeholders are available [12].

It can be argued that the most important level for prevention of suicide and mental health crises is at the familial level. It has been shown that family psycho-education has many positive effects, including: reduction of relapse, reduction of readmissions to hospital, improvement of family involvement, and patient adherence to treatment. In terms of the caregivers, there was more knowledge of mental health problems, more empowerment, and reduced stress and worry in regards to their affected loved one. A successful example is the Support and Family Education (SAFE) Program: Mental Health Facts for Families, which provides a 90-minute workshop once a month, to be attended at the convenience of the families, which covers signs and symptoms, educates on available services, teaches about prevention, and offers families opportunities to ask questions. In addition, the workshop covers caregiver support to prevent caregivers from developing their own mental health conditions in response to their caregiver-related stress [13]. These programs increase knowledge and awareness, preventing individuals from seeking emergency care in crisis.

2. Addressing Response Needs – Public & Workplace Engagement

Mental Health Care training can be offered in the workplace setting to general public servants, as well as emergency and primary care physicians. Mental Health First Aid (MHFA), originally developed in Australia, is well known and an accepted standard for mental health crisis vocational training. In a recent trial, individuals having taken the course experienced the following in comparison to the control groups: more confidence in assisting mental health patients, more likely to assist individuals in seeking professional help, reducing stigma, and more concordance with health professionals and treatments. It was also found to have improved the mental health of the individuals taking the courses [14].

Morawska et al. examined the effectiveness of this program design in multicultural communities. At its core, MHFA should educate the public to support those in immediate, life-threatening crisis, and should offer instruction in symptoms, causes, treatments for depression, anxiety, psychosis, substance abuse, and crisis training including suicidal ideations, panic attacks, and drug overdose. In an examination of a successful, culturally sensitive program, there was an increase in recognizing mental health disorders, concordance between professionals on treatment, confidence in giving first aid treatment, decreased stigma, as well as continued competency following a 6-month post-test [15].

Most importantly, non-psychiatry medical workers should be trained in this intervention, as well. A successful 2-hour program was designed for medical residents based on

MHFA, and was evaluated. Physicians showed improved confidence and attitudes, abilities to assess risk, listen to patients non-judgmentally, give reassurance, and encourage further professional help, and self-help strategies [16]. A similar program was also conducted for general practitioners in the Gotland Study; however, it should be noted that in the case of general practitioners, not all programs have been successful [17]. Each program should be designed to fit each individual culture [18].

3. Addressing Sustainability Needs – Technology-based Therapies

Many nations are finding cost-saving solutions by relying increasingly on technological medical solutions, in particular capitalizing on recent advances in broadband telecommunication, thus reducing reliance on in-person care-giving.

E-Mental Health, in the scope of this article, refers to communication for the purposes of medical care, delivered via the Internet. It has been recommended by the Canadian Mental Health Commission as one of their top upcoming priorities and can be relatively low-cost, as it is often provided by those who are not psychiatrists; however, they are trained nonetheless to offer tele-therapies, internet-based interventions, design mobile applications, and self-help programs online [19, 20].

A specific design that has been evaluated is the use of Cognitive-Behavioral Therapy or Problem-Solving Therapy via online video-conference, which has been shown to lower depressive symptoms, and increase feelings of control in patients, a skill necessary to those living in Austerity. Warmerdam et al. have shown that it is the professional-patient relationship, and not the type of therapy offered, that determines the success of the program [21].

Suicide hotlines are also a useful technology to decreasing suicide rates. A randomized control trial examining a waitlist control group, Solution Focused Brief Therapy (SFBT), and Common Factors Therapy (CFT) groups, has shown significant improvements in all examined populations treated therapeutically. The distinction in this program is that this particular hotline does not merely offer brief assistance via telephone to discourage suicide, but rather follows up with sessions after the episode with secondary mental health care workers, in a program sponsored by the agency [22]. A variety of hybrid options are available to beset population, with varying combinations of interaction.

Clearly, the major barrier to implementing such technological interventions is start-up cost. However, any budgetary planning exercise would be well advised to consider the long term cost savings potential of an expanded reliance on technological assistance.

CONCLUSION

While it is unlikely that we will see a sudden policy reversal concerning the funding of Greece's mental health sector, other steps can be taken to relieve the damage being done by the nation's extreme financial measures. Of course, any of these strategies would have to be implemented with sensitivity to prevailing Greek values, and within the narrow confines of that nation's constrained budget. Communal Greek values are often dictated by the Greek Orthodox Church, which condemns suicide and thus, generally refuses to bury victims of suicide. Those implementing these community health measures must be culturally sensitive and expect a certain level of stigma [23]. However, this should not deter intervention, as failure to take constructive, incremental action now may result in increased suffering, as measured in rising rates of depression, suicide, and other manifestations of mental ill health.

The aforementioned solutions are ideal as they are low cost. In absence of our reforms, there are two alternatives: increased expensive specialist care, or no available treatments, causing great financial strain to an already vulnerable society. Removing shortages in formal mental health workers would result in a substantial amount of cost for the affected country. Shifting the tasks to available complimentary health workers, in low cost, preventative, responsive, and sustainable program options, would be less expensive solutions [24]. These simple, yet effective interventions, present Greece with a chance for resilience in the long term.

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The Potential of Video in Patient Education Post Skin Biopsies

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ABSTRACT

Plastic surgeons perform excisional skin biopsies that may be in aesthetically sensitive areas. Excisional biopsies are performed on an outpatient basis and therefore patients are expected to perform wound care at home. The current standard of patient education for post-procedural care is verbal information along with a written set of instructions to take home. However, a patient's comprehension of verbal directions and literacy level can greatly affect the transmission of knowledge, and verbal instructions are not standardized across each patient encounter. The importance of patient education in self-care with the use of video has great potential in promoting improved outcomes.

RÉSUMÉ

Les chirurgiens-plasticiens peuvent effectuer des biopsies-exérèse de la peau dans des zones sensibles du point de vue esthétique. Les biopsies-exérèses sont pratiquées sur une base ambulatoire et les patients sont donc tenus de traiter les plaies à la maison. Des explications verbales et un document de directives à apporter constituent la norme actuelle pour l'éducation du patient sur les soins postinterventions. Cependant, la compréhension de consignes verbales et le niveau d'alphabétisation d'un patient peuvent grandement influer sur la transmission des connaissances. De plus, les directives verbales ne sont pas normalisées dans chaque rencontre avec des patients. L'utilisation de la vidéo pour améliorer l'éducation des patients qui s'occupent de leurs propres soins offre un grand potentiel pour améliorer les résultats pour le patient.

INTRODUCTION

Skin biopsies form a substantial portion of a plastic surgeon's practice. Plastic surgeons perform excisional skin biopsies that may be in aesthetically sensitive areas. Skin biopsies are generally classified as "clean procedures" (primary closure of a wound that does not enter the respiratory, gastrointestinal, or reproductive tract), and are expected to have an infection rate of <2% [1]. Excisional biopsies are performed on an outpatient basis and therefore patients are expected to perform wound care at home. The current standard of patient education for post-procedural care is verbal information from either the staff or resident, along with a written set of instructions to take home. However, a patient's comprehension of verbal directions and literacy level can greatly affect the transmission of knowledge. Furthermore, verbal instructions are not standardized across each patient encounter. Therefore, a different means of providing more accessible and standardized patient education on wound care and infection recognition needs to be considered.

POST-PROCEDURAL INFORMATION NEEDS OF PATIENTS

Patients who have procedures performed on an outpatient basis are expected to perform self-care. A literature review by Peiper et al. examined what information was felt by patients to be the most important for discharge [2]. Within ambulatory surgeries, the topic of pain management and analgesic use was found to be a common concern that was often missed.

A further study by Peiper et al. addressed the knowledge and concerns of patients discharged home with wounds [3]. They found that pain management, wound complications, and recognizing infection were at the top of patients' concerns. Furthermore, a knowledge gap was revealed in that 38.2% of patients did not know the type of dressing used on their wound (wet vs. dry gauze), and 58.7% did not know the cleaning solution (saline, soap, tap water or peroxide) to use on the wound. As well, many of them incorrectly believed that drying out wounds was appropriate management.

Holland et al. examined the problems and unmet needs of patients discharged home for self-care through a prospective cohort study [4]. They administered a questionnaire 1 week post-discharge, and found that the most common concern for surgical patients was knowledge of the recovery process and knowing where to access care if needed.

Therefore, patients who are expected to provide self-care at home have concerns about pain management, recognizing infection, need and access to care, and expectations for recovery. There may be a patient knowledge gap for correct management of wounds. Therefore, an online video could address these gaps in knowledge and potentially improve patient outcomes.

Keywords: skin biopsy, patient education, plastic surgery, video

CURRENT TRENDS IN PATIENT EDUCATION

The current standard in patient education is the use of verbal information along with written instructions. Kruzik examined the trends of pre-operative patient education for elective surgery and found that on top of verbal education, information pamphlets are the most commonly used for expectations of surgery and on post-operative care [5]. A Cochrane review by Johnson et al. examined discharge instructions with the use of written information with verbal instructions versus verbal information only [6]. However, only 2 studies were found to be pertinent to their outcome measures, and both focused on parents caring for children (otitis media (OM) in the emergency department, and a pediatric burn unit). Parental knowledge was measured with questionnaires (burn: 10-item questionnaire at first outpatient follow-up; OM: 7-item questionnaire at discharge, and repeated at 1 and 3 days). Parental knowledge was significantly higher with extra written information in both studies. Parental satisfaction with the discharge instructions was also high in both studies, however only the OM study showed a significant increase with written. As well, one of the studies (OM) suggested that written information might have significantly decreased the number of returns to the emergency department.

There is an increasing trend of using audio-visual media for obtaining informed consent within different specialties [7-9]. Video patient education is also widely used in pre-operative care [10-11]; however, their outcomes focused on measurements such as quality of life and anxiety, and did not include post-operative care education.

The benefits of written materials with verbal instruction enables the patient to bring the instructions home for later reference, and it is the current standard of patient education. Video is not widely used for post-operative education. The patient's level of literacy is not taken into consideration, and details about self-care and recognizing infection are areas that would benefit from video media.

THE USE OF EXTRA MEDIA IN PATIENT EDUCATION

The use of extra media within patient education is hypothesized to promote better outcomes, as patients may forget verbal instructions easily. The Cochrane review by Johnson et al. revealed that written information helps to significantly increase patient knowledge and satisfaction in parents caring for their children [6]. Whitby et al. examined the discharge instructions for surgical patients. The use of oral with pictorial instructions on recognizing surgical site infections (SSIs) was compared with only advice to seek help if worried [12]. Both groups were then followed on a weekly basis by infection control nurses for 1 month and told to report any signs of infection. They found that the educated cohort over-diagnosed SSIs and had a poorer correlation with the nurse's diagnosis of infection compared to the non-educated cohort. Patients in both groups were equally able to identify the criteria for wound infection in a SSI survey at 4 weeks post-op. Based on this study, educating patients on the signs of infection failed to improve the validity of infection diagnosis. However, it is important to note that the surgeries included within this study were chosen based on having expected substantial rates of infection, and included all surgical specialties. Patient education for admitted surgical patients may encourage over-diagnosis of infection in the post-operative period.

Another study by Merle et al. is a randomized controlled trial looking at the use of an information leaflet on surgical site infections (SSIs) within GI surgery [13]. They compared the leaflet group to patients who only received oral instructions at discharge. Patients were then interviewed at 5 weeks post-op to assess information recall on SSIs and satisfaction with education. They found that both groups had similar rates of knowledge recall, with the leaflet group rating higher in satisfaction with education. However, it is also interesting to note that the group with written information also had higher rates of beliefs that SSIs were always preventable, and trended towards higher intention to seek legal action if a SSI occurred.

Although it may appear that educating patients on infection recognition may cause overdiagnosis, patient satisfaction is consistently higher with more education. Also, it can be argued that an increased awareness of wound infection may be good for preventing negative patient outcomes. Furthermore these studies did not examine the use of videotape in wound care and recognition of SSIs within a procedure that is expected to have a lower rate of infection.

VIDEO WITHIN PATIENT EDUCATION

The use of audio-visual media for patient education is not a new concept. A literature review by Gagliano in 1988 looked at 25 articles that examined the use of videotape in patient education [14]. It concluded that video is at least equivalent to traditional methods of patient education (verbal, written) in increasing short-term knowledge. However, it does not offer better retention of long-term knowledge or increased compliance with medical regiments. A noted benefit that video has over traditional methods is the ability to role model for patients. There is a possible benefit from seeing another patient effectively tolerating a procedure, and this can help to decrease anxiety and increase the patient's coping ability. Furthermore, videotape can save a physician time in counselling without compromising the quality of information being delivered. The use of videotape is seen throughout medicine, such as in the management of chronic diseases such as cancer, depression, COPD, diabetes, and asthma.

Within more current uses of videos within patient education, Idriss et al. conducted a randomized controlled trial examining the use of an online video-based platform versus a pamphlet for recognition of melanoma [15]. Ten-item questionnaires were administered at baseline prior to the education, and then repeated at 1 month post-education via telephone interviews. They found that the video group had a significant increase in melanoma knowledge from baseline to one month in compari-

son to the pamphlet group, and the use of video was rated significantly higher in terms of usefulness and appeal by patients.

Video appears to be often used in patient education within dermatology. Armstrong et al. performed a randomized controlled trial examining patients with atopic dermatitis (AD) and the use of an online video versus a written pamphlet on disease severity and patient knowledge [16]. Patient were assessed on AD disease severity with a validated clinical outcome instrument at both pre-education and then at 12-weeks. Atopic dermatitis knowledge at baseline and then at 12-weeks was also assessed. The patients with video education showed a significant improvement within disease severity at 12 weeks. As well, patients within the video cohort demonstrated a significantly greater improvement in AD knowledge compared to the pamphlet group. Patients within the video group also rated their education as significantly more appealing than the pamphlet group.

Beyond patient education on a disease and its chronic management, videos have been used in the pre-operative period to manage patients' expectations and anxiety. A prospective cohort study by Crabtree et al. looked at the use of preoperative video education in non-emergent pulmonary resections compared to verbal and written education [17]. The video explored pre-operative, operative and post-operative expectations, and provided education on post-operative management and exercises. Patients who had video education reported significantly higher satisfaction with the surgical experience, more relief of anxiety, and less pain at rest on the McGill Pain score at discharge compared to controls.

The use of video in patient education is consistently linked to higher patient appeal and satisfaction. Furthermore, video education may be related to increased knowledge recall, and improved patient psychological and physical comfort.

USE OF VIDEO EDUCATION WITHIN SKIN BIOPSIES

The use of video patient education has been studied within skin biopsies. Armstrong et al. performed a randomized controlled trial comparing video-based education versus verbal education on obtaining informed consent and post-procedural wound care [7]. The main outcomes included knowledge pre- and post-biopsy, and patient satisfaction with the education medium. The study included 84 patients who received shave or punch skin biopsies. The study group watched a video to obtain informed consent (detailing why and how a skin biopsy is performed, risks and benefits of the procedure, and what happens to the skin specimen) prior to consenting for the procedure, and then another video after the biopsy on wound care. The control group had the traditional verbal explanation of the procedure to obtain consent, and then verbal explanation of post-procedural wound care. All patients in both groups were given a pamphlet on post-biopsy care to take home. A questionnaire (6 multiple choice questions developed by the staff dermatologists focusing on biopsy purpose, risks, wound care, and signs and symptoms of infection) was completed before any education, and then repeated at the end of the visit. Patient satisfaction with the education was measured with a 10-point visual analog scale. They found that the video group demonstrated a significant increase in knowledge at the end of the visit, but not within the verbal group. Satisfaction within the education was found to be equally high in both methods.

This study suggests that video education is at least as effective (and may be superior) to verbal education in increasing patient knowledge. Furthermore, it is a method of education that is reproducible, timesaving, and may be more appealing and comprehensive to patients with lower literacy.

CONCLUSION

The current standard of patient education post skin biopsies can be greatly improved. With differing levels of patient literacy, the ability to visually demonstrate self-care and signs of infection holds great potential for improving patient outcomes and satisfaction. Further research into the use of video education within specific patient populations (targeting patients with lower literacy level or lower socioeconomic status) may help to elucidate the value of this media. As well, the development of new video platforms (ex. online interactive modules) is a potential route for improving patient education.

As the adoption of patient education videos becomes more prevalent, some basic guidelines for content and delivery will need to be developed and evaluated. The ideal environment for the use of video would be where patients have access to a healthcare professional at the first viewing so that they can ask questions, and are then available for repeated viewing as needed by the patient. For example, an online link could be accessed by the patient in the waiting room, and the link would be given to the patient as part of their post-procedural instructions. Videos should be screened for basic grade 8 level comprehension, and aim to be concise (less than 30 minutes). The physicians using video instruction would be involved with quality control, and ensuring that the videos meet their criteria for patient care. For skin biopsies, the location of the biopsy may necessitate a different set of instructions that would be given to the patient (ex. involving the eyelid vs. the ear vs. scalp). Different videos targeting the care of these special areas would need to be considered.

We believe that having a video adjunct to the patient-doctor interaction would strengthen the relationship, as it enables better patient understanding and can open up opportunities for discussion that may be missed in unidirectional verbal based education. Naturally, the value of video within patient education is seen as a complement, and cannot replace the human interaction between the doctor and patient.

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Cardiovascular Pre-participation Screening for Young Competitive Athletes

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ABSTRACT

This commentary discusses pre-participation cardiovascular screening for young competitive athletes. Canada currently does not have a consolidated document of guidelines for such screening procedure, even though athletes with pre-existing cardiovascular conditions may experience sudden cardiac death (SCD) during intensive training or competitions. How can we balance the safety of athletes while considering the costs of implementing such program and the downstream effects of athletes who may be barred from pursuing their dream sport upon diagnosis? This commentary examines the common causes of SCD, components of the screening procedure, cost-benefit analyses of pre-participation screening, and management strategies upon diagnosis.

RÉSUMÉ

Ce commentaire aborde le dépistage cardiovasculaire chez les jeunes athlètes de compétition avant la participation. Le Canada ne dispose actuellement pas de lignes directrices relativement à ce type de dépistage, même si un athlète qui aurait une affection préexistante pourrait être victime de mort cardiaque subite lors d'un entraînement intensif ou d'une compétition. Comment pouvons-nous équilibrer la sécurité des athlètes et tenir compte du coût pour mettre un tel programme sur pied, puis gérer les effets en aval pour des athlètes qui pourraient être interdits de poursuivre leur rêve sur la réception d'un diagnostic? Ce commentaire aborde les causes courantes de la mort cardiaque subite, les composantes du processus de dépistage, une analyse coût/bénéfice du dépistage avant la participation, de même que des stratégies pour gérer les effets d'un diagnostic.

INTRODUCTION

Recently in the news there have been several cases of young competitive athletes who have collapsed in the middle of their game due to pre-existing cardiac problems. Rich Peverley, a 31-year-old hockey player, collapsed on the Columbus Blue Jackets-Dallas Stars' bench in the middle of the game due to an underlying arrhythmia on March 11th, 2014 [1]. Collapses that lead to sudden death have been vividly captured by the media and have raised concerns in the medical community, as they serve to remind us that even young, healthy athletes can succumb to cardiovascular abnormalities. Each year in Canada, unsuspected sudden cardiac events cause approximately 500 deaths in people under the age of 40 in the general population [1]. For the purposes of this article, competitive young athletes are defined as those in high school or those pursuing post-secondary education, between the ages of 14-22, and participate in any organized or individual sport that demands systematic training and regular competition, and rewards athletic excellence [3]. Sudden cardiac events are the leading cause of non-traumatic sudden death in athletes worldwide [2]. To prevent such devastating deaths at the prime of a young competitive athletes' career, pre-participation cardiovascular screening is a systematic way to identify those who have pre-existing conditions that may lead to sudden death. The American Heart Association (AHA), European Society of Cardiology (ESC), and International Olympic Committee (IOC) have set their own recommendations regarding pre-participation cardiovascular screening [2,3,4]. Most of these guidelines are based on a 25-year-long Italian observational study, as no clinical trials have been done to date [5]. A consensus document of guidelines has yet to be set for young competitive Canadian athletes participating in high school or post-secondary-level varsity sports. For example, at the University of Ottawa, a "certified team doctor annually screens all players during [their] 1-2 week training camp in August before school begins," and there is "more in depth screen for rookie players" [6]. This article will explore the cost-benefit analysis of such screening procedure, as well as management strategies for athletes who have positive results.

Keywords: sudden cardiac death, athletes, cardiovascular screening

CAUSES OF SUDDEN DEATH IN ATHLETES

There are 1101 reported cases of sudden cardiac deaths athletes under the age of 35 from years 1966 to 2004 [1]. Soccer, basketball and running are sports that are most frequently

involved in sudden cardiac death (SCD) [2]. Approximately half of these athletes had congenital anatomical heart disease and cardiomyopathies, and 10% had early-onset atherosclerotic coronary disease [2].

Common congenital anomalies for SCD are anomalous origin of the coronary artery and hypertrophic cardiomyopathy (HCM) [5]. Anomalous origin of the coronary artery is often associated with structural forms of congenital heart disease. HCM occurs when a portion of the myocardium and the septum is thickened, causing dynamic outflow obstruction for blood to enter to systemic circulation. Arrhythmogenic right ventricular cardiomyopathy (ARVC) is the most common type of cardiomyopathy in SCD patients [5]. This occurs when the right ventricle and the subepicardial region of the left ventricle are replaced by fibrofatty tissue, thus increasing the risk of life-threatening tachyarrhythmias. Atherosclerotic coronary disease can lead to death when plaque on the vessel wall breaks off and occludes an important coronary artery that can result in myocardial infarction [5]. Under strenuous exercise, or situations of dehydration or vasodilation that decreases preload to the heart, these pre-existing conditions can cause SCD in asymptomatic athletes.

COST-BENEFIT ANALYSES OF PRE-PARTICIPATION SCREENING

The rationale of cardiovascular pre-participation screening is to identify young competitive athletes who may be at risk of sudden cardiac death. Whether screening is economically justifiable from a public health standpoint is debatable. The incidence of sudden cardiac death among young competitive athletes is about 1 in 50,000 athletes, which is much lower than that of the general population (1 in 300) [8]. Furthermore, there are many different components of a screening protocol that can be very costly. AHA, ESC and IOC all advocate for a cardiovascular history and physical exam for young athletes in college and professional sports (Figure 1), which saves 0.56 life-year per 1000 athletes compared to no screening [9].These first steps can identify cardiomyopathy and other genetic cardiac conditions. Furthermore, AHA and IOC recommend the screening to be supplemented by a 12-lead rest electrocardiogram (ECG) to identify rhythm, conduction and repolarization abnormalities [2,3]. For those between the ages of 18 to 29, ECG screening has a low sensitivity of 46% and an excellent specificity of 100% for familial HCM [11]. Although ECG screening is not very sensitive and may capture some false positives for cardiovascular diseases, it is an effective first step that can save money from conducting an unnecessary workup. Adding an additional ECG test to screen for abnormalities saves 2.06 life years per 1000 athletes at a cost of $42,000 per life-year saved compared to cardiovascular history and physical exam alone after sensitivity analyses [9]. The intervention of ECG would be considered cost-effective, as it is less than the traditional cost-benefit benchmark of $50,000 per life-year gained (approximately the cost of dialysis per year) [10].

IOC also mandates that if cardiovascular history, physical exam and ECG findings are positive, then athletes should be referred to an age-appropriate specialist [2]. The cardiac workup done by the specialist may include an echocardiogram, stress test, 24-hour Holter monitoring, cardiac MRI (CMR), cardiac CT, radionuclide angiogram and electrophysiology studies. These additional investigations are necessary for diagnosis of certain cardiovascular conditions [8]. For example, the definitive diagnosis of HCM is done by echocardiography. However, the diagnostic value of an echocardiogram and ECG for familial HCM is not significantly different from ECG alone. For those between the ages of 18 and 29, the sensitivity only increases by 4% with further screening using echocardiogram, and specificity remains at 100% [11]. If echocardiac images are suboptimal, CMR is recommended for those who have a high index of suspicion for HCM, or alternatively cardiac CT for those who have implantable cardioverter defibrillator (ICD) or pacemakers [12]. Other cardiovascular diseases may also require further testing. The diagnoses of other diseases may also require modalities beyond ECG screening [12]. Coronary artery disease can be ruled out by coronary angiography. Acute aortic dissection can be excluded by transesophageal echocardiography. Genetic tests are newer, more definitive measures of hereditary cardiac conditions. These tests, if added as part of mandatory pre-participation screening for young competitive athletes, can place a stress on Medicare in Canada.

Although the IOC has suggested further workup for young competitive athletes who have positive cardiovascular history, physical exam and ECG findings, Medicare in Canada may not have the necessary infrastructure to support this protocol. In Ontario alone, 498 million Canadian dollars have been spent on echocardiograms from 1992 to 2001 [13]. There is an increasing usage of cardiac technologies over this 10-year span, and a total of $2.87 billion expenditure would need to be invested to meet the cost-benefit benchmark of $50,000 per life-year gained. Although only a handful of athletes would have positive findings that lead to extensive cardiac workup, further cost-benefit analyses should be conducted before implementing mandatory pre-participation screening. These tests, nonetheless, ensure that athletes with underlying cardiovascular conditions are training safely.

MANAGEMENT STRATEGIES AFTER DIAGNOSIS

Despite the benefits of pre-participation cardiovascular screening before admission to a varsity team, it may bring about psychological turmoil to young competitive athlete. There are various management strategies to cope with the diagnosis, such as psychotherapy, maintaining a positive outlook, lifestyle changes and pharmacological interventions. Athletes who are identified at risk are not alone; family, relatives, coaches and teammates are affected as well. Although sudden cardiac death (SCD) does occur, it is not a topic that is discussed casually among friends. In a news article, a father wrote about his feelings towards his son's death from a heat stroke in the middle of a football game in Arkansas. The father had wished that his

son's death would promote the importance of pre-screening that could prevent heart diseases from occurring. Others around who witnessed his son's death had treated this event as a, "freak thing," which is something abnormal and rare [19].

Psychotherapy

Emotional stress plays a factor on athletes who have pre-existing cardiovascular conditions [14]. For example, emotional stress can lead to hypertrophic cardiomyopathies [15]. In addition, athletes who experience anger may encounter spontaneous ventricular and atrial arrhythmias leading to SCD [15]. These athletes may suffer from emotional stress because they are young and otherwise appear healthy, and results from the pre-participation screening can have a negative effect on their dreams of becoming a professional athlete and discourage them from further intense training.

Psychotherapy helps to ease the mental stress for susceptible individuals. Patients with HCM attending specialty clinics demonstrate lower levels of anxiety and depression [14]. Support groups and clinics can also positively influence the mentality of individuals who feel vulnerable. Test results indicating an underlying cardiovascular condition can eliminate a patient's doubt and motivate positive behavioural changes [20]. He or she is now aware to refrain themselves from participating in intense sports. On the other hand, since most SCD in athletes are caused by hypertrophic cardiomyopathies (HCM) that is characterized as a genetic condition, individuals who have this condition place an additional burden on family members to get tested as well. A range of emotion such as fear, guilt, anger, denial, grief and despair can be experienced by family relatives [20].

Lifestyle Modifications

Although young competitive athletes at high risk of cardiovascular disease are encouraged to participate in fewer, less intensive sports, completely withdrawing from physical exercise or a sport may make the situation worse. Those who do so may still experience SCD or other cardiovascular disorders [14], such as changes in rhythm or electrical conduction [18]. Assuring that there will be no abnormalities in rhythm and electrical conduction of the heart, the individual should not feel any chronic pain while engaging in moderate level exercising.

In general, it is common for athletes to follow a strict dietary plan or even consume dietary supplements. However, those with cardiovascular conditions may need to modify their diets after diagnosis. For example, they may need to avoid foods like grapefruit juice that contain flavonoids, which affect the electrical depolarization and repolarization of the ventricles (QT) interval [18].

Maintaining a Positive Outlook

Young competitive athletes who are diagnosed with cardiovascular diseases and at high risk of SCD are prevented from competing in a sport they are passionate about. However, they can still be involved even if they are not recommended to participate in high intense training. Other alternatives involve: coaching, managing the team and training other athletes. These are potential positive outlooks for an individual who is put in such a situation. Regardless if one is affected from cardiovascular disease or not, if we consider coaches and professional trainers as athletes who once competed but had stopped for a certain reason, staying involved and becoming a coach/trainer is one way they keep in touch with the sport that they are passionate about. Coaching help athletes grow and become a part of others' success in winning or accomplishing their goals. Being involved as a coach can help individuals have a positive reflection on themselves.

Pharmacological Interventions

Once an individual has been identified at high risk of SCD, he or she may need to take medications to prevent SCD. For example, calcium channel blockers or beta-blockers are commonly administered to these individuals [15,17]. Many athletes

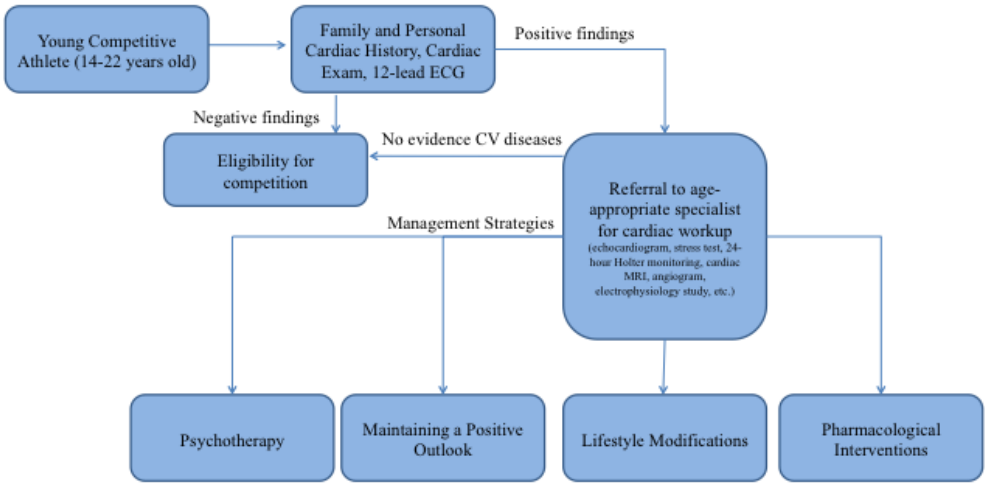

Figure 1: Steps in cardiovascular pre-participation screening and subsequent management strategies.

also use non-steroidal anti-inflammatory drugs (NSAIDs) to treat sports injuries, but there is a lack of knowledge on the cardiac electrophysiological effects of these compounds. NSAIDs can block certain potassium channels; consideration of risks must be taken into account when administering drugs and dietary supplements that may prolong the repolarization of the heart.

CONCLUSION

We believe that some aspects of the cardiovascular pre-participation screening should be conducted in young competitive athletes (between the ages of 14-22 in high school or post-secondary education), so that those with pre-existing cardiovascular conditions can be identified. However, it may not be economically justifiable from a public health standpoint given the low incidence of sudden cardiac death in athletes compared to the general population, marginal diagnostic value of further testing and the consideration that Canada may not have the infrastructure to support such policy. Upon finding the results of pre-participation screening, there are many management strategies to address individuals' emotional stress and risk of developing future cardiovascular events, such as psychotherapy, maintaining a positive outlook and pharmacological interventions. Further investigation should be conducted on the costs of implementing these management strategies.

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Feasibility Assessment for Implementation of Heart Failure Clinical Care-maps using Electronic Medical Records in Primary Practice

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ABSTRACT

Objectives: The primary aim of this project is to evaluate the impact and level of use of Electronic Medical Records (EMRs) by family physicians (FPs) specifically with respect to heart failure (HF) management. This study provides pilot work towards successful implementation of HF clinical caremaps in EMRs to support decision making for FPs.

Methods: A survey questionnaire was sent to 207 FPs from which 42 (20%) replies were received. The survey included questions on demographic information of the FP's practice, specifics about HF patients and their management, EMR use and whether they have improved management in HF patients.

Results: Among the 42 FPs who responded, 39 (93%) practice in the urban area of Hamilton and each have over 10 confirmed HF patients at their family practices, supporting the need for proper management of HF at the primary care level. FPs expressed concerns about difficulty in treating HF preserved versus systolic HF, in managing HF patients with renal insufficiency and difficulty in the use of beta-blockers. There was no consensus on whether EMRs have helped in improving the management of HF patients.

Conclusions: There is a perceived need for management tools that can be integrated into EMRs to provide decision-making support for FPs in managing HF. Tools such as caremaps may help provide optimal care in managing HF patients as per the Canadian Cardiovascular Society guidelines.

RÉSUMÉ

Objectifs: L'objectif principal de ce projet consiste à évaluer l'utilisation des dossiers médicaux électroniques (DME) par les médecins de famille et ses répercussions sur leur pratique, tout particulièrement dans la prise en charge des cas d'insuffisance cardiaque (IC). L'étude est un projet pilote visant la mise en œuvre réussie de cartes de soins cliniques pour l'IC dans les DME afin d'appuyer la prise de décisions des médecins de famille.

Méthode: Un sondage a été envoyé à 207 médecins de famille, dont 42 (20 %) ont répondu. Le sondage comprenait des questions sur les données démographiques relatives à la pratique du médecin de famille, sur les données particulières relatives aux patients souffrant d'IC et leur prise en charge, et sur l'utilisation des DME. Le sondage demandait également si l'utilisation des DME améliorait la prise en charge des patients souffrant d'IC.

Résultats: Des 42 médecins de famille qui ont répondu au sondage, 39 (93 %) pratiquent dans la région urbaine de Hamilton et chacun a 10 patients atteints d'IC confirmés, ce qui appuie le besoin d'une prise en charge adéquate de l'IC dans les services de santé primaires. Les médecins de famille ont exprimé des préoccupations relativement aux difficultés rencontrées pour soigner les personnes atteintes d'insuffisance cardiaque, à la prise en charge de l'IC à fonction systolique préservée par opposition à l'IC systolique, à la prise en charge des patients qui ont une IC s'accompagnant d'insuffisance rénale et qui ont de la difficulté à prendre des bêtabloquants. Il n'y avait pas de consensus si les DME avaient aidé à améliorer la prise en charge des patients atteints d'IC.

Conclusions: Un besoin est perçu pour des outils de prise en charge qui pourraient être intégrés aux DME afin d'appuyer la prise de décisions des médecins de famille dans la gestion des cas d'IC. Des outils tels que des cartes de soins pourraient aider à fournir des soins optimaux dans le cadre de la prise en charge des patients atteints d'IC selon les lignes directrices de la Société canadienne de cardiologie.

INTRODUCTION

It is estimated that heart failure (HF) affects over 500,000 Canadians, and 50,000 new patients are diagnosed each year, contributing to significant mortality and health-care costs [1-4]. Most community-dwelling HF patients in Canada are under the care of family physicians (FPs) [5]. Current evidence-based treatments for HF management are often not fully implemented in clinical practice [6-9]. The Congestive Heart Failure Assessment and Management in Primary Care (CHAMP-C) study was conducted to assess the effectiveness of HF clinical caremaps (a treatment algorithm based on evidence based guidelines - see Figure 1) designed to optimize the use of angiotensin converting

Keywords: electronic medical records, heart failure; family practice/general practice/primary care

enzyme inhibitors (ACE-I), angiotensin receptor blockers (ARB) and beta-blockers in primary care [10]. This study was a cluster-randomized control trial where 53 FPs were randomized to intervention or control group (n = 176 HF patients, mean age: 78, standard deviation: 7). This was a six-month intervention where FPs implemented clinical caremaps based on Canadian Cardiovascular Society (CCS) HF guidelines with the support of a specialized HF nurse [11].

One important finding of the study was that clinical caremaps are most effectively used if primary care practitioners are receiving regular prompts by a HF specialized nurse clinician. Hence, a method is required to improve the prescription of HF therapy in a larger number of family practices using ongoing and timely prompts. This led to the consideration of transforming these paper-based caremaps into an electronic format and implementing them into an electronic medical record (EMR) platform which FPs commonly use. Before implementing these caremaps into EMRs, it is critical to obtain objective evidence for the use of EMRs by FPs for the management of HF.

EMRs provide many advantages over paper based health records including auto population of patient data forms, decreased need for space for physical paper records, automation of many procedures with reduction in errors, e-prescribing and clinical documentation capabilities which may lead to enhanced patient workflow and increased productivity.

Most outpatient electronic modules available to FPs have been developed for the management of other chronic conditions such as diabetes mellitus and hypertension [12-15]. The "Smart" HF Sheet was developed as an EMR based clinical decision-making tool to assist physicians in the outpatient setting, and it provides alerts based on class Ia recommendations of the American Heart Association [16]. However, there is little data on its use and impact on the adoption of HF guidelines in the community. The current tools available to FPs for HF management are quite limited and primarily involve stand-alone paper based/pdf methods. These include the Canadian Cardiovascular Society guidelines [3], and American Heart Association Heart Failure Pathways/Algorithms [17]. The National Institute for Health and Care Excellence (NICE) chronic heart failure pathways [18] offer interactive online modules that can help guide physicians through various steps of the management process but are stand-alone and cannot be incorporated as part of an EMR.

This project provides necessary pilot work towards successful implementation of HF caremaps in EMRs. However, the primary aim of this project and the first step to this successful implementation was to evaluate the level of use and impact of EMRs in the Family Medicine Association of Hamilton (FMAH), Ontario. This project assessed the current level of EMR use, potential future use of EMR, and the advantages/disadvantages of EMRs particularly with respect to managing HF. In addition, it provided information on potential difficulties FPs face on a daily basis in managing HF patients.

METHODS

A survey was sent to 207 FPs within the FMAH. Out of these, 42 (20%) FPs replied. The FPs were reached through an anonymous e-mail list provided by the FMAH. The survey (see Appendix: FP Survey [online at uojm.ca]) was designed specifically for the purposes of this study and has not been validated or pilot tested before. The survey was sent via e-mail as a fillable PDF form and could be returned via e-mail, or printed and faxed. The survey was sent twice during the months of October and November, 2010 to increase response rate. The information received was removed of any identifiers during data retrieval. The McMaster University Faculty of Health Sciences Research Ethics Board approved this project.

The survey included questions regarding demographic characteristics of FP practices including method of payment, whether it is a group practice, and estimated number of total patients per FP. There were more HF specific questions including estimated number of HF patients, use of CCS guidelines, and the most common problems FPs face in manage in HF patients. The subsequent questions were related to EMR use and whether the use of EMRs has improved management of HF patients.

RESULTS

Results are summarized in Tables 1 to 3. Table 1 shows that the large majority of FPs (n=39, 93%) practice in an urban area. 96% (n=40) of FPs have over 1000 enrolled patients and 79% (n= 33) FPs manage over 10 confirmed HF patients in their practice. Table 2 shows that the majority of FPs expressed some difficulty in treating HF preserved versus systolic (n=27, 64%); difficulty in use of beta-blockers (n=22, 52%), and difficulty in treating HF with renal insufficiency (n=26, 52%). 64% (n=27) of the FPs were aware of the CCS guidelines but 74% (n=31) did not utilize these guidelines in their daily practice. In terms of EMR use (see Table 3), the large majority of FPs (n=30, 71%) in our study were using EMRs in their clinical practice. Out of the FPs surveyed who did not currently use an EMR, four were planning to adopt EMRs within the next year. 57% (n= 17) of the FPs had been using EMRs for 5 years or less. The most common barriers to adopting EMR were time commitment towards learning to use EMRs (n=6, 50%), followed by technical barriers (n=3, 25%) and lack of interest (n=3, 25%). There was no consensus in our study on whether EMRs currently have helped in improving the management of HF patients, with only 43% (n= 13) of responses stating that they have helped.

Table 1: Demographic Characteristics for Family Physician (N=42)

	n	%
Large Urban Area >300,000 population	39	93
No fee for service	35	83
Capitated Billing Method	20	48
Family Health Group	11	26
Other	4	9
Group Practice 2 FP or more	30	71
1000 - 1500 patients/practice	17	41
>1500 patients/practice	23	55
10-40 HF patients/practice	26	62
>40 HF patients/practice	7	17
>5 HF patients in long-term care facility	8	19

HF: Heart Failure; FP: Family Physician

Table 2: Heart Failure Management (N=42)

	n	%
Difficulty in treating HF preserved vs. systolic HF	27	64
Difficulty in treating HF with renal insufficiency	26	62
Difficulty in use of beta-blockers	22	52
Difficulty in uptitration of beta-blockers	16	38
Difficulty in titrating/adjusting diuretics	20	48
Aware of the CCS guidelines	27	64
Have not read the latest 2009 or 2010 CCS updates	28	67
Do not use the CCS guidelines in their daily family practice	31	74
Do not use MOHLTC HF management incentive?	34	81
MOHLTC HF management incentive has affected management of HF patients?	8	19

HF: Heart Failure; CCS: Canadian Cardiovascular Society; MOHLTC: Ministry of Health and Long-Term Care

Table 3: Electronic Medical Records (N = 42)

	n	%
Clinical practice uses EMR	**30**	**71**
EMR used - Practice Solutions	18	60
EMR used - OSCAR	5	17
EMR used - P & P	3	10
Used EMR < 5 years	17	57*
Used EMR 5-10 years	8	27*
Used EMR > 10 years	5	17*
Use of EMR has improved management of HF patients	13	43

EMR: Electronic Medical Records; OSCAR: Open Source Clinical Application and Resource; P & P: P & P Data Systems

*The combined percentage is greater than 100% due to round

DISCUSSION

Our results show that many HF patients are managed at the primary care level by the FP. This is in accordance with the previous data presented by Boom et al [8]. This study was conducted in Ontario, Canada and includes 7,634 newly hospitalized HF patients of which 64% were managed by generalist alone, 20% by cardiologist alone, and 16% received consultative care. Ahmed et al. performed a study in Alabama, USA which showed that of 1075 patients, 55% received care from generalist alone, 13% from cardiologist alone and 32% received consultative care [7].

Our results demonstrate that there is a need for tools to help manage complex HF patients at the primary care level. More than half the family physicians surveyed expressed difficulty in treating HF preserved versus systolic HF, difficulty in treating HF with renal insufficiency, and difficulty in the use of beta-blockers. Although EMR is not used by all FPs, it is already adopted by the majority (n=30, 71%), and this number is expected to rise in the coming years. The effectiveness of EMR, particularly in the management of HF patients, may be improved by incorporating clinical decision support tools that provide regular and timely prompts such as electronic caremaps (see Figure 1).

Previous web-based/electronic medical record (EMR) initiatives, including modules for the management of diabetes mellitus and hypertension, show that clinical decision support that is incorporated as part of a multicomponent quality improvement initiative can lead to improvements in clinical outcomes [12-15]. To our knowledge, there have been three previous studies concerning HF management through EMR support. Leslie et al. in two studies discuss the benefits, development, and evaluation of clinical decision support software to support physicians in treating patients with HF [19-20]. These studies highlight the complexity of HF guidelines and the idea that knowledge and expert advice, in addition to guidelines, are required to optimally treat patients. They also mention the need for improving computer skills and integrating clinical decision support software into referral pathways and requests for investigation. They found that general practitioners had lower computer literacy scores than junior doctors and students (both $p<0.01$). In addition, it was felt by most (70%) that the clinical decision support software was more useful than written guidelines. A study performed by Toth-Pal et al. used a guideline-based computerized decision support system to assess FP confidence about diagnosis and treatment of patients with HF [21]. It was found that the FPs' confidence in the diagnosis with the use of the computerized system changed in 25% of the cases, with equal numbers of increases and decreases in confidence. The FPs also considered further investigations in 31% of the cases and medication changes in 19%. Thus, based on previous studies, electronic caremaps incorporated into EMR may be successful in improving care and outcomes for HF patients.

According to a systematic review by Go et al., HF patients in the United States who are followed by cardiologists as opposed to FP are more likely to receive evidence based care and

likely to have better outcomes [6]. It is also shown by Boom et al. and Ahmed et al. that cardiologist involvement in consultation with FPs in managing HF patients leads to better HF care outcomes [7-8]. Patients are more likely to undergo diagnostic procedures, such as echocardiography, have higher rates of utilizing evidence-based pharmacologic therapy, such as beta-blockers or ACE-I, and have lower odds of 90-day readmission. In addition, Tsuyuki et al. previously demonstrated that passive approaches to the dissemination of CCS guidelines for HF have had little impact on the use of ACE-I in HF patients, and further efforts to deliver guidelines are needed [9]. This is where HF caremaps integrated into EMRs to provide support specific to a patient, based on pre-defined evidence-based algorithms, may help FPs to make better decisions or to serve as reminders to update required patient medications.

In terms of EMR use, the large majority of FPs (n=30, 71%) in our study were using EMRs in their clinical practice. A comparison between the results of the 2007 and the 2010 National Physician Survey (NPS) shows that exclusive use of EMRs by physicians across Canada has increased from 10% to 16% and the combined use of EMRs and paper charts by physicians increased from 26% to 34% over 3 years [22]. In addition, the number of FPs using EMRs to manage chronic conditions in the 2010 NPS survey was reported to be 27% [23]. According to Schoen et al., the use of EMRs by FPs in Canada increased from 37% in 2009 to 56% in 2012 [24].

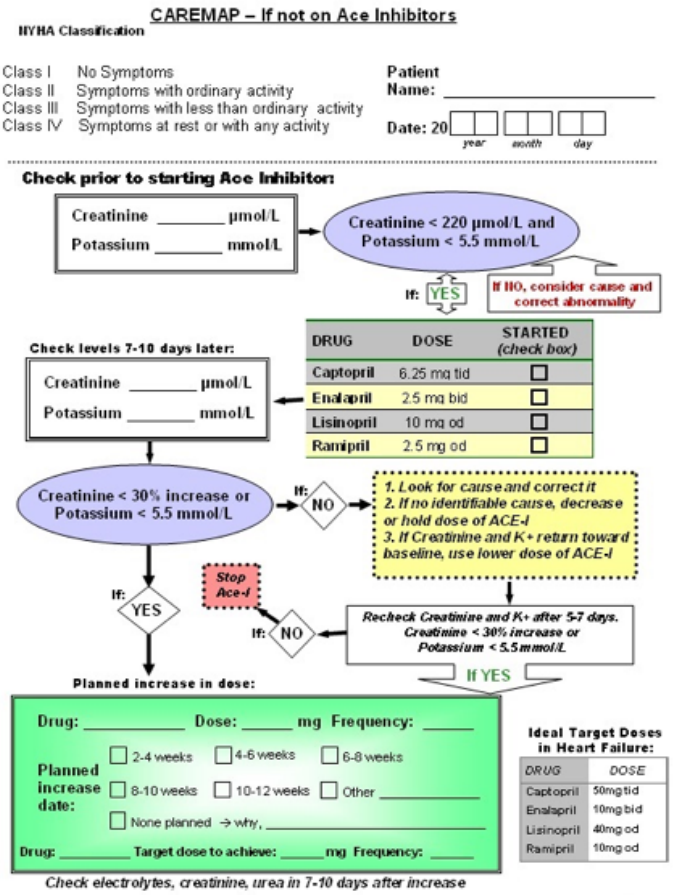

Figure 1: HF Caremap

There was no consensus in our study on whether EMRs currently have helped in improving the management of HF patients with only 43% (n=13) of responses stating that they have helped. The impact of EMR on HF management may be lower than expected due to lack of implemented electronic modules available. In addition, it is a chronic disease and does not have implementation into EMRs of many associated financial incentives such as Ministry of Health and Long Term Care Heart Failure Management Initiative that still remain paper based. This is a critical aspect that shows great potential for improvement through functionalities, such as clinical decision support in HF management for FPs through their respective EMRs.

A limitation of our study is the small sample size, which restricts the generalizability of the results. The low response rate may lend itself to bias by offering more skewed results as a consequence of any outliers in data. Non-response bias may also be a factor as the surveys may more likely be completed by FPs with existing EMRs, hoping for further improvement. In addition, the survey performed was exploratory and not previously formally validated. All the FPs involved in this study were located within the Greater Hamilton Area, which is primarily an urban location. The survey response rate was low at approximately 20%, whereas the generally accepted response rate for surveys is around 30%.

CONCLUSION

In conclusion, we found that a relatively large number of FPs currently employs EMRs, and this number is expected to rise in the coming years. Many HF patients are managed at the primary care level by the FP. Many of the FPs surveyed expressed some difficulty in managing certain HF patients and medications. As such, there is a definite need for management tools that can be integrated into EMRs to provide decision-making support for FPs in managing HF.

This project provides necessary pilot work towards successful implementation of HF caremaps in EMRs. Many of the multimodal approaches for managing HF can be complex to implement, and tools such as caremaps can help provide optimal care as per the Canadian Cardiovascular Society (CCS) guidelines [2]. The great need for optimally managing HF at primary care level also calls for further investigations with larger sample sizes. There is still large potential for improving EMRs for the management of HF patients. Future directions involve performing a survey to gauge interest in electronic caremaps. Alternatively, we may look to implement electronic caremaps in some of the most used EMRs such as Practice Solutions® or OSCAR®, and perform post-implementation surveys.

APPENDIX

FP Survey can be accessed online at uojm.ca.

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Is Next-Generation Sequencing Appropriate for the Clinic?

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ABSTRACT

Next-generation sequencing (NGS) has ignited a revolution in genomic science and presents a new tool for use in the clinical setting. Previous sequencing technologies suffered from inherent limitations in throughput, scalability, and speed, thus restricting this tool to laboratory research. One can now perform exome sequencing as well as whole genome sequencing at a low cost and quickly enough so that it can be used in the clinic to make diagnoses or pre-screen for risk to future disease. Despite its clinical uses, many challenges exist before next-generation sequencing becomes a mainstay in the clinical setting. The largest challenge remains in data analysis. There is a lack of understanding of the impact of genetic variants and mutations on health and disease and how to best apply genetic information to patient care. Multidisciplinary teams including physicians, medical geneticists, and genetic counselors need to be established and be familiar with this technology, both with what it can and cannot offer as well as its technical and ethical challenges. Nevertheless, the translation of base pair reads to clinical applications has truly begun.

RÉSUMÉ

Le séquençage de prochaine génération a déclenché une révolution dans la science génomique et offre un nouvel outil qui pourra servir dans le milieu clinique. La technologie qui était utilisée précédemment pour le séquençage avait des limites inhérentes dans son débit de traitement, son extensibilité et sa vitesse, ce qui limitait l'utilisation de cet outil à la recherche en laboratoire. Il est maintenant possible de séquencer l'exome en plus de procéder au séquençage du génome complet, à faible coût et avec une rapidité suffisante pour que nous puissions l'utiliser en clinique pour établir des diagnostics ou pour le prédépistage des risques ultérieurs de maladie. Malgré son utilité dans le contexte clinique, il reste de nombreux défis à relever avant que le séquençage de prochaine génération ne soit utilisé de façon courante dans le milieu clinique. Le plus grand de ces défis demeure l'analyse des données. Il y a encore beaucoup d'incompréhension quant aux répercussions des variantes et des mutations génétiques sur la santé et sur la maladie. Il faut en outre élucider comment cette information génétique peut être appliquée au soin des patients. Il faut créer des équipes multidisciplinaires comprenant des médecins, des généticiens médicaux et des conseillers en génétique, puis les familiariser avec cette technologie, de même qu'avec ce qu'elle peut faire et ce qu'elle ne peut pas faire. Il faut également les informer des défis techniques et éthiques que cette technologie présente. Il n'en reste pas moins que la transcription des paires de bases pour l'utilisation clinique est véritablement lancée.

INTRODUCTION

DNA sequencing technologies have progressed rapidly in the last decade. The initial sequencing of the human genome cost approximately $70 million dollars and took about a decade to complete [1]. The technology used to complete the Human Genome Project was based on the sequencing method introduced by Sanger in the 1970s [2]. Although this project was a remarkable achievement, the limitations of the technology created a demand for rapid, cost-effective, and accurate DNA sequencing data. In 2004, the National Human Genome Research Institute (NHGRI) sought to fund the development of technologies capable of genome sequencing at a cost of $1,000 within a decade [3]. This initiative led to the emergence of next-generation sequencing (NGS) technologies. The ultimate goal of the initiative by the NHGRI is to reduce the cost of genome sequencing so that it can be implemented into the clinical practice of medicine. Despite ushering a critical and transformative period in the history of DNA sequencing with respect to genomics research, the readiness of NGS technologies for clinical application remains unclear. While studies have demonstrated the clinical application of NGS in diagnosing novel diseases, determining best treatment approaches, and screening for disease-relevant genes, the rapid evolution of these technologies have outpaced the development of other essential resources needed to achieve their full potential.

Keywords: next-generation sequencing; translational medicine; medical ethics

METHODOLOGY OF DNA SEQUENCING

The classical method of sequencing developed by Sanger required several arduous steps, starting with fragmenting the genomic DNA of interest and cloning it into a plasmid vector and transforming E. coli [2]. An amplified template is obtained from the bacterial colony and sequencing reactions for each DNA base are performed in the presence of chain-terminating dideoxynucleotides [2]. The resulting mixture of radiolabelled terminated products is subsequently denatured and run in separate lanes on polyacrylamide gels to separate strands based on size [2]. Finally,

the DNA sequence can be determined by viewing the gel using autoradiography and reading the banding pattern on the gel [2]. This process allows approximately 1,000 bases of sequence to be read per run, making it extremely slow when sequencing the human genome, which has almost 3 billion base pairs [2].

NGS is capable of generating data rapidly by sequencing large amounts of DNA in parallel using various approaches including Illumina sequencing, Roche 454 sequencing, Ion Torrent sequencing, and SOLiD sequencing. Although each platform differs in regards to sequencing biochemistry, they all share similarities in their conceptual design. Firstly, genomic DNA is fragmented and common adapters are ligated [1]. Then an array of immobilized PCR (polymerase chain reaction) colonies is generated according to each platform's unique protocol [1]. This array can then be enzymatically manipulated (i.e. addition of primers and extensions) in parallel and fluorescent labels can be detected with each extension to determine the sequence [1]. The array can be continuously manipulated to build up the entire DNA sequence, allowing sequencing of an entire human genome in less than a day [1].

EXOME VS. WHOLE GENOME SEQUENCING

Only a small percentage of the human genome's sequence is characterized, therefore it is often more effective and less expensive to sequence only the protein-coding regions (i.e. exome) or disease-relevant genes to screen for relevant mutations for the diagnosis and treatment of disease [4]. Due to the smaller region being sequenced in exome sequencing, specific sites of interest can be sequenced multiple times or at a higher depth of coverage [5]. A higher depth of coverage indicates higher accuracy. Although annotated regions are highly accurate, the shorter read lengths in exome sequencing provide less reliable information about the relative location of specific base pairs [5]. For the aforementioned reasons, exome sequencing is only limited to detecting coding and splice-site variants in annotated genes, making it most suitable for highly penetrant Mendelian disease gene identification [6]

While whole genome sequencing is still costly, it is capable of uncovering all genetic and genomic variations as well as discovering functional coding and non-coding variations amounting to approximately 3.5 million variants [5]. Compared to targeted sequencing, whole-genome sequencing has longer reads but with a lower depth of coverage [5]. This makes it more suited for identifying Mendelian and complex trait genes, as well as rare phenotypes caused by de novo single nucleotide variations or copy number variations. Table 1 summarizes the differences between targeted and whole-genome sequencing [7].

Table 1: Exome versus whole-genome sequencing.

	Cost (per sample)*	*Coverage*	*Depth*	*Read Length (10^6 bp)*
Exome	$1,000-$2,000	Small	60x-200x	30-100
Genome	$4,000-$20,000	Large	15x-70x	225-1050

*Presented in US dollars

CLINICAL APPLICATIONS: EXOME SEQUENCING

Several groups have demonstrated the effectiveness of targeted whole exome NGS approaches in diagnosing novel diseases in the clinic. Whole-exome sequencing was used to make genetic diagnoses of congenital chloride diarrhea in a subset of patients showing symptoms of Bartter syndrome, a renal salt-wasting disease [8]. Exome sequencing was performed on six patients who lacked mutations in known genes for Bartter syndrome on site-specific sequencing [8]. The data revealed homozygous deleterious mutations in the SLC26A3 (Solute Carrier Family 26, Member 3) gene for all six patients, suggesting a molecular diagnosis of congenital chloride diarrhea [8]. This diagnosis was later confirmed upon clinical evaluation [8]. Furthermore, whole-exome sequencing was used to make diagnoses in individuals with novel diseases such as childhood intractable inflammatory bowel disease and autoimmune lymphoproliferative syndrome [9,10].

Targeted sequencing strategies have also been successfully used to screen for diseases. For instance, NGS methods are capable of preconception screening of up to 448 severe recessive pediatric diseases that were formerly impossible under single gene testing models [11]. Additionally, targeted NGS have been used to screen panels of cancer genes, in particular for mutations in the breast cancer genes, BRCA1 and BRCA2, in individuals with a family history of breast and ovarian cancer [12].

Another application for targeted sequencing is to characterize the genetic basis of diseases. This approach was used to determine the genetic basis of 10 non-familial pancreatic neuroendocrine tumors [13]. The findings showed that the most common mutations occurred in the following cell cycle regulating genes: MEN1 (multiple endocrine neoplasia type 1), DAXX (death associated protein 6), ATRX (alpha thalassemia/ mental retardation syndrome X-linked), and mTOR (mechanistic target of rapamycin) [13]. These findings are clinically relevant due to the availability of drugs that inhibit mTOR pathways, therefore providing new avenues regarding treatment plans for this disease [13].

CLINICAL APPLICATIONS: GENOME SEQUENCING

Due to the significant decrease in sequencing costs made possible by NGS technologies, re-sequencing entire human genomes from clinical samples is becoming increasingly feasible. Whole genome NGS was used to identify a promyelocytic leukemia – retinoic acid receptor alpha (PML-RARA) gene fusion event, characteristic of acute promyelocytic leukemia, in a patient with an undifferentiated form of leukemia [14]. More significantly this fusion event was identified and confirmed within a week of obtaining a biopsy, thus allowing the physicians to alter the patient's treatment plan suitably [14]. Similarly, both whole-genome and targeted exome sequencing were used to develop and carry out a clinical protocol that identified individualized regions of mutations for tumors from patients with metastatic colorectal cancer and malignant melanoma [15]. Additionally, these tumor mutations were detected within 24 days

of biopsy and allowed the formation of biomarker-driven clinical trials in these types of cancer [15].

Whole genome sequencing can also be used pre-clinically for identifying novel cancer-related genetic abnormalities. Many cancer genomes have been sequenced using NGS providing a wealth of information on mutated processes and gene regulatory networks in different cancers. An exhaustive record of somatic mutations in a malignant melanoma genome revealed mutations linked to previous UV exposure, as well as 470 previously unknown somatic substitutions and 42 previously unknown mutations [16]. Similarly, NGS was used to sequence breast cancer genomes to elucidate the mutation and evolution of primary cancer to metastasis [17]. These findings showed a large deletion as a result of metastasis during disease progression, and 20 previously unknown mutations common to primary and metastatic cancer cells [17].

Cell-free DNA fragments circulating in an individual's bloodstream can also be sequenced using NGS. This non-invasive technique was applied to diagnose an acute cellular rejection following a heart transplant procedure [18]. A diagnosis was made after finding an increased level of cell-free DNA fragments from the donor's genome in the recipient bloodstream, and this was confirmed with an endomyocardial biopsy [18]. These findings relied on high coverage sequencing of cell-free DNA to identify minute amounts of DNA that belonged to the donor's heart [18]. Additionally, NGS was used to sequence cell-free DNA from a pregnant mother's bloodstream belonging to her fetus to detect severe chromosomal abnormalities such as Down syndrome, trisomy 13, and trisomy 18 [19].

ETHICAL CONSIDERATIONS

The biggest challenge in performing whole-exome and whole-genome sequencing on a clinical basis is dealing with the potential of identifying unexpected sequence variants that are unrelated to the primary reason for ordering the sequencing test. The American College of Medical Genetics (ACMG) recommends that laboratories report mutations of 24 highly medically actionable genetic diseases in all subjects, irrespective of age, but excluding fetal samples [20]. It is approximated that 1-3% of NGS tests present such findings and this may fall outside the expertise of the physician who ordered the test [20]. This situation presents an ethical dilemma, as the physician might be held liable if there is a failure to disclose this incidentally detected risk. This is particularly concerning when the patient is a child and the disease in question may only onset in adulthood. A child or their family should not be burdened with this knowledge, as a genetic mutation associated with an adult-onset disease does not accurately predict the development of said disease particularly due to other predictors of such disorders such as environmental factors. On the other hand, the parents and the child can take precautions to prevent the occurrence of this disease provided with preconceived knowledge. Therefore, physicians and staff must be trained and educated suitably to be able to use NGS appropriately and effectively. This necessitates a multidisciplinary team with genetic counselors who can provide medical guidance to patients. Patients must be made aware that NGS testing is not a comprehensive test for all disease-associated variants and that additional specific testing may be necessary to confirm the presence of incidental findings. Furthermore, since genetic information is shared among relatives, genetic variants in one individual may also affect that person's parents, siblings, or offspring. The patient -- and with consent, the patient's family – should be provided with information on the inheritance and penetrance of the condition in question.

Prenatal genetic testing is another area of ethical concern. These tests allow couples to determine if there is a risk that their unborn child will have a genetic condition. Although this may allow the couple to plan for delivery, it also allows couples to decide whether to continue a pregnancy. Similar to the problem with incidental findings, parents must be made aware that prenatal genetic testing does not identify all of the possible gene mutations that can cause a particular condition and that they may have limited predictive value.

PRACTICAL CHALLENGES

Although NGS technologies present many applications in the clinical setting, several practical challenges exist that must be addressed for these technologies to achieve their full potential. NGS approaches produce enormous sequence data sets that range from millions to billions of bases; therefore, their interpretation is not a simple undertaking. The nature of data produced by NGS technologies place substantial demands on computational infrastructure [17]. Generation, analysis, storage, and management of NGS data requires a high-end computing infrastructure with highly trained bioinformatics staff to maintain and run NGS data analysis tools [21]. Cloud computing presents a good alternative to investing in expensive advanced computing infrastructure and allows the easy sharing of information among different clinics, labs, and practices [21].

INHERENT LIMITATIONS OF DNA SEQUENCING

DNA sequencing has inherent limitations in that it does not provide information relating to gene expression or RNA transcript levels. A mutated gene identified via sequencing is not an accurate predictor of mutated proteins. Processes that may affect end-product protein include gene expression, post-transcriptional regulation, epigenetic regulation, protein expression, and post-translational modification. DNA microarray is one technology capable of measuring expression levels of a large number of previously sequenced genes simultaneously [22]. This technology has been mostly replaced by RNA sequencing which is capable of measuring the complete set of RNA transcripts that are produced by an un-sequenced genome either under specific circumstances or in a specific cell [23]. For instance, this technique can be used to distinguish healthy cells from pathological cells by identifying differentially expressed transcripts. Epigenetic regula-

tory systems, including DNA methylation, histone modification, and non-coding RNA associated gene silencing, are recognized as big determinants of gene expression [24]. Epigenetic changes have been shown to be predictors of several diseases and these changes can be detected using methylation sequencing or chromatin immunopreciptation sequencing (ChIP-Seq) [24]. previously sequenced genes simultaneously [22]. This technology has been mostly replaced by RNA sequencing which is capable of measuring the complete set of RNA transcripts that are produced by an un-sequenced genome either under specific circumstances or in a specific cell [23]. For instance, this technique can be used to distinguish healthy cells from pathological cells by identifying differentially expressed transcripts. Epigenetic regulatory systems, including DNA methylation, histone modification, and non-coding RNA associated gene silencing, are recognized as big determinants of gene expression [24]. Epigenetic changes have been shown to be predictors of several diseases and these changes can be detected using methylation sequencing or chromatin immunopreciptation sequencing (ChIP-Seq) [24].

DIRECT-TO-CONSUMER TESTING

As sequencing prices continue to plummet, commercial laboratories began to market to the public personalized testing of an individual's genome, regardless of whether there was a medical indication for such a test. These direct-to-consumer tests do not provide pre-test counseling which can help the individual understand the limitations of the test. Interpretation of results and post-test counseling are essential to provide meaning to the information provided to the individual. The ACGM strongly recommends that a certified medical geneticist or genetic counselor be involved in the process of ordering and interpreting such tests [25]. Unfortunately, the continued increase in the speed, decreases in cost, and the ability to perform it on samples easily collected at home will make direct-to-consumer genetic testing more prevalent in the near future [25]. Government oversight might be necessary to restrict or regulate the public's access to such services.

CONCLUSION

The evidence provided demonstrates the promise and dramatic effect of NGS on the diagnosis of genetic conditions. Because of advances in NGS techniques, parents may have the option in the foreseeable future to have their child's genome sequenced at birth to enable unprecedented health management and personalized care. The progress that has been made recently in the field of NGS is very encouraging, but certain challenges must be overcome in order for it to be used routinely in the clinic. The largest challenge is one of data interpretation. There is a lack of understanding of the impact of genetic variants and mutations on health and disease. Finally, there is lack of physician and patient understanding on how to implement genetic information for health benefits. Better education in genetics, as well as better tools are required for an effective integration of genetic data into the practice of medicine. Despite these obstacles, there are many examples of successful implementation of NGS in the clinic and it is only a matter of time before genetic medicine is an integral part of clinical care.

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Endovascular Stenting for Idiopathic Intracranial Hypertension

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ABSTRACT

Transverse sinus stenosis (TSS) is often observed in patients with idiopathic intracranial hypertension (IIH). Studies show that symptoms of IIH can be resolved by transverse sinus stenting. We report a case of a 39-year-old woman who presented with several weeks of progressive headaches and visual disturbances. Ophthalmologic examination demonstrated papilledema and imaging features confirmed the diagnosis of IIH. The need for interventional management was necessitated by the preceding failure of several months of medical treatment. Her vascular imaging demonstrated stenosis of the transverse sinus and her intracranial venous pressure measurements indicated elevation with a high pressure gradient across the stenosis. She underwent transverse sinus stent placement across the stenotic segment. After this intervention, her symptoms improved and her intracranial pressure normalized. The imaging follow-up revealed efficacious patency of the stent. Based on a mathematical model, we suggest that a Starling-like resistor demonstrating a collapsible transverse sinus can permanently be replaced by a rigid-walled sinus upon employment of an endovascular stent in the stenotic transverse sinus, preventing the recurrence of IIH. This novel method of transverse sinus stenting provides a less invasive, effectual alternative to other high-risk surgical procedures currently used for IIH patients.

RÉSUMÉ

La sténose du sinus transverse (SST) est souvent observée chez les patients souffrant d'hypertension intracrânienne idiopathique (HII). Des études démontrent que les symptômes de l'HII peuvent être résolus avec l'installation d'endoprothèses (stents) dans le sinus transverse. On signale le cas d'une femme de 39 ans qui souffrait depuis plusieurs semaines de céphalées progressives, accompagnées de troubles de la vue. L'examen ophtalmique a démontré de l'œdème papillaire et l'imagerie a confirmé le diagnostic d'HII. L'échec du traitement médical durant plusieurs mois a nécessité une prise en charge interventionnelle. Son imagerie vasculaire a démontré une sténose du sinus transverse. La mesure de la pression veineuse intracrânienne indiquait une hypertension démontrant un gradient de pression à travers de la sténose. On a installé une endoprothèse dans le segment sténosé du sinus transverse. Après l'intervention, ses symptômes se sont améliorés et sa pression intracrânienne s'est normalisée. L'examen de suivi par imagerie a démontré la perméabilité efficace de l'endoprothèse. En fonction d'un modèle mathématique, nous suggérons qu'une résistance de type Starling démontrant un sinus transverse collabable pourrait être remplacée en permanence par un sinus rigide en installant une endoprothèse vasculaire dans le sinus transverse sténosé, prévenant ainsi la récurrence de l'HII. Ce nouveau modèle d'installation d'une endoprothèse dans le sinus transverse est un choix moins invasif et plus efficace que les autres méthodes chirurgicales à risque élevé qui sont utilisées actuellement auprès des patients souffrant d'HII.

INTRODUCTION

Idiopathic intracranial hypertension (IIH) is a syndrome of elevated spinal fluid pressure, in the absence of any tumors or other diseases [1]. Numerous associations related to the occurrence of IIH have been established [1,2], including stenosis of the transverse sinus [3]. The transverse sinus, located at the base of the brain, is one of the venous sinuses that form the major drainage pathway from the brain to the internal jugular vein. Since the cerebrospinal fluid (CSF) drains into the transverse sinus, narrowing or 'stenosis' of this venous channel causes fluid backup and elevates the CSF pressure (intracranial pressure - ICP). This increased ICP, if left untreated can lead to damage of the optic nerve, resulting in blindness. The diagnosis of IIH typically includes swelling of the optic disc (papilledema) and an increased CSF opening pressure during the lumbar puncture, in the absence of mass lesions [1]. Although the disease does occur in men and older women, most of the IIH patients are obese women of childbearing age presenting with symptoms such as nausea, vomiting, headache, and visual disturbances. While the prognosis is generally good, the principal morbidity associated with this disease is vision loss [4,5]. Although the pathophysiology of raised ICP in IIH remains unclear, numerous mechanisms have been proposed, including augmented rate of CSF production, prolonged increase in intracranial venous pressure, decreased rate of CSF absorption by arachnoid villi, and an increase in brain volume [6,7].

The primary focus of the treatment of IIH is uphold-

Keywords: idiopathic intracranial hypertension (IIH), transverse sinus stenosis (TSS), endovascular, stent, intracranial pressure (ICP), headache, papilledema, cerebrospinal fluid (CSF), Starling-like Resistor, neuroradiology

ing optic nerve function while normalizing the ICP, initially with drugs that reduce CSF production (such as Acetazolamide), combined with dietary counseling for weight loss. In patients with severe symptoms, or intolerance/poor response to standard medical therapy, CSF diversion procedures are used. These surgical procedures comprise of implantation of a shunt that allows excess CSF to be drained into another part of the body. Lumboperitoneal (LP) shunts divert the CSF from the spinal space of the lower back into the abdomen. Ventriculoperitoneal (VP) shunts channel the CSF from the brain ventricles into the abdomen [8]. Nevertheless, just as any surgical procedure, shunts can lead to many complications including shunt dislocation, infection, and intracerebral hemorrhage. In addition, up to 64% of VP/LP shunts fail within 6 months and re-operation is common for recurrence of papilledema due to high CSF pressure. Despite the poor surgical results, these procedures have endured due to lack of alternatives for the treatment of IIH [9,10].

Recently, numerous studies have demonstrated that a great percentage of IIH patients have transverse sinus stenosis (TSS). Moreover, direct manometry of the stenotic transverse sinus has shown elevated venous pressures in the superior sagittal and proximal transverse sinuses, and a significantly reduced venous pressure in the distal transverse sinus, with a pressure gradient across the TSS [11-13]. Normal transverse sinuses are collapsible segments susceptible to stenosis, either due to extrinsic compression (smooth steady narrowing), an intrinsic obstruction resulting from intraluminal filling defects (more focal eccentric narrowing), or a combination of both [14]. Irrespective of the source of the stenosis, findings suggest that TSS can be both a cause and a consequence of IIH. Although removing or diverting the CSF resolves the stenosis [15], TSS can persist in IIH patients even after normalization of CSF pressure. Furthermore, intrinsic obstructions such as arachnoid granulations can be seen in the transverse sinus on computerized tomography venography (CTV) and magnetic resonance venography (MRV) scans of patients without IIH [16]. IIH has been predicted on the basis of a mathematical model (see discussion) to compress the collapsible transverse sinus, resulting in venous outflow obstruction and causing additional venous hypertension, which then minimizes CSF absorption and promotes further increase in the ICP. This supplementary increase in the ICP constitutes a positive feedback loop causing further compression of the transverse sinus [17].

A new surgical procedure known as transverse sinus stenting for IIH patients has been reported in a few studies, with the largest one conducted by Ahmed and colleagues in 2008 [14]. In this study, 49 out of the 52 IIH patients who were unresponsive to maximum medical treatment were cured of their symptoms as a result of transverse sinus stenting. Placing a stent into the stenotic transverse sinus abolished the TSS pressure gradient, normalized the ICP, and resolved IIH symptoms. The risks associated with this procedure were much lower than other surgical options, suggesting a safer and more efficient alternative to the current CSF shunting procedures [14]. Based on the literature discussed, we hypothesized that, as an alternative to LP/VP shunting, precisely positioning an expandable stent across the narrowed portion of the transverse sinus will allow blood to drain more freely, relieve the CSF pressure, and alleviate IIH. Here, we report a patient with IIH successfully treated by an endovascular stent placement in the stenotic transverse sinus, and discuss the mathematical model that highlights the rationale for this new method of treatment.

CASE

A 39-year-old woman presented to her family doctor with several weeks of progressive headaches and visual troubles. Her ophthalmologic examination demonstrated papilledema. Further imaging and lumbar puncture were performed confirming the diagnosis of IIH. Her CSF opening pressure measured by lumbar puncture was severely increased (41mmHg) as compared to a normal pressure of below 20-25mmHg. Since the patient started but was not able to tolerate Acetazolamide for various reasons, interventional management procedures such as LP/VP shunting, as well as transverse sinus stenting, had to be considered. Her vascular imaging demonstrated focal stenosis of the right transverse sinus and an underdeveloped, or hypoplastic, left transverse sinus. She underwent retrograde intracranial venous manometry that revealed abnormal pressures in the venous sinuses and a high-pressure gradient of more than 8mmHg across the stenosis (Figure 1). After balancing the risks and benefits for all therapeutic options, it was decided that the patient was a suitable candidate for transverse sinus stenting across the stenotic segment. Two wall stents measuring 9x40mm and 7x40mm were placed as shown in Figure 2. The procedure was uneventful and the patient recovered well. After this intervention, there was a significant improvement in her headaches, papilledema, and CSF pressure. Moreover, her long term imaging follow-up with dynamic CT venogram showed efficient patency of the stent (Figure 3). The patient required dual antiplatelets therapy for 3 months to avoid in-stent thrombosis or stenosis.

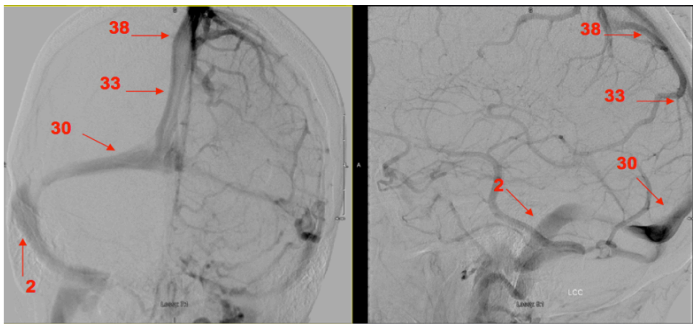

Figure 1: Antero-posterior and lateral view on venous phase cerebral angiogram demonstrating left TS hypoplasia and right TS stenosis. Pressure values (shown in red) obtained via retrograde intracranial venous manometry in superior sagittal sinus, proximal and distal TS are shown. Note the significant pressure gradient (30 mmHg to 2mmHg) across the right TSS. TS; transverse sinus. TSS; transverse sinus stenosis.

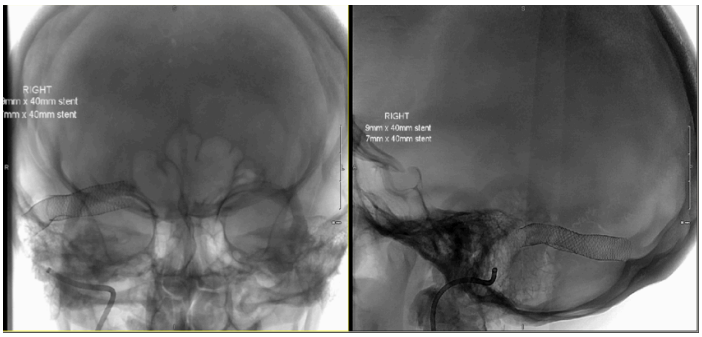

Figure 2: Crane X-Ray antero-posterior and lateral view showing placement of stents within the right transverse sinus.

DISCUSSION

Patients with IIH are frequently diagnosed with papilledema and increased CSF without any mass lesions [1], and they often have stenosis of either both or only the dominant transverse sinus, along with venous hypertension [3,11]. The emphasis during treatment is on perpetuating optic nerve function while stabilizing the ICP. Surgical procedures such as CSF shunting, despite their high risks, are habitually employed on IIH patients with severe symptoms. We used a novel method called transverse sinus stenting as an efficient and a minimally invasive alternative to improve IIH symptoms in a patient. As proposed in Figure 4, a mathematical model of intracranial pressure dynamics provides a basis for sinus stenting in IIH. This model consists of three compartments: proximal transverse sinus, brain/CSF, and distal transverse sinus. A key component of the model is a Starling-like resistor that consists of a flexible tube (collapsible transverse sinus) inside a pressurizable chamber (brain/CSF compartment). As the pressure inside the chamber (intracranial pressure) elevates, the tube (sinus) compresses, and the resistance of fluid (venous blood/CSF) flow through the tube increases (Figure 4A). The tube will collapse at a point where the pressure in the tube becomes critically less than the pressure in the chamber.

In the presence of a Starling-like resistor (a collapsible transverse sinus) under normal pressure conditions, alterations in the intracranial environment such as an upsurge of cerebral blood flow or an infusion of CSF, elevates the ICP and leads to the collapse of the resistor, in other words, stenosis of the transverse sinus. This ultimately generates a transition from a disease-free condition to a higher-pressure IIH condition. Similarly, changes such as a decline in CSF production or removal of excess CSF by shunting lead to a transition from a disease state back to a normal ICP state. However, the stenosis of the collapsible sinus can return by further perturbations in the intracranial environment. We suggest that the incorporation of an endovascular stent in the stenotic transverse sinus is modeled by elimination of the collapsible Starling-like resistor and the constitution of a rigid-walled sinus (Figure 4B). This rigid-walled (stented) transverse sinus is now no longer prone to collapse by further distresses in the intracranial environment and thus prevents the recurrence of IIH by permanently interrupting the positive feedback loop discussed earlier.

This procedure is performed in the angiography suite, using X-ray and iodine contrast (radiographic dye). When placement of an intravascular device, such as a stent, is necessary, the patient requires several months of blood thinner therapy (usually dual antiplatelets therapy). Contraindications of this procedure are related to the presence of an intravascular device and contrast intolerance. Thus the main contraindications are pregnancy, previous history of venous thrombosis and X-ray contrast allergy. Patients are screened for inclusion criteria and contraindications before having the intervention.

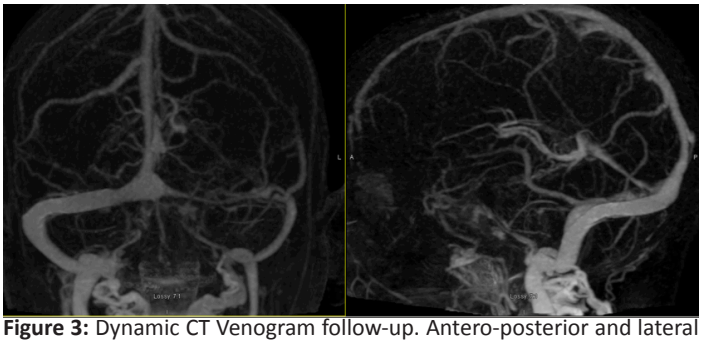

Figure 3: Dynamic CT Venogram follow-up. Antero-posterior and lateral view demonstrating normal caliber of the right transverse sinus after stent placement with no in-stent stenosis.

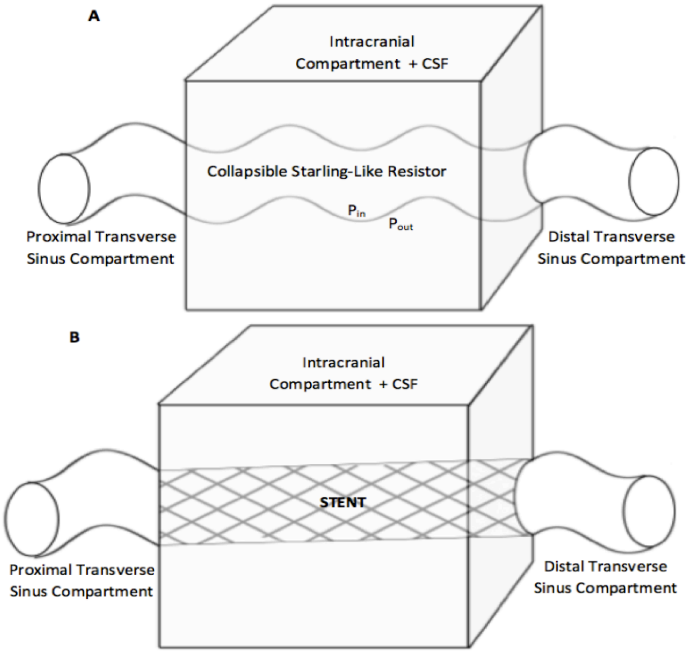

Figure 4: Model of Intracranial Pressure Dynamics for Transverse Sinus Stenting in IIH. **(A)** Three compartments described as proximal sinus, intracranial structures and CSF (boxed), and distal sinus, as well as a collapsible sinus as Starling-like resistor is shown. **(B)** Endovascular stent in the transverse sinus modeled by eliminating the Starling-like resistor resulting in a rigid-walled sinus unsusceptible to further perturbations.

CONCLUSION

We propose that if an IIH patient is being considered for a CSF diversion procedure, and has a TSS with significant pressure gradient, then transverse sinus stenting could be considered as an alternative. The results of this case study, if validated through larger future prospective studies, have the potential to provide interventional neuroradiologists with a primary, low-risk interventional method for IIH treatment.

CONSENT

Both oral and written informed consent were obtained from the patient for publication of this case presentation.

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The Early Signs of Sympathetic Ophthalmia

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ABSTRACT

Sympathetic Ophthalmia is a rare form of form of bilateral, non-necrotizing granulomatous uveitis that may develop after ocular injury. This is a case of sympathetic ophthalmia in a 31 year old man presenting five months after a penetrating globe injury to his left eye. Vision loss in the right eye was unexpected and the patient's uveitis became refractory to prednisone treatment. The patient was successfully treated and his uveitis remains quiet with combined methotrexate and prednisone therapy. This case was well documented with fluorescein angiography and fundus photography throughout the treatment course and highlights early findings of the disease for clinicians and learners.

RÉSUMÉ

L'ophtalmie sympathique est une forme rare d'uvéite granulomateuse bilatérale non nécrosante qui peut se manifester après une lésion oculaire. Le cas d'ophtalmie sympathique présenté s'est manifesté chez un homme homme de 31 ans, cinq mois après qu'il ait subi une blessure pénétrante du globe oculaire. La perte de la vision dans l'œil droit était imprévue et l'uvéite du patient est devenue réfractaire au traitement avec de la prednisone. Le traitement combiné avec du méthotrexate et de la prednisone a été un succès et l'uvéite du patient reste silencieuse. Ce cas a été bien documenté à l'aide de l'angiofluorographie et de la photographie du fond de l'œil tout au long du traitement. Il illustre bien les premières constatations de la maladie pour les cliniciens et les apprenants.

INTRODUCTION

Sympathetic ophthalmia (SO) is a rare form of bilateral, non-necrotizing granulomatous uveitis that is associated with ocular injury to the "exciting eye", and the contralateral eye, known as the "sympathizing eye", developing posterior inflammation. [1,2]. In severe cases this inflammation can progress to optic nerve swelling and exudative retinal detachment, resulting in legal blindness [1,2]. SO has an incidence of 0.03 per 100,000 in the general population and 0.5% after a penetrating ocular injury [2]. First-line medical treatment for SO involves high dose systemic steroids tapered over 2-3 months to a maintenance dose [3,4]. If a patient demonstrates a lack of response to treatment, steroid-sparing immunosuppressive medications, such as Cyclosporine, Cyclophosphamide, and Azathioprine, can be used [3,4].

CASE PRESENTATION

A 31 year old man presented with decreased vision OD five months following a traumatic globe rupture OS. Despite a primary globe rupture repair and later a pars plana vitrectomy with silicone oil and laser retinopexy, the eye had no light perception OS (Figure 1). He described an insidious onset of blurred vision OD with photophobia and orbital pain at the site of trauma. The best-corrected visual acuity (BCVA) was 20/25 OD, there were 2+ cells and 2+ flare in the anterior chamber (AC), and vitreous OD had no cells and no flare.

Keywords: sympathetic ophthalmia, Methotrexate, uveitis

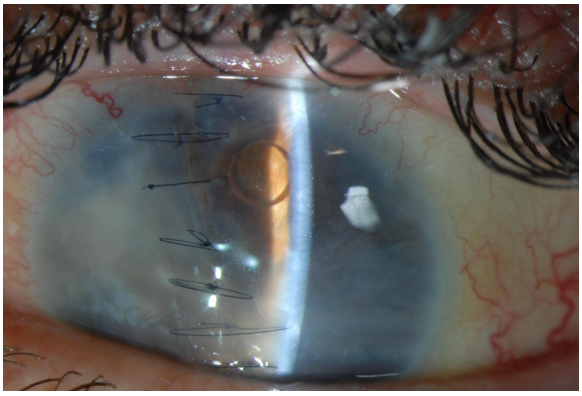

Figure 1: Left eye of a patient following primary closure and a vitrectomy with silicone oil infusion.

Multiple subretinal lesions were noted on funduscopy (figure 2) (Topcon TRC-50DX). Fluorescein angiography (IVFA) (Topcon TRC-50DX) showed discrete subretinal lesions, primarily in the macula and inferior retina, with early hypofluorescence, late hyperfluorescence, and leakage from the optic disc. The left eye could not be assessed because of the prior traumatic injury, dense cataract, and corneal sutures. SO was suspected because of panuveitis in the right eye with anterior segment inflammation and mild vitritis, with a history of penetrating trauma to the left eye. Prednisone 1 mg/kg/d was started with a tapering dose over

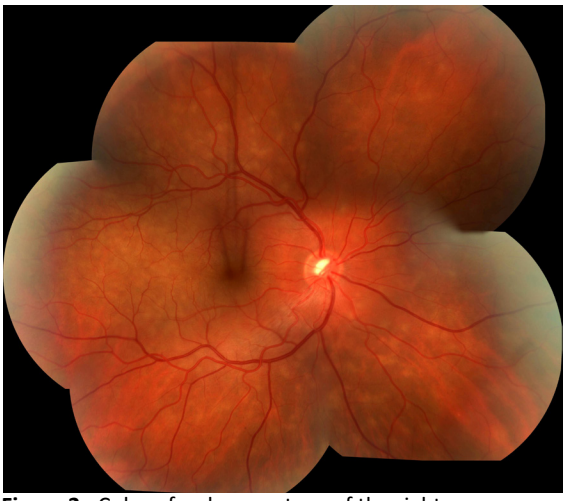

Figure 2: Colour fundus montage of the right, sympathizing eye showing early choroidal inflammatory lesions throughout the fundus, suggestive of Dalen Fuchs nodules.

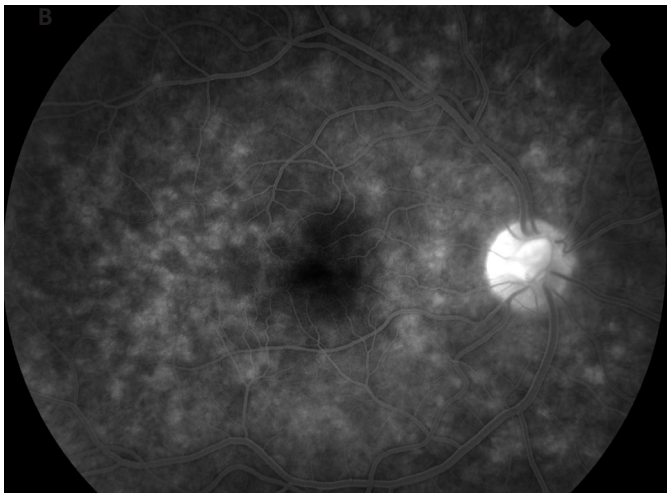

Figure 3: Fluorescein angiography, venous phase, right eye, with systemic prednisone showing choroidal hyperfluorescence and late optic disc leakage as angiographic signs of ocular inflammation (panuveitis).

two months, in addition to prednisolone every 2 hours OU. Seven months following globe rupture, the patient had decreased vision with BCVA of 20/30 and 0.5+ cells in the AC OD. A repeat IVFA showed a similar pattern of choroidal lesions and optic disc leakage (Figure 3) (Topcon TRC-50DX; 35˚).

Prednisone was started in combination with methotrexate (MTX) and folic acid supplementation. One month later, the patient's BCVA improved to 20/20 OD and there was no inflammation. IVFA showed resolution of hypo- and hyperfluorescent lesions OD (Figure 4) (Topcon TRC-50DX; 35˚). Six months later, the patient was able to taper off of the corticosteroid and his ocular inflammation remains in remission, with no chorioretinal lesions after four months of follow-up on MTX alone (Figure 5) (Topcon TRC-50DX; 35˚).

DISCUSSION

We present a case of a patient who developed SO and decreased vision five months following a penetrating globe injury OS. The recent globe injury OS and the discovery of choroidal lesions, which were likely early Dalen-Fuchs nodules, resulted in a high clinical suspicion of SO and early implementation of therapy. After initial remission of the panuveitis, the recurrence of inflammation was treated with prednisone and a steroid-sparing agent, MTX. The use of long-term immunomodulatory therapy, such as Cyclosporine, Azathioprine, Mycophenolate, Chlorambucil, Cyclophosphamide or MTX, in addition to corticosteroids, has been reported in cases where uveitis did not respond to corticosteroids alone [5]. Intravitreal steroid injections of triamcinolone acetonide, fluocinolone acetonide implants, and infliximab have also been used to control uveitis in cases of SO [1].

MTX hinders the production of thymidylate via inhibition of dihydrofolate reductase, and it has a disproportionate effect on rapidly dividing cells, such as leukocytes [4]. Dihydrofolate reductase is essential for the production of purines

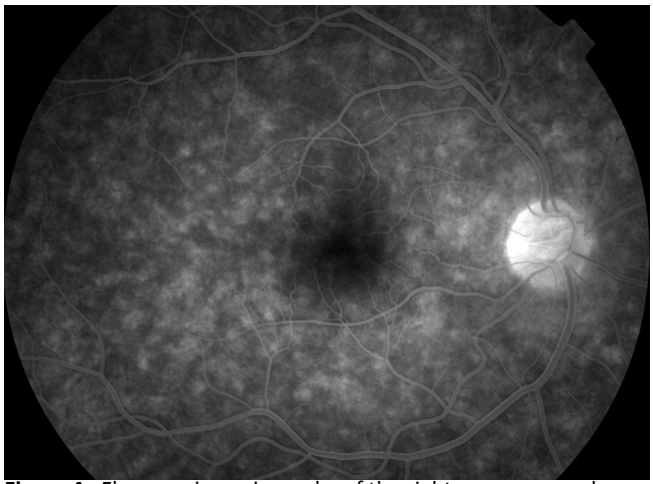

Figure 4: Fluorescein angiography of the right eye, venous phase, after one month of combined MTX-prednisone therapy showing early resolution of chorioretinal lesions and a reduction of optic disc edema.

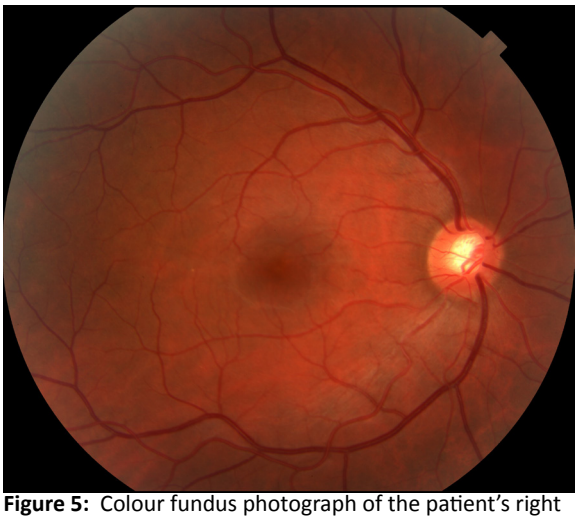

Figure 5: Colour fundus photograph of the patient's right eye after methotrexate therapy showing clinical resolution of inflammatory chorioretinal lesions.

and thus its inhibition can affect DNA replication. Treatment of non-infectious ocular inflammation is a common off-label use of MTX [1,4,5]. This patient's uveitis relapsed following tapering of oral corticosteroid and was then controlled with oral MTX. The dose of MTX was within the range previously reported and was increased from an initial dose of 10 mg to the therapeutic dose of 15 mg, with ongoing therapy. [4] Remission of inflammation and a resolution of chorioretinal lesions were noted after four weeks of combined therapy.

CONCLUSION

SO is a vision-threatening disease that must be identified and treated promptly to improve prognosis and prevent blindness. This case highlights and documents early findings in SO, and the importance of an early diagnosis and treatment in preventing vision loss. Dalen-Fuchs nodules are characteristic feature of SO, but appear only in 25% to 35% of cases [6]. These nodules begin as a deposit of macrophages in the early phase, but later are primarily composed of lymphocytes and non-functional retinal pigment epithelium [7, 8]. MTX was originally developed as chemotherapy for and remains a mainstay of the treatment of cancer [1,4,5]. The increased susceptibility of fast-dividing cells, such as lymphocytes, to the inhibition of dihydrofolate reductase, makes MTX a treatment option for non-infectious ocular inflammation [4]. Severe uveitis with pain and photophobia following a history significant for ocular surgery or trauma, should raise the suspicion for SO.

LIST OF ABBREVIATIONS

SO - Sympathetic ophthalmia
OU- Both eyes (oculus uterque)
OS - Left eye (oculus sinister)
OD - right eye (oculus dexter)
BCVA - Best Corrected Visual Acuity
IVFA - Fluorescein angiography
MTX - Methotrexate

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White Coat over a Blue Gown: Perspectives and E-management Tips from a Medical Student with Diabetes

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ABSTRACT

Mainstream technology has become a vital component of the medical world. Along with it comes the advent of electronic applications for chronic management, particularly diabetes mellitus. As a medical student with type 1 diabetes, I provide here a brief overview of advancements in diabetes self-management.

RÉSUMÉ

La technologie courante est devenue un élément essentiel du monde de la médecine. Celle-ci nous apporte des applications électroniques qui facilitent la prise en charge de maladies chroniques, plus particulièrement le diabète sucré. En tant qu'étudiante atteinte de diabète de type I, je vous fournis ici un aperçu des progrès accomplis dans l'autogestion du diabète.

Diabetes mellitus is rapidly climbing in prevalence worldwide [1]. With it comes the many complications of macrovascular and microvascular damage that impacts the healthcare system. As a result of this, diabetes management has become a priority for Canadian physicians. Medical students find the name "diabetes" prominent in their lectures, and are taught the guidelines for diabetes management. Nonetheless, medical students and many healthcare providers do not receive training on how to make management easier and user-friendly, in the way that e-management tools can. This experience, however, is different when you are a medical student living with diabetes.

I was diagnosed with Type 1 diabetes in the summer of my "sweet sixteen", which I always found a cruel irony. As broken as I felt, I managed to build myself back up and make health a priority, where my interest in medicine bloomed. My condition has helped me understand the intricate metabolism of the body, the importance of compassion for the impact of chronic illness, the delicate nature of breaking bad news, and, most critically, the importance of glucose management to prevent the complications of diabetes.

One of the largest contrasts between the separate generations of diabetes patients is the popularity of the insulin pump. My HbA1c hovered above 7% until I encountered the Animas 2020, the latest insulin pump at the time. I would have to say that choosing to go on the insulin pump, despite the initial 2 weeks of checking my blood sugar 10 times per day (including at 3 am), was the best decision of my life. With ongoing technological advancements, insulin pumps are becoming more desirable. The latest insulin pumps feature wireless technology, where the glucometer acts as a remote control to the insulin pump, such as the OneTouch Ping (the model I currently use). There are also tubeless systems (for example, the OmniPod), and continuous glucose monitoring (CGM), where a glucose sensor communicates with the insulin pump to deliver multiple glucose readings throughout the day [2,3]. Furthermore, an artificial pancreas is in development that will combine a CGM system with an insulin pump capable of delivering insulin and glucagon automatically [4]. However, the majority of those with diabetes still use glucometers, which have also modernized. Examples include the Bayer Contour USB meter, which is a glucometer that is part USB key for quick download onto a computer [5], and the iBGStar, an app and accessory that turns the iPhone into a glucometer [6].

As advanced as glucometers are, many patients with diabetes find it tedious to write every blood glucose measurement of the day in a tiny logbook. I would often delay the assessment of my blood glucose measurements in order to find trends, as the work became tiresome and time-consuming. This was until I discovered the many at-home programs where meters can be downloaded to produce digital logbooks and summaries that can be sent to healthcare providers, an example (and my favourite) being Diasend [7].

In addition to glucometer-downloading applications, there are other electronic tools that can help patients manage their diabetes. Exercise and healthy eating have become much easier for

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all patients. My favourite tool is Calorie King, an iPhone app that provides nutrition information from almost every food and food chain, making carbohydrate-counting on-the-go much easier.

Healthcare providers can use their iPads and electronic applications to diagnose their patients and look up information quickly on the wards. They should also take the opportunity to show their patients how they can medically help themselves using technology. Being aware of these tools helps healthcare providers in their roles as health advocates, as well as clinicians, allowing their patients to optimally self-manage. Therefore, if you are a healthcare provider, the next time you see a patient with diabetes, pull out your iPad and say, "Let me show you a great app…".

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