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# UOJM

***UNIVERSITY OF OTTAWA JOURNAL OF MEDICINE***

# JMUO

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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 run by students.

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 géré par les étudiants au Canada.

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**Address:**
University of Ottawa Journal of Medicine
Journal Médical de l'Université d'Ottawa
451 Smyth Rd
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K1H 8M5



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# UOJM Article Award

UOJM has always seeked to give a platform to students and researchers to disseminate high quality manuscripts. This goal and the growth of the journal would not be possible without the dedication and contribution of the authors who choose to submit to UOJM. Research can be an arduous task, with both challenging and gratifying moments. However, it is essential to advancing knowledge in any field. Whether it is a review paper or an original research article, authors have the heavy task of supplementing existing literature with their own valuable perspectives.

Starting with this issue of the UOJM, the editors are establishing the "UOJM Article Award" in recognition of the outstanding works submitted by our authors. Key criteria for selection of the article include scientific merit, rigorous design and methodology, originality, significance, timeliness, and clarity of writing style, as applicable.

After careful review of all articles selected for publication in Issue 10.1, we are pleased to announce the following papers as the winner of the inaugural "UOJM Article Award":

**"Implications of Striatal Dopamine Signalling for Schizophrenia" by Alexander Simmons**

**"5 Strategies to Facilitate the Development of Physician-Scientists during Undergraduate and Postgraduate Medical Education Education" by Mimi Deng et al.**

**Editors-in-Chief**
Melissa Phuong
Hao Wang

# Prix de l'article de UOJM

UOJM a toujours eu pour but d'offrir aux étudiants et aux chercheurs une plateforme afin de partager des articles de recherche de haute qualité. Nous n'aurions pu atteindre cet objectif et UOJM n'aurait pu croître ainsi si ce n'était pour le dévouement et la contribution de nos auteurs qui nous ont choisi. La recherche peut être une tâche laborieuse qui présente à la fois des défis ainsi que des moments gratifiants. Par contre, cette dernière est essentielle à l'avancement des connaissances au sein de n'importe quel domaine. Qu'il s'agisse d'un article de synthèse ou d'un article de recherche original, les auteurs ont la lourde tâche d'enrichir la littérature déjà existante avec leurs propres perspectives si précieuses.

Débutant avec cette édition de UOJM, l'équipe éditoriale a créé le "Prix de l'article de UOJM" en reconnaissance des travaux exceptionnels soumis par nos auteurs. Les principaux critères de sélection de l'article incluent le mérite scientifique, la rigueur du design et de la méthodologie, l'originalité, l'importance clinique, l'actualité du sujet et la clarté du style d'écriture, le cas échéant.
Après une revue minutieuse de tous les articles sélectionnés pour publication lors de l'édition 10.1, nous avons le plaisir d'annoncer que les articles suivants ont remporté le premier "Prix de l'article de UOJM" :

**« Implications de la Signalisation de la Dopamine Striatale dans la Schizophrénie » par Alexander Simmons**

**« 5 Stratégies pour Faciliter le Développement de Médecins Scientifiques dans l'Enseignement Médical de Premier et de Troisième Cycle » par Mimi Deng et al.**

***Rédacteurs en chef***
Melissa Phuong
Hao Wang


# UOJM Reviewer Award

The publication of high-quality manuscripts cannot be achieved without the contribution of dedicated peer reviewers. High-quality peer reviews are critical to the publication process, as they provide constructive feedback to authors to help improve their manuscripts. The UOJM editorial team is enormously thankful to all of our reviewers who have volunteered to participate in the peer review process for UOJM. Their time and efforts have been integral to the editorial process, helping to ensure that the quality and standards that define UOJM are upheld for every issue.

We are honouring two outstanding reviewers with the UOJM Reviewer Award. Key criteria for selection of award recipients included being readily available for peer review when invited and submitting constructive reviews in a timely manner that were demonstrative of critical appraisal. Upon careful review of all peer reviewers, we are pleased to announce Chloé Thabet and Soroush Shahryari Fard as the recipients of the UOJM Reviewer Award. Congratulations and well done, Chloé and Soroush!

**Managing Editor**
Faizan Khan

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La publication de manuscrits de haute qualité ne pourra pas être achevéesans la contribution d'évaluateurs de pairs dédiés. Des évaluations par les pairs de haute qualité sont critiques pour le processus de publication, afin de fournir de la rétroaction critique aux auteurs pour aider à améliorer leurs manuscrits. L'équipe éditoriale du JMUO est énormément reconnaissante de tous nos évaluateurs qui se sont présentés comme bénévoles pour participer dans le processus d'évaluation par les pairs du JMUO. Leurs temps et leurs efforts ont été intégrants au processus éditorial, en aidant à assurerque la qualité et les standards qui définissent le JMUO sont soutenus dans le présent numéro.

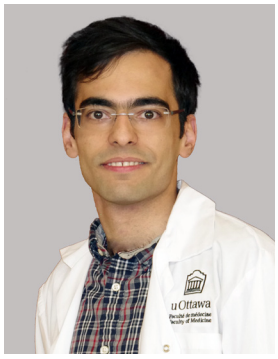
Nous honorons deux évaluateurs exceptionnels avec le prix Évaluateur du JMUO. Les critères pour la sélection des récipiendaires comprennent être disponibles régulièrement pour l'évaluation par les pairs quand inviter, et soumettre des évaluations constructives qui démontrent une estimation critique dans un délai raisonnable. Après une considération prudente de tous nos évaluateurs, nous sommes fiers d'annoncer comme récipiendaires Chloé Thabet et Soroush Shahryari Fard pour le premier prix Évaluateur du JMUO. Félicitations et bravo, Chloé et Soroush!

**Chef d'édition**
Faizan Khan

***Rédacteurs en chef***
Melissa Phuong
Hao Wang

**Chloé Thabet**
***MD Candidate, University of Ottawa***

I'm a PGY1 in Internal Medicine at the University of Ottawa. In particular, I'm passionate about medical education and research in palliative care. Outside of work, you can find me hiking or cycling by the Ottawa River.



**Soroush Shahryari Fard**
***MSc. Biochemistry with Specialization in Bioinformatics, University of Ottawa***

Soroush is a Master's student co-supervised by Dr. Mathieu Lavallée-Adam and Dr. Theodore J. Perkins. His research involves identifying biomarker for intraductal carcinoma of prostate using a machine learning algorithm and mass spectrometry imaging. He is also a member of Ottawa DOM-NFP which aims to advance healthcare by linking medicine, business, and technology, and he is currently involved with developing a machine learning model to predict Chronic Kidney Disease in order to prevent unplanned dialysis. Outside of research, his interest includes playing violin, reading non-fictions, watching movies, and listening to classical Persian music.

The University of Ottawa's Journal of Medicine

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# UOJM: Preface

When we spoke to you in the last issue, the world was ravaged by the ongoing pandemic, COVID-19. Several months have passed since then, and this has definitely been a challenge for everyone. We want to reiterate our appreciation for all the frontline workers, including all the physicians, residents and medical students, who have supported us during the pandemic. Your work is instrumental. Thankfully, there is some good news. Advancements have been made to the detection and treatment of this novel disease. Multiple vaccines have been approved for use in Canada, and it is hopeful that the population will be fully vaccinated by the summer.

This past September, we sat down with Dr. Virginia Roth, The Ottawa Hospital's Chief of Staff to discuss a number of topics, including her career path, the ongoing pandemic, and advice for medical trainees. While our discussion was some time ago, the insights she shared remain as timely as ever. Both the recording and transcript are available on our website and in this current issue, respectively. While it's unfortunate that there weren't any in-person UOJM talks this year due to the pandemic, we are grateful for all the work by the UOJM education team who has managed to transition many of the activities online.

Finally, we want to utilize this issue to welcome the new UOJM Co-Editors-in-Chief, Zacharie Saint-Georges and Omar Dewidar. Zach and Omar previously served as indispensable members of the UOJM academic and editorial teams as section editors. They have been quick to dive in their new roles as Editors-in-Chief and we look forward to the talent and new ideas that they will bring to UOJM in the coming year. Their most notable ideas to date include the first edition of the UOJM National Commentaries Contest, the addition of faculty members as Expert Reviewers in UOJM's peer review process, and the implementation of continuous online publication. We also want to thank our returning Managing Editor, Faizan Khan, and Publication Director, Sarah LaFramboise, both of whom have so wonderfully decided to stay on for another year. Their work has been irreplaceable in the previous issues and they will be a great resource for the new team.

WIth that, we want to thank our readers again for a wonderful year. It has been an absolute pleasure for us to serve as Editor-in-Chiefs, and we are grateful for the opportunity. We would like to give a big round of thank you to the executive and editorial teams who we worked with over the past year. Please stay safe everyone!

**Melissa Phuong and Hao Wang**
***UOJM 2019-2020 Editors-in-Chief***

# JMUO: Préface

Lorsque nous nous sommes parlé lors de la dernière édition, le monde avait été ravagé par la pandémie de la COVID-19 en cours. Plusieurs mois se sont écoulés depuis, et cela a certainement été un défi pour nous tous. Nous tenons à réitérer notre reconnaissance envers tous les travailleurs de première ligne, y compris tous les médecins, résidents et étudiants en médecine qui nous ont soutenus pendant la pandémie. Votre travail est essentiel. Heureusement, il y a de bonnes nouvelles. Des progrès ont été réalisés dans la détection et le traitement de cette nouvelle maladie. L'utilisation de plusieurs vaccins a été approuvée au Canada et nous espérons que la population sera entièrement vaccinée d'ici l'été.

En septembre dernier, nous avons rencontré Dre. Virginia Roth, médecin-chef de l'Hôpital d'Ottawa, afin de discuter d'un certain nombre de sujets dont son cheminement de carrière ainsi que la pandémie en cours, et elle a gracieusement offert des conseils aux stagiaires en médecine. Bien que notre discussion ait eu lieu il y a quelque temps, les idées qu'elle nous a partagées sont toujours aussi pertinentes. L'enregistrement et la transcription de notre discussion sont tous deux disponibles sur notre site internet et au sein de cette édition respectivement. Bien qu'il soit regrettable qu'il n'y ait pas eu de conférences du JMUO tenue en personne cette année en raison de la pandémie, nous sommes reconnaissants pour tout le travail de l'équipe d'éducation du JMUO qui a réussi à transitionner de nombreuses activités en ligne.

De plus, nous souhaitons profiter de cette édition pour souhaiter la bienvenue aux nouveaux corédacteurs en chef du JMUO, Zacharie Saint-Georges et Omar Dewidar. Zach et Omar étaient auparavant des membres indispensables des équipes académiques et éditoriales du JMUO en tant que rédacteurs de section. Ils ont rapidement plongé dans leurs nouveaux rôles de rédacteurs en chef et nous nous réjouissons du talent et des nouvelles idées qu'ils apporteront au JMUO dans l'année à venir. Leurs idées les plus remarquables à ce jour comprennent la première édition du Concours National d'Articles Commentaires du JMUO, l'ajout de membres du corps professoral en tant qu'évaluateurs experts dans le processus d'évaluation par les pairs du JMUO, et la mise en œuvre d'une publication en ligne continue. Nous tenons également à remercier notre directeur de la rédaction, Faizan Khan, et notre directrice de publication, Sarah LaFramboise, qui ont tous deux si merveilleusement décidé de rester pour une année supplémentaire. Leur travail a été irremplaçable lors des éditions précédentes et ils seront de grande aide pour la nouvelle équipe.

Enfin, nous tenons à remercier une nouvelle fois nos lecteurs pour cette merveilleuse année. Ce fut un plaisir absolu pour nous de servir en tant que rédacteurs en chef et nous sommes reconnaissants de cette opportunité. Nous tenons à remercier chaleureusement les équipes de direction et de rédaction avec lesquelles nous avons travaillé au cours de l'année écoulée. Restez en sécurité et soyez prudents !

**Melissa Phuong et Hao Wang**
***UOJM 2019-2020 Rédacteurs en chef***

# Implications of Striatal Dopamine Signalling for Schizophrenia

Keywords: Schizophrenia; Striatum; Dopamine Signalling; Optogenetics

**Alexander Simmons**[1]

[1]Faculty of Medicine, University of Ottawa, Ontario, Canada

## ABSTRACT

Our understanding of striatal dopamine function has come a long way since the inception of the dopamine hypothesis of schizophrenia. Advances in this field have largely been contributed by the technique of optogenetics and have in turn helped provide a neural basis for the motivational-salience theory of psychosis. Studies of striatal dopamine function have proven to be a promising area of research with important implications for our understanding of schizophrenia and its treatment.

## RÉSUMÉ

Notre compréhension de la fonction striatale de la dopamine a beaucoup avancée depuis le début de l'hypothèse de la dopamine dans la schizophrénie. Les avancées dans ce domaine ont été largement apportées par la technique de l'optogénétique et ont, à leur tour, contribué à fournir une base neurale pour la théorie de la motivation-salience de la psychose. Les études sur la fonction striatale de la dopamine se sont révélées être un domaine de recherche prometteur avec des implications importantes pour notre compréhension de la schizophrénie et de son traitement.

## INTRODUCTION

Schizophrenia is a chronic and debilitating psychotic disorder, with a prevalence approaching 1% internationally. It is among the most disabling and economically disastrous medical disorders and is ranked by the World Health Organization as one of the top 10 illnesses contributing to global burden of disease (1). Dopamine (DA) dysfunction is central to the underlying pathophysiology of schizophrenia. Excessive DA signalling in the mesolimbic pathway, which projects from the ventral tegmental area in the midbrain to the ventral striatum, is thought to mediate the positive symptoms of schizophrenia, including hallucinations and delusions. Conversely, reduced DA signalling in the mesocortical pathway, which projects from the ventral tegmental area to the prefrontal cortex, is thought to mediate the negative and cognitive symptoms of schizophrenia, including poverty of speech, apathy and inattention to social or cognitive input (2).

D2 receptors are G-protein coupled receptors, which bind DA, and are implicated in several neuropsychiatric disorders, including schizophrenia. Antipsychotic medications exert their effect via D2 receptor antagonism, thereby reducing the positive symptoms of schizophrenia. Thus far, antipsychotics have remained limited in their ability to target the negative and cognitive symptoms of schizophrenia.

Recent studies have demonstrated significant variation in DA signalling across the striatum. The striatum is a subcortical structure in the midbrain that modulates neuronal input to the basal ganglia. It consists of the dorsal (i.e., caudate, putamen) and ventral (i.e., nucleus accumbens) striatum and is implicated in regulating motor behaviours as well as responding to rewarding and aversive stimuli (3). In schizophrenia, DA release has been shown to be increased in the dorsal striatum, where it is associated with positive symptoms, and reduced in the ventral striatum, where it is associated with negative symptoms (3). Optogenetics is a biological technique, which uses light to control neurons that have been genetically modified to express light-sensitive ion channels. Optogenetics has enabled the selective targeting of striatal DA neurons to enable functional connectivity analyses, which has allowed for the study of these neurons at a synaptic level (2). Importantly, optogenetic studies of striatal DA function have shown promise in advancing our understanding of the pathophysiology and treatment of schizophrenia.

## PRE-SYNAPTIC REGULATION OF DOPAMINE SIGNALLING

The striatum is divided broadly into associative, sensorimotor and limbic domains, based on the source of excitatory input (4). There is significant variation in DA signalling across these three domains, based on the location of the neuron within the striatum and the specific post-synaptic target. Pre-synaptic regulation of excitatory input has been shown to modulate DA neuron signalling (5). This modulation of synaptic transmission has long-term effects on motivational salience, vigor and social behaviour (6). These behavioural effects, particularly those involving motivational salience, have important implications for schizophrenia, which are discussed later in the text. Modulation of DA signalling is, in part, facilitated by co-transmission with glutamate and GABA. Our current model of schizophrenia involves reduced cortical DA release, leading to increased activity of glutamatergic neurons and increased striatal DA synthesis and release (7). There are a number of genetic risk factors that act on these upstream pathways, particularly the glutamatergic system. Impaired glutamatergic regulation of midbrain DA neurons may make them more vulnerable to acute psychosocial stressors (7). This is in keeping with the diathesis-stress model, which posits an interaction between inherent genetic vulnerability and environmental stressors in the etiology of schizophrenia.

Co-transmission of glutamate with DA is thought to mediate DA neuron fast actions. This is supported by the finding that monosynaptic DA neuron excitatory connections depend on the expression of vesicular glutamate transporter 2 (VGLUT-2) (8). Most DA neurons also co-release GABA, which is loaded into vesicles by vesicular monoamine transporter 2 (VMAT-2) (9). Co-transmission with glutamate and GABA greatly increases the diversity of DA-neuron synaptic signalling. These co-transmitters can either excite or inhibit post-synaptic cholinergic interneurons and spiny projection neurons. Spiny projection neurons are the primary cell type in the striatum, and release GABA at their synaptic terminals (10). Cholinergic interneurons are another cell type in the striatum, which are implicated in reward-predicting stimuli and may play a role in learning (10). Co-transmission with glutamate and GABA plays an important role in encoding phasic firing patterns (i.e., a transient response to a stimulus followed by accommodation) throughout the striatum (10).

Imaging studies have identified pre-synaptic striatal DA dysfunction during the prodrome (i.e., early phase) of schizophrenia, suggesting that it is associated with the development of psychosis (7). DA release is mediated by vesicular loading, a process that demonstrates diversity across the striatum. Vesicular loading is performed by VMAT-2 and is regulated by VGLUT-2 (11). VGLUT-2, which mediates glutamate co-transmission, also mediates vesicular DA release via vesicular synergy (12). Vesicular synergy refers to a process by which packaging, and release of DA is enhanced by co-transmission with glutamate. Vesicular synergy in VGLUT-2-expressing DA neurons has been implicated in reward processing (8). The role of vesicular synergy in DA release is believed to be most prevalent in the nucleus accumbens, which is an important part of the brain's reward circuitry (10). Reduced reward-pathway signalling could be implicated in some

of the negative symptoms of schizophrenia, including avolition (i.e., lack of motivation) and anhedonia (i.e., inability to feel pleasure).

## DOPAMINE NEURON FIRING

Dysfunctional DA release in schizophrenia can also be attributed to abnormalities in DA neuron firing. This firing depends on both intrinsic membrane properties as well as synaptic inputs (13). There is significant variation in both membrane conductance and synaptic input throughout the striatum. In mouse models, DA neurons alternate between tonic and phasic firing, and this is determined by synaptic inputs (10). Tonic firing refers to a sustained neuronal response, which activates during the course of a stimulus. Whereas phasic firing refers to a transient response with one or several action potentials at the onset of a stimulus, followed by accommodation. The regularity and frequency of pacemaker firing (i.e., firing in the absence of synaptic input) is controlled by differences in membrane conductance (14). The slow membrane potential oscillations that drive pacemaker firing differ between substantia nigra and ventral tegmental area neurons (13). The substantia nigra projects to the dorsal striatum via the nigrostriatal pathway and the ventral tegmental area projects to the ventral striatum via the mesolimbic pathway. The variations in slow membrane potential oscillations between these two pathways produce complex patterns of burst firing (i.e., intermittent discharge of rapid action-potential sequences) throughout the striatum. There is a gradient of decreasing burst firing from the ventral tegmental area to the lateral substantia nigra (15). Small-conductance calcium-activated potassium channels are a family of calcium-activated potassium channels that generate slow membrane potential oscillations in DA neurons (16). The expression of these channels follows a gradient that closely matches the gradient of burst firing frequency (16). These channels may therefore regulate the excitability gradient observed across striatal DA neurons. It is possible that differences in tonic and phasic DA release in the ventral and dorsal striatum contribute to the increased DA transmission in the associative striatum (10).

Pre-synaptic acetylcholine (ACh) receptors also contribute to regional variations in DA transmission across the striatum and may be implicated in schizophrenia (17). These nicotinic receptors mediate the balance between tonic and phasic firing of DA neurons (18). Enhanced DA neuron burst firing in the dorsal striatum may draw attention to less salient cues in individuals with schizophrenia (19). Saliency is defined as the extent to which an environmental cue stands out from others. Identifying salient environmental cues is a key component of attentional awareness, by focusing cognitive resources on the most pertinent sensory information. Inability to distinguish between salient and non-salient environmental cues has been proposed as a mechanism underlying psychosis. Low-level phasic DA release in the ventral striatum may also contribute to disturbances in salience signals (19). This could explain the inattention to social and cognitive input that underlies the negative symptoms of schizophrenia. Activation of nicotinic ACh receptors on DA neuron terminals has been shown to increase DA release by a single action potential and limit DA release by subsequent action potentials (20). Disruptions in these patterns of DA release could interfere with the appropriate assignment of salience to various environmental cues.

## ROLE OF DOPAMINE SIGNALLING IN REWARD PROCESSING & MOTIVATIONAL SALIENCE

Research has demonstrated that there is extensive variation in DA signalling throughout the striatum. A theoretical framework that relates abnormal DA signalling to psychosis must be developed if the implications of this research are to be understood. The role of DA in reward processing has often been linked to psychosis. The firing of midbrain DA neurons is known to be associated with reward prediction (19). In this process, the DA system is activated when novel rewards are encountered or when well learned associations are broken (21). This information is encoded via burst firing of DA neurons in the limbic regions and subsequent phasic release of DA (21).

The DA system is also involved in long-term regulation of motivational salience. Motivational salience is the process by which reward-associated stimuli become conspicuous and guide goal-directed behaviour (19). Abnormal DA-mediated motivational salience has been hypothesized as a mechanism underlying psychosis (19). Typically, DA mediates the experience of novel stimuli and the appropriate development of motivational salience. In schizophrenia, the DA system is dysregulated, and DA is released regardless of the environmental context.

Therefore, in psychosis, the DA system drives an abnormal sense of novelty and inappropriate assignment of salience to internal and external stimuli (19). This theoretical framework can be used to explain the positive symptoms of schizophrenia. Delusions can be thought of as cognitive explanations used to understand experiences which are inappropriately assigned novelty or salience (19). In the case of thought insertion (i.e., the feeling that one's thoughts are not their own), individuals with schizophrenia may attempt to explain the abnormal salience of their thoughts by ascribing them to an outside source (22). Hallucinations are thought to result from the abnormal salience of internal stimuli, such as language or memories (23).

The abnormal-salience model can also be used to explain the mechanism of antipsychotic action. By blocking DA transmission, antipsychotics may be able to reduce the abnormal salience of the individual's experiences (19). By reducing salience, individuals with schizophrenia are gradually able to extinguish the cognitive frameworks that they developed to make sense of their experiences. However, the salience of all experiences is diminished, including the salience of normal motivational drives (23). By reducing normal salience signals, antipsychotics may actually worsen the negative symptoms of schizophrenia. For example, blockade of DA in the ventral striatum may impair motivation and affective processing (7). Increasing the synaptic specificity of antipsychotics within the striatum could represent one way to improve their efficacy in targeting both the positive and negative symptoms of schizophrenia.

## CONCLUSION

Optogenetic studies have allowed for the selective targeting of striatal DA neurons, facilitating functional connectivity analyses, and elucidating much variation in striatal DA signalling at the synaptic level (10). We now know that DA signalling involves co-transmission with glutamate and GABA within distinct striatal regions. Additionally, variations in pre-synaptic receptors, vesicular loading and DA neuron firing contribute to heterogeneity within the striatum. These developments in our understanding of the striatum have helped to provide a neural basis for the motivational-salience theory of psychosis. As our understanding of the complex pathophysiology of schizophrenia continues to advance, we get closer to uncovering novel therapeutic targets. Our current antipsychotic therapies are effective in treating the positive symptoms of schizophrenia yet remain limited in their ability to treat the negative and cognitive symptoms. Therapeutic targets outside of D2 receptor antagonism may be required if the negative and cognitive symptoms of schizophrenia are to be targeted directly. Further research is also required if the underlying disease process of schizophrenia is to be elucidated. Optogenetic studies of dopamine signalling have helped to further our understanding of the complex processes taking place in the striatum at a synaptic level, and may represent one way forward in advancing our understanding of schizophrenia and its treatment.

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# Global Health Disparities: A Pressing Issue and a Student-based Initiative to Help

**Keywords:** Philanthropy, Global Health, Student Initiative, Foreign Donation, Resource Poor Countries

**David Ripsman[1], Philip Chkipov[1], Kelsie Ou[1], Isabel Shamsudeen[1], and Mehr Jain[1]**

[1]Faculty of Medicine, University of Ottawa, Ontario, Canada

## ABSTRACT

Developing countries, such as India, suffer profound healthcare disparities compared to developed countries. This commentary explores these healthcare disparities, the barriers to improving healthcare in developing countries, and potential solutions to address these barriers. As an example of a medical student initiative, we highlight a not-for-profit organization that we started with a group of University of Ottawa students, Heart 2 Heart: International Healthcare Relief. Heart 2 Heart provides students at Ontario Universities an opportunity to support the health of low-income individuals in India, Morocco, and Bangladesh.

## RÉSUMÉ

Les pays en développement, tels que l'Inde, souffrent de profondes disparités en matière de soins de santé par rapport aux pays développés. Ce commentaire explore les disparités en matière de soins de santé, les obstacles à l'amélioration des soins de santé dans les pays en développement et offre des solutions pour y remédier. À titre d'exemple d'initiative d'étudiants en médecine, nous mettons en évidence une organisation à but non lucratif que nous avons créée avec un groupe d'étudiants de l'Université d'Ottawa, « Cœur à Cœur : Aide internationale en matière de soins de santé » (soit « Heart 2 Heart : International Healthcare Relief »). Cette initiative offre aux étudiants des universités de l'Ontario l'opportunité de soutenir la santé des personnes à faible revenu en Inde, au Maroc et au Bangladesh.

One afternoon in a hospital in rural Rajasthan, India, a family rushed their 22-year-old son, Arjun, to the hospital*. A team of doctors and nurses were waiting for him at the door. Four hours earlier, his family found him paralyzed from a stroke. Arjun was rushed upstairs to the only ward in the hospital. There was a frenzy of activity around him, with healthcare staff using every intervention available in an attempt to save this young man's life. However, many healthcare services in India must be paid out-of-pocket. Arjun's family was poor and could not afford the expensive medication that would dissolve the clot in his brain. After three days of treating him with supportive measures, a doctor had a heart-breaking conversation with Arjun's family. There was sadly no longer any hope for Arjun's

recovery. There was no choice but to remove him from life support, and he tragically passed away. Arjun's tragic and preventable death is a commonplace occurrence in a system where many die from preventable or treatable illnesses (1).

## THE SCOPE OF HEALTHCARE INEQUALITY IN INDIA

India has a shockingly low average life expectancy of 69 years, in contrast to 82 years in Canada (2). India's life expectancy is higher than the average life expectancy for low-income countries of 63 years (2). However, death due to preventable or treatable diseases is a major contributor to India's low life expectancy. Like Arjun, a staggering 2.4 million Indians die of preventable or treatable conditions every year (1). For example, cardiovascular disease (CVD) accounts for 25% of all mortality in India. However, the vast majority of CVD patients are not on any evidence-based secondary prevention therapies (aspirin, beta blockers, angiotensin-converting enzyme inhibitors, statins) because patients cannot afford to pay out-of-pocket for them (3). Many of the problems with the Indian healthcare system stem from a simple reason: it is grossly underfunded. India spends only 5% of its annual gross domestic product (GDP) on healthcare, a far cry from Western countries, where the expenditure is often more than 10% of GDP (4). As a result, access to healthcare services in India is extremely limited, and many services lack appropriate equipment, healthcare staff, and medications (4). Only 22% of public healthcare centers have adequate supplies of necessary drugs in India (4). Consequently, much of the burden for healthcare payments falls on individual families; more than 3.1 million households in India are forced below the poverty line each year by their hospital fees (1).

## HEALTHCARE DISPARITIES WITHIN CANADA

With such overwhelming disparities present in India as well as many other countries, it may feel more constructive to focus on our own backyard first. Despite increased public awareness and advocacy efforts, healthcare discrepancies across regions and demographics in Canada still exist. 13% of Canadians are unable to access necessary healthcare, with poorer Canadians more likely to struggle with access (5). Moreover, there is a 14% higher death rate among Canadians living in the most remote parts of Canada (6). These statistics are sobering and as a result, we may feel more inclined to pass up opportunities to aid those in other countries in favour of helping our own. However, as unacceptable as the mortality rate is among the most remote populations in Canada, the average mortality rate among adults in India is almost 200% higher than these remote regions of Canada (7). The shortcomings of the Canadian healthcare system are important issues that must be addressed; at the same time, deficiencies in healthcare in developing countries that lead to millions of preventable deaths every year cannot be overlooked either.

## EXISTING BARRIERS TO IMPROVED HEALTHCARE IN DEVELOPING COUNTRIES

Improving healthcare in low-income countries to reduce disparities in health outcomes does not have a simple solution. Healthcare services are resource intensive and some services are beyond the means of low-income countries. One approach to address this inequality is to raise funds for low-income countries through foreign donations. However, foreign donation is a complicated process characterized by unique rules in every donor and recipient nation. The importance and challenges associated with the use of foreign aid for funding healthcare in developing nations was highlighted in a 2018 press release by the Organization for Economic Co-operation and Development (OECD) (8). The OECD release suggested that low-income nations may be able to increase the magnitude of private donations they receive for the development of infrastructure for key sectors, including the healthcare sector, by creating an 'enabling environment' for donation (8). The OECD suggests that low- income countries adopt charitable law more consistent with Western nations, provide tax incentives for donations, and provide more detailed data about their local initiatives in order to receive more financing (8). The OECD report does not comment on the equally crucial foreign donation policies in developed nations, where most donations originate (9,10). In developed countries, like Canada, grants are primarily tailored to enriching local communities, and the Canadian government only lists a handful of foreign charities as eligible for donation (11,12). Increased ease of donating abroad for individuals in wealthier nations is crucial to help address the massive inequities that exist in countries with less access to healthcare (13).

The effectiveness of foreign aid has often been called into

question. Conventional wisdom suggests that countries should focus locally, and that foreign donation is not helpful or is even harmful (14,15). However, it is becoming increasingly clear in recent years that both government-sponsored foreign aid and private donations can be invaluable tools in the fight for improved healthcare in low-income nations. Many detractors of foreign aid have suggested that it may reduce the receiving country's domestic spending in critical industries and ultimately deprive domestic development, a phenomenon referred to as 'crowding out'. However, a recent analysis of healthcare coverage in rural Rwanda showed that foreign aid was positively associated with government investment, which refutes the claim that foreign aid crowds out domestic spending (16). Governmental foreign aid is also crucial to reduce mortality rates in resource-poor countries. In a study of 140 foreign aid recipient countries, the level of governmental aid provided to a country was associated with decreasing levels of infant mortality and increasing life expectancy (17). These associations between foreign aid and decreased mortalities have become more tightly correlated, suggesting that the governmental aid has been utilized increasingly effectively in recent years (17). Aside from governments, the other large source of foreign aid are private donors, who provide billions of dollars every year to support healthcare in lower income countries (18).

Many lower income countries rely on private donations from individuals to provide a sizable portion of their overall healthcare funding (19). Private donations have proven critical for developing life-saving healthcare initiatives in low-income countries (20,21). However, the current level of philanthropic donation for global healthcare fails to meet the World Health Organization's (WHO) funding goal for global healthcare development, given the immense need for more healthcare financing in low-income countries (22,23). In the modern era, foreign aid appears to be an unambiguous force for the betterment of humankind, which has saved millions of lives around the world (16). There is an urgent need to increase foreign donation to help meet the WHO's healthcare goals and save millions more lives (23).

## THE ROLE OF MEDICAL STUDENTS IN ADDRESSING GLOBAL HEALTHCARE INEQUITIES

Within this byzantine legal and geopolitical context, the extent of healthcare disparities in low-income countries can seem like an immense issue to address. It may, therefore, seem naive to expect that medical students can play a significant role in this challenging environment. However, it is important not to discount the agency of medical students. In fact, there are many ways we can help, and the story of Heart 2 Heart is a testament to the determination of students at the University of Ottawa to improve global health, despite the entrenched barriers complicating foreign donation.

Three years ago, Mehr Jain, a medical student at the University of Ottawa, witnessed Arjun's tragic circumstances and eventual death while on an observership. She was later appalled to learn that such stories were all too common in parts of India, where patients and families frequently were unable to afford life-saving medications. Upon her return to Canada, she shared her experiences with her closest classmates and together, the group envisioned a not-for-profit organization that aimed to address healthcare discrepancies in developing countries. Motivated to interrupt this cycle of preventable tragedy, this team founded Heart 2 Heart: International Healthcare Relief (official website: http://h2hihr.squarespace.com/). Heart 2 Heart's mission is to aid in addressing global healthcare inequity while enhancing our local community in Canada. To date, Heart 2 Heart has partnered with four organizations, namely DDMM Institute of Cardiology and Cardiovascular Surgery in India, Mahavir International in India, the Pediatric Palliative Program in Bangladesh, and the Hassan II Hospital in Morocco. Heart 2 Heart raises money through local fundraising initiatives and then transfers funds overseas to their partner organizations.

In the past couple of years since it was founded, Heart 2 Heart has raised funds to purchase a multitude of vital goods and services for patients in financial need, including baby kits for new mothers to allow for a higher quality of sanitation, medications, food, and transportation for patients of low socioeconomic status to receive critical health services. Heart 2 Heart has raised approximately $4000 for these charities to date and laid the groundwork for continued support of these charities. At the same time, Heart 2 Heart has also shaped the local community by providing mock medical school interviews, student mentorship programs, educational workshops, affordable lunches, fitness classes, and leadership opportunities to

medical and undergraduate students.

Heart 2 Heart has established itself as a registered not-for-profit organization in Canada and has applied for charitable status. The organization's application for charitable status has been significantly complicated by the legal restrictions in Canada on charitable donations to foreign institutions**, an obstacle representative of the current lack of government policy supporting foreign donations discussed previously. Despite this setback, Heart 2 Heart continues to persevere to obtain official status; in fact, its application has been submitted and is currently being reviewed for approval. The organization is run entirely on a volunteer basis and one of its core principles is maximizing the amount of its proceeds, which are used to improve patient care***.

## CONCLUSION

India's healthcare struggles are emblematic of a global issue. There are dozens of countries with lower life expectancies than India (2). A 2019 WHO report highlights that at least half of the world's population does not have full coverage for essential health services, with millions continuing to be pushed into extreme poverty paying for healthcare expenses (24). This means tens of thousands of lives like Arjun's are being cut short due to treatable diseases every day. Many of the treatments they need are inexpensive and otherwise accessible if not for the patients' financial barrier.

Heart 2 Heart is one example of how positive change can be enacted by a small group of medical students with passion and vision, demonstrating that one can help another's community while simultaneously supporting their own. However, Heart 2 Heart was one group of medical students' solutions and is certainly not the only feasible solution out there. It is imperative that, as members of the Canadian healthcare community, we do not allow geopolitical borders to prevent us from helping those in the greatest need.

There is a wellspring of untapped potential for medical students to shape communities and help individuals - even those that are thousands of miles away. It may simply take a bit of creativity and commitment to see it through.

*Names and locations have been changed to protect anonymity

**The legal restrictions mentioned here include the requirement that the applying organization must have direct control of all raised funds even if the money is transferred to (and therefore ultimately managed by) other organizations with charitable status in their regions, as is the case with Heart 2 Heart and its partner organizations. This poses a challenge as it requires the development of sophisticated and redundant organizational infrastructure within Heart 2 Heart to address the problem.

***Heart 2 Heart and other philanthropic organizations like it need the help of passionate individuals to continue to operate. If you are interested in working with Heart 2 Heart, please consider emailing (Heart 2 Heart at heart2heart.ihr@gmail.com). Financial support can be provided for the work Heart 2 Heart carries out through our website (http://h2hihr.squarespace.com/donate).

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# 5 Strategies to Facilitate the Development of Physician-Scientists during Undergraduate and Postgraduate Medical Education

**Keywords:** Research; Medical Education; Physician-Scientist; Training

**Mimi Deng[1], Leonardo Martin Calderon[2], Ricarda M. Konder[3], Portia Tang[4]**

[1]Faculty of Medicine, University of Ottawa, Ontario, Canada
[2]Faculty of Medicine, University of Ottawa, Ontario, Canada
[3]Faculty of Medicine, Dalhousie University, Nova Scotia, Canada
[4]Faculty of Medicine, Queen's University, Ontario, Canada

## ABSTRACT

In the last decade, there has been a discrepancy between the increasing recognition for research involvement in medical training and the stagnation in the number physician-scientists. Health research funding cutbacks, inadequate mentorship, heavy schedules, and unfamiliarity with scientific methodology are obstacles that limit research interest amongst junior medical learners and cause attrition of promising physician-scientists in training. This article outlines five strategies to promote and facilitate the development of physician-scientists: (1) partnerships between healthcare and academia, (2) increasing admission to MD/PhD and Clinical Investigator programs, (3) establishing fundamentals of scientific thinking, (4) long-term research mentorship, and (5) facilitating knowledge translation.

## RÉSUMÉ

Au cours de la dernière décennie, il y a eu un écart entre la reconnaissance croissante de l'implication de la recherche dans la formation médicale et la stagnation du nombre de médecins-scientifiques. Les coupures de financement pour la recherche dans le domaine de la santé, le mentorat inadéquat, les horaires chargés et la méconnaissance de la méthodologie scientifique sont tous des obstacles qui limitent l'intérêt des jeunes étudiants en médecine pour la recherche et provoquent l'attrition de médecins scientifiques prometteurs. Cet article présente cinq stratégies visant à promouvoir et à faciliter le développement de médecins scientifiques : (1) partenariats entre le secteur des soins de santé et le monde universitaire, (2) augmenter l'admission aux programmes MD/PhD de formation en médecine ainsi qu'aux programmes de formation en recherche clinique, (3) établir les bases de la pensée scientifique, (4) assurer un mentorat en recherche à long terme, et (5) faciliter l'application des connaissances.

## INTRODUCTION

Research engagement by medical trainees is beneficial for both professional development and quality of patient care (1, 2), whether it's developing skills in analytical thinking and communication or staying on the forefront of best practice. Consequently, Scholar is one of the Canadian Medical Education Directives for Specialists (CanMEDS) roles (3). Early and positive research exposure is critical to inspiring the development of physician-scientists. Given

their unique skillset at the intersection of clinical discovery and application, physician-scientists are often catalysts for knowledge translation (4). Despite this understanding, the total number of physician-scientists engaged in research has stagnated in the past decade (5).

In 2014, 1.5% of all practicing physicians in the United States reported research as their primary activity, compared to 5% in 1987, even though the number of MD/PhD and Clinician Investigator Program (CIP) positions has been increasing (6). This trend can be attributed to research becoming a predominantly MD/PhD engagement and decreasing in popularity amongst MDs. Research resources are already limited for MD/PhD and CIP programs, and funding allocation favours already established investigators (7). In 2015, the Canadian Institutes of Health Research announced the phasing out of the Clinician Scientist Training Awards, equivalent to $1.8 million CAD that has traditionally been awarded to more than 100 MD/PhD students in training (8, 9). In addition, the technologies and expertise conducive to innovation are often inaccessible outside of large academic centres, thus geographically restricting the types of research projects that can be conducted. As the aging physician-scientist population wind down their careers and shift into retirement or clinical practice exclusively, the incoming generation is lacking mentors to guide them in navigating the complexities of the physician-scientist identity (7). In other words, the absence of robust and comprehensive support systems can force the students' hand in forfeiting a career in research. In particular, the transition between clinical or post-doctoral fellowship and starting an independent research position is especially vulnerable to attrition (10).

From the medical student's perspective, the duality of physician-scientist may be losing its appeal for logistical and personal reasons. Competency in both medical practice and scientific research comes at the cost of a substantially prolonged education. By the time physician-scientists become hospital staff or chief investigators, their medical school colleagues will have already seen years of clinical practice. Furthermore, engaging in research on top of a dense medical curriculum (among other obligations) is challenging and can be discordant with the current movement towards work-life balance in the healthcare profession (11). Aside from the fear of burnout, students may be hesitant to commit heavily to research given the plethora of non-academic endeavours, such as involvement in health policy and advocacy, international health, and social accountability, which may be of interest. Compounded with an emphasis on developing clinician skills as the primary objective of medical education, it comes as no surprise that research has fallen out of favour.

A 2010 cross-sectional survey on the attitudes of Canadian medical students towards research revealed that although the majority (76%) of medical students are interested in research, prominent barriers include time, availability of research mentors, and lack of formal teaching on scientific methodology (12). Herein, we outline five strategies to promote the development of physician-scientists in undergraduate and postgraduate medical education programs.

## 1. REMOVING RESEARCH AND EDUCATIONAL SILOS

The first step in introducing students to the multidisciplinary teamwork behind innovation involves removing silos between healthcare and academia. In Germany, the government has created six new health centres in biomedicine as part of the nation's largest scientific organization (13). The Helmoholtz Association – Research for Grand Challenges comprises 18 educational and health institutions that work together to tackle environmental and common health concerns, including diabetes, cancer, dementia, infectious disease, cardiovascular disease, and lung disease (14). Many American universities have successfully integrated universities and hospitals through the Flexner model (15). Conceived by the educational reformist, Abraham Flexner, this model recommends the affiliation of hospitals with medical universities to ensure a strong research focus behind healthcare decision-making. A notable example of the Flexner model is John Hopkins University School of Medicine and John Hopkins Hospital and Health System, known collectively as Johns Hopkins Hospital (JHM). JHM is an integrated health enterprise that brings together scientists and physicians across six academic and community hospitals, four suburban healthcare and surgical centres, and 39 outpatient sites (16). The University of Ottawa Heart Institute's affiliation with the University of Ottawa and The Ottawa Hospital enables provision of specialized cardiovascular education, research, and patient care (17). Partnership between healthcare and academia yields opportunities in knowledge

translation that inspire the next generation of clinician-scientists (15).

## 2. SUPPORTING MD/PHD AND CIP PROGRAMS

One of the most salient examples of training physician-scientists is the MD/PhD program offered at 15 of 17 medical schools across Canada, with the number of successful MD/PhD applicants ranging from three to 10 depending on the school (18). According to a recent survey of the Canadian MD/PhD program alumni, 53% had been principal investigators on at least one recent funded project and 44% have dedicated at least half of their time to research. The postgraduate equivalent to the MD/PhD program is the CIP program, which enables residents to pursue formal research training within a Royal College-accredited program. Many CIP graduates obtain academic appointment with protected time for research after completing residency, with 39% receiving external award funding (19). MD/PhD and CIP programs are effective at producing competent and motivated clinician-scientists. There is merit in increasing the number of MD/PhD and CIP spots in medical school and residency, respectively, with a focus on professional and financial support in critical periods of transition.

## 3. TEACHING THE FUNDAMENTALS OF SCIENTIFIC METHODOLOGY

One of the barriers to medical student engagement in research is the lack of structured education surrounding scientific methodology and statistical analysis (12). The University of Tennessee Health Science Center and Vanderbilt University have a unique National Institutes of Health-sponsored Medical Student Research Fellowship (MSRF) program that offers lectures in scientific methods alongside research involvement (20). A longitudinal study following 1000 students enrolled over 25 years found that there was significantly more interest in academic careers amongst MSRF alumni, compared to students who did not attend the program. In addition, one-third of MSRF graduates reported that research was a significant part of their post-residency careers (20). Similarly, the Professional Student Mentored Research Fellowship (PSMRF) program at the University of Kentucky College of Medicine begins their longitudinal, mentored research project with an Introduction to Clinical Research course that offers: (1) core lectures on research ethics, data analysis, and manuscript review, and (2) discussion with clinician-scientists on balancing clinical and research careers, evidence-based medicine, and translational research (21). PSMRF students are 50% more productive in publishing research during medical school (21).

## 4. LONGITUDINAL RESEARCH MENTORSHIP IN MD PROGRAMS

Another solution to consider is establishing a standardized longitudinal research track for medical students involving protected research time. The University of Michigan has a program titled The Scientific Discovery Path of Excellence (22), in which medical students outside the MD/PhD program receive research guidance from faculty, which culminates in a capstone research project. Similarly, the Research in Medicine (RIM) program at Dalhousie University pairs their first-year medical students with a research mentor to begin a four-year research project from scratch, starting from developing a research question, drafting a proposal, attaining Research Ethics Board approval and conducting investigations, to manuscript writing and submission (23). RIM requirements include a research presentation in at least one academic meeting and a manuscript submission of publishable quality. These programs standardize research experience and allow students to oversee a project from inception to completion. It would be worthwhile to pilot similar research initiatives in other Canadian medical schools to introduce students to the physician-scientist identity.

## 5. EMPHASIZING KNOWLEDGE TRANSLATION

Knowledge translation describes the application of basic science research to clinical guidelines and medical technologies, or more colloquially referred to as “bench-to-bedside” research (24). As future medical professionals, medical students are well-positioned to engage in translational research as they will be able to identify the medical issues that can benefit from further work in knowledge translation. In recent years, the merit of translational research has become increasingly recognized. In 2016, a research team at Sick Kids Hospital in Toronto delineated a new cancer surveillance protocol that dramatically improves survival for patients with Li-Fraumeni syndrome, a hereditary disease associated with significant

cancer risk. Five-year survival was 89% for people who underwent surveillance compared to only 60% for those who did not (25). Another example is the amendment in dosing of hormone therapy for prostate cancer. Intermittent androgen deprivation therapy demonstrates comparable efficacy to continuous treatment, but reduced adverse events (26). Translational research instills medical trainees with the importance of research stewardship. Seeing their research endeavours manifest to improve the lives of their patients and communities can help reduce the estimated 17-year delay between scientific discovery and clinical implementation (27).

## CONCLUSION

Allowing medical trainees to gain the confidence in incorporating research into their future careers begins with positive research exposure in undergraduate medical education and residency. This can be achieved through integrated academic healthcare centres, support for MD/PhD and CIP programs, formal education on scientific methodology, longitudinal research mentorship programs, and developing competencies in knowledge translation. Despite the financial implications of the aforementioned strategies, investing in physician-scientists is worthwhile as they are in a unique position to conduct high-quality research that can greatly contribute to the medical field. The role of studentships in inciting research interest amongst junior medical learners has been well-investigated. However, further research should be performed on trajectory of research interest as clinical learners enter practice. Understanding the downstream challenges affecting budding physician-scientists will inform how research processes can be systemically improved.

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# Perspectives on ageism: understanding and combatting age discrimination in healthcare

Keywords: Ageism, Geriatrics, Health Equity, Resources

**Neel Mistry[1], Paul Rooprai[1], Shubham Mistry[2], Kim Rooprai[3]**

[1]Faculty of Medicine, University of Ottawa, Ottawa, ON, Canada
[2]Leslie Dan Faculty of Pharmacy, University of Toronto, Toronto, ON, Canada
[3]College of Dentistry, New York University, New York, USA

## ABSTRACT

Ageism is prevalent in Canadian healthcare settings. On average, Canadian seniors spend less time talking to their healthcare providers (HCPs) than any other age group. However, even when seniors are allowed to see an HCP, they can be subjected to discrimination based on age. This can lead to blunders in care such as undertreatment and/or overtreatment, misinterpretation of cognitive impairments such as functional impairments, and ineffective communication that is, ultimately, patronizing. Combating ageism requires implementing training for HCPs, revising institutional procedures, and addressing ageist attitudes amongst HCPs and older patients.

## RÉSUMÉ

L'âgisme est très répandu dans les établissements de soins de santé canadiens. En moyenne, les personnes âgées canadiennes passent moins de temps à parler à leurs prestataires de soins de santé (PSS) comparé aux autres groupes d'âge. Cependant, même lorsque les personnes âgées sont autorisées à consulter un professionnel de la santé, elles peuvent faire l'objet de discrimination fondée sur l'âge. Cela peut conduire à des gaffes dans les soins telles que des traitements insuffisants et/ou excessifs, à une mauvaise interprétation des troubles cognitifs tels que des troubles fonctionnels, et à une communication inefficace qui, en fin de compte, est condescendante. La lutte contre l'âgisme nécessite la mise en place d'une formation pour les professionnels de la santé, la révision des procédures institutionnelles et la lutte contre les attitudes âgistes des professionnels de la santé et des patients âgés.

American psychiatrist, Dr. Robert N. Butler, first coined the term "ageism" in 1969; since then, it has become one of the greatest impediments to modern medicine. Defined as the systematic stereotyping and discrimination against people because of their age, ageism is ubiquitous throughout Canadian healthcare settings (1).

In 2018, seniors were the fastest-growing age group in Canada with an estimated 4.8 million people aged 65 and older (2). This number is expected to double in the next five years (2). With just over 300 geriatricians in Canada, experts say another 500 are needed to provide effective medical care to the elderly (3). The lack of geriatricians

makes access to healthcare resources much harder for seniors. A report from the Canadian Institute for Health Information (CIHI) revealed that Canadian seniors endured a longer waiting period to see their doctors in comparison to those in 10 other high-income countries (4). Older adults are likely to have a greater number of, and more pressing, health concerns than the average Canadian (4). Seniors often present with multiple comorbidities, be it urinary tract infections, cardiovascular complications, osteoporosis, or dementia (4). If not given immediate medical attention, their health may rapidly deteriorate. Alternatively, while numerous factors affect one's decision to match to a specialty, inadequate exposure to caring for the elderly and the negative connotation associated with it may explain the unmatched geriatric residencies (5).

Even when seniors are able to see an HCP, they may still find themselves subject to discrimination based on age. For instance, ageism can take place behind closed doors when the physician refuses to differentiate age-related changes from pathognomonic findings (6). In some cases, a physician may avoid treating a certain pathology by merely labeling it as a feature of "old age" (6). This lack of homogeneity in treating patients may result in under-treatment and, in severe cases, medical negligence. A cross-sectional study by Davis et al. found that 64% of primary care providers (PCPs) agreed that "having more aches and pains is an accepted part of aging," while over half deemed it normal to experience forgetfulness (7). If HCPs solely attribute these symptoms to increasing age, conditions such as chronic pain, anxiety, depression, and cognitive impairment may go unnoticed. In the long run, age-based clinical decision-making will drain healthcare resources rather than save them.

Ageism is starkly apparent in encounters between patients and physicians. On average, Canadian seniors spend less time talking to their HCPs than any other age group (8). Once inside the room, the situation is no better. Elderly patients are usually accompanied by a companion to their medical visits. Doctors often take advantage of this by directly communicating with the family member, even if the patient in question is fully competent (9). While having a third person in the room can be beneficial, it may also affect the group dynamic. Seniors accompanied to their medical visits are less likely to raise topics with their doctors and are less assertive during the discussion (10). If patients do not fully disclose their concerns to the HCP, this may result in an inaccurate medical diagnosis and may, ultimately, compromise the quality of care they receive. Therefore, when consulting with an elderly patient, it is important for HCPs to give their undivided attention. Doctors may also speak with the patient privately if they feel that this will strengthen the patient-physician rapport.

Ageism presents in a myriad of ways throughout the healthcare system. Stemming largely from the assumption that all members of a given group are alike, ageism inherently manifests within the attitudes of HCPs. It is so deeply rooted within our system that it enables common blunders in individualized care, such as the potential for the misinterpretation of cognitive impairments including functional impairments, and ineffective communication that is often patronizing (11). Combating it will require implementing a strategy that mandates geriatric training for HCPs, revisits institutional procedures, and addresses ageist attitudes amongst HCPs and older patients.

A critical place to begin is by developing an awareness of the inequalities that persist between age groups and to appreciate the diversity that exists amongst older adults. They differ in health and functional status, educational background, and cultural upbringing. Labelling older adults with descriptions such as disease, disability, and decline reinforces our current discriminatory perceptions of what aging entails. According to Ashton Applewhite, a renowned author and activist for ageism, it is essential that we attempt to reshape negative thoughts concerning aging in order to build a society that does not isolate older adults by allowing them to contribute to it (12).

An additional necessary step to fight internalized ageism is to foster intergenerational collaboration. Interaction between HCPs and older adults is imperative to changing our current misconception that older individuals are dependent and frail. The goal in any healthcare setting with the elderly should focus on individualized treatment plans that enable patients to remain independent, healthy, and outside of hospital settings. Williams et al. emphasized that healthcare outcomes depend on the physical health of a patient in addition to the HCP's ability to attend to their patient's psychosocial and biomedical needs (13). Effective patient-physician communication not only facilitates the exchange of health information, but it also

builds interpersonal relationships that encourage decision making and patient satisfaction. We can change the way practitioners interact with older adults by encouraging the use of age-friendly language, as well as refraining from associating the elderly with labels (12). This will allow for patients to be empowered to use both their skills and confidence to take responsibility for their health and wellness.

Better education is part of the solution to combat ageism (9). Those who work with the elderly in healthcare settings should receive training that dispels negative assumptions and attitudes towards the elderly and serves to increase awareness of how to appropriately respond to the aging process. Educational initiatives should include enhanced training in gerontology, care-giving skills, and communication techniques (14). Improved training for doctors, nurses, physician assistants, nurse practitioners, psychologists, and social workers, as well as paramedics, firefighters, and other first responders who work directly with older persons is a necessary starting point. With the aging of the population and longer life expectancies, HCPs need to become more familiar with the aging process and the needs of older adults (15). Since family physicians are often the first point of entry into the healthcare system, it is important that they receive more comprehensive training in caring for older adults than is currently offered (16). Besides HCPs, education must also be aimed at older persons so that they can identify if and when they are experiencing age-based discrimination in addition to knowing what recourses are available to address it (17). Keeping the elderly informed about ageist practices empowers them to take part in changing current healthcare practices.

The healthcare system has an obligation to actively address ageism. The task remains to define the approach to healthcare for older adults in a way that is not ageist. What does this look like? One possible advance is to develop healthcare services for older persons that moves away from standardizing assessment and treatment procedures across the age spectrum. Healthcare equity for older adults refers to equality, rather than uniformity, in the case-appropriateness of diagnosis and treatment (18). It means establishing care that respects the unique needs of the elderly, which achieves success in reaching desired health outcomes (18). Quality medical treatment is relative to what is required and what is adequate for that particular patient. It requires an individualized, person-centered approach to care (19), and is in keeping with the anti-ageist ideology inherent in the principles of modern geriatric practice (20). It supports the potential for geriatric medicine to not only treat health conditions and reduce suffering in the elderly, but to also reconstruct ageist conceptions regarding patients' own aging and health (20).

We are all united by the natural process of aging, and it is important that we aim to challenge our ageist perceptions to create an accepting society. Becoming advocates for older adults means that we need to choose our words with care. Avoiding stereotypes and discrimination commonly associated with older age will allow us to positively affect both implicit attitudes and explicit actions. Supporting funding for clinical and educational research within the field of geriatrics is another prerequisite to gaining knowledge regarding how to build communication models that combat ageist language. Finally, it is critical to invest more in training qualified individuals who have an interest in providing healthcare to older adults. With the aging population growing rapidly, addressing the lack of HCPs with geriatric knowledge will aid our healthcare system in supporting all stages of life equally.

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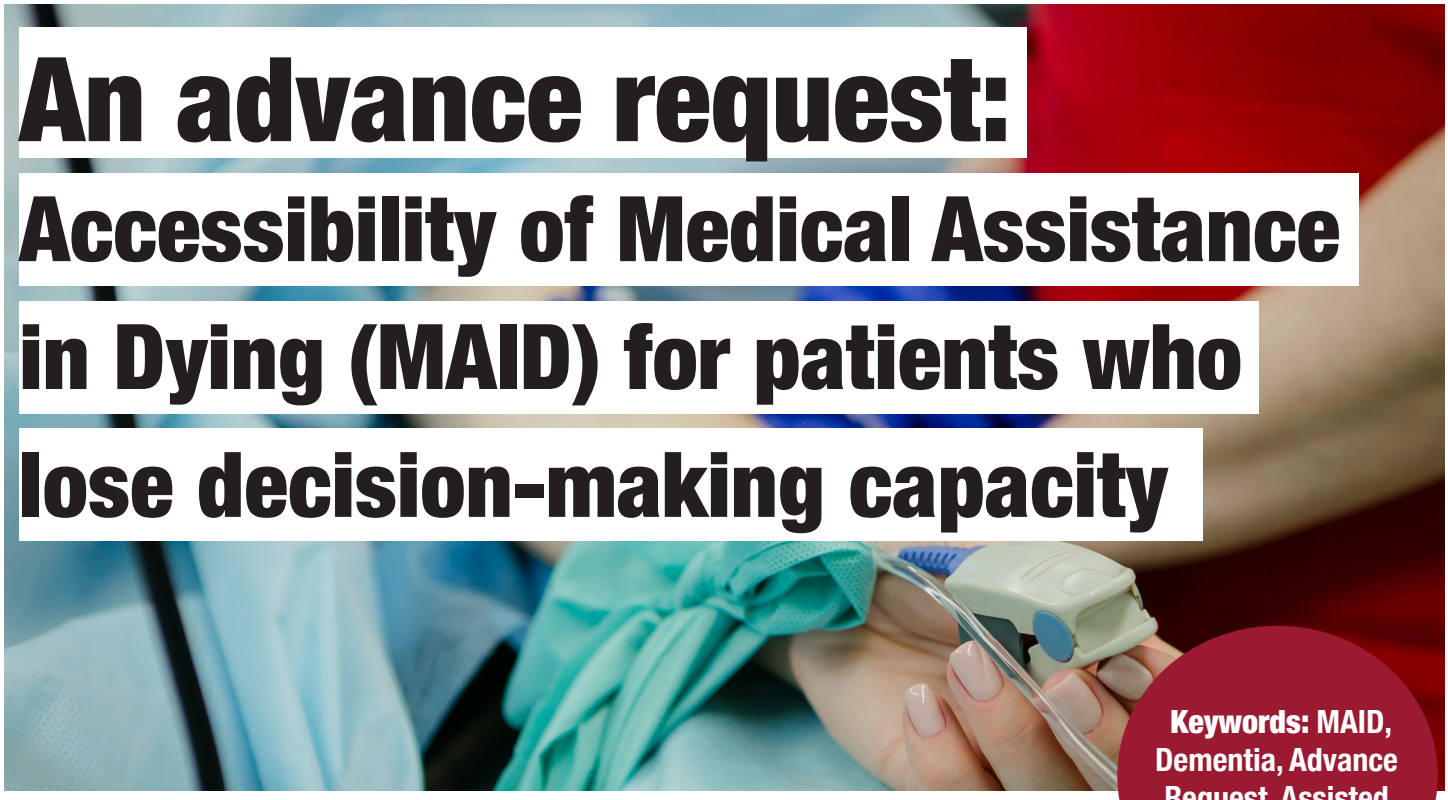
# An advance request: Accessibility of Medical Assistance in Dying (MAID) for patients who lose decision-making capacity



**Keywords:** MAID, Dementia, Advance Request, Assisted Suicide

**Natasha Harris**[1]

[1]Faculty of Medicine, University of Ottawa, Ottawa, ON, Canada

## ABSTRACT

Since the legalization of Medical Assistance in Dying (MAID) in Canada in 2016, there have been discussions regarding the extension of this service to patients who lose decision-making capacity but have made a prior advance request for physician-assisted suicide. Both caregivers and physicians have shown some support for allowing patients to make advance requests for MAID. The proposed changes to the legislation would remove the mandatory 10-day waiting period for patients whose deaths are imminent and would include a waiver of final consent for those who lose decision-making capacity following their MAID request. There are important ethical considerations as well because as the inclusion criteria becomes broader, the subjectivity in the decision to implement MAID rises. Determining clear eligibility criteria and strong safeguards is essential for the safe and equitable implementation of this procedure.

## RÉSUMÉ

Depuis la légalisation de l'aide médicale à mourir (« Medical Assistance in Dying, MAID ») au Canada en 2016, des discussions ont eu lieu concernant l'extension de ce service aux patients qui perdent leur capacité de décision mais qui ont fait une demande préalable de suicide médicalement assisté. Tant les soignants que les médecins ont montré un certain soutien pour permettre aux patients de faire des demandes en avance pour le service. Les modifications proposées à la législation supprimeraient la période d'attente obligatoire de dix jours pour les patients dont le décès est imminent et comprendraient une dérogation au consentement définitif pour ceux qui perdraient leur capacité de décision à la suite de leur demande d'aide à mourir. Il y a également d'importantes considérations éthiques car plus les critères d'inclusion sont larges, plus la décision de mettre en œuvre le programme d'aide médicale à mourir est subjective. La détermination de critères d'éligibilité clairs et de mesures sécuritaires solides est essentielle pour une mise en œuvre sûre et équitable de cette procédure.

## MEDICAL ASSISTANCE IN DYING (MAID) IN CANADA

On February 6th, 2015, the Supreme Court of Canada unanimously ruled that the prohibition of physician assisted dying was unconstitutional, as it violated the Canadian Charter of Rights and Freedoms (1). Following this decision, the Province of Quebec adopted the first MAID legislation, Bill 52, which had been passed on June 5th, 2016 (2). Six months later, the Canadian parliament created a similar legislation, Bill C-14, which allowed

physicians and nurse practitioners to provide MAID (3).

In order to qualify for MAID, a patient must be eligible for health services funded by the Canadian government, be at least 18 years of age, be capable of giving informed consent and be suffering from an incurable medical condition (3). In the fall of 2019, a Quebec Superior Court Judge ruled that certain sections of the federal and provincial laws were unconstitutional on the grounds that the eligibility criteria were too restrictive (4). Justice Christine Baudouin ruled in favor of two Quebecois citizens with incurable degenerative diseases who were denied access to MAID on the grounds that their deaths were not "reasonably foreseeable" (4). Since this was seen by many as limiting these patient's rights to a dignified death, these cases sparked a nation-wide discussion regarding the question of broadening the eligibility criteria for patients seeking MAID.

Specifically, there have been discussions regarding the lack of accessibility of MAID for patients who lose decision-making capacity due to major neurocognitive disorders or other medical ailments. The expert panel working group, a collection of individuals from varying disciplines assembled to prepare a report for the Government of Canada regarding the nuances of MAID, describe an advance request as "a request for MAID, created in advance of a loss of decision-making capacity, intended to be acted upon under circumstances outlined in the request after the person has lost decisional capacity" (5). Currently, it is not possible to make advance requests for MAID should an individual become incapable throughout the course of their illness. However, on February 24th 2020, a new bill was introduced which proposed a waiver of final consent for those already approved for MAID. This bill would allow for an arrangement between patients and their practitioner to waive final consent if the patient was at risk of losing decision-making capacity before their chosen date to receive MAID and "whose natural death is reasonably foreseeable" (6). The new legislation would also extend the previous 10-day reflection period to take place over 3 months unless the loss of capacity is imminent (6).

## LIMITATIONS FOR PATIENTS WITH ADVANCED STAGES OF DEMENTIA

The Alzheimer's Society of Canada has released a 2019 statement expressing their view that patients should have the ability to access MAID through advance requests (7). This demonstrates a change in opinion since their 2016 position statement (8). In order to further investigate the wishes for advance requests, the province of Quebec has conducted several studies to assess the opinions of informal caregivers and physicians (9-10). Informal caregivers, mainly spouses or adult children of patients with dementia, showed support for extending MAID to patients with Alzheimer's disease who lose decision-making capacity. Surveys demonstrated that 68% of respondents agreed that MAID should be extended to patients with advanced Alzheimer's disease who had previously completed a written request (9). This agreement increased to 91% if the patient was also in the terminal stages of their disease and was showing signs of distress (9). Compared to informal caregivers, physicians appeared to be less in favor of increasing access to MAID. One study demonstrated that only 45% of physicians supported extending access to MAID for patients suffering from advanced dementia in the presence of a written request. However, support increased to 71% if the patient was also demonstrating signs of distress (10). It would be important to explore the reasons why physicians may be less in favor of MAID in individuals with advanced dementia compared to informal caregivers. It is possible that the emotional burden of actively ending an individual's life discourages physicians from supporting MAID to the same extent of caregivers. Furthermore, it is possible that family understand their loved ones better than physicians and witness the patient's suffering firsthand, which could lead them to be more comfortable with decisions regarding the implementation of MAID. Another factor which would be important to explore is the impact of caregiver burnout on end-of-life decision making. Overall in both studies, there was significantly less support for access to MAID when no prior request was expressed (10).

## MAID IN OTHER PARTS OF THE WORLD

Currently, there are four countries that allow for advanced euthanasia requests: the Netherlands, Belgium, Luxembourg and Colombia (5). In Belgium and Luxembourg, this procedure is limited to individuals who have given prior written consent and whose condition has progressed to a state of irreversible coma (10). In contrast, the law in the Netherlands requires patients to be conscious at the time of euthanasia and there is no guarantee that a patient who has made an advance request will be provided with

the service (5). Although legally permitted, there are no available statistics on advance requests for euthanasia in Colombia (5).

In the United States, there is a different approach to assisted suicide. In the few states where MAID is permitted, physicians are responsible for prescribing a lethal dose of barbiturates but cannot legally be involved in its administration. According to the 2018 Data Summary from Oregon, 249 individuals filled Death With Dignity Act prescriptions in 2018 and 11 had prescriptions from previous years, but only 169 individuals were confirmed to have ingested the medication (11). Based on these numbers, there are over 90 patients who completed the process for acquiring a lethal prescription, but who did not ingest the medication. In Canada, however, the administration is almost exclusively conducted by care providers. This raises the question as to whether or not certain patients in Canada who are eligible for MAID would have opted against completing the process had they been responsible for self-administering the lethal substance.

## KEY CONSIDERATIONS FOR MAID

There are numerous key elements that should be examined when assessing the ethical questions pertaining to advance requests for MAID. Firstly, there is an emotional burden placed on health care providers and patient families responsible for life ending decisions. Furthermore, although some patients with Dementia develop Behavior and Psychological Symptoms of Dementia (BPSD), many continue to appear quite content during the terminal stages of their disease. In these cases, it seems unreasonable to complete a MAID request despite the patient's prior wishes.

Health care providers have also expressed the challenge of characterizing intolerable suffering among patients whose communication is limited (12). When creating advance requests, it is not feasible that every possible situation be addressed, leaving large amounts of uncertainty regarding the timing of MAID implementation. Furthermore, the expert panel working group expresses concerns regarding the stigmatization of incapacity as well as the potential for abuse in the context of external pressures, such as systematic lack of resources for long-term care (5). Indigenous elders contacted by the expert panel for their input argue that, instead of spending resources to increase accessibility of MAID, these resources should instead be focused toward improving quality and access of medical care in underserviced areas (5). A new safeguard included in the proposed bill to amend the current legislation addresses this, stating that "the person must be informed of available and appropriate means to relieve their suffering […] and must be offered consultations with professionals who provide those services" (6). There is also no consensus as to the acceptable amount of time that can elapse between the request for MAID and the completion of the request (5). Furthermore, there is no agreement as to whether or not patients could make advance requests prior to being diagnosed with a severe and incurable illness (5).

Although there are numerous hesitations regarding advance requests for MAID, making this option accessible to patients ultimately offers advantages. It allows for greater patient autonomy and self-determination. It creates opportunities for people to dictate the context of their death and could remove stresses surrounding potential loss of capacity to make decisions for one's own care needs. Although sufficient literature is lacking, there is also speculation that offering advance requests for MAID would prevent premature suicide. Some believe that patients may take their lives prematurely, while they are still competent, in order to prevent their perceived suffering of terminal stage dementia (5). Contrastingly, a systematic review concluded that dementia may not confer a significant overall risk to suicidal behavior, and thus, MAID may not cause premature loss of quality life years among patients with dementia (13). Furthermore, due to the mandatory 2-week waiting period between the MAID request and the procedure, certain patients may lose their ability to provide consent, thereby restricting their access.

## FUTURE DIRECTIONS FOR MAID IN CANADA

There are arguments both for and against advance requests for MAID. With the proposed amendments to the current legislation, we must explore the reasoning behind such requests and consider the possible implications of revising current laws. It is important to acknowledge the motivations underlying advance MAID requests and determine if they may be mediated by other factors such as existential anxiety or perception of being burdensome to family members, which could potentially be mediated. Additionally, we must consider whether patients with

advanced dementia suffer intractably, since this becomes impossible to assess with 100% certainty during advanced stages of the disease. If we consider infants who demonstrate limited knowledge of the world around them, we can conclude that although they are reliant for their basic needs and lack the ability to communicate effectively, we do not interpret this as suffering. Alternatively, we can argue that for patients who seem to be in frequent and visible agony, that perhaps there is a subset of patients with dementia that may meet the criteria for irremediable suffering. In this subset of patients who do not respond to medical management, it may be reasonable to consider an advance request for MAID. For the subset of patients who do complete a request for MAID, but who lose capacity over the course of their illness, it is likely reasonable to uphold the patient's prior MAID request. Determining the criteria for this, however, is difficult and will imply a certain amount of subjectivity. Paradoxically, changing the legislation to include a wider range of patients increases the burden on health care providers and increases uncertainty, which may reduce the number of physicians willing to provide MAID, in turn, decreasing its accessibility. We find ourselves faced with the question of identifying the limit of precedent autonomy.

## CONCLUSION

The introduction of MAID in Canada has increased the ability to dictate the circumstances surrounding one's own death. The proposed amendment to the legislation would allow the patients who make prior requests for assisted suicide, but then lose decision-making capacity during the course of their illness, to waive their final consent and access the procedure. Although discussed in the expert panel on MAID, no consensus was made regarding what specific criteria would need to be met in order for individuals to qualify for advance requests and what safeguards would need to be put in place (5). With this in mind, I believe there is still considerable discomfort in discussing the ethical considerations of assisted suicide and further exploration of the ethical considerations and the values of our society is warranted. I predict, if advance requests become available in Canada, that the criteria will be restrictive, and that the time frame between making the advance request and implementing the procedure will be relatively short.

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# The Collaborative Effort of Genetics and Medicine:

## Can targeted genetic testing aid in early disease detection and improve patient outcomes?

**Keywords:** Arthritis, Diabetes, Genetic Screening, Mental Health Disorders, Multifactorial, Preventative Medicine

**Abanoub Aziz Rizk[1], George Botros[2], Ahmed Al-Izzi[3]**

[1]University of Ottawa, Faculty of Medicine
[2]University of Guelph, Department of Molecular Biology and Genetics
[3]University of Guelph, Department of Biomedical Sciences

### ABSTRACT

Increasing attention on preventative medicine promises to remodel healthcare by using proactive approaches designed to avert and avoid potential diseases from being introduced to the patient. Genetic screening is a subset of health program measures that is purposely designed to be offered to asymptomatic individuals to provide a promising form of early treatment. While many diseases are multifactorial in nature, early detection of the disorder can aid in tailoring effective medical interventions to the patient. This article will discuss implementing early genetic screening with the aim of promoting greater collaboration between the fields of genetics and medicine.

### RÉSUMÉ

L'attention croissante portée à la médecine préventive promet de remodeler les soins de santé en utilisant des approches proactives conçues pour éviter et prévenir l'introduction de maladies potentielles chez les patients. Le dépistage génétique est un sous-ensemble de mesures des programmes de santé qui est délibérément conçu pour être proposé aux personnes asymptomatiques afin d'offrir une forme prometteuse de traitement précoce. Bien que de nombreuses maladies soient de nature multifactorielle, une détection précoce peut aider à adapter des interventions médicales efficaces aux patients. Cet article traite de la mise en œuvre du dépistage génétique précoce dans le but de promouvoir une plus grande collaboration entre les domaines de la génétique et de la médecine.

### 1. INTRODUCTION

In today's healthcare, there seems to be an emphasis on curative medicine. For this approach, a prior diagnosis is required before an appropriate intervention is prescribed in an attempt to restore and maintain the patient's health (1). Preventative medicine, however, uses methods to lower the risks of the patient acquiring the disease. Genetic screening is a type of health program that can be systematically offered to asymptomatic individuals with the aim of identifying and providing those with high risk of a disease with preventative interventions or early treatments

(1). This type of screening refers to medical tests that detect aberrations in chromosomes, proteins and genes, confirming or ruling out hereditary illnesses. Most diseases manifest from a combination of genetic, environmental, and lifestyle factors. Multifactorial or complex conditions with genetic susceptibility such as diabetes, rheumatoid arthritis, and mental illnesses are conditions which are partially caused by multiple low penetrance genes with various behavioural and environmental factors (1). Penetrance refers to the proportion of individuals carrying a certain variant of a gene that also demonstrate clinical expression of the related trait. There are many types of genetic screens, but not all of them bear the same predictive value. Some tests have a high predictive value, while other tests are associated with a high degree of ambiguity. This article aims to present different ways by which genetic screening can aid in early detection of illnesses such as diabetes, rheumatoid arthritis, and mental health disorders. We also present the challenges and the benefits of utilizing genetic screening as a preventative tool for these conditions.

## 2. DIABETES

Diabetes has been recognized as a grave medical condition for over 2000 years, but only recently, two types have been made distinct due to their unique modes of development (2). While both conditions are characterized by an elevated level of serum glucose, type II diabetes (T2D) is caused by a decreased sensitivity of receptors on the body's cells, and type I diabetes is an autoimmune disease leading to a complete loss of the insulin-producing β-cells in the pancreatic islets (2).

### *A) Heritability*

Research has previously shown a strong hereditary component in T2D, although additional factors play a role (2). The multifactorial nature of the disease has often been an impediment for geneticists and physicians to effectively diagnose patients. However, it is estimated that T2D has a heritability value of 20% - 80% (3). This evidence was concluded using population sampling, twin-based, and family studies (3,4). The risk of developing T2D is 40% when just one of the individual's parents has the disease, and this increases to 70% when both parents do. People with no primary family history of T2D are about three times less likely to develop the disease later in their lives (3). Intriguingly, these observations point to the strong genetic component that may be involved in the development of T2D. For instance, candidate gene studies were used on genes previously known to have been involved in the secretion of insulin (3). Researchers have found that the PPARG, peroxisome proliferator-activated receptor gamma, is a profound candidate for determining T2D intermediate phenotypes in overweight patients (3). While PPARG is known for encoding the molecular target of thiazolidinediones (an old class of anti-diabetic medications), two variants of PPARG, particularly PPARG Pro12Ala and PPARGC1A Gly482Ser (C1A;Coactivator-1-alpha) polymorphisms, are associated with developing T2D mellitus due to gene-gene interactions (3). As another example, IRS-1 and IRS-2 genes encode peptides that play an important role in insulin signal transduction (3,4). Polymorphisms in these genes have been found to be associated with decreased insulin sensitivity in some individuals (3,4).

### *B) Challenges and Benefits*

The field of medicine meets multiple challenges in the prevention of T2D, as the disease can often develop at a very early age (1). Through proper genetic screening, a physician may take measures to slow the progression of the disease. Given that diabetes is dependent on a number of factors, a physician are to review the patient's background with regard to their proper physical growth, activity level, language skills, cognitive development, social development, and emotional development, in order to properly assess the condition (1). With the implementation of genetic screening as a preventative measure in healthcare systems, the root cause of numerous complex disorders can be determined more efficiently and may in fact even accelerate the diagnostic procedure, bettering the healthcare provided to the patient and reducing financial costs in the long run. The physician may be able to educate the family of children diagnosed with T2D about offering healthy nutrition and promoting physical activity (1). While the early detection of the disease can induce an unpleasant emotional burden on family members, it may also prevent future complications, such as the need for insulin injections. The physician who works together with a geneticist may be able to suggest a diet that is individualized for the patient (1). For many patients, this may involve a more natural plant-based diet, but for others, alterative regimens might be superior. In addition, the parents may enroll their children in more activities that would keep them active and decrease the

further development of diabetes, by avoiding weight gain, which is also strongly correlated with the disease (1).

## 3. RHEUMATOID ARTHRITIS

Rheumatoid arthritis (RA) is a medical condition characterized by swelling, pain and stiffness of joints (7). If left untreated, deformities and damage may occur due to the progression of the symptoms. While the ultimate cause of RA is unknown, researchers have found evidence for an association between family history and acquisition of the disease (7). Malfunction with gene expression is associated with the autoimmune attack of healthy lining of the joints. Treatment is used to relieve pain and swelling, slow down or stop joint damage, help lower the number of flare-ups, and improve the ability to perform daily activities (7).

### *A) Heritability*

RA is a progressive disease that worsens with age (10). The heritability of RA has been estimated to approximately 60 %, while the contribution of cell-surface proteins responsible for regulating the immune system of the body, Human Leukocyte Antigen (HLA), would be heritable by 11–37 % (8,9). In a cohort of 91 monozygotic twin pairs, increased concordance for RA was observed suggesting a hereditary aspect to the condition (9). In addition, a 5-fold increased risk for RA concordance was seen in twins who were "homozygous" for the shared epitope, compared with those negative for the same (9).

### *B) Challenges and Benefits*

While a genetic component is present, a multitude of other factors might be responsible for the accelerated degeneration of joints. Factors such as injury, abnormal metabolism, infections and immune system dysfunction, can potentially all play significant roles in the aggravation of rheumatoid arthritis in addition to the original genetic malfunction (10). Moreover, characteristics such as age, sex, weight, and occupation may also have an influence on the individual's condition.

Patients with a family history of rheumatoid arthritis who have implemented preventative measures in their lifestyle would benefit more from the physician's approach and recommendations (10). For instance, using a holistic approach, a physician may recommend a patient that is employed at a job requiring strenuous physical activity to look for an alternative occupation in order to prevent progression or even initial exacerbation of symptoms. Another example may involve an individualized diet rich in ingredients that lower inflammation, including fish, nuts, seeds, fruits, and vegetables, prior to the development of any symptoms at all (10). Omega 3 fatty acids, exclusively found in fish and nuts, have been shown to have a crucial role in the regulation of inflammation, which is considered to be one of the major causes of arthritis symptoms (10). Furthermore, while physical activity is almost always promoted as a mainstream method of acquiring good health, some exercises and types of workout regimens can, in fact, worsen the symptoms of arthritis by placing high pressures on joints (10). A preventative genetic screening could enable the physician to suggest specific exercises that are easier on bones and joints, such as swimming (10).

## 4. MENTAL HEALTH DISORDERS

Advancements in technology have created astonishing opportunities for diagnostics and personalized therapy, altering the practice of medicine, particularly in relation to mental health (11). It has been postulated that, in some cases, mental illnesses could have a genetic component (12). Both Mendelian and non-Mendelian disease inheritance patterns have been mathematically modelled and clear correlations were found between genetics and mental health disorders. Among numerous research studies performed in the past few years, one experimental investigation has demonstrated the significance of using genetically reprogrammed cells to unveil potential new therapeutic agents to treat bipolar disorder. The difficulties in understanding the underlying mechanisms of bipolar disorder arises from its varying array of symptoms and the inability to implement suitable animal models (13).

Mertens and colleagues have made progress using a biologically accurate model, known as induced pluripotent stem cell (iPSC) technology, to better understand the pathophysiology of bipolar disorder (13). Human induced pluripotent stem cells are derived from blood or skin cells and have been reprogrammed back into their pluripotent state in order to generate an unlimited source of all types of human cells, enabling therapeutic advancements (13). The research team found that bipolar neurons are hyperactive and represent notable transcriptional differences when

compared to the normally functioning neurons (control group) (13).

Cells derived from lithium-responsive patients were shown to respond to lithium in vitro by not only decreasing their cellular activity to control levels, but also partially correcting the transcriptional modifications associated with bipolar neurons (13). This trend was not observed in non-lithium-responsive cells (13). This correlation between in vitro and human phenotypes indicates that neuronal hyperactivity of iPSC-derived neurons might potentially be an endophenotype of bipolar disorder, which could be utilized to analyze the underlying disease mechanism of bipolar disorder and explore future therapeutic solutions for such complex disorders (13).

***A) Ethical Consideration: Challenges***

While genetic screening can demonstrate a promising role in terms of providing a vital source of information about the individual, a large component of medicine involves applying the ethics of beneficence and non-maleficence (11). To do no harm to a patient comes first in the mind of a physician. If a physician finds a medical history record of mental illnesses, he or she ought to consider the benefits and the disadvantages of requesting a genetic screen (11). Although genetic components are critical in the onset of a disease, many additional factors will either suppress or trigger the activation of the gene. Although the physician should ensure the patient understands that there is more to them than just the genetic aspect, informing patients about a high susceptibility of developing mental disorders may be unsettling.

***B) Ethical Consideration: Benefits***

On the other hand, a genetic screen may help prevent the onset of illness in some cases. Early detection of a genetic predisposition to a mental health disorder could enable the physician's work with the family to take precautionary measures that could benefit them in the long run (11). Examples of precautionary measures include involving children in multiple social groups, addressing concerns as soon as they arise, showing love and acceptance from an early age, showing interest for their activities and opinions, and teaching them how to set realistic goals. While these precautionary measures could be discussed with any families, there should be greater emphasis with families of children with greater predispositions to mental illnesses. Additionally, the family could help foster a more inclusive and affectionate environment to minimize stress (11). The family can do so by means such as offering additional protection or providing more attentive care in times of pressure. In addition, family members can also explore topics that stimulate learning about the illness, avoidance of stigmatizing language, joining a stigma-fighting mental health organization and fostering a strong peer support system (11). The benefits of informing the targeted individual about a predisposition to mental illnesses can in many ways prevent additional complications. Notably, genetic screening can exclude disorders imitating psychiatric conditions, which can lead to a faster and more precise diagnosis.

## 5. IMPLEMENTATION CHALLENGES

It is critical to point out that a great effort has been put toward combining the advanced strategies from the field of genetics with the practice of medicine for the improvement of healthcare (5,6). Genetic screenings have been rising as the advancement of technology has enabled the healthcare industry to seek more progressive and affordable means (5). Deciding on whom to perform the tests is an ongoing dilemma (6). Considering the vast array of socioeconomic statuses among the Canadian population and the struggle produced by the limited governmental funding, not all individuals will have insurance coverage or the means to pay themselves (5). In addition, running genetic screening on every single person would be very inconvenient and difficult to implement.

In rural areas for instance, there are limited medical resources that are accessible to healthcare professionals. Preventative medicine could be considered a long-term solution to resolve this issue since it can maximize the impact of financial resources for rural communities. Given the limited resources available, one could acknowledge that there might be a tendency to prioritize the resources toward achieving an immediate medical care available for rural patients in the form of curative medicine rather than preventative medicine. In a study comparing rural and urban differences in access to preventative healthcare among publicly insured populations, rural enrollees were more likely to report no past year preventative care compared to the urban group (14). Although it might impose a challenging transition for rural communities to adapt to such changes, it could ultimately benefit rural populations.

While in rural areas there may not be geneticists available, sputum vials could be easily shipped to nearby centres, enabling results to be properly analyzed and reported back to community physicians. This impediment leads to an alternative option which may be to use genetic techniques, such as hereditary family trees, to target those who are more susceptible (6).

If a child has a family history which includes a hereditary condition, it should prompt the physician to refer the presupposed patient, to a geneticist specialist. Increased awareness of the patient's family history may provide great benefits in the long run (6). While exercise and proper diet may be recommended by physicians to a child with risk of diabetes, a personalized approach may add value to the treatment plan. For example, a physician may recommend against a keto diet which may place the child's blood level into an acidic state. Combined with a risk factor for diabetes, a state of ketoacidosis could place an additional stress onto the child's body. Incorporating a genetic screen alongside a thorough family history, would give health providers a unique advantage to aid in picking up clues that otherwise would have been unknown. While both genetics and medicine can individually provide invaluable knowledge, only through their collaboration can the greatest benefits be achieved (6).

## 6 . CONCLUSION

Although a large emphasis in today's healthcare is directed on curative medicine, an increasing focus on preventative medicine could truly revolutionize the practice of medicine. While the majority of diseases are multifactorial, caused by genetic, environmental, and lifestyle factors, an early detection can help tailor medical interventions to the patient. A patient-centred approach to the practice of medicine ensures cost efficient and more effective treatment, which benefit the patient and minimizes the use of limited resources. The prevention of diabetes, rheumatoid arthritis, and mental illnesses are just a few examples of preventative medicine in practice. In conclusion, the many implications of genetic screening in preventative medicine should motivate additional research, which could further reveal many undiscovered advantages.

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# An Interview with the First Female Chief of Staff at The Ottawa Hospital: Dr. Virginia Roth

**Keywords:** Interview; Women in Medicine; Chief of Staff; Medical Career Advice

**Melissa Phuong[1], and Hao Wang[1]**

[1]University of Ottawa, Faculty of Medicine

## ABSTRACT

Dr. Virginia Roth, an infectious disease physician, was appointed as the first woman Chief of Staff at The Ottawa Hospital in 2018. An alumnus of the University of Ottawa Faculty of Medicine, Dr. Roth has previously worked as an Epidemic Intelligence Service Officer at the U.S. Centers for Disease Control and Prevention and as Director of Infection Control at The Ottawa Hospital. She also holds an Executive MBA from the Telfer School of Management. We sat down with Dr. Roth in late-September to learn more about her career path, professional roles, and the ongoing COVID-19 pandemic, as well as seek advice for medical students on how to navigate their own education and careers.

## RÉSUMÉ

Dr. Virginia Roth, médecin spécialiste en maladies infectieuses, a été nommée première femme Chef du Personnel à l'Hôpital d'Ottawa en 2018. Graduée de la Faculté de Médecine de l'Université d'Ottawa, Dr. Roth a travaillé auparavant comme agente du service de renseignements sur les épidémies au Centre de Contrôle et Prévention des Maladies des États-Unis et comme Directrice du Contrôle des Infections à l'Hôpital d'Ottawa. Elle est également titulaire d'un MBA exécutif de l'École de Gestion Telfer. Nous avons rencontré Dr. Roth à la fin du mois de Septembre pour en savoir plus sur son parcours professionnel, ses rôles professionnels, ainsi que pour discuter de la pandémie COVID-19 actuellement en cours. Nous lui avons aussi demander des conseils pour les étudiants en médecine sur la manière de naviguer lors de leurs propres études et carrières médicales.

### Can you tell us briefly about your academic background and professional roles?

I actually completed my medical school here at the University of Ottawa. It's a great place to go to medical school. It's not so big that you get lost in the crowd, but it's big enough that you can get a lot of diverse clinical experiences after medical school. I stayed in Ottawa to do my internal medicine and infectious diseases training, and I really became interested in international health. From there, I went to the Centers for Disease Control (CDC) in Atlanta to become an Epidemic Intelligence Service Officer.

Working at the CDC, I was deployed across the U.S. and internationally to respond to outbreaks. I developed a passion for managing hospital-acquired infections and outbreaks and keeping patients safe in hospitals. That was a great experience. After my position at the CDC, I was recruited back here in Ottawa to become the Director of Infection Control, a role I maintained for over 10 years before becoming Chief of Staff.

**For students who may not be aware of a Chief of Staff's role in the hospital, do you mind elaborating more about what your day-to-day job is like?**

The role of the Chief of Staff is overseeing physicians. At The Ottawa Hospital (TOH), we have over 1400 physicians and fellows. In Canada, and in every province that I'm aware of, physicians have a unique relationship with the hospital. They're not employees, but rather they're independent practitioners appointed to the hospital. And so, the Board of Governors recruit a Chief of Staff who reports directly to our Board around any medical or quality of care issues, and provides guidance to our physicians. However, to me, the most important role of being Chief of Staff is supporting and engaging the medical staff. I have the privilege of doing everything I can to make TOH a place where our highly trained physicians can perform at their best. So, it's kind of that link or interface between the hospital administration and the medical piece.

**What do you believe is the most rewarding and the most difficult aspect of your job as Chief of Staff?**

Those could both be very long lists. I think the most rewarding piece, to me, is recruiting amazing physicians. And by amazing, I mean skills and clinical competency, but I also mean personalities. Recruiting people who are collaborative and whose top priority is patient care and providing a great experience. My job is to try and make this hospital an environment where they can thrive or feel supported and engaged. I take great satisfaction in that since it impacts our community well beyond our hospital. I also take great satisfaction from the physicians in our hospital. In fact, I'm very proud of them.

The most difficult part of the job is a hard question to answer. For me, it's really about individual physicians who find themselves in trouble. Whether it be questions about their practice, behavioural issues that keep them from being effective as a physician, or legal trouble. I think shepherding and guiding physicians in trouble is a challenge. It's a privilege, but it's a challenge both because I have a responsibility to ensure that patients receive safe and high-quality care while also being respectful to that individual physician.

**Do you mind elaborating a little bit more for students who might not be aware of the CDC and what that job entails?**

The CDC has been in the news a lot, obviously because of the COVID-19 outbreak. It's a paramilitary organization, and they have a program by which they train epidemiologists in what we call "shoe leather epidemiology." It's not so much sitting at a desk doing statistics, but rather it's really about being deployed, being out there, and being on the site of an outbreak. The CDC responds to the state health departments, but also to international requests for assistance in investigating and controlling outbreaks.

**COVID-19 has been on a lot of our minds lately, and it's really transformed our day-to-day living. How did the staff have to adapt to address the challenges of COVID-19?**

It has impacted our staff in almost every way you can imagine, similar to students. First off, working in hospitals, we've all had to take additional precautions to protect ourselves and our patients. This includes wearing more protective equipment and being screened every time we come to work to make sure we don't have any symptoms and have not been exposed in the community. I think there's been a real concern about the risk of taking an infection from the hospital to our homes and families. It's also changed the way we deliver care in that we see patients virtually a lot more now and have less in-person visits. There are pros and cons, but I would say that the way care is delivered now looks very different than it did six months ago. It also means that we have to keep a closer track of our patients that are waiting for care, whether it be surgery, an MRI, or an endoscopy, since a lot of those services have been delayed. If a patient's condition changes, we have to know that, and we have to be able to bump them up the queue to get them in. It's been a massive change, and it's not over yet. Our cases have been climbing, and it's really about making sure our staff have the tools and the supplies that they need to keep safe, but also to worry about their wellness. When we're in a sustained pandemic

like this, I think it wears on people, and we have to ensure that our staff is well-supported and cared for.

**You have experience advising on other outbreaks like the 2002–2004 SARS outbreak and H1N1. In what ways has COVID-19 been similar and different compared to previous outbreaks from the perspective of physicians and the senior hospital leadership?**

I think most of us in infectious diseases feel like we've done our share of outbreaks for a lifetime, but here we go again. These outbreaks are all caused by new viruses that we've never encountered before. So, as an infectious disease physician, you're really facing the unknown. How is it spread? How infectious is the virus? Who's more vulnerable? And, maybe most importantly, what treatments will help and what will do more harm? They're all learning experiences. On the clinical and population health front, all of these viruses had difficult trade-offs between the health and economic impacts of public health measures. The main difference with COVID-19 is just how long it's been lasting. With SARS and H1N1, people felt they could get their lives back to normal after a couple of months. However, we can't let our guard down. We have to make sure that we adhere to public health measures until we either have a vaccine or an effective treatment, because otherwise there's no end in sight. It's been a slog. I think we have to recognize that this is not a sprint, where we'll hang on for a few weeks or months. This is a marathon, until we get an effective vaccine.

**You have published in topics such as infection control and health leadership. Can you tell us more about how you developed an interest in research, your research interests, and whether you consider research to be an integral part of your career?**

To me, today's research is tomorrow's answer, treatment, or cure. My research is mainly focused on healthcare-acquired infections and making healthcare safer. Health economics, which involves saving dollars by providing safer care and reinvesting into the healthcare system, is something else that is interesting. I am passionate about research because there's really unlimited potential in terms of addressing the challenges in healthcare and our health system.

Ottawa is a great place to work as a researcher because we've attracted, in my opinion, some of the top talent in terms of researchers. We can see the benefits it has to our community and how it impacts the care we deliver at TOH and in our day-to-day lives. Not everyone considers themselves a researcher, but I think we can all be curious, we can all ask questions, and we can all contribute to new knowledge and new learning.

**For students who are on the fence, do you have any advice on how they can choose between the different specialties of internal medicine?**

That is a really tough question. I absolutely faced that myself, and that's why I went into internal medicine. I figured with internal medicine, you can pretty much pick anything. After three years of internal medicine, I think it helps to focus, but keep your career options open. We talked a bit about leadership, and I think that, for me, clinical medicine is a big piece of it, but it's not your life. Regardless of your specialty, there are a lot of skills you learn as a physician that you can apply more broadly. For example, leadership skills as well as how to engage with patients. A lot of physicians also do encore careers. A few people regret their choices. I think most people go through the training and realize they can sub-sub-specialize or they can branch out into other areas of medicine. Research is another great opportunity. I know that it can be an agonizing choice, I've been there. Just be confident in your choice and realize that your life isn't going to be defined by that one decision.

**Do you have any advice for students who are interested in pursuing a career in internal medicine and specifically infectious diseases?**

I would say you can be assured of a career that's always exciting and always in great demand. COVID-19 is showing us that the world is a small and interconnected place. Work in infectious diseases spans from public health to international health and from microbiology to epidemiology. It touches acute care medicine in every discipline. Even many chronic diseases, we now know, are infectious diseases. I would say, if you've got varied interests, infectious diseases touch all of those and it's a great way to tie all of that together.

**We noticed you had completed an Executive MBA. Do you have any advice for medical trainees who are looking for an additional degree either during their training or as an attending physician?**

Those three letters mean a huge amount of time and financial commitment. What I would say is that leadership training is always valuable, but to me leadership is 90% experience and 10% formal training. Not that I don't value formal training, but I think to get the most out of it, it's good to have a bit of experience, so that you can apply it immediately to a leadership role you're in. Whether that is in your professional life or your personal life, I think the same principles apply. With respect to doing an MBA, it's a big commitment. Usually, I advise physicians and trainees to start with shorter leadership courses like a weekend or week-long course to better define your goals. If your goal is to get three letters behind your name, then go for the MBA. If you're trying to get something practical to further your own development, then you can best guide where you're going to put your time and money to achieve those goals.

**Can you tell us a bit about how you became Chief of Staff? Are there any advice or words of wisdom you would definitely give to students who would like to pursue a leadership role?**

For me, becoming a Chief of Staff was never a career goal. In fact, I don't know many people who would go into medical school because they want to become administrators. Most of us are driven by wanting to care for patients. But what I would say is that we need to be aware, as we go through medical school and as we become physicians, that we are leaders, whether we recognize that or not. We are seen by the community and by our patients as leaders. So, I think that self-awareness is important. In my case, I attribute a lot of my career path to our last CEO Dr. Jack Kitts who saw potential in me and really acted as a mentor and encouraged me to see myself as a leader. It is important to seek out mentors, get honest feedback, understand yourself, and really start defining your values. Seek out mentors that guide you and see things in you that you don't see in yourself. The other thing I would say is to embrace opportunities. In medicine, I find that you can't simply sit there and define your dream job or the steps you want to take to become a leader. I don't see it as a linear process or climbing a ladder in medicine. To me, it's more that you zigzag between opportunities and experiences that over time will strengthen your leadership skills. And just be prepared because you don't know what opportunity will come along. My advice would be to conduct yourself as if you were the next Chief of Staff or the next Dean of Medicine. It might not happen tomorrow, but just be prepared, be aware of how others perceive you, and remember that things don't always happen as we plan. I think it's hard to do leadership career planning in medicine, rather, seize opportunities when they come.

**Because you mentioned mentorship, do you have any advice on how to initiate a relationship or foster a good mentoring relationship?**

To me, it's not about "a" mentor but about multiple mentors. They can just be a single meeting, or they can be ongoing, spanning months to years. And all of that is valuable. It is important to look for diversity in mentorship, as in picking multiple people for different goals or different things you see in them. Don't be afraid to ask. I think the one thing about medicine is that we all feel that we've benefited from mentors, so we also want to give back as a general rule. So, I would say, don't be afraid to ask and don't limit yourself to certain constructs of mentorship. Be very broad about what pieces you can take or learn from different people.

**As Chief of Staff, your schedule must be even more packed. As medical students, we're always stressed for time. Do you have any advice for students in terms of time management?**

I would say to take charge of your life. I know it sounds easy, and maybe a bit flippant. But no one else is going to look out for you, so you have to put yourself first. You have to take care of yourself and your basic needs. We talk about how eating, sleeping, exercise, and even personal hygiene slips if you're really busy. And, when that happens, I would say it's a warning sign. Often as physicians and medical students, we are so busy thinking about others, we don't take care of ourselves. So, take care of yourself, and take charge of your schedule. Be prepared to be very clear on what you're not going to do and what things won't get done, so you have time for the things that are really important to you. And by important, I don't mean just in a professional sense, but also in a personal sense as well.

As the first female Chief of Staff at TOH, do you have any

advice for other female trainees who want to be involved in leadership roles in healthcare? Especially since we often discuss how there's a gap in female leaders, and so we would also like to hear your perspective on why this may be the case.

That gap in female leaders in medicine is a tenacious problem, and I wish I had a snappy, instant solution to that. I think there are two pieces to this. One is how we approach leadership as women, and the other is how we as leaders of organizations approach it. I think, as women, it starts with us asking ourselves some really tough questions. And to me, it's about being honest with ourselves and asking, "What is my purpose here? How am I contributing to the greater good? How could others benefit if I stepped up?". Often women are also reluctant to put themselves forward. I would say if you're reluctant, ask yourself, "What are others losing out on because I'm not stepping up into a role?". But I would also say that neither women nor men should put a lot of pressure on themselves. Don't be constrained by others' expectations. You need to be honest with yourself. If the role is not right or the timing is not right for you, feel free to say "no" or say, "not now, maybe later", and that's okay. We often want to please, and I think we need to be honest about what really is best. Also, since women are often hesitant to put themselves forward, unless they're asked, those of us who are leaders, whether it be in healthcare or academia, need to seek out the best talent. Because the best talent doesn't always present itself or show up and say, "I'm here. I'm available". It includes women. It includes men. It includes minorities. I think there is great talent, but people will often exclude themselves. If you want an organization to succeed, you have to actively seek out that talent.

**Are there any last words of wisdom you would like to give to our current medical cohorts?**

I would say to embrace your time in Ottawa. This is a great place to do medical school. Learn what you can, and it's not just about clinical learning. It's learning about life, learning about people, and realizing that you've got a lot of opportunities ahead of you for your career.

# Evaluation of the Effectiveness of Ophthalmology Emergency Clinic Intake Forms

Kaisra Esmail[1], Keean Nanji[2], Setareh Ziai[1]

[1]The University of Ottawa, Department of Ophthalmology
[2]McMaster University, Department of Surgery, Division of Ophthalmology

## ABSTRACT

**Objective**: To evaluate the effectiveness of a novel patient intake form in an emergency ophthalmology clinic at a Canadian academic center. Despite the popularity of intake forms, their effectiveness has not been previously reported in the literature in an emergency ophthalmology clinic setting.

**Methods:** All new patients at the University of Ottawa emergency ophthalmology clinic were provided with a patient intake form to complete while waiting to be seen. Ophthalmology residents and nurses at the University of Ottawa completed an effectiveness survey evaluating the benefits of these forms after 24 months of use. Emergency ophthalmology clinics at other Canadian academic institutions were questioned regarding their use of patient intake forms.

**Results:** Nine residents and two nurses completed the effectiveness survey. The mean (SD) score assessing the use of the form (1=never, 5=every patient encounter) was 3.90 (1.20). The greatest perceived benefit involved improved clinic efficiency (91%). Responses from 100% of participants indicated that the form should continue to be used in practice. Of the other 14 ophthalmology residency programs in Canada, nine currently do not use an intake form, two have forms completed by nurses and three utilize a form but are dissatisfied with their results.

**Conclusions:** Our results suggest that there are benefits with respect to clinic efficiency when utilizing patient intake forms in an emergency ophthalmology setting. The use of similar forms may provide an opportunity to improve clinical practice at other academic institutions within Canada.

## RÉSUMÉ

**Objectif:** Évaluer l'efficacité d'un nouveau formulaire d'admission des patients dans une clinique ophtalmologique d'urgence au sein d'un centre universitaire canadien. Malgré la popularité des formulaires d'admission, leur efficacité n'a pas encore été rapportée dans la littérature dans un contexte de clinique ophtalmologique d'urgence.

**Méthodologie:** Tous les nouveaux patients de la clinique ophtalmologique d'urgence de l'Université d'Ottawa ont reçu un formulaire d'admission à remplir en attendant d'être examinés. Les résidents et les infirmières en ophtalmologie de l'Université d'Ottawa ont répondu à un questionnaire d'efficacité évaluant les avantages de ces formulaires après 24 mois d'utilisation. Les cliniques ophtalmologiques d'urgence d'autres institutions universitaires canadiennes ont été interrogées sur leur utilisation des formulaires d'admission des patients.

**Résultats:** Neuf résidents et deux infirmières ont répondu au questionnaire d'efficacité. Le score moyen (SD) évaluant l'utilisation du formulaire (1=jamais, 5=chaque rencontre avec le patient) était de 3,90 (1,20). Le plus grand avantage perçu concernait l'amélioration de l'efficacité de la clinique (91 %). Les réponses de 100 % des participants ont indiqué que le formulaire devrait continuer à être utilisé en pratique. Sur les 14 autres programmes de résidence en ophtalmologie au Canada, neuf n'utilisent pas actuellement de formulaire d'admission, deux ont des formulaires remplis par des infirmières et trois utilisent un formulaire mais sont insatisfaits de leurs résultats.

**Conclusions:** Nos résultats suggèrent qu'il y a des avantages en termes d'efficacité clinique à utiliser des formulaires d'admission des patients dans un environnement ophtalmologique d'urgence. Ainsi, l'utilisation de formulaires similaires pourrait permettre d'améliorer la pratique clinique dans d'autres établissements universitaires au Canada.

**Keywords: Patient intake forms; Ophthalmology; Emergency clinic; Collaboration; Patient satisfaction**

## INTRODUCTION

A patient's interaction with the healthcare system is a complicated and often stressful process. Eliciting an accurate medical history is an essential part of a physician-patient encounter, particularly in the emergency setting. There are however, multiple barriers to reliable history taking, including but not limited to: respondents providing inaccurate reports out of fear of embarrassment (1), potential physician cultural, race or gender biases resulting in a variability of questions (2), and physicians interrupting patients and/or using medical jargon that could lead to incomplete problem presentation and a partial history (3). Additionally, patients do not always remember their complete past medical and medication history, and thus it is often challenging to accurately produce this information on command. Patient intake forms provide patients with the opportunity to answer these questions on their own in a low-pressure environment, while awaiting their physician encounter, and therefore have the potential to reduce these barriers.

Patient intake forms are templates that facilitate a more accurate and efficient method of gathering important information. They are traditionally completed by patients while in the waiting room and include relevant information for a healthcare provider to properly assess and treat a patient. Intake forms frequently include information such as a patient's history of presenting illness, past medical history, and current medications. They are intended to reduce the amount of time spent gathering information during the clinical encounter, allowing physicians to focus on explaining information and clarifying patient concerns. These forms also provide patients with the opportunity to confirm information by communicating with family members or other healthcare professionals before the clinical encounter.

Additionally, patient intake forms have the potential to affect patient satisfaction, an important marker in any healthcare system. In addition to gratifying patients, satisfied patients are more likely to have improved compliance (4) and have an increased likelihood for improvement in health related quality of life (5). From a healthcare provider standpoint, increased patient satisfaction has been associated with fewer complaints from patients (6), and has been shown to be linked to staff satisfaction. A qualitative review examining 20 years of patient satisfaction literature highlighted that patients evaluate their experience based on a combination of the medical treatment received and the way in which they are treated (7). A patient's experience begins well before their first interaction with a healthcare professional, thus optimizing their experience in the waiting room is of utmost importance.

A study investigating patient satisfaction in an ophthalmology clinic found that patient satisfaction with wait time was the strongest driver of overall satisfaction score (8). Interestingly, the literature has shown that patients' perceived waiting time rather than actual waiting time has been more strongly correlated with patient satisfaction (9,10). The issue of time also plays a role in the information dispensation phase of the clinical encounter. Patients have described that perceiving to be under a time constraint as well as feeling rushed are barriers to clarifying the concerns that they have (11). Similarly, physicians have cited time constraints as a significant obstacle to their ability to act in an evidence-based manner (12,13). In an ophthalmology clinic, it has been demonstrated that significantly more time is spent on conversing between the ophthalmologist and patient than on any other activity during the clinical encounter (14). A major portion of these conversations are spent gathering pertinent medical information from patients in order to establish a diagnosis. Patient intake forms have often been suggested as a solution to improve efficiency in a clinical setting. Consequently, the purpose of this investigation was to introduce a novel patient intake form at the University of Ottawa Eye Institute's emergency clinic and assess its utility and effectiveness.

## METHODS

### *Evaluation of Patient Intake Forms at the University of Ottawa*

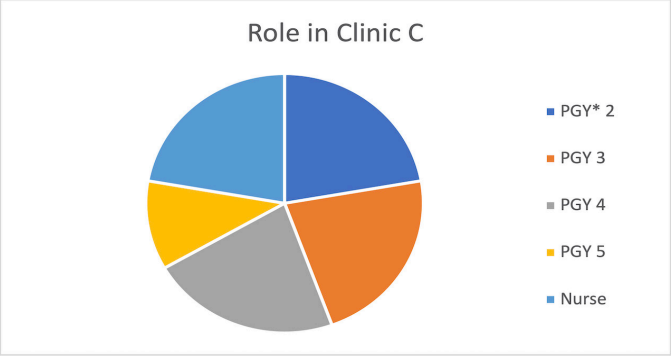
Ethics approval was waived due to the quality improvement nature of this study. Ophthalmology specific patient intake forms were created and introduced by a resident and attending physician at the University of Ottawa Eye Institute's emergency eye clinic. Once patients had registered at the front desk, they were provided with a patient intake form to complete [Appendix] while waiting to be seen. The intake form was provided in English and French and consisted of questions pertaining to other healthcare practitioners in the patient's circle of care, the patient's past ocular and medical histories, current medications, family history, as well as relevant questions regarding the

patient's social history. After 24 months of consistent use of the form, a survey [Appendix] was developed in order to determine its efficacy. All residents and nurses who work at the emergency clinic were provided with an anonymous electronic version of the survey. The survey consisted of six questions and was focused on how frequently the individual used the form, whether they found it helpful, and which aspects were the most beneficial.

### *Patient Intake Forms at Other Canadian Universities*

Residents in emergency ophthalmology clinics at the other 14 Canadian universities with ophthalmology residency programs were surveyed in order to determine their use of a patient intake form. Programs that indicated the use of a form were further asked about the role of the individual completing the form (e.g. patients vs nurses vs physicians), and to comment on its usefulness.

***Figure 1:*** **Graphical representation on the role of individuals who completed the effectiveness survey.**




PGY = postgraduate year

## RESULTS

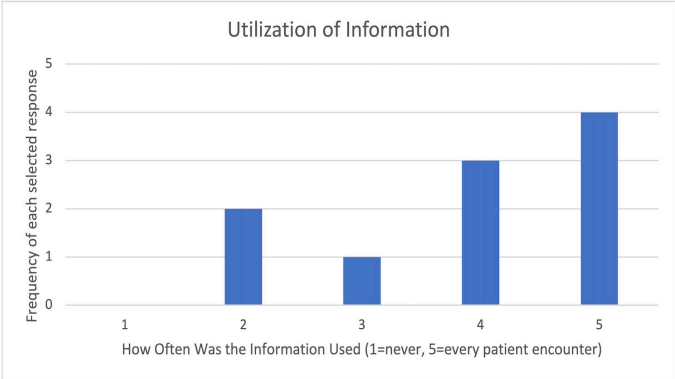
### *Survey Completion*

At the University of Ottawa Eye Institute, the emergency eye clinic is primarily staffed by the ophthalmology residents and two nurses. There are 12 ophthalmology residents from Post Graduate Years (PGY) 2-5, excluding the author. Nine of the 12 residents completed the effectiveness survey. The two nurses who predominantly staff the emergency clinic also responded to the survey **(Figure 1)**.

### *Utilization of Information*

As part of the effectiveness survey, individuals were asked if they utilized the information from the patient intake form when seeing new consults (yes/no) and if so, how often (1=never, 5 = every patient encounter). Nine individuals indicated that they utilized the form when seeing new consults. Ten individuals indicated how often they use the form. The mean (SD) score provided with regards to frequency of use was 3.90 (1.20) **(Figure 2)**.

***Figure 2:*** **Graphical representation of the frequency of information use.**




### *Benefits of the Intake Form*

The next section of the effectiveness survey evaluated the benefits of implementing patient intake forms. Individuals were asked to rate how helpful they found the form (1 = not at all, 5 = very helpful) and were subsequently asked what they thought the most beneficial aspect was. They were instructed to select as many options as they felt were appropriate (or none) from a list consisting of: improved clinic efficiency, improved accuracy of medical history, quick access to names of family physician/optometrist/ophthalmologist, or keeping patients occupied while waiting for their appointment. Individuals were also provided with a designated area to indicate any other benefits that they experienced.

All 11 individuals rated how helpful they found the form and indicated what they perceived to be the greatest benefits. The mean (SD) value with regards to perceived helpfulness was 4.0 (1.0). The greatest perceived benefit was improved clinic efficiency (91%) and the least indicated benefit was improved accuracy of medical history (45%) **(Table 1)**.

***Table 1:*** **Frequency of the Perceived Benefits of the Intake Form (n=11).**

| Beneficial Aspect of the Form | Individuals Who Noted This Benefit (%) |
|---|---|
| Improved clinic efficiency | 10/11 (91) |
| Improved accuracy of medical history | 5/11 (45) |
| Quick access to names of other HCPs to alloow for collaboration/communication | 6/11 (55) |
| Keeping patients occupied while waiting for their appointment | 7/11 (64) |

***Continuation of the Intake Form***

The final question of the effectiveness survey asked individuals whether or not they believe that the form should continue to be used. All 11 individuals responded that in their opinion, the form should continue to be used in clinical practice.

***Patient Intake Forms at Other Institutions***

A representative from each of the 14 other ophthalmology residency programs in Canada provided information regarding whether they currently use a patient intake form in their emergency clinic. The majority of clinics (9 out of 14; 64%) currently do not utilize a patient intake form. Of the five schools that do, two have nurses complete the form **(Table 2)**. Each of the three clinics that have patients complete the intake form reported some degree of dissatisfaction with their current results. One clinic indicated that they find the form to be redundant as the residents ask patients the same questions. Another indicated that the form is not used consistently by the residents working at their clinic. Rather, it is used variably depending on resident preference. The last clinic indicated that they did not find the form to be very helpful but did not elaborate as to why they felt this way.

***Table 2:*** **Current Status of Patient Intake Form Use at Other Canadian Ophthalmology Institutions.**

| Current Status of Form Use | Frequency (%) |
|---|---|
| No form is currently in use | 9/14 (64) |
| A form is currently used and is completed by patients | 3/14 (21) |
| A form is currently used and is completed by nurse | 2/14 (14) |

## DISCUSSION

The results of this investigation suggest that information gathered from patient intake forms is frequently utilized by healthcare professionals and have many benefits when implemented in an emergency ophthalmology clinic. The most experienced benefit was a subjective improvement in clinic efficiency. Other benefits include improved accuracy of medical information, quick access to contact information of other healthcare professionals for collaborative care, and keeping patients occupied in the waiting room. Most of the other Canadian academic institutions do not have a similar form in place in their emergency eye clinic, and those that do may not be experiencing the same benefits. Lack of consistent use of the form as well as poorly designed questions are two potential reasons as to why other institutions were not experiencing similar benefits. As a result, we believe that introducing a form such as ours at other Canadian academic institutions presents an opportunity for improved patient and healthcare provider experiences across the country.

The current literature reports similar findings as ours when utilizing patient intake forms. They have consistently been shown to be a reliable and valid method of collecting patient information (15–17). Consequently, clinicians are able to gather high-quality information in an efficient low-resource intensive manner. Patient chart data has been shown to be more complete when patients are provided with a self-administered health history questionnaire prior to the encounter, and this has resulted in physicians being able to recognize more health problems in a given encounter (18). This is particularly important in an emergency clinic setting when healthcare providers have little to no background information on the patient prior to the encounter. Additionally, patient intake forms provide patients with a task to complete while waiting. When occupied, patient satisfaction ratings have been reported to increase despite no changes to their wait time (19). Greater patient satisfaction has been linked to improved patient compliance with medical advice (4). This is important in any healthcare setting but particularly in an emergency clinic setting when there is often no scheduled follow up.

There are, however, several limitations that must be considered when examining the results of this investigation. First, much of our data is subjective in nature. There undoubtedly is great merit to subjective data, however, having both subjective and objective measures of a particular variable would provide more information regarding the benefits of our intervention. For instance, when examining clinic efficiency, comparing the time spent by healthcare professionals eliciting a history from a patient before and after the intake forms were implemented would have augmented our capacity to evaluate their effect on efficiency. Additionally, as this was a single site investigation, there was a relatively small sample who completed the effectiveness survey. A larger sample size would have given us greater power to detect the effect of our intervention. Lastly, patients were not surveyed regarding how long the intake form took them to complete or regarding their opinion of the forms. As a result, despite the current literature outlining the benefits regarding perceived wait time and patient satisfaction,

we cannot be certain that these benefits translate to our investigation.

In order to address these limitations, we suggest that future investigations involve more healthcare professionals to increase the sample size of the effectiveness survey. Furthermore, it would be beneficial to track objective measures of the variables that we investigated such as patient wait times, time spent by healthcare professionals eliciting a patient history, and patient chart completeness to supplement the subjective benefits of the patient intake forms. We would also suggest that an additional patient survey be completed by those involved to provide another perspective evaluating the benefits of the form. Future directions may include collaborating with other institutions to implement the same form in their emergency ophthalmology clinic and performing a comparative analysis.

## CONCLUSION

In summation, the current literature has well documented the benefits of utilizing intake forms in general clinical practice. Our investigation examined the effects of patient intake forms in a unique setting – an emergency ophthalmology clinic. Our results suggest that there are benefits with respect to efficiency in clinic when utilizing these forms. Furthermore, our investigation details a great opportunity for other Canadian ophthalmic institutions to implement such a form. They are a simple addition to clinical practice and offer numerous benefits to both healthcare professionals and patients.

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# Diagnostic Utility of Creatine Kinase in Patients Presenting to the Emergency Department with Chest Pain

Brandon Lam[1,2], Hina Chaudry[2], Muhammad Mukarram[2], Marie-Joe Nemnom[2], Soo-Min Kim[2], Aline Christelle Ishimwe[2], Monica Taljaard[2,3], Robert S. Beanlands[4], Ronald Booth[5,6], Guy Hebert[7], Ian Stiell[2,3,7], Venkatesh Thiruganasambandamoorthy[2,3,7]

[1]Faculty of Medicine, University of Ottawa, Ottawa Canada
[2]Ottawa Hospital Research Institute, Ottawa, Canada
[3]School of Epidemiology and Public Health, University of Ottawa, Ottawa, Canada
[4]Division of Cardiology, University of Ottawa, Ottawa, Canada
[5]Division of Biochemistry, The Ottawa Hospital, Ottawa, Canada
[6]Department of Pathology & Lab Medicine, University of Ottawa, Ottawa, Canada
[7]Department of Emergency Medicine, University of Ottawa, Ottawa, Canada

## ABSTRACT

**Introduction:** Creatine Kinase (CK) is routinely performed in some emergency departments (ED) for Non-ST-elevation myocardial infarction (NSTEMI) workup. Its diagnostic utility is not well understood. The objectives of this study were to assess the value of CK in NSTEMI diagnosis in the troponin era and the association between the highest CK/Troponin values and ejection fraction (EF) during NSTEMI follow-up.

**Methods:** A prospective cohort study conducted at the two EDs of The Ottawa Hospital from March 2014 to March 2016 enrolled adults (≥18 years) for whom troponin I (TnI) and CK were ordered for NSTEMI symptoms. We excluded those with ST-Elevation Myocardial Infarction (STEMI). The primary outcome was a NSTEMI within 30 days. We used descriptive statistics and report test diagnostic characteristics with 95% confidence intervals (CI). We compared the highest median CK/Troponin values using Wilcoxon test.

**Results:** Of the 2,153 patients enrolled, 99 (4.6%) suffered a NSTEMI. The sensitivity and specificity were: CK (cutoff >250U/L) 31.3% (95%CI 22.2, 40.5) and 91.1% (95%CI 89.9, 92.4) respectively; TnI (cutoff >0.045$\mu$g/L) 98.0% (95%CI 95.2, 100) and 86.2% (95%CI 84.7, 87.7) respectively. The median CK values were not significantly different between those with normal (n=267) and abnormal EF (n=55) on follow-up (107 U/L and 118 U/L respectively; p=0.31), whereas the median TnI values were significantly different (0.02 $\mu$g/L and 0.1 $\mu$g/L respectively; p<0.0001).

**Conclusions:** CK measurements do not provide any value in the ED work-up of NSTEMI and is not associated with EF on follow-up. Discontinuing routine CK measurements would improve resource utilization.

## RÉSUMÉ

**Introduction:** Le dosage de la créatine kinase (CK) est couramment effectué dans certains services d'urgence pour le bilan de l'infarctus du myocarde sans sus-décalage du segment ST (NSTEMI). Son utilité diagnostique n'est pas bien comprise. Les objectifs de cette étude étaient d'évaluer la valeur de la CK dans le diagnostic de l'infarctus du myocarde sans sus-décalage du segment ST à l'ère de la troponine et l'association entre les valeurs les plus élevées de CK/Troponine et la fraction d'éjection (FE) pendant le suivi de l'infarctus du myocarde sans sus-décalage du segment ST.

**Méthodes:** Une étude de cohorte prospective menée dans les deux urgences de l'Hôpital d'Ottawa de mars 2014 à mars 2016 a recruté des adultes (≥18 ans) pour lesquels la troponine I (TnI) et la CK ont été prescrites pour des symptômes de NSTEMI. Nous avons exclu les personnes présentant un infarctus du myocarde avec surélévation du segment ST (STEMI). Le résultat primaire était un NSTEMI dans les 30 jours. Nous avons utilisé des statistiques descriptives et rapporté les caractéristiques diagnostiques des tests avec des intervalles de confiance (IC) à 95%. Nous avons comparé les valeurs médianes les plus élevées de CK/Troponine en utilisant le test de Wilcoxon.

**Résultats:** Sur les 2153 patients recrutés, 99 (4,6 %) ont souffert d'un NSTEMI. La sensibilité et la spécificité étaient : CK (seuil >250U/L) 31,3% (95%CI 22,2, 40,5) et 91,1% (95%CI 89,9, 92,4) respectivement ; TnI (seuil >0,045$\mu$g/L) 98,0% (95%CI 95,2, 100) et 86,2% (95%CI 84,7, 87,7) respectivement. Les valeurs médianes de CK n'étaient pas significativement différentes entre ceux qui avaient une FE normale (n=267) et anormale (n=55) lors du suivi (107 U/L et 118 U/L respectivement ; p=0,31), alors que les valeurs médianes de TnI étaient significativement différentes (0,02 $\mu$g/L et 0,1 $\mu$g/L respectivement ; p<0,0001).

**Conclusions:** La mesure de la CK n'est d'aucune utilité dans l'évaluation de la NSTEMI aux urgences et n'est pas associée à la FE lors du suivi. L'abandon de la mesure systématique de la CK améliorerait l'utilisation des ressources.

**Keywords: Chest Pain, Creatine Kinase, Non-ST Elevated Myocardial Infarction**

## INTRODUCTION

Chest pain is the second most common emergency department (ED) presenting complaint with an estimated 600,000 patients presenting annually across Canada.1 The etiology of chest pain varies from musculoskeletal to cardiac causes such as acute coronary syndrome (ACS). ACS encompasses unstable angina (UA), Non-ST Elevated Myocardial Infarction (NSTEMI), and ST- Elevated Myocardial Infarction (STEMI).2 STEMI is diagnosed by electrocardiogram (ECG) and UA is diagnosed clinically in absence of elevated cardiac biomarkers. NSTEMI is defined as a rise and/or fall in cardiac troponin (cTn) with at least one value above the 99th percentile upper reference limit with clinical symptoms of ischemia such as chest pain or shortness of breath.2 As STEMI and UA constitute only 30% of patients with ACS, it is patients with a suspected NSTEMI that take up a significant proportion of ED resources.3 Currently, cTn is considered the standard biomarker for NSTEMI diagnosis.4 However, CK (creatine kinase) is also released into the blood stream as myocardial cells become infarcted and is one of the first cardiac biomarkers available in history to assess for NSTEMI.5 Hence, clinicians in several centers have been measuring serial CK levels in addition to cTn to rule-out NSTEMI. Additionally, in our center, patients hospitalized with NSTEMI have serial CK measurements performed and the peak CK levels documented on discharge.

The primary objective of this study was to assess the value of CK in NSTEMI diagnosis among ED patients with MI symptoms in the troponin era. The secondary objective was to evaluate the association between the highest CK or troponin I (TnI) values and ejection fraction (EF) on follow-up after NSTEMI hospitalization.

## METHODS

We conducted a prospective cohort study at two EDs of The Ottawa Hospital (Civic and General Campuses) from March 2014 to March 2016 with the primary objective of developing a pathway for optimal use of the conventional troponin assay. The secondary objective of this prospective study is to assess the role of CK in NSTEMI diagnosis. We enrolled adults (age ≥ 18) for whom cTn and CK tests were ordered for NSTEMI symptoms within the past 24 hours. We excluded patients with STEMI. The study was approved by the Ottawa Health Science Network Research Ethics Board. Emergency physicians obtained consent and enrolled patients into the study. We collected patient demographics, medical history, cTn and CK values, disposition, final ED diagnosis, and EF on follow-up echocardiogram among patients hospitalized with an NSTEMI. The EF was reported as intervals, >65%, 55%-65%, 45%-54%, 30%-44%, and <30%. EF ≥45 was considered normal while EF <45 was classified as abnormal.6 Both ED academic centers use a conventional Siemens Vista TnI assay.

The primary outcome was an NSTEMI within 30 days of the index ED visit. The outcomes were assessed by an adjudication committee comprised of two physicians who were blinded to the study data. A third physician adjudicated the outcome if there were any disagreements.

### *Data analysis*

We described our patient population using mean with standard deviation (SD), or median with interquartile range (IQR) for continuous variables based on the distribution, and frequency with proportion for categorical variables respectively. We used 250U/L, the upper reference range limit for CK and 0.045 $\mu$g/L, the 99th percentile for the normal population for TnI as the cut-point thresholds. We report sensitivity and specificity for the two biomarkers for NSTEMI diagnosis. We report 95% confidence intervals (CI) for the point estimates using either the large sample approximation or the exact binomial distribution where appropriate. We compared the median CK and TnI values between patients in the EF categories (normal vs abnormal) using the Wilcoxon test. We used SAS (version 9.4) software for data analysis. As the primary objective was to develop a troponin pathway, the sample size was guided by this primary objective.

## RESULTS

During the study period, of the 2,319 patients enrolled, 25 (1.1%) patients did not have CK measured and we were unable to achieve 30-day follow-up among 141 (6.1%) patients. The remaining 2,153 patients were included in the final analysis. ***Table 1*** shows the baseline characteristics, medical history, ED management and outcomes among study patients. Ninety-nine or 4.6% (95% CI 3.8% to 5.6%) of patients suffered a NSTEMI during the 30-day follow up period. Ninety patients were diagnosed with NSTEMI in the ED and nine patients after ED disposition.

***Table 1.*** **Patient characteristics and outcomes.**

| Variables | No. (%) of patients N = 2,153 |
|---|---|
| **Age (yrs)** | |
| Mean ± SD | 62.9 (15.7) |
| **Sex** | |
| Male | 1,175 (54.6) |
| **Medical History** | |
| Coronary artery disease | 667 (31.0) |
| Congestive heart failure | 180 (8.4) |
| Hypertension | 1,026 (47.7) |
| Diabetes | 391 (18.2) |
| Hyperlipidemia/Dyslipidemia | 757 (35.2) |
| Transient ischemic attack and cerebrovascular accident | 170 (7.9) |
| History of percutaneous coronary interventions and coronary artery bypass gr aft | 548(25.5) |
| Family history of coronary artery disease | 316 (14.7) |
| Previous cardiac arrest | 7 (0.3) |
| Current smoker | 237 (11.0) |
| **ED Management & 30-Day Outcomes** | |
| NSTEMI within 30-days | 99 (4.6) |
| Hospitalized | 270 (12.6) |

NSTEMI: Non-ST Elevation Myocardial Infarction

There were 213 patients (9.9%) who had CK levels >250U/L and 31 of them were diagnosed with NSTEMI (Appendix 1). Conversely, 68 patients diagnosed with NSTEMI had a normal CK level. ***Table 2*** shows the diagnostic characteristics of CK and TnI. The sensitivity and specificity of CK for NSTEMI diagnosis was 31.3% (95%CI 22.2% to 40.5%) and 91.1% (95%CI 89.9% to 92.4%) respectively. Of the 99 patients with NSTEMI, TnI was elevated TnI among 97 patients. The sensitivity and specificity of TnI was 97.9% (95%CI 95.2% to 100%) and 86.2% (95%CI 84.7% to 87.7%). The paired agreement for CK and TnI for NSTEMI diagnosis was 0.07 (95% CI 0.03 to 0.12).

***Table 2.*** **Diagnostic characteristics of CK and TnI**

| Diagnostic Characteristics of CK and TnI | Sensitivity (95% CI) | Specificity (95% CI) |
|---|---|---|
| **CK** | 31.3% (95% CI 22.2%-40.5%) | 91.1% (95% CI 89.9%-92.4%) |
| **TnI** | 97.9% (95% CI 95.2%-100%) | 86.2% (95% CI 84.7%-87.7%) |

CK: Creatine Kinase; CI: Confidence Interval; TnI: Troponin I

324 patients had an echocardiography performed within a mean of 22(±25.6) days after hospitalization. ***Table 3*** shows the relationship between EF and highest median CK/TnI values. Patients with normal EF had a median CK value of 107 U/L (IQR 71 to 166) and those with abnormal EF had a median value of 118 U/L (IQR 72 to 195; p=0.31). For TnI, patients with normal EF had a median TnI value of 0.02 $\mu$g/L (IQR 0.02 to 0.13) and those with abnormal EF had a median value of 0.1 $\mu$g/L (IQR 0.03 to 0.65; p<0.0001).

***Table 3.*** **EF versus highest median CK/TnI**

| Post-Admission EF Versus Highest Median CK/TnI | Highest Median CK (IQR) (U/L) | Highest Median TnI (IQR) ($\mu$g/L) |
|---|---|---|
| Normal EF (≥45) | 107 (71-166) | 0.02 (0.02-0.13) |
| Abnormal EF (<45) | 118 (72-195) | 0.1 (0.03-0.65) |

CK: Creatine Kinase; EF: Ejection Fraction; IQR: Interquartile Range; TnI: Troponin I

### *Limitations*

We compared CK to a conventional TnI assay. However, if compared to high-sensitive troponin assays such as Abbott ARCHITECT, Beckman ACCESS assays, the results may be more significant. Our study enrolled a random sample of patients and hence, selection bias is plausible.

## DISCUSSION

While most centers have abandoned the routine CK measurements for evaluation of patients with NSTEMI symptoms, there are still a significant number of healthcare facilities that continue the practice of CK measurements in addition to cTn for chest pain.7,8 However, our study shows evidence that CK is not useful in NSTEMI diagnosis when another cardiac enzyme assay such as TnI provides both a high sensitivity and specificity.

While the specificity of CK and TnI were similar, TnI has a markedly higher sensitivity. Due to TnI's high sensitivity and specificity compared to CK, TnI should be the only measurement used in patients with a suspected NSTEMI. Among 2 patients that were diagnosed with NSTEMI with TnI values below the cut-off, CK was also within normal limits and hence, had no diagnostic value.

Our study also shows that there is no statistically significant

difference of the median CK value between normal and abnormal EF. Although EF may seem associated with CK, the CK median values do not go above the cutoff (>250U/L) meaning these values would not be considered to be abnormally elevated. Furthermore, as the TnI values show an association for future low EF, there is no added benefit from CK measurements, and it is a waste of healthcare resources.

## CONCLUSION

In conclusion, our study shows that CK adds no diagnostic value in the workup of a NSTEMI among patients with negative TnI and hence should be discontinued. Our study shows no apparent association between highest median CK values and EF on follow-up echocardiogram. In contrast, TnI shows better association with lower EF. Discontinuing CK measurements will decrease costs and improve resource utilization.

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# Call For Submissions

The University of Ottawa Journal of Medicine (UOJM) is a peer-reviewed journal published by graduate and medical students of the Faculty of Medicine. The UOJM is the only bilingual institutional medical journal in Canada, welcoming high-quality submissions in English and in French. Accepted articles include original research, reviews & clinical practice, news and letters, commentaries, case and elective reports, and interviews. UOJM will be considering all articles, regardless of their topic, and implementing a continuous publication model. Articles will be available online within two weeks of acceptance for publication.

Additionally, we will still publish regular issues to highlight developments in research in specific areas and continue to provide high-quality printed content to our readership. UOJM is currently accepting submissions for our upcoming **Spring 2021 Issue 11.1: Medical Research in the COVID-19 Pandemic.** The submission deadline for our Spring issue is **May 10th, 2021 at 11:59 p.m**. High-quality writing and reviews will be recognized with an honorarium award. Authors submitting a high quality manuscript will receive the "UOJM Best Article Award". The manuscript will also be featured on the UOJM website and other UOJM media outlets. Submissions are made through our website and questions can be directed to contact@uojm.ca.

## Call for Spring Issue Cover Artwork

UOJM is also pleased to open the call for cover artwork to be featured on the cover of our **Spring 2021 Issue 11.1: Medical Research in the COVID-19 Pandemic.** We are looking for high quality photographic images that present the features and characteristics of healthcare and research during the COVID-19 pandemic.

We look forward to receiving your submissions!

**Zacharie Saint-Georges & Omar Dewidar**
**Co-Editors-in-Chief**
**University of Ottawa Journal of Medicine**

# Appel De Soumissions

Le Journal Médical de l'Université d'Ottawa (JMUO) est un journal évalué par les pairs et publié par des étudiants diplômés et des étudiants en médecine de la Faculté de Médecine de l'Université d'Ottawa. Le JMUO est la seule revue médicale institutionnelle bilingue au Canada, accueillant des soumissions de haute qualité dans les deux langues officielles, ainsi en anglais et en français. Les articles acceptés comprennent des recherches originales, des revues et des pratiques cliniques, des nouvelles et des lettres, des commentaires, des rapports de cas et des rapports électifs, ainsi que des entrevues. Le JMUO examinera tous les articles, quel que soit leur sujet, et mettra en œuvre un modèle de publication continue. Les articles seront disponibles en ligne dans les deux semaines suivant leur acceptation pour publication.

En outre, nous continuerons à publier des numéros réguliers pour mettre en évidence les développements de la recherche dans des domaines spécifiques et à fournir un contenu imprimé de haute qualité à notre audience. Le JMUO accepte actuellement les soumissions pour notre prochaine **édition 11.1 du printemps 2021 : La recherche médicale durant la pandémie de la COVID-19.** La date limite de soumission pour notre édition du printemps est **le 10 Mai 2021 à 23h59**. Les articles et les critiques de haute qualité seront récompensés par un prix honorifique. Les auteurs soumettant un article de haute qualité recevront le Prix du Meilleur Article du JMUO ("UOJM Best Article Award"). L'article sera également présenté sur le site internet du JMUO et au sein de ses autres médias. Les soumissions se font par le biais de notre site internet et les questions peuvent être adressées à contact@uojm.ca.

## Appel aux illustrations pour la couverture de l'édition du printemps

Le JMUO a également le plaisir de lancer un appel aux illustrations pour la couverture de son **édition 11.1 du printemps 2021 : La recherche médicale durant la pandémie de la COVID-19**. Nous recherchons des images photographiques de haute qualité qui présentent les caractéristiques des soins de santé et de la recherche pendant la pandémie de la COVID-19.

Nous attendons impatiemment de recevoir vos soumissions!

**Zacharie Saint-Georges & Omar Dewidar**
**Co-Rédacteurs en Chef**
**Journal Médical de l'Université d'Ottawa**


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