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The challenges of dealing with A.I. in academic publishing

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The rapid integration of artificial intelligence (AI) into scholarly communication has complicated long-standing norms surrounding authorship, research integrity and peer review.

The central challenge is maintaining the integrity of scholarly work where AI-generated text, images, data analyses and even entire research manuscripts can be produced with minimal human input. Traditional notions of authorship presuppose intellectual contribution, accountability and thus the ability to defend the work. However, when large language models can generate plausible arguments, literature reviews or experimental interpretations, identifying who truly 'authored' a piece becomes far less straightforward.

A second challenge concerns the potential for AI systems to amplify biases in scholarly literature. AI models trained on existing publications inherit the biases present in those sources, which is a particular issue for rural and Indigenous content. Editors must therefore consider not only the credibility of any given AI-assisted submission but also the broader epistemic effects of allowing AI-driven content creation at scale.

Peer review – already strained by increasing submission volumes – is also complicated by AI. AI makes it easy to generate superficially coherent but scientifically empty papers, overwhelming editorial systems with AI slop. Distinguishing genuine scholarship from AI-fabricated content adds an additional burden to our reviewers who are unpaid and already overextended.

Data transparency and reproducibility introduce another layer of complexity. If researchers depend heavily on opaque AI systems to perform statistical analyses or interpret results, the reproducibility crisis in science¹ will likely deepen rather than improve.

There are some safeguard policies that the CJRM, along with the International Committee of Medical Journal Editors, apply for the use of AI in the preparation of material to be submitted for publication in the journal.²

- Authors must disclose whether and which AI-assisted technologies were used
- AI-assisted technologies cannot be listed as authors
- Authors must carefully review and edit all materials produced through the use of AI to mitigate potential introduced bias and plagiarism and ensure appropriate citation of prior works.

Ultimately, the challenge of dealing with AI in academic publishing is not merely technical but deeply philosophical. It requires rethinking what counts as authorship and scholarly contribution in an age where machines can participate – sometimes meaningfully and sometimes deceptively – in the creation of knowledge.

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Les défis posés par l'IA dans l'édition scientifique

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L'intégration rapide de l'intelligence artificielle (IA) dans la communication scientifique bouleverse des normes bien établies concernant l'attribution d'auteurs, l'intégrité de la recherche et l'évaluation par les pairs.

Un premier enjeu majeur concerne la préservation de l'intégrité des travaux scientifiques, alors que des modèles d'IA peuvent désormais générer du texte, des images, des analyses de données — voire des manuscrits complets — avec très peu d'intervention humaine. Les modèles traditionnels d'attribution d'auteur reposent sur une contribution intellectuelle claire, la responsabilité et la capacité de défendre le travail produit. Or, lorsque des outils automatisés proposent des arguments crédibles, des revues de littérature ou des interprétations de résultats, il devient beaucoup plus difficile de déterminer qui est réellement l'auteur.

Un deuxième défi touche à la possibilité que les systèmes d'IA amplifient les biais déjà présents dans la littérature scientifique, ce qui est particulièrement préoccupant pour les sujets liés aux milieux ruraux et aux populations autochtones. Les comités éditoriaux doivent donc évaluer non seulement la fiabilité des textes produits ou assistés par l'IA, mais aussi les conséquences plus larges d'une production de contenu automatisée à grande échelle.

L'évaluation par les pairs, déjà mise à rude épreuve par l'augmentation constante des soumissions, devient également compliquée avec l'arrivée de l'IA. Produire un article qui semble cohérent, mais qui n'a aucune valeur scientifique, est aujourd'hui simple et rapide. Cette facilité risque d'inonder les systèmes éditoriaux de manuscrits générés à la chaîne, forçant les évaluateurs, bénévoles et déjà

surchargés, à distinguer la recherche authentique du contenu artificiel.

La transparence des données et la reproductibilité représentent un autre enjeu. Si les chercheurs s'appuient trop fortement sur des outils d'IA opaques pour réaliser des analyses statistiques ou interpréter des résultats, la crise de reproductibilité en science ne pourra que s'accroître¹.

Pour répondre à ces défis, la Revue canadienne de médecine rurale (CJRM) et le Comité international des rédacteurs de revues médicales (ICMJE) ont mis en place certaines règles encadrant l'usage de l'IA dans la préparation des manuscrits destinés à la publication²:

- Les auteurs doivent déclarer si, et quels outils d'IA ont été utilisés.
- Les technologies d'IA ne peuvent pas être considérées comme des auteurs.
- Les auteurs doivent réviser attentivement tout contenu produit par l'IA afin d'en corriger les biais potentiels, de prévenir le plagiat et d'assurer que les travaux antérieurs soient correctement cités.

Au final, les défis posés par l'IA dans l'édition scientifique dépassent largement la question technologique. Ils nous obligent à revoir ce que signifie "contribuer à la science" et ce qui constitue une véritable paternité intellectuelle dans un contexte où les machines peuvent désormais intervenir — parfois de façon constructive, parfois de façon trompeuse — dans la production de connaissances.

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Reactivate

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My first engagement with the global rural medicine community began years ago when I attended the Rural Medicine Australia Conference in 2013. That early international meeting – convened by the Australian College of Rural and Remote Medicine and the Rural Doctors Association of Australia (RDAA) – sowed seeds that helped lead to the first World Summit on Rural Generalist Medicine and to successive global gatherings of rural generalists. These early experiences instilled in me a deep appreciation for the value of cross-national collaboration: for sharing insights, blending perspectives, and learning from different health systems about how to sustain and support comprehensive rural practice. As such, I was especially pleased this fall to travel with the SRPC's President-Elect, Dr. Sarah Giles, to Australia and to formally sign a memorandum of understanding between the SRPC and RDAA establishing reciprocal membership. This agreement means RDAA members will have access to SRPC membership benefits, and our members may now tap into RDAA's substantial resources, supports, and educational offerings. In doing so, we deepen our international connection and broaden opportunities for rural physicians on both sides of the Pacific.

At the same time, the SRPC remains strongly engaged in domestic advocacy. In early October, on either side of our Fall Council Meeting, we met with a number of Members of Parliament and national health organizations in Ottawa to advance priorities essential to strengthening Canada's rural physician workforce. Since then, we have

continued to build on these discussions through regular virtual meetings. Notably, we have engaged the federal health minister's office multiple times around the issue of national licensure and physician workforce portability – a priority that we are pursuing in close collaboration with the Canadian Medical Association. These discussions are beginning to yield real momentum.

We are also continuing to push for dedicated federal and provincial-territorial funding to support the National Advanced Skills Training Program – a crucial initiative to ensure rural physicians can acquire and maintain enhanced competencies that meet the needs of their communities. Conversations with funding agencies and ministries remain active and constructive. Parallel to this, the SRPC is advancing components of a broader Health Human Resource Strategy, recognizing that a sustainable rural physician workforce requires coordinated training, recruitment, retention, and system-design efforts.

Finally, within the SRPC, we are undertaking a comprehensive review of our bylaws and governance structure, to ensure that our decision-making remains representative, resilient, and responsive – and that the SRPC is equipped to continue this important work for years to come.

The challenges facing rural health care are complex, but we believe they are not insurmountable. Through international collaboration, sustained advocacy, and strong organizational governance, we remain optimistic about the path ahead. The SRPC is committed to ensuring that rural physicians – and the communities they serve – receive the support, recognition, and resources they need to thrive.

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Ma première participation à la communauté internationale de la médecine rurale remonte à plusieurs années, lorsque j'ai assisté au congrès Rural Medicine Australia. Cette rencontre — organisée par l'Australian College of Rural and Remote Medicine (ACRRM) et la Rural Doctors Association of Australia (RDAA) — a marqué le début d'un travail qui a éventuellement mené au premier Sommet mondial sur la médecine généraliste rurale, puis à d'autres rencontres internationales rassemblant les généralistes ruraux.

Ces expériences m'ont rapidement montré l'importance des collaborations internationales: partager ce que nous apprenons, confronter nos approches et tirer parti des forces de différents systèmes de santé pour mieux soutenir la pratique rurale.

Cet automne, j'ai donc été particulièrement heureux d'accompagner la présidente désignée de la SMRC, la Dre Sarah Giles, en Australie afin de signer officiellement un protocole d'entente entre la SMRC et la RDAA établissant une adhésion réciproque. Grâce à cette entente, les membres de la RDAA pourront maintenant accéder aux avantages de la SMRC, et nos membres pourront bénéficier des ressources, du soutien et des formations offertes par la RDAA. Cette collaboration renforce nos liens internationaux et élargit les possibilités pour les médecins ruraux de part et d'autre du Pacifique.

Parallèlement, la SMRC poursuit son travail de représentation au Canada. Au début d'octobre, autour de notre réunion du Conseil d'automne, nous avons rencontré à Ottawa plusieurs députés ainsi que des organisations nationales en santé pour avancer des priorités essentielles à la stabilisation et au renforcement de la main-d'œuvre

médicale rurale. Depuis, ces échanges se poursuivent lors de rencontres virtuelles régulières. Nous avons notamment discuté à plusieurs reprises avec le cabinet du ministre fédéral de la Santé du permis d'exercice pancanadien et de la mobilité de la main-d'œuvre médicale; un dossier que nous menons en étroite collaboration avec l'Association médicale canadienne. Les progrès commencent à devenir tangibles.

Nous continuons également de réclamer un financement ciblé des gouvernements fédéral et provinciaux-territoriaux pour soutenir le Programme national de formation et compétences avancées, essentiel pour permettre aux médecins ruraux d'acquiescer et de maintenir les compétences élargies dont leurs communautés ont besoin. Les discussions avec les bailleurs de fonds et les ministères demeurent actives et constructives. Parallèlement, la SMRC fait avancer les composantes d'une stratégie plus large en ressources humaines en santé, sachant qu'un effectif médical rural durable nécessite une approche coordonnée de formation, de recrutement, de rétention et d'organisation des services.

À l'interne, nous avons également entrepris une révision de nos règlements et de notre structure de gouvernance afin de nous assurer que nos processus décisionnels demeurent représentatifs, solides et adaptés à notre réalité — et que la SMRC dispose de bases organisationnelles durables.

Les enjeux en santé rurale sont complexes mais peuvent être surmontés. Grâce à nos partenariats internationaux, à un travail de représentation soutenu et à une gouvernance organisationnelle rigoureuse, nous demeurons optimistes pour la suite. La SMRC demeure engagée à soutenir les médecins ruraux — et les communautés qu'ils desservent — afin qu'ils disposent des outils, de la reconnaissance et des ressources nécessaires pour offrir des soins de qualité.

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Improving resource stewardship in post-pandemic primary care: Insights into choosing Wisely Canada guidelines

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Abstract

Introduction: The COVID-19 pandemic significantly disrupted primary care delivery, amplifying challenges in resource stewardship. Choosing Wisely Canada (CWC) guidelines aim to reduce unnecessary interventions. However, barriers to their implementation persist, particularly in rural settings where access to resources is limited and patient expectations often conflict with evidence-based care. Our study explored primary care physicians' awareness of, utilisation of and barriers to implementing CWC guidelines in a post-pandemic context, focusing on challenges, quality improvement opportunities and innovative approaches to reduce low-value care.

Methods: An online survey of primary care physicians across Canada was used to collect demographic data, practice habits and perspectives on CWC guidelines. Quantitative analysis measured trends, while qualitative analysis of open-ended responses identified recurring themes.

Results: One hundred and twenty-seven primary care physicians responded to the survey. Results revealed high awareness of CWC guidelines (97.6%) but low familiarity with post-pandemic adaptations (36.2%) and patient-facing materials (61.4%). Key barriers included time constraints, fear of missed diagnoses and limited rural resources. Physicians highlighted the need for tailored approaches in rural settings, where deviations from guidelines are often necessary because of challenges related to healthcare access. Participants identified several opportunities for improvement, including integrating guidelines into electronic medical records and developing mobile applications to support decision-making. Enhanced patient education emerged as critical for addressing demands for unnecessary tests, often fuelled by misinformation from social media.

Conclusion: Targeted medical and patient education, interprofessional collaboration and technology integration are essential for improving CWC adoption. Tailored solutions that address rural-specific challenges and systemic barriers are pivotal for achieving sustainable resource stewardship in primary care.

Keywords: Choosing Wisely Canada Guidelines, physician feedback, resource stewardship

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Résumé

Introduction: La pandémie de COVID-19 a profondément bouleversé l'organisation des soins primaires, accentuant les défis liés à l'utilisation judicieuse des ressources. Les recommandations de Choisir avec soin visent à réduire les interventions inutiles, mais leur mise en œuvre demeure difficile, surtout en milieu rural où l'accès aux services est restreint et où les attentes des patients s'harmonisent parfois mal avec les pratiques fondées sur les données probantes. Notre étude examine la connaissance, l'utilisation et les obstacles à l'intégration des recommandations de Choisir avec soin chez les médecins de famille en contexte postpandémique, en mettant l'accent sur les défis rencontrés, les occasions d'amélioration de la qualité des soins et les approches innovantes pour diminuer les actes à faible valeur.

Méthodes: Une enquête en ligne a été distribuée à des médecins de soins primaires partout au Canada. Le questionnaire recueillait des données démographiques, des informations sur les habitudes de pratique et des perceptions par rapport aux recommandations de Choisir avec soin. L'analyse quantitative a permis d'identifier les tendances, tandis que l'analyse qualitative des réponses ouvertes a fait ressortir des thèmes récurrents.

Résultats: Cent vingt-sept médecins y ont répondu. Bien que la grande majorité connaissait les recommandations de Choisir avec soin (97.6%), peu étaient au fait des adaptations postpandémiques (36.2%) ou des outils destinés aux patients (61.4%). Les obstacles principaux mentionnés incluaient le manque de temps, la crainte de passer à côté d'un diagnostic important et le manque de ressources en région. Les médecins ont souligné la nécessité d'approches adaptées aux réalités rurales, où il faut parfois s'éloigner des recommandations en raison de contraintes d'accès aux services. Les participants ont également mis de l'avant plusieurs pistes d'amélioration, comme l'intégration des recommandations dans les dossiers médicaux électroniques et la création d'applications mobiles pour soutenir la prise de décision. Une meilleure éducation des patients a été identifiée comme essentielle pour répondre aux demandes d'examen inutiles, souvent alimentées par la désinformation circulant sur les réseaux sociaux.

Conclusion: Le renforcement de la formation clinique et de l'éducation du public, la collaboration interprofessionnelle et l'intégration de solutions technologiques sont essentiels pour augmenter l'adoption des recommandations de Choisir avec soin. Des stratégies adaptées aux réalités des milieux ruraux et aux obstacles systémiques sont indispensables pour assurer une gestion durable et responsable des ressources en soins primaires.

Mots-clés: Recommandations Choisir avec soin; gestion responsable des ressources

INTRODUCTION

Choosing Wisely Canada (CWC) is a physician-led national campaign that aims to identify and reduce unnecessary and potentially harmful tests, treatments and procedures.^{1,2} Physician orders for a patient must be evidence-based, have the potential to add value and minimise harm to patients. However, for a variety of reasons, physicians often order tests, treatments and procedures despite strong evidence that these interventions may not benefit and may even harm, their patients.² These unnecessary tests are often ordered by physicians, out of fear of litigation, to have all the possible information to ensure they have the correct diagnosis and to appease patients who insist they want a specific test.³ All medical interventions are associated with some level of risk and benefit, and it is the physician's role, in consultation with their patient, to determine which tests, treatments, and procedures are likely to provide the most benefit while doing the least

harm.² The CWC campaign aims to facilitate conversation between physicians and patients about reducing unnecessary interventions, with the goal of improved quality of care and resource utilisation in Canadian healthcare.^{1,4}

Despite the good intentions of the CWC campaign, there is mixed reception among physicians.⁵ Some physicians credit CWC with increasing dialogue between physicians and patients, thus encouraging greater patient involvement in their care.⁵ Others appreciate that the guidelines are phrased in simple sentences, making them easy to follow, and that it is a physician-led initiative.⁵ However, there remains some hesitancy among physicians in using the CWC guidelines.⁵ Physicians have expressed concern that guideline campaigns developed outside frontline practice can miss clinical realities.⁵ Some physicians also fear the possible legal ramifications of not providing a test or treatment to a patient that could potentially provide information about a diagnosis.⁵ There is

also the sentiment among physicians that the time restraints in clinical encounters do not allow a wholesome conversation with patients about what interventions are necessary for their medical care.⁵

Since health information has become more accessible via the internet and online search engines, physicians report a shift in the power balance between themselves and their patients.⁶ Patients are now frequently searching their health questions online before coming to appointments and may be requesting specific tests or have a certain expectation for the level of care they should receive.⁶ The CWC guidelines state that the ideal time to educate patients about why certain interventions may be unnecessary is during the clinical encounter, but many physicians report that they are already under enormous pressure to see patients quickly, reducing their time to engage in patient education; instead, they order the requested test and move on to the next patient.⁵ This may be even more likely in rural areas where there is a deficiency in primary care practitioners, and practitioners are more likely to report feeling overworked.^{7,8}

Although there are numerous challenges regarding the implementation of the CWC, there have been some positive outcomes reported since its inception in 2014.⁹ The Canadian Association of Emergency Physicians CW working group has reported a 31% decline in tests ordered since adopting the CWC guidelines.⁹ As well, the CWC oncology working group has reported that more than 65% of oncologists use CWC recommendations “always” or “most of the time,” and that over 80% of oncologists believe that the recommendations are relevant to their practice.¹ Patients are also described as responding positively to the CWC recommendations when provided with educational materials about the guidelines and the opportunity to discuss them with their primary care practitioner; however, as previously mentioned, this can be a challenge.¹⁰

To date, no studies have sought to understand the perspectives of primary care physicians regarding resource stewardship in a post COVID-19 pandemic context, which is a priority given current challenges in Canadian health care. Understanding the positive intentions of CWC, the successes seen in using the CWC campaign in other medical disciplines, and the challenges associated with following the guidelines is

particularly important for rural primary care practitioners.¹¹ The primary objectives of our study were to gain a better appreciation of CWC guideline use from a rural primary care practitioner perspective, specifically regarding barriers to use following the COVID-19 pandemic.

METHODS

Recruitment of physicians was done via email invitation with a link to a Google Survey. The survey was distributed by Local Education Group administrators across 12 Northern Ontario communities and by distribution to physician members of the Society of Rural Physicians of Canada via their internal email server. The inclusion criteria were that physicians be trained in and practising Family Medicine in Canada.

The online survey collected responses from February 2024 to July 2024. Informed consent was required prior to accessing the survey. The survey consisted of three sections, including physician demographics, primary practice habits and resource stewardship implementation. Demographics such as age, years of practice, gender, practice setting(s) and location of practice were collected. Respondents were required to self-identify as residing in a rural or urban community using the rurality index of Ontario as a reference.¹¹ Items regarding practice habits included awareness of the CWC campaign, physician use of 17 core CWC recommendations designed specifically for Family Medicine, impacts of the COVID-19 pandemic on practice habits, opinions on inclusion of resource stewardship in medical education and barriers to implementing resource stewardship practices. Resource stewardship implementation included questions on influences of practice habits, barriers faced providing care, as well as CWC recommendations and opinions on accountability of reducing unnecessary testing in health care. The survey included 25 questions total, with closed and open-ended options involving forced choice responses to include independently generated answers not otherwise listed, if desired.

Confidentiality and anonymity were maintained by aggregating all responses per question while not collecting any identifying information. Survey responses were securely stored on a password-encrypted Google Drive

that was not linked to respondents' email and was accessible only to researchers involved in this study.

Descriptive analysis was completed using frequency tables for nominal and ordinal data. To explore underlying themes within the qualitative data (open-ended responses), we employed thematic analysis to enable the identification and reporting of patterns (themes) within the data. Thematic analysis was chosen for its flexibility and to provide a detailed and nuanced understanding of the data collected.¹² To do this, the three student researchers conducting the study began with data familiarisation, each reviewing the responses to the seven qualitative questions and responses. Researchers independently generated initial codes from the data which involved systematically coding features of the data across the entire dataset of these seven questions. Each code represented a specific segment of data that was relevant to the research questions. Coding was done inductively, meaning that codes were derived directly from the data without preconceptions, ensuring that emerging themes were grounded in participants' perspectives. Codes were then narrowed down into potential themes. This process entailed collating codes into broader categories that reflected overarching patterns in the data into charts to visualise the relationships between different codes and themes.

Finally, the identified themes were reviewed and refined. This stage involved two levels of scrutiny: Reviewing the themes in relation to the coded data and revisiting the entire dataset to ensure that the themes accurately represented the data. This iterative process ensured that the themes were both internally coherent and distinctly separate from one another.

Our study received ethical approval through the Laurentian University Research Ethics Board (certificate 6021522).

RESULTS

A total of 127 primary care physicians responded to the survey [Table 1].

A quantitative analysis was initially conducted to examine potential differences in the responses of primary care physicians when comparing key factors such as geographical practice settings, years into practice and familiarity with CWC guidelines. Our analysis revealed no statistically significant differences across these variables, suggesting that the perspectives and practices regarding CWC guidelines were consistent, regardless of geographic location, years of professional experience or level of familiarity with CWC guidelines.

Physicians represented diverse experience levels [Table 2].

Table 1: Practice setting versus practice location

What best describes your current practice setting?	Rural Northern Ontario	Urban Northern Ontario	Rural Southern Ontario	Urban Southern Ontario	Rural Canada	Total	
						Count	Percentage
Solo practice	3	7	1	1	4	16	12.6
Group practice	42	31	5	0	11	89	70.1
Locum	6	3	0	0	6	15	11.8
Other	2	5	0	0	0	7	5.5
Total count	53	46	6	1	21	127	100.0

Table 2: Respondent age and years of practice

What is your age?	5 years or less	6–9 years	10–15 years	16–19 years	20 or more years	Total	
						Count	Percentage
Under 30 years	2	0	0	0	0	2	1.6
30–39 years	17	14	1	0	0	32	25.2
40–49 years	1	7	17	11	4	40	31.5
50–59 years	0	0	1	1	27	29	22.8
60 or above	0	0	0	0	24	24	18.9
Total count	20	21	19	12	55	127	100.0

Ninety-seven-point-six per cent ($n = 124$) of respondents reported an awareness of the CWC Family Medicine practice recommendations to reduce unnecessary tests/investigations. About 61.4% ($n = 78$) of respondents were aware of CWC information created for patients, and only 36.2% ($n = 46$) of respondents were aware of CWC recommendations to reduce low-value care after the COVID-19 pandemic.

The qualitative analysis of open-ended responses revealed several key themes regarding primary care physicians' experiences with CWC guidelines: misalignment, accessibility, consistency, fear of a missed diagnosis and time constraints in the clinical encounter.

The COVID-19 pandemic catalysed significant changes in primary care delivery, affecting both resource stewardship and clinical workflows. Key changes included increased use of virtual care and phone appointments, reduction in ordering tests and investigations, fewer routine physical examinations, increased use of personal protective equipment and adaptations to staff shortages and workflow changes. One respondent noted,

"Everything has changed: Workforce depletions and leadership disorganization have led to workarounds for MDs. We are not secretaries, administrators, and clinicians."

Physicians reported various methods for staying current with medical knowledge, including frequent use of UpToDate (evidence-based clinical solutions for health care) for case-specific research, using online content and social media (e.g., Twitter, FOAMed), teaching medical learners, which reciprocally updates the physician's knowledge, conferencing with colleagues and attending organised CME sessions. One physician mentioned,

"Teaching med students and residents! They update me on so much all the time!"

A prominent theme that emerged was the misalignment between patient expectations and CWC guidelines. Physicians frequently reported that patients often have preconceived notions about necessary tests or treatments, which may conflict with evidence-based recommendations. This misalignment created challenges in clinical practice, as physicians noted their need to navigate patient expectations while adhering to best practices. Many respondents emphasised the need for increased patient education to address this issue. One physician stated,

"The public needs to be better educated/informed."

Another noted,

"Daily, family physicians battle the health 'education' provided on TikTok and other forms of social media. Choosing Wisely should advertise/promote to patients on those platforms."

The extent to which physicians incorporated CWC recommendations into their daily practice varied among respondents. Some practitioners reported fully integrating the guidelines into their clinical decision-making processes, finding them valuable for providing evidence-based care. However, others noted that the guidelines were not always aligned with their clinical experience, particularly in rural settings where unique challenges exist. Rural practitioners highlighted specific issues, such as limited access to certain investigations or specialists, which sometimes necessitated deviations from CWC recommendations.

A significant theme that emerged was the desire for improved accessibility to CWC guidelines. One physician expressed interest in having the guidelines integrated into their electronic medical record systems, which would allow for easier reference during patient consultations. In addition, 49.6% ($n = 63$) of respondents suggested the development of a dedicated mobile application for quick access to CWC recommendations. These comments reflect the growing importance of technology in clinical practice and the need for guidelines to be readily available at the point of care. Primary care physicians felt it should be a team effort driven by health care providers who ultimately order tests.

Concerns about consistency in following CWC guidelines across different healthcare providers were raised by one respondent. This individual highlighted a discrepancy in guideline adherence, stating:

"Specialists and other physicians are often not following the guidelines, which makes things difficult. For example, radiology will word things as if repeat scans, etc., are needed, and it is hard to explain to patients why this is not evidence-based and may cause harm."

Several challenges were identified in implementing CWC guidelines, including fear of missing diagnoses, rare diseases or medical presentations post-pandemic and perceived misalignment between CWC recommendations

and standards of care or clinical experience. Physicians also described difficulty remembering numerous guidelines, patient expectations and demands for unnecessary tests and time constraints in educating patients about appropriate testing. One respondent noted,

"Patients are often more stubborn than I am-they whittle me down. I am often already exhausted by so many competing challenges in primary care that I can't be bothered to fight with them."

Respondents offered several suggestions for improving the implementation of CWC guidelines, including enhanced patient education initiatives, better integration of CWC guidelines into undergraduate and postgraduate medical education, development of a user-friendly CWC mobile application, regular updates and CME sessions on CWC recommendations. Suggestions on improved consistency in guideline adherence across different healthcare providers, and adaptation of guidelines to accommodate diverse clinical settings, particularly in rural areas, were noted.

DISCUSSION

In our study, researchers wanted to better understand the utilisation of resource stewardship, particularly with CWC guidelines, from rural primary care physicians' perspectives, in a post-COVID-19 pandemic context. We found that primary care physicians in rural settings across Canada expressed many common concerns in their clinical practice environments following the COVID-19 pandemic. Our study also highlighted how the pandemic led to rapid changes in primary care, with increased reliance on virtual care, fewer routine physical exams and changes to the patterns of ordering tests. Our research is consistent with current studies which highlight the burden being placed on primary care physicians working within a system that is not functioning as optimally as it should be.¹³⁻¹⁵

With regard to resource stewardship, particularly CWC recommendations, there was varying consensus around utilisation and barriers to use in practice. Despite variations in practice settings (urban vs. rural) and years of practice among surveyed primary care physicians, they had equivalent awareness of

CWC guidelines. This suggests that primary care physicians, especially those in rural Canada, have a widespread understanding of CWC. Despite this, the full actualisation of resource stewardship has not followed suit. Notable barriers to implementation became evident, such as fears of missing diagnoses, the frequency of so-called 'zebra' cases following long periods of reduced direct patient contact, and overwhelming time constraints which reduce the opportunity to discuss with patients why guidelines support reduced testing. Regional differences were also important to note, as physicians in more remote locations felt that ordering more investigations for their patients was important, as their ability to access repeated or additional follow-up was significantly limited. This demonstrates that guidelines are just guidelines; their applicability in unique clinical contexts warrants further understanding, not explored in this study. More insight into why there is discordance between awareness and implementation of resource stewardship practices like CWC may come from inconsistencies of awareness between medical specialities. This was one area deemed particularly problematic by primary care providers, in that patients can sometimes be presented with conflicting suggestions as to why they may or may not need further testing. This suggests that awareness of CWC recommendations in other specialities is not consistent, which may warrant further exploration. Education for trainees is also paramount. Overwhelmingly, physicians felt that integration of CWC recommendations and resource stewardship principles into undergraduate medical education should be done.

Our study demonstrated minimal awareness among primary care physicians regarding CWC patient-facing materials around reducing unnecessary testing. Nonetheless, understanding patients' awareness of these same materials was not studied, and this would be useful in the future. Physicians in our study expressed concern that patients can be influenced by social media and non-evidence-based means, which often results in their insistence on tests and treatments that are not medically needed. Therefore, improving patient education to address misconceptions and to promote shared decision-making should be a priority for resource stewardship, particularly in CWC's

campaigns moving forward. This discordance demonstrates a barrier for physicians who are already tasked with an insurmountable expectation to reduce resource burden on the healthcare system and meet patients' expectations for care. It is important to recognise that primary care physicians are often exposed to numerous practice guidelines which are used to frame their practice policies.

The themes we have identified in this study provide valuable insights into the challenges and opportunities associated with implementing CWC recommendations in diverse clinical settings. The CWC initiative is one among many that physicians can choose to utilise, but it is not the only viable resource available, nor does it preclude the use of other initiatives.¹⁻⁴ Guidelines are just guidelines— they are not prescriptive elements. Physicians' practice habits are shaped by numerous factors, including those of guidelines, practice location and regional or community factors which we examined in this study. Understanding how physicians' practice habits are influenced by initiatives such as CWC, as in our study, offers insights that could also be examined with other resource stewardship or clinical practice guidelines.

Our study highlights that it is not the sole responsibility of primary care physicians to reduce the burden of unnecessary care. Resource stewardship efforts should also include policymakers and patients, who need to be made aware of these principles, particularly in the context of our overwhelmed primary care system.

While general awareness of CWC guidelines among rural primary care physicians across Canada is present, challenges persist in translating this awareness into consistent practice. In the face of evolving patient expectations and COVID-19 pandemic-related disruptions, there is a need for continued efforts in medical and patient education, technology integration of resource stewardship and guideline adaptation to local contexts. Attempts to improve the current systemic challenges in primary care, particularly in rural regions, by reducing unnecessary testing is feasible. There is no blanket approach; however, targeted early education for healthcare providers from all specialties and patient education is paramount. Balancing expectations while reducing unnecessary testing and investigations with patient harm is key.

Limitations

Sampling bias may have occurred, as the survey distribution may have excluded physicians not engaged with the particular networks utilised. This may have skewed the sample towards those already aware of or interested in resource stewardship. In addition, the study focused on rural primary care physicians, limiting the generalisability of the results to other regions with different healthcare contexts. The use of self-reported data introduces potential social desirability and recall biases, with physicians possibly over-reporting their awareness or implementation of CWC recommendations. The sample size may also limit the robustness of the conclusions and their broader applicability. Thematic analysis of qualitative data, although rigorous, is inherently subjective and interpretations could be influenced by researcher bias. The short data collection period (February to July 2024) means that our results reflect practices during this specific time frame and may not capture longer-term trends or ongoing impacts of the COVID-19 pandemic on physician behaviour.

CONCLUSION

Our study highlights that while awareness of CWC guidelines among primary care physicians is high, consistent implementation remains limited— particularly in rural settings facing unique access and resource challenges. Sustained improvement in resource stewardship requires more than awareness; it demands system-wide strategies that integrate guideline education into medical training, support for interprofessional collaboration and leveraging of technology to make evidence-based decisions easier at points of care. Strengthening patient education and aligning expectations with the best clinical practices will be critical to advancing sustainable and high-value primary care in the post-COVID-19 pandemic era.

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The impact of the COVID-19 pandemic on burnout and resilience amongst healthcare personnel in rural Northern Ontario: A cross-sectional study

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Abstract

Introduction: The COVID-19 pandemic imposed an unprecedented strain on the healthcare system, resulting in rising burnout levels among healthcare personnel. The pandemic's effect on the mental well-being of those working within resource-limited healthcare settings remains unexplored. We assessed the impact of the pandemic on burnout and resilience in healthcare personnel working in rural Northern Ontario.

Methods: We surveyed healthcare personnel across 15 rural communities in Northern Ontario, gathering demographic, occupational, burnout and resilience data. Chi-square tests (χ^2) determined response variations by demographic and occupational factors, whereas ANOVAs assessed mean differences. Pearson correlation coefficient measured the relationship between burnout and resilience, and linear associations were identified using the Mantel-Haenszel test.

Results: Ninety-nine healthcare workers from 15 rural communities were sent the survey. Seventy-six (77%) responded. Fifty-five per cent of respondents experienced burnout, with 81% rating it as moderately severe or worse. Those who grew up in their current community reported higher burnout rates, and 73% of participants reported strong resilience. Childhood community ties correlated with lower resilience, whereas higher resilience was linked to lower burnout severity. Physicians had lower Connor-Davidson-Resilience Scale[®] (CD-RISC 2) scores compared to hospital CEOs.

Conclusion: Despite high burnout, respondents had strong resilience. A correlation between burnout severity and resilience suggests that higher resilience is linked to less severe burnout which suggests that resilience can buffer the impact of burnout. Enhancing resilience could improve the ability to cope with stress and adversity. The data emphasises the need to consider factors, such as occupation and community history, when assessing burnout risk and designing well-being interventions.

Keywords: COVID-19, healthcare workers, mental health, occupational health, rural health

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2-25 L'impact de la pandémie de COVID-19 sur l'épuisement professionnel et la résilience du personnel de la santé dans le Nord rural de l'Ontario: Une étude transversale

Résumé

Introduction: La pandémie de COVID-19 a exercé une pression sans précédent sur le système de santé, entraînant une hausse marquée de l'épuisement professionnel chez le personnel soignant. Les répercussions de cette crise sur la santé mentale des professionnels œuvrant dans des milieux où les ressources sont limitées demeurent peu documentées. Cette étude évalue l'impact de la pandémie sur l'épuisement professionnel et la résilience du personnel de la santé travaillant dans des communautés rurales du Nord de l'Ontario.

Méthodes: Une enquête a été menée auprès de membres du personnel de la santé provenant de 15 communautés rurales du Nord ontarien. Nous avons recueilli des données démographiques, professionnelles, ainsi que des mesures d'épuisement professionnel et de résilience. Des tests du khi carré (χ^2) ont permis d'examiner les variations selon les caractéristiques sociodémographiques et professionnelles. Des ANOVA ont été utilisées pour comparer les moyennes. Le coefficient de corrélation de Pearson a évalué la relation entre l'épuisement professionnel et la résilience, et des associations linéaires ont été analysées à l'aide du test de Mantel-Haenszel.

Résultats: Parmi les 99 membres du personnel de la santé provenant de 15 communautés rurales à qui l'enquête a été envoyée, 76 ont répondu (77%). Cinquante-cinq pour cent des répondants ont indiqué vivre de l'épuisement professionnel, et 81% l'ont qualifié de modérément sévère ou pire. Les personnes ayant grandi dans la communauté où elles travaillent rapportaient des taux d'épuisement plus élevés, tandis que 73% des participants présentaient une forte résilience. Les liens communautaires établis durant l'enfance étaient associés à une résilience plus faible, alors qu'une résilience élevée était liée à une sévérité moindre de l'épuisement professionnel. Les médecins affichaient également des scores inférieurs au Connor-Davidson Resilience Scale® (CD-RISC 2) comparativement aux PDG d'hôpitaux.

Conclusion: Malgré des niveaux élevés d'épuisement professionnel, les participants présentaient une résilience notable. La corrélation entre résilience et sévérité de l'épuisement suggère qu'une meilleure résilience atténue l'impact de l'épuisement, renforçant la capacité à faire face au stress et à l'adversité. Les résultats soulignent l'importance de considérer des facteurs tels que l'occupation et l'ancrage communautaire dans l'évaluation du risque d'épuisement et dans la conception d'interventions pour soutenir le bien-être.

Mots-clés: Personnel de la santé, santé mentale, santé au travail, santé rurale, COVID-19

INTRODUCTION

The World Health Organization has recognised burnout as a workplace phenomenon in its most recent International Classification of Diseases.¹ Defined by prolonged and unaddressed occupational stress, burnout is characterised by three features: overwhelming exhaustion, cynicism, and a sense of reduced personal accomplishment.² Even prior to the COVID-19 pandemic, healthcare workers (HCWs) experienced high rates of burnout, driven by severe occupational demands, limited resources and a responsibility to prioritise others well-being over their own.^{3,4} The pandemic exacerbated burnout with global demand for health resources that far outstripped supply, leaving already understaffed HCWs to manage heavier workloads in an overburdened system. As a result, burnout rates among HCWs increased to over 60% in 2021, representing a 1.5–3-fold increase from pre-pandemic rates.⁵

Healthcare administrators, particularly those in leadership roles, have also experienced an increase in burnout during the pandemic.⁵ This may be attributable to the challenge of implementing measures to safeguard the health and safety of colleagues and patients amidst limited resources and constantly changing public health guidelines.⁶ The rise in burnout across healthcare professions, both clinical and non-clinical, highlights the pandemic's significant impact on mental health. It underscores the need for strategies to address its consequences, including absenteeism, reduced patient care quality, decreased clinical engagement and a lack of organisational effectiveness.^{2,7,8} Personal resilience has emerged as a promising approach for mitigating the deleterious effects of burnout.⁹⁻¹¹ Studies have consistently demonstrated that resilience exhibits an inverse association with emotional exhaustion and depersonalisation, while exhibiting a positive correlation with personal achievement.^{12,13}

The onset of COVID-19 offered a unique opportunity to examine how burnout and resilience manifest amongst staff across different healthcare settings. However, most research focused on urban centres or large-scale cohorts and overlooked the distinct challenges of working in resource-limited environments. As a result, little attention has been paid to the distinct contextual factors faced by those working in low-resourced rural healthcare settings that may have amplified burnout rates in comparison to their urban counterparts.

Northern Ontario exemplifies a resource-limited and often unstable healthcare environment in Canada, with chronic staff shortages and inadequate funding.¹⁴ The pandemic exacerbated these vulnerabilities, culminating in an unprecedented staffing crisis that has forced numerous emergency room closures across the region.¹⁵⁻¹⁷ It is important to consider how managing the pandemic within this historically fragile healthcare system impacted those working in this environment. This is particularly relevant as the challenges posed by COVID-19 and its aftermath have driven staff to leave Canada's healthcare system at unprecedented rates, exacerbating existing disparities in care within this underserved region.^{15,18,19} Given this context, understanding how resilience functions as a protective factor is important in order to support the well-being of healthcare personnel working in these demanding environments.

Our study sought to investigate burnout and resilience amongst healthcare personnel in rural Northern Ontario during the 1st year of the COVID-19 pandemic. It aimed to determine how the unique challenges of working in this resource-limited health environment influenced the manifestation of burnout and resilience. The results of our study provide valuable insights to guide the development of targeted strategies aimed at improving the well-being and quality of life for healthcare personnel working in Northern Ontario and similar underserved healthcare environments.

METHODS

Between June and July 2021, a standardised 89-item questionnaire was sent to 99 healthcare personnel working in frontline patient-facing roles (primary care physicians and paramedics) and senior administrative positions (executive directors of primary care clinics, hospital nurse

managers and hospital chief executive officers) at hospitals, EMS and primary care clinics located in 15 rural communities in Northern Ontario, 7 in the Northwestern region and 8 in the Northeast [Figure 1]. Participants received a monetary stipend of \$100CAD for completing the survey.

The questionnaire collected demographic information (age and gender), professional details (occupation, years of experience in current position and years worked in the community) and whether respondents had lived in the community prior to age 18 years. Participants were also asked to evaluate their levels of burnout and resilience during the 1st year of the COVID-19 pandemic. Personal resilience was measured using the 8-item Short Resilience Survey (SRS), a psychometrically validated measure of resilience that also identifies burnout risk.²⁰ The 2-item Connor–Davidson Resilience Scale[®] (CD-RISC 2), validated for assessing the ability to adapt to and recover from periods of adversity or crisis, was also used to measure resilience.²¹ In addition, respondents rated their perceived resilience during COVID-19 on a five-point Likert-type scale.

To assess burnout, respondents were asked to self-report whether they experienced burnout during the COVID-19 pandemic. Those who indicated experiencing burnout were then asked to rate its severity on a five-point Likert-type scale.

Chi-square (χ^2) tests were used to determine whether the distribution of responses differed based on demographic variables, whereas *t*-tests were used to determine statistically significant differences in proportions ($P < 0.05$). ANOVAs with Bonferroni *post hoc* tests were used to test differences in means between groups. Linear trends between variables were identified using the Mantel–Haenszel test. The strength and direction of the relationship between burnout and resilience were measured using the Pearson correlation coefficient (*r*). All analyses were performed using IBM SPSS Statistics for Windows, Version 26 (IBM Corp., Armonk, N.Y., USA).

This study was approved by the Lakehead University (Thunder Bay, Ontario) Research Ethics Board (Research ID #1468565).

RESULTS

Of the 99 distributed questionnaires, 76 were returned for a total response rate of 77%. Table 1



Figure 1: Location of the 15 rural communities in Northern Ontario where healthcare personnel were surveyed about their level of burnout and resilience during the 1st year of the pandemic. ■ = Northern West Region ■ = Northern East Region

outlines the respondent demographics and occupational characteristics, distribution of age, gender, position, years in position, years worked in the community and whether they lived in the community before the age of 18 years.

Burnout

Just over half (55%) of respondents reported experiencing burnout related to the COVID-19 pandemic [Table 2]. Chi-square indicated that the incidence of burnout did not significantly differ by gender, position, years in current role or years working in the community. However, individuals who lived in their current community before the age of 18 years experienced significantly higher rates of burnout than expected. Furthermore, while the incidence of burnout among different age groups was not significantly different from expected values (under a null hypothesis), a significant negative linear correlation was identified between age and burnout rates as determined by the Mantel–Haenszel test of trends [Table 2].

Additional Chi-square analyses revealed no significant differences between the observed and expected degree of burnout across age, gender, position, years in community, years in position or living in the community prior to age 18.

Resilience

Respondents who completed the SRS scored an average of 29.3 ± 4.3 out of 40, indicating a relatively high level of resilience. Similarly, those who completed the CD-RISC 2 had an average score of 6.9 ± 1.2 out of 8, reflecting a high level of resilience and ability to adapt or bounce back from hardships. In addition, the average self-reported resilience score was 3.9 ± 0.8 of 5.

Amongst those who self-reported their resilience during COVID-19, 5% ($n = 4$) rated their resilience as weak, 21% (16) as moderate, 49% (37) as strong and 24% (18) as very strong.

Resilience levels, measured by the SRS, CD-RISC 2 and self-reports, did not significantly

Table 1: Respondent demographics and occupational characteristics

Variable	Group	Frequency, n (%)
Age (n=75)	21–29	1 (1.3)
	30–39	19 (25.3)
	40–49	13 (17.3)
	50–59	29 (38.7)
	60+	13 (17.3)
Gender (n=72)	Female	51 (70.8)
	Male	21 (29.2)
Position (n=76)	EMS	7 (9.3)
	Hospital CEO	13 (17.3)
	Hospital CNO	12 (16.0)
	Physician	30 (40.0)
	Primary care clinic executive director	14 (18.7)
Years in current position (n=76)	0–5	34 (44.7)
	6–10	17 (22.4)
	11–15	4 (5.3)
	16–20	4 (5.3)
	21+	17 (22.4)
Years worked in current community (n=76)	0–5	24 (31.6)
	6–10	12 (15.8)
	11–15	8 (10.5)
	16–20	7 (9.2)
	21+	25 (32.9)
Lived in current community before age 18 (n=76)	Yes	23 (30.3)
	No	53 (69.7)

EMS: Emergency medical services, CEO: Chief executive officer, CNO: Chief nursing officer

differ by age, gender and years of experience in the current position or years working in the community. However, an ANOVA revealed a significant difference between CD-RISC 2 scores and position with a Bonferroni *post hoc* test, indicating that physicians had a significantly lower CD-RISC 2 resilience score compared to hospital CEOs [Table 3]. Moreover, individuals who have lived in the community prior to age 18 years had significantly lower resilience across self-reported resilience scores, SRS scores and CD-RISC 2 scores, which trended towards statistical significance.

Burnout and resilience

Summarised in Table 4, a significant moderate correlation ($r = -0.47$) was observed between self-reported resilience and burnout, indicating that higher personal resilience is associated with lower severity of burnout. Similarly, a weaker but still significant negative correlation was observed

between burnout and CD-RISC 2 score ($r = -0.37$), suggesting that greater resilience, as measured by the CD-RISC 2 scale, is linked to reduced burnout severity. Further, a significant negative correlation was also found between burnout and total SRS scores ($r = -0.40$), indicating that higher resilience measured by the SRS scale is associated with less severe burnout.

DISCUSSION

Our study examined resilience and burnout amongst healthcare personnel in rural Northern Ontario following the 1st year of the COVID-19 pandemic. Despite reporting high levels of resilience, respondents experienced substantial burnout.

Resilience

The high level of resilience amongst the respondents suggests that healthcare personnel working in Northern Ontario have the capability to adapt and manage job-related stressors even amidst crises like the COVID-19 pandemic. Factors unique to rural environments, such as a strong sense of community and close connections with patients, may contribute to this outcome by providing a greater sense of purpose and meaning in their work.^{22–24} In addition, for providers, rural healthcare settings allow greater autonomy and control over their work, which provides flexibility to cope with the demands of their job.

Another explanation could be self-selection and experience. Those who choose to work in rural areas may possess or develop higher resilience due to their familiarity and experience with managing challenges in low-resource environments. Interestingly, the level of resilience was not associated with age, gender and years in position or years working in the community, suggesting those working in rural health care may possess a certain degree of ‘innate’ resilience, unrelated to personal background or work experience.

Occupation, for the most part, did not impact the level of resilience reported. One exception was that physicians demonstrated significantly lower resilience, as measured by CD-RISC 2, compared to hospital CEOs. The CD-RISC 2 assesses an individual’s ability to overcome challenges, and this disparity

Table 2: Incidence and severity of burnout reported by respondents

A. Incidence of self-reported burnout, “Did you experience burnout due to COVID-19?”		
Response (n=76)	Frequency, n (%)	
Yes	42 (55.3)	
No	31 (40.8)	
Prefer not to answer	3 (3.9)	
B. Self-reported severity of burnout amongst respondents who indicated experiencing burnout		
Response (n=42)	Frequency, n (%)	
Severe	4 (9.5)	
Somewhat severe	8 (19.0)	
Moderate	23 (54.8)	
Mild	3 (7.1)	
Very mild	4 (9.5)	
C. Demographic characteristics of respondents who reported experiencing burnout		
Variable	Group	Frequency reporting burnout, n (%)
Age (n=41)*	21–39	13 (72.2)
	40–49	8 (66.7)
	50–59	15 (51.7)
	60+	5 (38.5)
Gender (n=40)	Female	26 (52.0)
	Male	14 (70.0)
Position (n=42)	EMS	2 (33.3)
	Hospital CEO	6 (60.0)
	Hospital CNO	9 (69.2)
	Physician	18 (60.0)
	Primary care clinic executive director	6 (46.2)
Years in current position (n=42)	0–5	17 (53.1)
	6–10	12 (75.0)
	11–15	3 (75.0)
	16–20	2 (50.0)
	21+	8 (47.1)
Years worked in current community (n=42)	0–5	13 (59.1)
	6–10	7 (63.6)
	11–15	5 (62.5)
	16–20	3 (42.9)
	21+	14 (56.0)
Lived in current community before age 18 (n=42)	Yes	17 (77.3)*
	No	25 (49.0)

*A significant difference ($P<0.05$) in observed values as identified by a Chi-square test, *A significant ($P<0.05$) linear association with frequency of burnout as identified by Mantel–Haenszel test of trends. EMS: Emergency medical services, CEO: Chief executive officer, CNO: Chief nursing officer, COVID-19: Coronavirus disease 2019

suggests that certain occupations/occupational groups may experience greater difficulties in adapting to new situations and recovering from hardship. This may be due to the varying demands and distinct responsibilities specific to each role. Physicians are directly positioned at the forefront of patient care, often facing dynamic, high-stress situations. During the COVID-19 pandemic, these challenges may have been compounded by resource shortages, increased patient loads and rapidly changing

healthcare policies, leaving physicians with limited control of their work environment, which may have further strained their ability to adapt. In contrast, while hospital CEOs were also under significant pressure, they operated at a systems level with responsibilities centred around organisational management rather than patient care. Therefore, their role may have provided a greater degree of control and decision-making autonomy to enhance or better support adaptability and resilience.

Table 3: Post hoc tests for individual resilience scores

Variable	Group	RISC-2
Position (n=72)	EMS	6.33 (1.5)
	Hospital CEO	7.67 (0.65)*
	Hospital CNO	6.92 (1.5)
	Physician	6.43 (1.1)*
	Primary care clinic executive director	7.28 (0.91)
Variable	Group	Self-reported COVID resilience
Lived in current community before age 18 (n=73)	Yes	3.55 (0.8)
	No	4.08 (0.78)*

*A significant difference ($P<0.05$) as identified by a Bonferroni *post hoc* test. EMS: Emergency medical services, CEO: Chief executive officer, RISC-2: Resilience Scale©

Table 4: Correlation between burnout severity and personal resilience

Resilience measure	Burnout level	
	Pearson correlation	P
CD-RISC2	-0.367	<0.014
SRS	-0.403	<0.008
Self-reported resilience	-0.469	<0.002

CD-RISC2: Connor-Davidson Resilience Scale©, SRS: Short resilience survey

Individuals working in the community where they grew up reported significantly lower levels of resilience compared to those without such ties. This finding challenges the expectation that familiarity with one's community fosters resilience. It raises intriguing questions surrounding the relationship between community connection, rurality and resilience. One possibility is that individuals working in the community where they lived during childhood may possess greater social capital. While social capital often supports resilience, over-reliance on these networks could foster conformity, suppress individual strengths and problem-solving abilities and ultimately result in lower personal resilience. One's social capital may counterintuitively suffer during crises of decreased cohesion due to fear, differences in beliefs and other factors.

Burnout

The incidence and severity of burnout during the 1st year of the pandemic showed no significant association with age, gender, years living in a community, occupation or tenure in current

position. This suggests burnout related to COVID-19 affected healthcare personnel broadly, with personal and occupational factors offering little protection against the risk and severity of burnout.

A notable exception was among those working in a community where they had lived during their childhood. While this factor did not influence burnout severity, it was linked to a higher prevalence of burnout compared to those without such ties. One potential explanation is a greater sense of responsibility and emotional attachment to the community's well-being, intensifying the stress and burnout experienced during the pandemic. The increased incidence of burnout in this cohort may be attributed to their significantly lower levels of resilience. As resilience serves as a protective factor against burnout, diminished resilience may have heightened their susceptibility to experiencing burnout. Notably, the number of years working in a community may not reflect the depth of personal and emotional connections that influence well-being, which could explain the lack of association between years of service and burnout incidence. These results merit further investigation into how returning to or remaining in one's home community influences the mental health and occupational well-being of healthcare personnel. A more nuanced understanding of these dynamics could inform support mechanisms and retention strategies for rural healthcare personnel with strong local ties.

We were particularly interested in understanding how the stress of the pandemic affected the incidence and severity of burnout among healthcare personnel in rural Northern Ontario. Burnout rates reported by physician respondents were consistent with findings reported within/across Canada,^{25,26} nationally²⁷ and internationally²⁸ during a similar timeframe as this study. This suggests that the pandemic's stressors, including increased patient volumes, resource limitations and heightened emotional demands, have affected healthcare personnel in rural Northern Ontario in similar ways to those in other regions, regardless of location or resource constraints.

For EMS workers, the impact of burnout was notably low compared to what has been reported in the literature.^{29,30} This may be due to the low response rate from this group, which may not

accurately reflect the true incidence of burnout in this profession. Another possibility is that EMS workers in Northern Ontario experienced lower COVID-19-related call volumes compared to their counterparts in urban areas, leading to lower levels of burnout.³¹

Research on the impact of COVID-19 on healthcare administrators' well-being remains limited, with most studies focusing on the impact of the pandemic on frontline workers. As one of the first studies to assess burnout among healthcare leaders in rural Northern Ontario, our findings reveal that the prevalence of burnout among senior healthcare administrators was comparable to that of frontline HCWs. These findings show that leadership roles did not shield individuals from pandemic stressors, which affected them equally. This underscores the need for future studies on burnout to include those in leadership positions and broaden their focus. This will enable a more comprehensive understanding of burnout in these important roles and support the development of targeted strategies to support and safeguard the well-being of these workers.

The majority of respondents experiencing burnout reported at least moderate severity [Table 2], which is concerning given its association with poor mental health,³¹ decreased job satisfaction³² and diminished quality of life.³³ Furthermore, high levels of burnout among HCWs have been linked to poorer health outcomes for patients.^{34,35} Therefore, high levels of burnout among healthcare personnel, combined with its potential impact on patient care, risk widening the gap in access to high-quality healthcare between rural and urban areas. Addressing burnout among those working in rural healthcare settings is essential not only to safeguard their well-being but also to improve patient care and health outcomes for residents of rural communities.

Burnout and resilience

An interesting relationship emerges when examining burnout and resilience together; respondents reported both high levels of burnout and relatively high levels of resilience. While this may appear contradictory, as resilience is typically regarded as a protective factor against burnout, analysis revealed that burnout severity was inversely correlated with resilience. This

suggests that individuals with higher levels of resilience may still experience significant burnout, indicating that resilience does not fully shield individuals from burnout, instead mitigates its severity. This suggests that while resilience-building initiatives are important to help attenuate the severity of burnout, they should be part of a broader approach that includes promoting a healthy work-life balance,³⁶ developing strategies for managing stress³⁷ and creating a positive work environment,³⁸ all of which have demonstrated effectiveness in reducing burnout. Implementing multifaceted strategies can help address the root causes of burnout and its impact on the individual. These efforts are important in reducing the severity of burnout and improving the overall well-being of healthcare personnel.

Limitations

Our study has several limitations. While overall response was strong, lower participation among certain subgroups limits the generalisability of findings and may not accurately capture the true extent of burnout and resilience within these cohorts.

Another limitation of this study was that survey responses were not collected precisely at the 1-year mark after the onset of the COVID-19 pandemic. Consequently, results reflect the experiences from a period surrounding the 1st year of the pandemic. As such, results may not accurately represent levels of burnout or resilience in later stages of the pandemic, during which evolving public attitudes and subsequent waves of COVID-19 may have further influenced the experiences of healthcare personnel. Future research could build on these results by examining how burnout and resilience evolved over the course of the pandemic. In addition, the lack of pre-pandemic baseline data limits the ability to comprehensively assess the pandemic's impact on burnout and resilience amongst healthcare professionals in rural Northern Ontario.

Portions of the questionnaire required retrospective recall, which is susceptible to bias. Although recall at the individual level may be unreliable, evidence suggests consistency at the aggregate level.^{39,40} Responses, particularly regarding pre-pandemic conditions, may also have been influenced by changes in current

work conditions.³⁹ Another limitation was that burnout was measured exclusively through self-reporting, which is inherently vulnerable to recall bias.⁴¹ Consequently, these biases may have impacted the accuracy of responses, particularly in categories with lower sample sizes. However, by analysing the data at an aggregate level and using appropriate statistical methods, we aimed to minimise the potential impact of these factors on our conclusions.

The exclusion of frontline nursing staff limits the study's comprehensiveness and lessens the generalisability of study results. However, as nurses are a vital part of the healthcare workforce, a focused study into burnout and resilience within this profession is essential to better understand their unique challenges and needs.

CONCLUSION

Our study provides valuable insights into the experiences of healthcare personnel in rural Northern Ontario during the 1st year of the COVID-19 pandemic. The high levels of resilience observed suggest that respondents may have developed effective coping strategies during the pandemic or already possessed a high level of resilience at baseline.

The inverse relationship between resilience and burnout severity supports the notion that resilience is a key psychological asset that attenuates the degree of burnout experienced. Consequently, our results highlight the importance of initiatives aimed at bolstering resilience to reduce burnout severity and potentially translate into improved job satisfaction, well-being and the quality of patient care.

The influence of occupation and community history on resilience and burnout further emphasises the need to consider individual and contextual factors when identifying heightened risk of burnout. Tailored interventions that address these factors can better support, protect and enhance the well-being and resilience of healthcare personnel. Such an approach becomes particularly important in underserved and resource-limited areas like rural North Ontario, where staff retention is vital to maintaining access to quality healthcare services.

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rédactrice administrative, JCMR,
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The Occasional limb tourniquet application and tourniquet conversion

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INTRODUCTION

The application of a limb tourniquet is a potentially life-saving intervention in the context of significant limb hemorrhage. It is essential that physicians encountering amputations or wounds with significant hemorrhage can properly perform tourniquet application as well as understand the potential complications of tourniquets and their removal. When a tourniquet remains in place for prolonged periods of time, the complications of the intervention itself can contribute to increased morbidity and even mortality. The rate of complications rises the longer that the tourniquet remains applied. Physicians assessing patients who have had a tourniquet applied in the pre-hospital environment must be familiar with the criteria for determining if an attempt at tourniquet conversion (i.e., removal) is appropriate and have an organised approach to attempting the tourniquet conversion. This is especially important in rural centres, where patients are more likely to experience long transfer times and potential delays in transfers to hospitals with advanced surgical capabilities.

TOURNIQUET APPLICATION

Indication for tourniquet application

The indication for tourniquet application is significant hemorrhage from a limb injury that cannot be immediately managed by other means. Multiple large epidemiologic studies using data from military trauma registries have demonstrated that the application of tourniquets carries a mortality benefit of up to 67% in patients with significant limb hemorrhage.^{1,2} The mortality benefit of tourniquet application has been demonstrated in the civilian context as well.^{3,4}

Tourniquet site selection

There are 2 methods for selecting the site of tourniquet application [Figure 1]. The *distal method* is traditionally taught to physicians, paramedics and other advanced medical providers. In this method, the tourniquet is applied 2–3 inches just proximal to the site of bleeding, or if this site is noncompressible, then over the next closest compressible site on the limb.⁵ Joints are noncompressible, and therefore, tourniquets should

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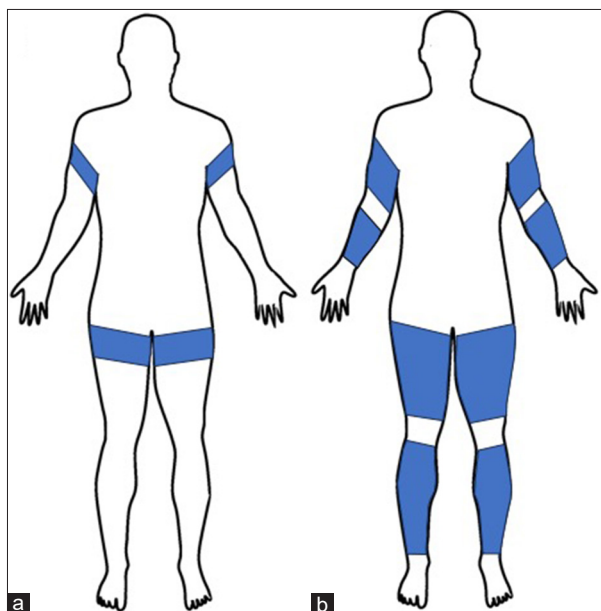


Figure 1: Tourniquet application sites. (a) Represents the application sites described in the 'high and tight' approach to tourniquet application. (b) Represents the application sites described in the 'distal method'.

never be applied over joints.⁵ The alternative *high and tight method* is often taught to individuals trained to operate in the pre-hospital environment, such as military medics, police officers and other first responders. In this method, the tourniquet is always placed on the most proximal compressible portion of the injured limb.⁶ This method is preferable when the clinician is unable to immediately assess the limb in the pre-hospital environment to determine the site of bleeding, due to external constraints. Physicians managing a patient with a *high and tight* tourniquet should recognise that even if the tourniquet cannot be fully converted, attempts should be made to reposition the tourniquet site more distally on the limb.

Tourniquet application procedure

1. Remove the tourniquet from the manufacturer's packaging
2. Expand the loop to be able to apply to the limb or break the loop completely
3. Slide the tourniquet up the limb to the desired site, or if the loop was removed, wrap the tourniquet around the limb at the desired site
4. Pull the loop as tightly as possible and hold in place with the Velcro on the strap
5. Turn the windlass using both hands to gener-

ate enough force to tighten it enough to stop arterial flow. Usually, 3 turns is required to accomplish this

6. Confirm that the bleeding stops and pulses are lost distally
7. Lock the windlass bar in place and cover with the distal part of the Velcro strap
8. Note the time that the application took place by writing it on the tourniquet.

REPERFUSION SYNDROME

While a tourniquet is applied and the flow of blood is restricted, the tissues distal to the device experience ischemia. As the tourniquet application time increases, the degree of ischemia increases proportionally.⁷ When a tourniquet is released, and blood flow is restored, the venous return from the limb carries metabolic products caused by cellular ischemia and cell death, which can cause a number of immediate life-threatening effects.⁸ These effects are collectively called *reperfusion syndrome*.

The elements of reperfusion syndrome include acidosis, cardiac arrhythmias, hypothermia, hypotension and acute kidney injury. The acidosis is mostly caused by the circulation of lactic acid released by ischemic tissues. Cardiac arrhythmias are precipitated both by the acidosis and by hyperkalemia. Hyperkalemia occurs because ischemic and dying cells release intracellular stores of potassium. Hypothermia occurs through 2 mechanisms. The blood that had been sequestered in the limb behind the tourniquet is cool, and when it returns to the core, it causes an immediate drop in core body temperature. More significantly, the tissues distal to the tourniquet are also cool, so the limb itself acts as a heat sink for the fresh circulating blood perfusing the limb after the tourniquet conversion. Hypotension occurs after a tourniquet is taken off, and there is a sudden increase in the amount of tissue the body's circulating volume must perfuse. Hypotension can be worsened by inappropriate vasodilation in the affected limb due to ischemia-caused impairment of the nerves involved in sympathetic vasoconstriction. An acute kidney injury is caused by the impact of myoglobin and other metabolic products on the proximal tubule.⁹ The elements of reperfusion

syndrome are summarised well in an online medical blog post by Weinrauch.¹⁰

The different elements of reperfusion syndrome can be pretreated by applying the ABCDE approach presented by Weinrauch, where each letter represents an intervention to be performed.¹⁰ A stands for (inducing) Alkalosis, B stands for (raising the) Blood pressure, C stands for (administering) Calcium, D stands for (applying) Defibrillation pads and E stands for both Electrolyte (meaning lowering serum potassium) and Environment (meaning hypothermia prevention). These interventions and how to perform them are described in detail in Table 1.

TOURNIQUET CONVERSION

Tourniquet conversion refers to the process of taking off the tourniquet and converting to another form of hemorrhage control. The term ‘tourniquet conversion’ is recommended over ‘tourniquet removal’ because it emphasises that the clinician must have a plan to transition to another form of hemorrhage control before taking off the tourniquet. Other methods of controlling limb hemorrhage include direct pressure, wound packing, balloon catheter tamponade, vessel ligation or vessel clamping.

In the pre-hospital management of trauma, there are often multiple competing priorities, including the need to initiate patient transport and ensure scene safety for both the patient and responders. A patient may therefore have a tourniquet applied in the pre-hospital environment, even though the hemorrhage could be effectively controlled with other methods once the patient arrives at a higher level of care. Studies from both military and civilian contexts have shown that between half and three-quarters of tourniquets can be successfully converted to another form of hemorrhage control.^{4,11,12} Given the high rate of successful conversion, clinicians should consider tourniquet conversion in every patient with a tourniquet to avoid preventable morbidity and mortality caused by an unnecessary prolonged tourniquet application.

When attempting a tourniquet conversion, the alternative method of hemorrhage control should be applied before the tourniquet is loosened. The goal is to prevent the recurrence of bleeding, rather than manage the recurrence of bleeding after the tourniquet is removed. If wound packing is going to be employed as a method of hemorrhage control, the wound should be packed and direct pressure applied for 3 min before tourniquet removal.⁶

Table 1: ABCDE approach to managing reperfusion syndrome

	How to perform	Purpose
Alkalosis	Administer 1 ampule (50 ml) of IV sodium bicarbonate 5 min before TQ conversion In mechanically ventilated patients, hyperventilate patient to induce a respiratory alkalosis targeting an end tidal CO ₂ of 33–35 mmHg	Counteracts the acidosis caused by the return of lactic acid from the affected limb after TQ release
Blood pressure	Resuscitate the patient with crystalloids, blood products and vasopressors if required	Raises the systolic blood pressure high enough to accommodate the anticipated sudden drop that occurs immediately after TQ release
Calcium	Administer 1 ampule of IV calcium gluconate 2 min before TQ conversion	Stabilises cardiac myocytes to counteract the dysrhythmic effects of hyperkalemia and acidosis Calcium also functions as a cofactor in the activation of multiple coagulation factors
Defibrillation	Apply defibrillation pads to the patient before completing TQ conversion	Be prepared to manage unstable arrhythmias which may develop
Electrolyte	Administer 10 units of IV regular insulin along with 1 ampule of D50 Repeat as required, targeting a serum K level of 3.5 mEq/L prior to TQ conversion	Lowering the serum potassium allows for accommodation of the anticipated sudden raise in serum potassium that occurs after TQ release
Environment	Warm the affected limb with warmed blankets and forced warm air prior to TQ conversion	Prevents hypothermia caused by the return of cold blood to the core immediately after TQ release and from the affected limb acting as a heat sink as it is reperfused

Adapted from Weinrauch¹⁰. D50: 50 g dextrose in water, TQ: Tourniquet, IV: Intravenous

Contraindications

There are 3 contraindications to attempting tourniquet conversion.⁶ The first contraindication is if the patient is clinically in shock. Since an attempt at tourniquet conversion could fail, clinicians must not attempt the procedure in patients who cannot reasonably tolerate the effects of further blood loss without becoming critically unwell. Patients who are in shock should be resuscitated first, and then, conversion can be considered once they are hemodynamically stable. The second contraindication is if it will not be possible to monitor the patient following the proposed tourniquet conversion. It would not be appropriate to perform an intervention that could result in the recurrence of bleeding or other complications if it won't be possible to monitor for those complications. Practically speaking, this could arise when space restrictions limit access to the affected limb during an interfacility transfer or when a patient is taken to another area of the medical facility where they will have a lower level of monitoring (e.g., the radiology department). The third contraindication is if the tourniquet is on a limb that has been amputated. The goal of tourniquet conversion is to avoid a prolonged tourniquet time that could affect the health of salvageable tissues sequestered behind the tourniquet. If the limb has been amputated, there is no longer any salvageable tissue present, and therefore, the goal of tourniquet conversion is unachievable.

Timeline

The goal is to limit tourniquet application time to <2 h.^{5,6} If a tourniquet is successfully converted in <2 h, there is unlikely to be any significant damage to the distal tissues due to the ischemia. There has also not been sufficient ischemia to precipitate the elements of reperfusion syndrome [Figure 2]. It is therefore safe to convert a tourniquet within 2 h without treating for any of the elements of reperfusion syndrome [Figure 3]. If the patient can be transferred to a surgical centre within 2 h of tourniquet placement, then tourniquet conversion should only be attempted if it will not delay the patient transfer.

Once a tourniquet has been applied for more than 2 h, there has been significant ischemia to the

Risk of Permanent Damage: minimal	<2 Hours	Risk of Reperfusion Syndrome: minimal
Risk of Permanent Damage: likely	2-6 Hours	Risk of Reperfusion Syndrome: possible
Risk of Permanent Damage: likely	>6 Hours	Risk of Reperfusion Syndrome: likely

Figure 2: Risk of tourniquet application based on tourniquet application time. Adapted from Weinrauch.¹⁵

distal tissues. Between 2 and 6 h of tourniquet time, it is anticipated that there will be some permanent damage to the ischemic tissues, but the limb is potentially salvageable. There is also a moderate risk of precipitating a reperfusion syndrome by taking off the tourniquet within this timeframe. These tourniquets are the most urgent to convert, since the ischemic tissue damage is worsening the longer the tourniquet is applied. However, due to the risk of reperfusion syndrome, these tourniquets should only be removed by a team capable of ACLS level of care that is prepared to treat for reperfusion syndrome.^{5,6}

Once a tourniquet has been applied for 6 h or more, it is anticipated that there has been a significant amount of damage to the distal tissues. These limbs are unfortunately at high risk of undergoing a delayed amputation due to the damage caused by the tourniquet. It is therefore less urgent to convert a tourniquet that has been on for more than 6 h, as there is a limited likelihood of benefit to the distal tissues. Removing a tourniquet that has been applied for more than 6 h will, however, likely cause a significant reperfusion syndrome.^{5,6} These tourniquets should only be removed in a surgical facility once the patient has been pretreated for all the elements of reperfusion syndrome.¹⁰

CONCLUSION

The majority of tourniquets that are applied to manage hemorrhage can be successfully removed without the resumption of life-threatening

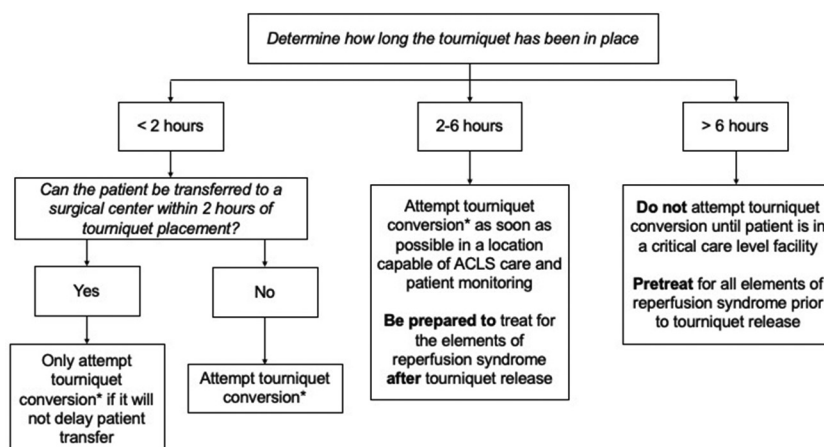


Figure 3: Approach to initiating tourniquet conversion based on the duration of tourniquet application. Adapted from Jerome.¹⁴ *Tourniquet conversion should only be attempted if no contraindications are present. The contraindications are if the patient is in shock, the tourniquet is managing a traumatic amputation or the team is unable to closely monitor the patient after tourniquet removal.

hemorrhage. There are 3 contraindications to tourniquet removal – if none of these are present, the goal is to limit tourniquet application time to <2 h. Tourniquets that have been applied for 2–6 h are the most urgent to remove, since the degree of permanent damage is increasing within this timeframe. When clinicians are removing tourniquets that have been applied for a prolonged period of time, they should be aware of and prepared to manage the elements of reperfusion syndrome.

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Conflicts of interest: There are no conflicts of interest.

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Teledermatology

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At the time of writing
Dr. McMullen was a learner
at Michael G. DeGroot
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McMaster University,
Hamilton, ON

A pixel used as a doctor's tool – strange, a spectral ballet reliant of light and shadow.

In teledermatology's virtual realm, distant – a solution, yes, yet bereft of flesh, blind to the nuances that dwell beneath the skin – in rural communities and homes hushed in remoteness.

Yet, silent phones do not ring in empty homes.

No device, no light – imperfect art of medicine, a dance, stilted by spotty connection, shadowed by technological illiteracy.

Can't palpate the canvas, the skin, biopsies lie out of reach.

Maldistribution of doctors, with complex constraints, a different dance is danced.

A virtual orchestra of healing, more than a consultation – it's a performance, till the screen communicates to them alone.

The poem, 'Teledermatology', uses imagery to explore the potential and implicit limitations of teledermatology in patient care. Through painting a 'spectral ballet', the poem illustrates virtual medicine, which, while groundbreaking in its

ability to serve patients in rural and remote communities, does limit a clinician's physical exam. The imagery of 'pixel' and 'technological illiteracy' alludes to the barriers rural communities face, including unstable internet connections, varying levels of technological literacy and willingness to use technology in accessing medical care. 'Can't palpate the canvas, the skin' resonates with the limitations of virtual care, especially in a field where touch is very important in the diagnostic process.

This narrative subtly critiques the maldistribution of medical professionals across Canada, pointing to broader systemic issues in health care. While teledermatology offers one solution, the poem emphasises the gaps in its current form. This work urges clinicians and healthcare providers broadly to be sensitive to limitations of technology, ensuring its benefits reach even the most remote corners of Canada.

Acknowledgement: Thank you to the rural clinicians who continue to provide care for Canada's underserved populations.

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Letter to the editor concerning 'can implementation of *in situ* simulation support rural emergency provider self-confidence and improve patient safety? A mixed-methods study'

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Dear Editor,
We read with interest the mixed-methods study by Diebel *et al.*, which evaluates the implementation of *in situ* simulation in a rural Canadian Emergency Department (Espanola Regional Hospital and Health Centre) with an aim to enhance provider self-confidence and identify latent safety threats.¹ The use of a validated satisfaction and confidence scale, alongside thematic analysis of debriefing responses, represents a structured and commendable approach to evaluating simulation effectiveness in a rural, resource-constrained context. However, certain design and interpretive elements warrant closer examination.

The study administered only post-intervention surveys, precluding meaningful measurement of change. Without a pre-simulation baseline, it is unclear whether the high self-confidence scores reflect actual learning gains or pre-existing attitudes among providers. Clinically, this distinction is critical, as interventions intended to improve preparedness must demonstrate

measurable change rather than static self-perception.² Inclusion of pre-post paired evaluations, even with brief or adapted instruments, would strengthen causal inferences about the intervention's educational impact.

The convenience sampling strategy, while pragmatic, may introduce hidden skew in staff representation.³ Participants were those on duty or available during quieter clinical periods, potentially excluding less confident or higher-risk clinicians from the sample. This sampling pattern risks overestimating the true generalisability of simulation-induced confidence or engagement.⁴ Given the small provider base typical of rural emergency departments, representativeness is essential to ensure that institutional training reflects the full range of competencies and needs.

The identification of latent safety threats, such as equipment positioning and gaps in paediatric resuscitation readiness, is a valuable outcome. However, the absence of formal triangulation, such as observational

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validation or adverse event tracking, limits the ability to distinguish between perceived and actual safety vulnerabilities.⁵ For instance, the placement of video laryngoscope power cords was highlighted in simulations but not linked to documented clinical hazards. Bridging simulation insights with real-world incident reports or root-cause analyses may enhance the fidelity of these findings and inform more actionable quality improvement.

We commend the authors for addressing an urgent gap in rural emergency training by demonstrating the feasibility of *in situ* simulation using existing infrastructure. Their structured debriefings, theme-driven analysis and follow-up implementation steps, including ventilator training and procurement of paediatric equipment, provide a replicable model for rural departments across Canada and beyond. Future studies may benefit from longitudinal outcome tracking, control comparisons and the integration of objective clinical metrics to substantiate the

impact of simulation-based education on rural patient care and provider performance.

Financial support and sponsorship: Nil.

Conflicts of interest: There are no conflicts of interest.

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Response

Dear Editor,

We are grateful to the correspondents for reading our paper and for their thoughtful engagement with our design and interpretation. Their comments help strengthen an emerging rural simulation literature.

Pre-post measurement: We agree that paired pre-post evaluations better quantify change. As noted in our limitations, we used post-only surveys to limit burden on a small workforce during live clinical hours. An ultra-brief pre-survey might have been possible, though likely unvalidated. With the programme now established and staff comfort is higher, we plan to implement concise digital pre-post measures (e.g., five-item scales via bedside QR codes) to capture paired change with minimal disruption.

Sampling and representativeness: The potential for bias with convenience sampling is acknowledged in our limitations. In a one-physician/one-nurse overnight model, shift randomisation risks unsafe understaffing. To

broaden representation, we will rotate sessions across shifts and invite targeted participants based on needs assessments, including clinicians who self-identify as less confident. Although the absolute numbers were small, participants represented the majority of our ED nursing workforce. Scheduling simulations during quieter periods with maximal staffing provided the widest feasible reach.

Triangulating latent safety threats (LSTs): We agree that linking simulation-identified LSTs to operational data can distinguish perceived from actual hazards. As an early-phase project, our aim was to surface issues rapidly and feed them to leadership for action. Going forward, we will align LSTs with existing quality structures such as incident reports and equipment check logs. For items such as video-laryngoscope cord placement, we will add observational checks during mock codes and simulations and audit the effects of equipment relocations (e.g., cord-related delays, bed-movement

constraints and tripping hazards) to ensure changes translate into safer practice.

Balancing rigor and feasibility in rural settings: We share the correspondents' desire for stronger causal inference and objective outcomes. We also note that in underserved contexts without research staff, a 'perfect-or-nothing' threshold can stall practical improvements. Our approach was to start small, use validated tools, disclose limitations and convert findings into changes (paediatric NIPPV masks, ventilator refreshers and PPE re-layout). With the platform now accepted by staff, we are positioned to add rigour: brief paired

measures, longitudinal follow-up, and – where volumes permit – comparators across similar rural sites.

In sum, we appreciate the constructive critique. It affirms the value of rural ISS while pointing to concrete next steps that we are already incorporating. We hope our experience encourages other small centres to begin, learn and iteratively strengthen methods as capacity grows.

Sincerely,

Aidan Wharton, MD CCFP (EM), Northern Ontario School of Medicine University on behalf of all authors.

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Erratum: Can implementation of *in situ* simulation support rural emergency provider self confidence and improve patient safety? A mixed methods study

In the article titled **Can implementation of *in situ* simulation support rural emergency provider self confidence and improve patient safety? A mixed methods study**, published on pages 182-188, Issue 4, Volume 30 of Canadian Journal of Rural Medicine,^[1] the credential of co-author Michelle Parker has been published incorrectly as BScN.

The credential of co-author Michelle Parker should read RN.

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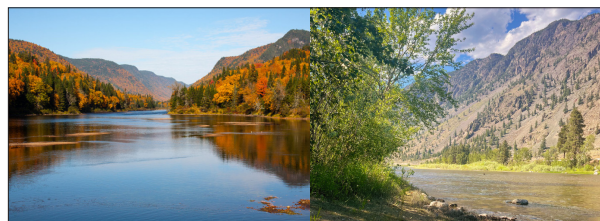
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FAMILY PHYSICIAN – EVERGREEN MEDICAL CLINIC



Number of Vacancies: 4
Term: Full-time Physician
Type: Permanent, beginning with 3-year contract
Operating Name: Evergreen Medical Clinic
Location: 219 Evergreen Square, Saskatoon, SK S7W 0W2

Qualifications:

- Medical degree
- Hold certificate or be eligible for certification from the College of Family Physicians of Canada (CFPC)
- Eligible for a provisional or regular license to practice medicine in Saskatchewan

Compensation: Fee-for-service for all medical services based on agreements between SK Ministry of Health and the SMA. Anticipated salary range: \$350,000-\$450,000 based on minimum 40 hours/week. Competitive rate of overhead charged. Entitled to 4 weeks/year vacation without contribution to overhead costs of the clinic.

Description: Evergreen Medical Clinic is a purpose-built clinic, opened in October 2019, servicing both walk-ins and appointments. Located at the beautiful Evergreen Square in the Evergreen community in Saskatoon, the clinic has in-house laboratory, x-ray, and ultrasound units as well as a pharmacy. It is a paper-light clinic with offices and examination rooms equipped with networked computers for EMR use.

The clinic is lifestyle based and flexible enough to accommodate your family's needs. You will work with a team of friendly Family Physicians and be responsible for the duties associated with a family practice including examining and advising patients, addressing minor emergencies, ordering diagnostic procedures, prescribing medications, and performing minor surgeries. Services are provided in English.

Benefits: Can participate in company benefits program after 3 months, provided working at least 40 hours/week.

Contact: For more information or to submit CV, contact **Dr. George Tuwor** at 306-331-0245 or gtuwor@evergreenmedicalclinic.ca

Dr. George Tuwor Medical Prof Corp o/a Evergreen Medical Clinic, corporate address at 314 Baltzan Cove, Saskatoon, SK

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