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I take great delight and inspiration in nature: both the wild and the cultivated. The Sunflower grows with astonishing harmony: every leaf, petal, and seed spiral expressing that harmony, making her the crown jewel of the garden.

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Rural clinical research

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Our populations are not the populations described in the pages of the New England Journal of Medicine. Our questions are often not the questions prioritised in the *Canadian Medical Association Journal* or even the *Canadian Family Physician*. Rural communities experience illness differently, access care differently and are cared for by rural generalist systems that differ from specialised systems found elsewhere. It can only follow that the studies that we need, have to be rooted locally.

To our advantage we have something extraordinary: data rooted in entire communities. In many rural settings, we don't sample. We often care for and follow the entire community. Continuity of care, and stable populations, allow for meaningful longitudinal research that many urban systems struggle with.

And still, as highlighted elsewhere in this issue (pg. 122) the barriers to rural clinical research remain immense.

As editor, I have lost count of the number of otherwise worthwhile submissions that risk relevance to our readership. Studies labelled "rural" are often so heavily diluted by urban populations that any meaningful rural signal disappears. Mixed studies without rural learning can be read elsewhere.

Even among studies conducted in rural settings, the research

agenda can read urban. Rural communities become sites of data collection, rather than the drivers of inquiry.

The most important rural questions are often visible only to those who practise here daily: delayed access, transportation barriers, health workforce instability, continuity across vast geography, Indigenous health partnerships, ageing populations and the adaptations clinicians make when resources are limited.

Funding matters, certainly. Rural research has historically been underfunded, and dedicated funding streams remain necessary. However, money alone will not solve the problem. The decisive issue is infrastructure.

What rural clinical research truly requires are durable networks that connect isolated rural researchers with mentorship, training, structure and opportunities for collaboration.

If we are serious about improving rural health outcomes, rural evidence generation cannot remain an afterthought. Rural medicine must contribute directly to defining the questions worth asking in the first place.

What we lack are the structures that allow rural knowledge to move from the bedside to publishable evidence. Building those structures may be one of the most important investments rural medicine can make in its own future.

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La recherche clinique en milieu rural

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Nos populations ne sont pas celles qu'on retrouve dans les pages du New England Journal of Medicine. Nos questions ne sont pas toujours celles qui retiennent l'attention du Journal de l'Association médicale canadienne, ni même du journal Le médecin de famille canadien. En région rurale, les communautés vivent la maladie autrement, accèdent aux soins autrement et sont prises en charge par des systèmes de médecine générale rurale qui diffèrent des systèmes spécialisés qu'on retrouve ailleurs. Il va donc de soi que les études dont nous avons besoin doivent être ancrées dans nos milieux.

Nous avons toutefois un avantage exceptionnel : des données qui proviennent de communautés entières. Dans bien des milieux ruraux, on ne travaille pas à partir d'un simple échantillon. Bien souvent, on soigne et on suit toute la communauté. La continuité des soins et la stabilité des populations permettent de mener des recherches longitudinales pertinentes, ce que plusieurs systèmes urbains ont du mal à faire.

Cela dit, comme il est mentionné ailleurs dans ce numéro (pg. 122), les obstacles à la recherche clinique en milieu rural demeurent énormes.

Comme rédacteur, j'ai vu passer un grand nombre de soumissions autrement valables, mais dont la pertinence pour notre lectorat était discutable. Des études dites « rurales » sont souvent tellement diluées par des populations urbaines que le signal proprement rural finit par disparaître. Les études mixtes qui ne dégagent aucun apprentissage clair pour les milieux ruraux peuvent très bien être lues ailleurs.

Même lorsque les études sont menées en milieu rural, le programme de recherche peut avoir une couleur très urbaine. Les communautés rurales deviennent alors de simples lieux de collecte de données, plutôt que les véritables moteurs des questions de recherche.

Les questions rurales les plus importantes sont souvent visibles seulement pour celles et ceux qui y pratiquent au quotidien : les délais d'accès, les obstacles liés au transport, l'instabilité de la main-d'œuvre en santé, la continuité des soins sur de vastes territoires, les partenariats en santé autochtone, le vieillissement des populations et les adaptations que les cliniciens doivent faire lorsque les ressources sont limitées.

Le financement compte, bien sûr. La recherche rurale a longtemps été sous-financée, et des enveloppes dédiées demeurent nécessaires. Mais l'argent, à lui seul, ne réglera pas le problème. L'enjeu déterminant, c'est l'infrastructure.

Ce dont la recherche clinique rurale a réellement besoin, ce sont de réseaux solides et durables qui relient les chercheurs ruraux isolés à du mentorat, à de la formation, à une structure de soutien et à des possibilités de collaboration.

Si nous voulons vraiment améliorer les résultats de santé en milieu rural, la production de données probantes rurales ne peut pas rester une réflexion après coup. La médecine rurale doit contribuer directement à définir, dès le départ, les questions qui méritent d'être posées.

Ce qui nous manque, ce sont les structures qui permettent au savoir rural de passer du chevet du patient à des données publiables. Bâtir ces structures pourrait bien être l'un des investissements les plus importants que la médecine rurale puisse faire pour son propre avenir.

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Looking ahead

When I joined the SRPC as a medical student in 2003, I would never have imagined that 23 years later I would become the President of the organisation. Life is a wild ride!

It is an honour to represent you, the physicians working in rural and remote Canada. I am indebted to Dr. Gavin Parker, who did a fantastic job as President over the past 2 years, for his mentorship and being incredibly generous with his knowledge and wisdom. I am thankful to still have him as Past-President for the next 12 months.

In the year ahead, the SRPC will continue to focus on our 3 strategic priorities: renewing the National Advanced Skills and Training Program, pushing for a health human resources plan for rural and remote Canada and advocating for multi-jurisdictional registration in this nation. We have made considerable progress towards each of these goals, and we hope to have exciting announcements in the next few months.

After the success of the Rural and Remote Medicine Conference in Québec City, organised by Dr. Michelle Lajzerowicz, Dr. Nicholas Potvin and our

incredible office staff, and attended by none other than the Federal Minister of Health, Marjorie Michel, the 2027 conference organisers will be hard-pressed to pull off another record-breaking event. Luckily, I hear Halifax knows a thing or two about having a good time! I look forward to seeing you all there (or in Thunder Bay at Mini R'n'R, October 24-25, 2026).

The SRPC, with the City of Calgary, is thrilled to announce that our bid to host the Rural World Organization of Family Doctors (WONCA) conference in 2028 was successful. Stay tuned for conference dates and the invitation to join the organising committee.

Please join the rural email listserv, follow SRPC on social media and/or read our newsletter to stay in touch, let us know about your local concerns and learn about exciting initiatives and opportunities to use your skills to improve the lives of rural doctors and their patients.

I look forward to serving you for the next 2 years.

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Un regard vers l'avenir

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Lorsque je me suis jointe à la SMRC comme étudiante en médecine en 2003, je n'aurais jamais imaginé qu'un jour, 23 ans plus tard, j'en deviendrais la présidente. La vie nous réserve parfois tout un parcours!

C'est un honneur de vous représenter, vous, les médecins qui œuvrez en milieu rural et éloigné partout au Canada. Je tiens aussi à exprimer ma profonde reconnaissance envers le Dr Gavin Parker, qui a accompli un travail remarquable à la présidence au cours des deux dernières années. Son mentorat, sa grande générosité et le partage de son expérience et de sa sagesse m'ont été extrêmement précieux. Je suis heureuse de pouvoir encore compter sur lui comme président sortant au cours des douze prochains mois.

Au cours de la prochaine année, la SMRC poursuivra ses efforts autour de ses trois grandes priorités stratégiques : renouveler le Programme national de formation et compétences avancées, faire avancer l'idée d'un plan de ressources humaines en santé pour les régions rurales et éloignées du Canada, et promouvoir l'obtention d'un permis d'exercice multiterritorial à l'échelle du pays. Nous avons réalisé des progrès importants dans chacun de ces dossiers et nous espérons pouvoir vous annoncer de bonnes nouvelles au cours des prochains mois.

Après le succès du congrès Médecine rurale et éloignée tenu à Québec, organisé par la Dre Michelle Lajzerowicz, le Dr Nicholas Potvin et notre formidable équipe du bureau national, et auquel a participé n'importe quel ministre fédérale de la Santé, Marjorie Michel, les organisateurs du congrès de 2027 auront tout un défi à relever s'ils veulent battre ce record. Heureusement, il paraît qu'à Halifax, on sait très bien comment recevoir le monde! J'ai bien hâte de vous y voir, ou encore à Thunder Bay pour le Mini R'n'R, les 23 et 24 octobre 2026.

La SMRC est également très heureuse d'annoncer, avec la Ville de Calgary, que notre candidature pour accueillir le congrès rural de l'Organisation mondiale des médecins généralistes, WONCA, en 2028 a été retenue. Les dates du congrès et l'invitation à vous joindre au comité organisateur suivront sous peu.

Je vous invite à vous inscrire à la liste de diffusion rurale, à suivre la SMRC sur les médias sociaux et à lire notre bulletin afin de rester en contact, de nous faire part des enjeux qui touchent votre milieu, et de découvrir les initiatives et les occasions qui vous permettront de mettre vos compétences à contribution pour améliorer la vie des médecins ruraux et de leurs patients.

J'ai hâte de vous servir au cours des deux prochaines années.

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Enhancing trauma care in remote regions: A trauma training course for physicians in Northern Canada

Abstract

Introduction: This study reports the implementation of the Nunavik Trauma Course (NTC), a simulation-based curriculum developed in collaboration with rural physicians in Nunavik.

Methods: A needs-assessment pilot questionnaire was distributed to rural physicians in Nunavik through snowball sampling. In response to the questionnaire, an 8-h trauma course was developed, incorporating hands-on and scenario-based training sessions. The curriculum prioritised the unique challenges and training requirements identified by the participants of the pilot survey. A simulation centre hosted the course to replicate realistic, high-stakes scenarios, providing participants an opportunity to enhance their procedural skills and decision-making abilities in a supportive atmosphere. In-training surveys assessed participants' knowledge, confidence and skills pre/post-course.

Results: Of the 13 participants, 11 completed the pre-course survey (85% response rate). Most were employed full-time ($n = 8$; 73%) and had >5 years of experience ($n = 6$; 55%). Among them, 36% managed critically injured people once per week ($n = 4$), whereas 64% were involved once every 1–3 months ($n = 7$). Following the course, physicians endorsed significantly greater comfort with bougie-assisted endotracheal intubation ($P = 0.014$), cricothyroidotomy ($P = 0.003$), pleural pigtail insertion ($P = 0.003$), pelvic binder application ($P = 0.003$), tourniquet placement ($P < 0.001$) and increased intracranial pressure management ($P = 0.007$).

Conclusion: The NTC represents a targeted educational initiative addressing the needs of physicians in remote resource-limited settings. By prioritising contextual relevance and procedural proficiency, the NTC is a model for adaptable, physician-informed rural trauma training.

Keywords: Emergency, Nunavik, rural, simulation, training course, trauma

Résumé

Améliorer les soins en traumatologie dans les régions éloignées: Une formation en traumatologie destinée aux médecins du Nord canadien

Introduction: Cette étude présente la mise en œuvre du Nunavik Trauma Course (NTC), un programme de formation par simulation élaboré en collaboration avec des médecins ruraux du Nunavik.

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Méthodes: Un questionnaire pilote d'évaluation des besoins a été distribué à des médecins ruraux du Nunavik au moyen d'un échantillonnage boule de neige. À la suite des réponses obtenues, une formation de huit heures en traumatologie a été conçue, combinant des ateliers pratiques et des mises en situation. Le contenu de la formation a été établi en fonction des défis particuliers et des besoins de formation soulevés par les participants au sondage pilote. La formation s'est déroulée dans un centre de simulation afin de recréer des scénarios réalistes à haut niveau d'enjeu, permettant aux participants de renforcer leurs habiletés techniques et leur prise de décision dans un environnement encadrant. Des questionnaires administrés pendant la formation ont permis d'évaluer les connaissances, la confiance et les compétences des participants avant et après le cours.

Résultats: Parmi les 13 participants, 11 ont rempli le questionnaire préalable à la formation, pour un taux de réponse de 85%. La majorité travaillait à temps plein ($n = 8$; 73%) et comptait plus de cinq ans d'expérience ($n = 6$; 55%). Parmi eux, 36% prenaient en charge des personnes gravement blessées une fois par semaine ($n = 4$), tandis que 64% y étaient exposés une fois tous les un à trois mois ($n = 7$). Après la formation, les médecins ont rapporté un niveau de confort significativement plus élevé pour l'intubation endotrachéale assistée par bougie ($P = 0,014$), la cricothyroïdectomie ($P = 0,003$), l'insertion d'un drain pleural de type pigtail ($P = 0,003$), l'application d'une ceinture pelvienne ($P = 0,003$), la pose d'un garrot ($P < 0,001$) et la prise en charge d'une hypertension intracrânienne ($P = 0,007$).

Conclusion: Le NTC constitue une initiative de formation ciblée qui répond aux besoins des médecins pratiquant en régions éloignées et à ressources limitées. En misant sur la pertinence du contexte et la maîtrise des gestes techniques, le NTC offre un modèle adaptable de formation en traumatologie rurale, conçu à partir de l'expérience et des besoins des médecins sur le terrain.

Mots-clés: urgence, traumatologie, simulation, milieu rural, formation, Nunavik

INTRODUCTION

Traumatic injuries remain the third-leading cause of death in Canada,¹ with rural populations disproportionately affected due to distance-related barriers to timely healthcare access. Although an estimated one in five Canadians lives in rural regions,² Canada ranks among the lowest of developed nations for rural healthcare accessibility.³ Compared to urban populations, rural Canadians experience elevated morbidity and mortality⁴⁻⁶ because of widespread disparities in primary care,^{7,8} acute care^{9,10} and surgical services.¹¹ This imbalance is particularly concerning given that over 23% of the population lives more than an hour away from a trauma centre.⁹ In rural Quebec, for instance, 40% of emergency departments are over 300 km from the nearest Level I-II trauma centre,¹² contributing to higher mortality during pre-hospital transport compared to urban regions.¹³ Compounding these challenges, remote healthcare facilities face significant resource constraints, including underdeveloped infrastructure, insufficient funding and challenges in recruiting and retaining medical professionals.^{7,8,14,15}

Given these limitations, remote populations depend heavily on small, local primary care facilities as their initial point of contact for a wide

range of healthcare needs. These services are often overburdened by the demand of the region and operating beyond their original capacities.¹⁴⁻¹⁶ For instance, although rural Canada has seen the fastest population growth among developed countries from 2016 to 2021,² the proportion of family physicians in rural areas has remained below 20% since 2000.¹⁷ Rural physicians must therefore function as comprehensive medical lifelines, singularly responsible for managing complex medical emergencies, performing critical interventions and providing subspecialty care across multiple disciplines, often without the support of trauma centres or specialists.^{8-10,14,15} This growing mismatch between population need and healthcare availability contributes to fragmented service delivery and disproportionately high trauma-related mortality in rural communities.^{5,6,13}

The College of Family Physicians of Canada and the Society of Rural Physicians of Canada have discussed these inequities in the provision of trauma care through The Rural Road Map for Action. In their report, they outline priorities which could further improve the current system, such as infrastructure investment, targeted funding and enhanced training for rural physicians.¹⁶ Despite these initiatives, critical gaps in emergency care access persist and training for rural general physicians remains limited.^{15,16} In particular,

61% of rural physicians report good working knowledge of provincial emergency guidelines; however, 6% received formal emergency medicine training during residency.¹² Many rural physicians express interest in pursuing further critical care training, particularly through simulation-based and practice-specific approaches that address their unique context.^{18,19} Research consistently demonstrates a direct correlation between implementing trauma training programmes and enhanced patient outcomes, including reduced mortality and enhanced clinical care capacity.²⁰⁻²⁵ While established programmes such as Advanced Trauma Life Support (ATLS) and the Rural Trauma Team Development Course (RTTDC) provide foundational knowledge, they are not tailored to the realities of resource-limited rural practice and do not emphasize the hands-on skill development crucial for rural practitioners facing critical cases in isolation.^{16,18,19,26} This disconnect highlights the urgent need for trauma education that is both contextually relevant and practically feasible for rural healthcare providers working within significant resource constraints.

Recognising these distinct educational needs, the Nunavik Trauma Course (NTC) was developed; it is a simulation-based course designed to directly address feedback solicited from physicians serving rural communities in Nunavik, Quebec, a region which experiences a fourfold higher risk of trauma compared to the provincial average.⁶ The course aimed to align with real-world challenges faced by physicians, improve provider preparedness and strengthen collaboration between urban trauma centres and remote healthcare teams. This initiative serves as an important step toward developing sustainable, scalable training models that bridge research, education and clinical practice.

METHODS

Study design

Rural physicians, including full- and part-time practitioners working in Nunavik communities, were invited to complete a needs assessment pilot questionnaire. Physicians practising in the region on a temporary basis, such as visiting specialists, or those without a license to practise in the region, were excluded from the

study. The NTC was implemented in a remote northern region of Quebec characterised by multiple small fly-in communities, limited local resources and considerable distances from tertiary trauma centres. Although the course was developed in partnership with regional leaders in Nunavik, individual community names and facility identifiers have been omitted to protect participant confidentiality. Physicians in this region routinely manage high-acuity cases with limited on-site support, making targeted skills training operationally necessary.

Using a Modified Delphi approach, the pilot questionnaire included 4 sections: demographics, training background, clinical content and course format preferences. Clinical preparedness was assessed across 6 domains: prehospital care (10 skills), resuscitation (15), stabilisation (15), patient transfer (3), collaboration/communication (10 scenarios) and common emergencies (4). Comfort levels were rated on a 6-point scale ('not applicable' to 'extremely comfortable'). Preferences for training delivery (e.g., in-person simulation, remote didactics and online modules), course duration and location were also rated using 5-point scales.

Subsequently, a course was designed directly integrating physician-identified training gaps. The training course was held at a Simulation Centre in Montreal, chosen to facilitate attendance by rural physicians who routinely travel to the city. The high-fidelity simulation environment replicated realistic trauma scenarios, allowing participants to practise both procedural and decision-making skills in a controlled setting. The 8-h course included 45-min modules on: advanced airway management (difficult intubation, cricothyroidotomy and laryngeal mask airway); thoracic trauma interventions (pigtail insertion, chest tube placement, needle decompression and thoracotomy); circulatory support procedures (central line placement, massive transfusion protocols, intraosseous access, pelvic binding and tourniquet application) and patient stabilisation techniques (management of increased intracranial pressure, sedation and ventilator troubleshooting). Resuscitative endovascular balloon occlusion of the aorta (REBOA) was included as a benchmark advanced skill presumed to be outside participants' comfort levels. The course concluded with a 2.5-h hands-on simulation

incorporating case-based scenarios and targeted feedback.

During the simulation section, participants rotated through procedural stations led by trauma surgeons, using task trainers and high-fidelity manikins to replicate realistic injury patterns. Each module followed a structured approach: (1) brief demonstration, (2) participant hands-on practice and (3) scenario-based integration. Simulations included case vignettes mirroring rural challenges such as delayed transport, limited blood products and equipment improvisation. Faculty provided immediate feedback and guided post-scenario debriefings emphasising communication, teamwork and transfer decision-making. The course was also intentionally structured as a team-building exercise, fostering collaboration among physicians. By integrating procedural skill development with interprofessional communication and shared problem-solving, the course reinforced both technical and relational aspects of rural trauma care.

Selection and Description of Participants

The sample size was determined by the number of practising physicians in Nunavik at the time of data collection. Given that the total physician workforce in the region is small and highly distributed across remote communities, all available physicians were invited to participate. This approach maximised inclusivity and minimised selection bias, but it also meant that the final sample size was constrained by the size of the physician population rather than by statistical power analysis. Finally, participants completed the initial pilot questionnaire to inform course design and subsequently participated in the course, completing pre- and post-course surveys.

Outcome measures

The pre-course survey was used to collect demographic data (training, years of practice, employment status, frequency of critical care exposure and certifications across 11 emergency courses) and assessed comfort with 17 trauma-related skills on a 5-point Likert scale ('not at all' to 'extremely comfortable'). Skills spanned airway, thoracic, circulatory and critical care procedures.

The post-course survey repeated the skills assessment and added 6 domains of course

satisfaction: clinical relevance, improvement in comfort, format appropriateness, content clarity, interest in future courses and likelihood of recommendation. Each was rated on a 5-point Likert scale. Open-ended questions solicited qualitative feedback and suggestions for future training topics. Data collection and course delivery occurred in October 2024.

Data analysis

Anonymous survey administration resulted in unpaired pre-course and post-course responses. Consequently, comparisons were performed at the group level using permutation tests to estimate the null distribution of mean differences between pre- and post-course scores. No imputation was undertaken because the primary aim was descriptive and feasibility-focused, the sample was small and any single-imputation strategy would risk model-dependent bias under these conditions. Permutation testing was selected because it provides valid inference with small samples and does not rely on parametric distributional assumptions; however, it cannot replace the precision that true paired data would have provided and may yield wider uncertainty around estimates. Permutation tests were used to estimate mean differences between pre- and post-course scores, accounting for unequal sample sizes. Pre-course scores were subtracted from resampled post-course scores over 1000 replicates to estimate treatment effects. Paired pre- and post-course labels were randomly assigned to twice the number of available pre-course scores (20 or 22) over 100,000 permutations. Mean differences were calculated for each permutation, and *P* values were derived as the proportion of scores more extreme than the observed mean effect. Statistical significance was set at $P < 0.05$.

Ethics

The project was deemed exempt from review from the McGill University Health Centre Ethics Board, as it was classified as a quality improvement initiative. Surveys were clearly explained as voluntary, with no consequences for non-completion. All participant information remained anonymous, in accordance with confidentiality standards. The course relied

on simulations of real-world scenarios, and participants were not exposed to experiences beyond those already encountered in their professional practice. All procedures were conducted in accordance with the ethical standards of the institutional review board and with the principles outlined in the Declaration of Helsinki (1975, as revised in 2000). Consent to participate was obtained from all participants, with the understanding that survey responses and feedback during the course would be included in a potential de-identified manner in published work to allow for candid reporting.

RESULTS

Part I: Evaluating the needs of physicians in Northern Quebec

The pilot questionnaire was completed by 17 family physicians, 76% ($n = 13$) of whom work full-time in Nunavik. Many physicians held certifications in various trauma-related courses, including ATLS ($n = 16$; 94%), ultrasound-guided resuscitation ($n = 12$; 71%) and fundamentals of critical care support (FCCS; $n = 3$; 18%). While 94% ($n = 16$) agreed these courses adequately prepared them, all were interested in additional training to enhance their clinical skills [Figure 1]. The identified topics of priority included advanced airway management, thoracic trauma interventions, circulatory support procedures and patient stabilisation techniques. Although many physicians had prior experience with these interventions, their comfort with specific skills varied. For example, physicians reported being 'moderately' comfortable with initiating

and titrating vasopressors ($n = 12$; 71%), central venous access ($n = 11$; 65%), traumatic brain injury and increased intracranial pressure ($n = 11$; 65%), post-intubation sedation and analgesia ($n = 10$; 59%), massive transfusion protocol ($n = 9$; 53%), pelvic binder application ($n = 8$; 47%) and tourniquet application ($n = 8$; 47%). Physicians stated they were 'not at all' to 'slightly' comfortable with cricothyroidotomy ($n = 8$; 47%).

To address these needs, the NTC was structured around the highest-priority gaps while also incorporating additional skills related to emergency trauma care. The advanced airway management topics included difficult airway assessment, bougie-assisted endotracheal intubation, LMA insertion and cricothyroidotomy. Thoracic trauma interventions included chest tube insertion, pleural pigtail insertion and pleural needle decompression. Circulatory support procedures were addressed through central line placement, pelvic binder application, tourniquet placement, intraosseous insertion, massive transfusion protocols and vasopressor use. The course also incorporated training on patient stabilisation techniques, including post-intubation sedation, mechanical ventilation, management of increased intracranial pressure and polytrauma management. While not all identified skills from the pilot questionnaire could be covered, the curriculum was structured to align with the most pressing needs. In addition, some topics, such as LMA insertion and mechanical ventilation, were included despite not being explicitly highlighted in the pilot questionnaire to complement the broader training in advanced airway management, an area where many physicians expressed interest.

Regarding the course format, the majority of respondents favoured a full-day or 2–3 day format, with most respondents believing that in-person training would be ideal. Following additional discussions with participants, simulation centre-based training was ultimately selected to enable the greatest possible physician participation.

Part II: Evaluating the designed course

Thirteen physicians participated in the course and provided feedback, with the majority ($n = 11$; 85%) also completing the pre-course survey, which included demographic information. The participants included 10 family physicians

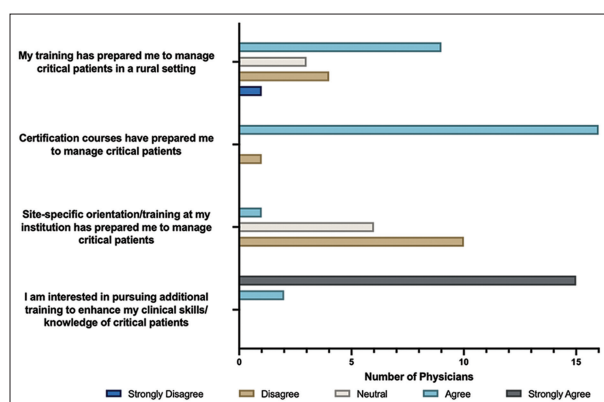


Figure 1: Previous formal training in managing critical patients.

and 1 emergency physician, most of whom were employed full-time ($n = 8$; 73%) and had more than 5 years of experience ($n = 6$; 55%). Of those surveyed, 36% were involved in the management of a critically ill or injured person approximately once per week ($n = 4$), whereas most were involved once every one to 3 months ($n = 7$; 64%). Courses and certifications previously completed included ACLS ($n = 11$; 100%), ATLS ($n = 11$; 100%), ultrasound-guided resuscitation ($n = 7$; 64%), FCCS ($n = 2$; 18%) and wilderness first responder ($n = 2$; 18%).

Following the course, physicians demonstrated notable self-reported improvements in their comfort levels with several critical procedures, including bougie-assisted endotracheal intubation ($P = 0.014$), cricothyroidotomy ($P = 0.003$), pleural pigtail insertion ($P = 0.003$), pelvic binder application ($P = 0.003$), tourniquet placement ($P < 0.001$) and increased intracranial pressure ($P = 0.007$). Although there was a general trend towards increased comfort, no statistically significant changes were observed for difficult airway assessment, Laryngeal Mask Airway (LMA) insertion, chest tube insertion, pleural needle decompression, central line placement, intraosseous insertion, massive transfusion protocols, post-intubation sedation, vasopressors, mechanical ventilation or the management of polytrauma patients [Table 1].

The post-course survey revealed unanimous positive feedback from participants. All attendees considered the course relevant to their clinical practice and reported increased comfort with the presented material. They agreed that the course effectively met their learning needs and objectives and was delivered with clarity. Furthermore, participants expressed strong interest in similar future educational opportunities and would recommend the course to colleagues.

DISCUSSION

The aim of our study was to design, evaluate and implement a training course in response to the identified needs of physicians serving rural communities in Northern Quebec. The NTC curriculum incorporated the feedback of 17 rural physicians to provide additional, specialised training in skill areas identified as less comfortable that are not typically offered in traditional trauma education programmes. Following participation in a targeted, 1-day simulation-based training, the results demonstrated the overall effectiveness of the course in enhancing emergency preparedness, with rural physicians reporting a significant increase in their overall comfort relative to their pre-course comfort levels across various critical care competencies. Notably, physicians who completed the course provided overwhelmingly

Table 1: Participant self-rated comfort in performing trauma-related skills pre- and post-course

Outcome	Pre-course, mean (SD)	Post-course, mean (SD)	Difference between means	Mean of differences	<i>P</i>
Difficult airway assessment	2.00 (0.45)	2.38 (0.51)	0.385	0.381	0.053
Bougie-assisted endotracheal intubation	1.91 (0.54)	2.46 (0.52)	0.552	0.550	0.014
LMA insertion	2.50 (0.71)	2.77 (0.73)	0.269	0.259	0.442
Cricothyroidotomy	1.20 (0.63)	2.23 (0.73)	1.031	1.022	0.003
Chest tube insertion	2.55 (0.82)	2.77 (0.60)	0.224	0.220	0.468
Pleural pigtail insertion	1.09 (1.14)	2.38 (0.51)	1.294	1.290	0.003
Pleural needle decompression	1.82 (0.87)	2.15 (0.80)	0.336	0.330	0.375
Central line placement	1.82 (1.08)	2.15 (0.90)	0.336	0.329	0.456
Intraosseous insertion	2.64 (0.50)	2.62 (0.97)	-0.021	-0.024	0.872
Massive transfusion protocols	1.64 (0.92)	2.31 (0.73)	0.671	0.667	0.071
Pelvic binder application	1.75 (0.75)	2.77 (0.83)	1.019	1.021	0.003
Tourniquet placement	1.45 (0.69)	2.69 (0.63)	1.238	1.233	<0.001
Increased intracranial pressure	1.45 (0.69)	2.31 (0.63)	0.853	0.849	0.007
Post-intubation sedation	2.36 (0.81)	2.38 (0.51)	0.021	0.018	0.872
Vasopressors	2.27 (0.65)	2.46 (0.66)	0.189	0.187	0.413
Mechanical ventilation	2.27 (0.47)	2.31 (0.48)	0.035	0.033	0.830
Management of polytrauma patients	2.09 (0.70)	2.38 (0.51)	0.294	0.290	0.227

Based on a 5-point Likert Scale survey – 0: Not at all, 1: Slightly, 2: Moderately, 3: Very, and 4: Extremely comfortable. *P*-values were estimated using permutation tests on artificially paired data with 100,000 replicates. SD: Standard deviation, LMA: Laryngeal mask airway

positive feedback of the course and requested continuation of future iterations.

Our results demonstrate a substantial improvement in the overall comfort levels of physicians across a range of critical clinical skills, particularly in cricothyroidotomy, pleural pigtail insertion, pelvic binder application and tourniquet placement. These skills are essential for managing high-acuity, low-occurrence (HALO) events in remote settings, where maintaining competency can be challenging due to limited exposure. Significant improvement in comfort levels was also observed in bougie-assisted intubation and in increased intracranial pressure management, reinforcing the value of structured training in ameliorating technical proficiency. Of broader relevance, these techniques are integral aspects of patient stabilisation and transfer. Studies have shown that rural physicians primarily identify transfer management as a critical challenge, particularly when stabilising trauma patients for long-distance transport or when transfers are delayed.^{18,26} Furthermore, the literature indicates that one-third of trauma patients in Nunavik require transfer to a tertiary care centre,⁶ increasing the importance and relevance of this training course in helping to improve patient survival rates during transfers. By demonstrating measurable gains in physician confidence across key trauma skills, our study highlights the effectiveness of physician-informed, simulation-based training in addressing these gaps and strengthening rural emergency preparedness. Moreover, the data suggest that, despite many participants holding prior certification such as ATLS, the demand for additional skill development remained evident.

In contrast with traditional trauma education programmes such as the ATLS and RTTDC, which provide a foundational understanding of trauma care and emphasize initial patient management and multidisciplinary teamwork, the NTC's curriculum addresses gaps in individual skill development for rural trauma care. Findings regarding transfer times suggest that an emphasis on stabilisation during delays could have a significant impact across rural trauma systems, with improvements in training and protocols shown to decrease time to transfer for trauma patients.^{27,28} While ATLS equips practitioners with a strong foundation in trauma assessment and initial care, it does not delve deeply into managing

complex trauma cases in rural environments experiencing such logistical and resource challenges. Similarly, while the RTTDC focuses on team dynamics in rural trauma resuscitation, it provides limited training in individual technical skills. Early initiatives such as the *Rural Advanced Life Support Update Course* highlighted these same challenges more than three decades ago, underscoring the enduring need for rural-specific emergency and trauma education programmes designed to maintain procedural competence and confidence among rural physicians.²⁹ However, that programme primarily described course structure and implementation, without assessing its impact on participants' confidence.²⁹ The NTC builds on these foundational efforts by incorporating a systematic needs assessment and formal evaluation of participant outcomes, representing an evolution in rural trauma education methodology. The curriculum offers hands-on training for managing complex emergency scenarios, including advanced airway management, thoracic trauma interventions and circulatory support techniques, tailored to rural-specific scenarios. These skills are vital in rural settings but are often overlooked in typical trauma courses. Our course integrates a simulation environment that reinforces technical skills and offers targeted feedback on performance in complex, time-sensitive cases, fostering individual expertise in high-stakes emergency care.

Beyond clinical skills, such training programmes reduce professional isolation and improve job satisfaction, contributing to better retention of physicians in rural areas, thereby increasing access to trauma care.³⁰ These outcomes underscore the external validity of the NTC curriculum, as the challenges addressed in Northern Quebec (e.g., geographic remoteness, limited resources and transfer delays) mirror those faced by rural health systems worldwide. The enduring necessity for rural acute care underscores the critical importance of tailored, rural-specific training programmes, a perspective echoed in foundational work by Rourke and reinforced by contemporary simulation-based education research across varied disciplines and settings.^{29,31} By grounding the curriculum in physician-driven needs assessment and simulation scenarios tailored to local contexts, the NTC model can be readily adapted globally to other

rural communities that encounter similar barriers to trauma care. This adaptability suggests a scalable framework for improving emergency preparedness in diverse global settings.

The implementation of simulation-based training in the NTC aligns with recent successful approaches in rural healthcare education, such as Knapp's study, which examined high-fidelity simulation training in rural Level III trauma centres. Their study demonstrated marked improvements in provider confidence and team performance, particularly in managing trauma within resource-limited environments.³² By integrating simulation-based training with local, context-specific scenarios, the NTC ensures the immediate applicability of the training, reinforcing procedural proficiency in critical, time-sensitive interventions. Trauma patients in rural hospitals in Quebec experience higher mortality rates pre-hospital and in the emergency department compared to major urban centres.¹³ Research has shown that rural regions with limited trauma care access have higher mortality rates due to delayed trauma care, underscoring the need for targeted training.⁵ Furthermore, specialised trauma care training in rural settings has been demonstrated to improve patient outcomes during the critical initial hours following trauma.³³ These findings reinforce the value of simulation training for enhancing trauma care education for rural settings, where rapid, effective intervention is needed.

Delivering trauma education to rural physicians presents inherent challenges, including time constraints, geographic dispersion and variability in baseline experience.³⁰ The NTC addresses these barriers through its 8-h format, enabling participation without requiring extended periods away from clinical duties. In fact, at the participants' request, our course was conducted in Montreal during non-clinical time to minimise disruptions to clinical coverage. However, another iteration of the course has been developed to be given locally within the communities to minimise travel time and offer flexibility to local physicians. The use of site-specific equipment and scenarios enhances the training's relevance, an approach supported by literature emphasising the need for compact and relevant programmes tailored to the unique demands of rural practice.^{26,30} Another distinguishing feature of the NTC is its physician-driven development process. By

incorporating direct feedback through our Delphi survey, the curriculum prioritises actual needs rather than perceived needs, marking a departure from traditional top-down educational strategies. This approach aligns with research emphasising the importance of personalised training in improving skill acquisition and retention.³⁴⁻³⁶ Our focus on interprofessional simulation reflects recent research demonstrating the value of team-based training in improving trauma care outcomes.³² Partnerships with urban trauma centres, exemplified by the collaboration between the trauma programme and Nunavik physicians, further bolster the programme's efficacy. These collaborations provide access to specialised expertise while strengthening networks crucial for coordinated care during patient transfers.

Limitations

While our results demonstrate significant improvements in provider confidence across multiple competencies, several limitations must be acknowledged. The small sample size and single-region focus may restrict generalisability, and long-term skill retention and direct impact on patient outcomes remain areas for further research, concerns similarly noted in rural trauma education literature.^{18,26,30} Most skills, such as massive transfusion protocols and polytrauma patient management, showed a trend toward increased comfort, but did not demonstrate significant improvement. This may be due to variations in prior experience or the limited time available for hands-on practice. Moreover, these findings reflect self-perceived rather than observed competence, and the employed methodology of single post-course measurement does not allow for conclusions about long-term skill retention. In addition, while the direction of change across several skills appears clinically meaningful, the absence of individual-level pairing and the rarity of these procedures in practice may limit inferences about generalisability and real-world impact. However, the success of the NTC underscores its potential scalability.

Future development should focus on expanding the programme's reach through hybrid delivery methods that integrate virtual and in-person components, an approach supported by recent studies on mixed-modality rural

medical education.³⁷⁻³⁹ While many participants expressed a preference for on-site training in rural locations, others favoured the simulation centre, due to its accessibility for those frequently in the urban area. On-site training may reach fewer physicians, as rural locations often have limited staff at any given time. Future iterations could address this by offering both on-site and simulation-based options, thus maximising reach and adapting the course to the realities faced by rural physicians, while reducing their travel burden.^{26,30-33}

CONCLUSION

The NTC represents a responsive and targeted educational initiative that addresses the specific needs of physicians in remote rural territories. Our study provides insights into the competencies that healthcare providers in remote Northern Quebec regions find challenging and demonstrates that a tailored trauma course can significantly improve confidence levels in these areas. The success of this accessible, short-duration programme offers a model for future rural trauma training initiatives, while informing how the trauma programme can enhance its support for remote communities. Scaling similar programmes to other underserved regions could close critical gaps in trauma care delivery and improve patient outcomes. By prioritising accessibility, contextual relevance and procedural proficiency, the NTC serves as a model for adaptable, physician-informed trauma training. It empowers rural healthcare providers, strengthens healthcare resilience and helps reduce disparities.

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The qualitative impact of the rural exercise for cancer patients and survivor programme (RECaPS)

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Abstract

Introduction: Structured exercise is increasingly reported to be a viable form of adjunct psychological care for cancer patients and survivors, but its availability in rural centres is scarce. Rural cancer survivors face significant psychosocial strain due to limited resources, programming and mental health support. Meta-reviews highlight the physiological and psychosocial benefits of exercise but often overlook hard-to-reach populations. This emphasizes the need for a more integrative, scalable approach to rural health and survivor diversity, a gap this study aims to address. Exercise should be promoted as an accessible form of care for this population. Our study assesses the qualitative outcomes of a rural community-based exercise programme for cancer patients.

Methods: This descriptive, mixed-methods study evaluates the implementation and impact of a Rural Exercise for Cancer Survivors and Patient. RECaPS is a 12-week, personalised exercise programme aimed at promoting accessibility to specialised-exercise support services to rural, community-based cancer patients and survivors. The programme incorporated both qualitative insights and fitness assessments to assess physical outcomes and participant experiences.

Results: Structured, personalised exercise programming fostered a cohesive environment where participants felt safe and supported in a flexible model that allowed them to improve their physical health despite individual barriers. Where participants may have felt powerless about their cancer diagnosis, RECaPS programming and support enabled them to regain control over their physical recovery.

Conclusion: The importance of individualised programming and competent, compassionate care cannot be overstated in the literature of exercise oncology. Structured, yet flexible programming is highly valued by participants across the cancer care continuum. RECaPS programming was effective for all participants to begin rebuilding their physical capacity in a safe, supportive environment.

Keywords: RECaPS, rural cancer patients, rural exercise programme

Résumé

L'impact qualitatif du programme Rural Exercise for Cancer Patients and Survivors (RECaPS)

Introduction: L'exercice structuré est de plus en plus reconnu comme une forme viable de soutien psychologique complémentaire pour les personnes atteintes

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d'un cancer et les survivants du cancer. Toutefois, ce type de programme demeure peu accessible dans les milieux ruraux. Les survivants du cancer vivant en région rurale font face à une pression psychosociale importante, notamment en raison du manque de ressources, de programmes et de soutien en santé mentale. Les méta-revues soulignent les bienfaits physiologiques et psychosociaux de l'exercice, mais tiennent souvent peu compte des populations plus difficiles à rejoindre. Cela met en évidence la nécessité d'une approche plus intégrée, adaptable et sensible à la diversité des survivants en santé rurale — un vide que cette étude cherche à combler. L'exercice devrait être encouragé comme une forme de soins accessible pour cette population. Notre étude évalue les retombées qualitatives d'un programme d'exercice communautaire en milieu rural destiné aux personnes atteintes d'un cancer.

Méthodes: Cette étude descriptive à devis mixte évalue la mise en œuvre et les retombées du programme Rural Exercise for Cancer Survivors and Patients (RECaPS). RECaPS est un programme d'exercice personnalisé de 12 semaines visant à améliorer l'accès à des services spécialisés de soutien par l'exercice pour les personnes atteintes d'un cancer et les survivants du cancer vivant en milieu rural et suivis dans leur communauté. Le programme combinait des données qualitatives et des évaluations de la condition physique afin d'examiner à la fois les résultats physiques et l'expérience des participants.

Résultats: Un programme d'exercice structuré et personnalisé a permis de créer un environnement cohésif où les participants se sentaient en sécurité et soutenus, dans un modèle flexible leur permettant d'améliorer leur santé physique malgré leurs obstacles personnels. Alors que plusieurs participants pouvaient se sentir impuissants face à leur diagnostic de cancer, le programme RECaPS et l'accompagnement offert leur ont permis de reprendre un certain contrôle sur leur rétablissement physique.

Conclusion: Dans le domaine de l'exercice en oncologie, l'importance d'un programme individualisé et de soins compétents, humains et empreints de compassion ne saurait être surestimée. Les participants, à toutes les étapes du continuum de soins en cancer, accordent une grande valeur à des programmes à la fois structurés et flexibles. Le programme RECaPS s'est révélé efficace pour permettre à l'ensemble des participants d'amorcer la reconstruction de leurs capacités physiques dans un environnement sécuritaire et soutenant.

Mots-clés: personnes atteintes d'un cancer, programme pour survivants du cancer, RECaPS, exercice

INTRODUCTION

Rurality is a socioenvironmental determinant of health. Rural cancer survivors experience higher mortality and poorer health outcomes than their urban counterparts.¹⁻³ Rural areas are classified as having low population density situated outside of major population centres.⁴ Rural residents face multi-level barriers across the cancer care continuum, from treatment to survivorship.^{5,6} This places a disproportionate strain on the limited rural healthcare resources, due to a geographically dispersed and ageing population.⁷ Although oncological advances have improved survival outcomes, they bring extended psychosocial and logistical challenges, stressing the need for a more holistic and integrated model of care that prioritises quality of life.^{8,9} Undergoing cancer treatment increases the risk of additional comorbidities and cancer-specific mortality due to direct, multisystem toxicities and indirect functional sequelae.¹⁰⁻¹² This promotes a wide range of chronic conditions, including physiological challenges such as cardiometabolic

dysfunction, psychological conditions such as anxiety, and multifactorial sequelae such as cancer-related fatigue.¹³⁻¹⁵ Most indirect comorbidities share modifiable risk factors, such as inactivity. If left untreated, they can lead to reduced quality of life and functional limitations such as neurocognitive impairment, disabilities or neuropathy.^{12,13,16}

Exercise is an adjunct therapy that can reduce the risk of recurrence, cancer-specific mortality and related functional impairments.¹⁷⁻¹⁹ Evidence consistently demonstrates that exercise improves quality of life across cancer populations and treatment contexts.¹⁹ Rural cancer survivors have reduced exercise uptake due to systematic barriers such as low programme visibility, geographic inaccessibility and lack of cancer-specific programming.^{20,21} Exercise acts on multiple physiological pathways by improving treatment tolerability and cardiometabolic markers, while attenuating treatment-related muscle loss and associated health risks.^{18,19,22} While the direct effects on cancer are still being explored, pre-clinical evidence suggests it may enhance

tumour oxygenation, modulate tumour metabolism and support early anti-tumour mechanisms.²³ These enhanced defence mechanisms can boost responses to anti-cancer treatments, improve surgical outcomes and minimise post-operative complications and symptoms.^{19,24,25}

It is well established that physical activity also supports psychological well-being and provides holistic benefits from improved energy to sleep quality.²⁶⁻²⁹ Exercise acts through complex biological processes such as neurotransmitter regulation (e.g., serotonin), growth factor enhancement (e.g., brain-derived neurotrophic factor) and regulation of the hypothalamic–pituitary–adrenal axis.^{30,31} These mechanisms improve cognition, reduce inflammation and mitigate the stress response.^{26-28,32} Exercise also acts through several psychosocial mechanisms such as components of self-determination (e.g., mastery and control), social support and self-efficacy (e.g., belief in one’s capabilities), thereby improving adherence by restoring a survivor’s sense of physical capacity.³³⁻³⁸ In the case of cancer survivors, supervised, personalised interventions show greater adherence and stronger outcomes due to the instilled sense of normality, growth in physical confidence and connection with fellow survivors.^{26,33,34,39} Exercise programming is especially important for rural survivors, who face significant psychosocial strain due to limited access to mental health services.⁴⁰ Therefore, exercise should be promoted as an accessible form of care for this population.

Despite growing evidence in support of exercise as an adjuvant therapy, key research gaps remain in the effective analysis of its implementation and outcomes on rural populations, as most studies are urban-based and not easily adaptable to rural settings.⁴¹⁻⁴³ This only furthers the need for a more integrative, scalable approach to rural health and survivor diversity – a gap our study aims to address.

Since the focus of our study lies in understanding how rural cancer survivors engage with specialised exercise intervention, a qualitative approach is appropriate for capturing levels of engagement, attendance and psychosocial outcomes. The purpose of our study is to assess the outcomes of a rural, community-based exercise programme for cancer patients and survivors, with the aim of improving access to specialised support

services for underserved rural populations across Northern Ontario.

METHODS

Our study is a descriptive, mixed-methods study evaluating the implementation and impact of a Rural Exercise for Cancer Survivors and Patients (RECaPS) programme in Muskoka. Muskoka, Ontario, is a regional municipality of approximately 65,000 residents having more than 3000 new cancer diagnoses annually, which exceeds the provincial average.^{7,43} In addition, Muskoka has an aging population; 28.3% are 65 years or older compared to 18.3% in all of Ontario.⁴⁴⁻⁴⁷ All exercise regimens and testing took place at a local gym and training facility in Huntsville and Bracebridge, Ontario. RECaPS is a 12-week, personalised exercise daytime programme aimed at promoting accessibility to specialised-exercise support services to rural, community-based cancer patients and survivors. This manuscript reports on the results of the qualitative component of the broader mixed-methods evaluation, focusing on participant experiences of the RECaPS programme. Quantitative outcomes from physical assessments and standardised questionnaires are available through the corresponding author (manuscript under review).

Participants consisted of adult cancer survivors, or those currently undergoing treatment, residing in rural Ontario, specifically in the region of North Simcoe Muskoka (Townships of Huntsville and Bracebridge). Eligibility criteria included a previous (within 5 years of programme start-date), or current, cancer diagnosis, informed consent and physician clearance for participation for programme enrolment. Participants were assigned a unique study ID to protect confidentiality.

Recruitment methods included hospital-based mailouts, poster placements within the waiting rooms of the Muskoka Algonquin Healthcare’s chemotherapy clinic and local doctors’ offices, local media support and word of mouth. Participants from related communities were also invited to participate with appropriate medical clearance. Physician clearance was required before screening with support from primary care physicians (PCP) and colleagues. Most referrals came from PCPs (58%), with none refusing their patients’ requests.

Pre-testing before RECaPS

Participants completed a set of standardised, baseline surveys and physical assessments, the quantitative aspect of our study. Information on lifestyle behaviours (e.g., smoking status), dietary intake and general health status were collected, along with baseline health metrics (e.g., blood pressure). Lasting approximately 1 h, patients participated in semi-structured interviews with the research assistant (MP), informing about their goals and expectations for their participation in the programme. Data collected also included demographics, information related to their cancer treatments, previous exercise experience and barriers to exercise, with open-ended questions for each section, allowing personal feedback. Completion of the Senior's Fitness Test (including Chair Stand and Arm Curl) and Grip Strength protocol (using standardised dynamometry procedures) was also administered to record any negative events or participant commentary.^{48,49} These pre-programme assessments allowed modifications for individual programming, where indicated, because of medical complexity. At baseline, aerobic fitness was estimated using a modified Naughton protocol (treadmill exercise stress test). In this study, a progressive, ramp cardiopulmonary exercise test, validated in cancer patients¹⁸ to maximal or submaximal thresholds according to individual capacity and medical clearance (*Protocol available upon request*). Treadmill speed and grade were incrementally increased each minute until maximal or submaximal exertion, with incline recorded at test termination. Aerobic fitness was quantified using maximum heart rate, total test duration and peak Rate of Perceived Exertion Scale (RPE) (0–10 scale), recorded every 3 min. For submaximal tests, heart rate at 85% of predicted HRmax was recorded.

Exercise intervention

Over the course of the study, 12 cohorts were offered. Each cohort was structured to include 10–15 participants, lasting a total of 12 weeks. Individuals took part in 1 cohort, which included twice-weekly, 60-min sessions over the course of 12 weeks, totalling 24 sessions. Each session consisted of both resistance and aerobic training and was personalised based on the pre-test

results. Attendance, modifications, exercise adherence and adverse events were recorded in the participants' logs. A master Excel Sheet was used to code and produce specific high-intensity interval training and moderate-intensity continuous training sessions. The resistance training portion of the exercise session consisted of a full-body weightlifting workout. Each session included 8 exercises, each targeting a different area of the body (e.g., seated row and chest press). Many alternatives were used for each exercise, including using free weights, resistance bands, body weight or alternative machines when necessary. At the end of each session, the exercise lead (DL) reviewed and recorded any adverse events. DL filled out the prescriptions for the next session, adjusting the weights as needed.

Post-testing after RECaPS

The post-test process was identical to pre-testing. Qualitative data included a second semi-structured interview using the baseline questionnaire to record patient outcomes after their experience. Pre- and post-quantitative data were collected after the 12-week programme. Each participant attended a one-on-one session with the Exercise Lead and the research team to complete the final fitness testing.

Data analysis

Qualitative data derived from pre- and post-intervention interviews and open-ended survey responses were analysed using Braun and Clarke's (2006) 6-step thematic analysis.⁴² 2 authors (FS) and (AB) independently analysed participants response's using NVivo software to inductively identify codes and collaboratively developed a codebook. Responses were then analysed by 1 author (LA) using the developed codes to finalise themes. Authors performing coding communicated as needed during final coding to discuss any new codes that emerged. Saturation of data was ensured during the coding process. Deidentified findings were checked with participants to confirm credibility.

This study was approved by the Laurentian University Research Ethics Board file 6013841 and is compliant with the Declaration of Helsinki.

RESULTS

One hundred and 4 participants took part in the study. One individual was excluded due to medical limitations (multiple metastases), although their PCP supported inclusion. The Coronavirus disease 2019 (COVID-19) pandemic had a significant effect on accessibility to in-person programming throughout the world as compliant gyms were closed. As a result, class sizes were reduced from 10 to 12-5 participants; however, the last cohort expanded to 9. However, it is important to note that even with the 18-month study interruption, <20 participants were unable to complete the programme. Reasons for discontinuing were the COVID-19 pandemic and increased scheduling complexities related to personal matters.

Theme 1: Benefits of community-based support

Across participant accounts of the RECaPS programme, a strong sense of community emerged as a key theme, highlighting the unique value of a group of peers sharing similar biopsychosocial challenges. As 1 participant stated:

‘Many of us carry with us a sense of PTSD and this program brings us together and helps us understand we are not alone in our struggles’.

This image evokes the weighted, ongoing burden cancer survivors carry at each stage of their journey. The programme helped in bridging the gap between isolation and a shared sense of humanity, helping participants realise that cancer is a universal experience that many share. This cultivated adherence, as the programme was described as ‘energetic’ and ‘motivational’ by participants. The leaders were also described by participants as being crucial in fostering a positive, socially cohesive environment through guiding and promoting their emotional and physical safety.

Theme 2: Individualised programming and coaching

Cancer causes very heterogeneous and complex side effects, along with altered physical capacities that require more specialised attention. The ability to create customised exercise plans for RECaPS’ participants made this programme more accessible and rewarding to many people. Despite differing physical abilities, participants in the programme

were able to progress at a safe and manageable pace because of the guidance and modifications instituted by the exercise leader. Participants found that this flexible model allowed them to improve their physical health despite individual barriers.

‘My RECaPS experience was highly valued and I particularly found the coaching and supervision crucial to helping me manage and overcome long-term cancer treatment side effects that had previously limited my ability to exercise’.

Many participants have commented that their experience was enhanced by the customised exercise programme (e.g., adjustments and accommodations) that met their individual needs. Overall, this programme succeeded in increasing or maintaining the physical abilities of participants.

Theme 3: Enhancing health and strength

This programme succeeded in increasing or maintaining the physical abilities of participants. Many participants commented on noticeable improvements in both their strength and cardiovascular capacity following their participation in those components of the programme.

‘I was very nervous about the treadmill part but was very pleased that I went from 10 min to 40 min by the end. I now look forward to doing the treadmill now that I found a speed that is a groove for my hips. I am challenging myself with some sprints and incline’.

This programme has helped individuals gain confidence in exercise and achieve manageable goals through the individualised, adaptable and educational plans. Many participants were motivated to continue exercising outside of the programme as they were more physically capable and knowledgeable about increasing activity in a safe manner while managing treatment-related side effects.

Theme 4: Embodiment and reclaiming the body

Notably, cancer therapies and the illness itself can drain a survivor’s physical vitality, leading to a sense of disembodiment and alienation from one’s own body. Exercise has the power to counteract this by encouraging a sense of

embodiment, a feeling of presence and control over oneself.

'I can honestly say I feel the best I have felt in 5 years.'

This statement effectively captures the long and taxing journey faced by participants and how exercise can promote a form of pre-cancer vitality through physical re-engagement.

'I gained so much from this experience – I gained mobility, strength, and well-being.'

This quote highlights how physical embodiment is a multi-faceted process and a key benefit of exercise for cancer patients beyond conventional physical health measures.

Theme 5: Education and empowerment

Cancer can be marked by a sense of powerlessness. Being educated on how to manage one's own physical capacity was empowering for participants, helping them regain control over their physical recovery. Confidence and engagement come from physical competence and knowledge, which participants gained through education on machine use, proper form and how to understand heart rate readings.

'As a cancer survivor trying to get back into a fit lifestyle, I struggled with fatigue and weakness. I would try to exercise more but as soon as I felt fatigue I would stop; I now check my heart rate and feel more confident pushing through a workout to the desired exertion level. Game changer!'

Participants learned how to push themselves in a safe and structured way, which changed how they approached their lifestyle. Equipped with knowledge and appropriate enthusiasm, participants felt more proactive, confident and better able to measure and manage their own gains.

Theme 6: Positive experience

Many RECaPS participants commented on how excellent the programme was for them and the positive experiences they had. Multiple participants said the programme was well-structured, with the combination of cardiovascular and strength exercises enhancing their experience. Often, descriptors such as 'positive impact', 'motivational' and 'exceptional' were used to describe the programme.

Participants also recognised the benefits of this programme for cancer patients:

'RECaPS is an exceptional program that should be available to everyone at any time during their diagnosis and recovery.'

Overall, this programme has made a positive impact on many lives and has left participants eager to continue exercising, due to its holistic design.

Theme 7: Barriers and limitations

Although RECaPS has many positive components, participants have experienced barriers as well. Barriers for individuals include a lack of attendance due to work, difficulty travelling to the gym from far distances and the inability to participate due to the onset of injuries. As some participants were in recovery during the programme, cancer treatments and their side effects also became a barrier for certain participants.

'The program was great, with the only limitation on my part, due to my health journey with treatments and surgery during the same period.'

DISCUSSION

This qualitative study examined participant experiences in a structured, rural-community-based exercise program (RECaPS) that took place over a 12-week span. While expanding on current exercise-oncology literature, this study aimed to bring forth valuable insights on rural survivors and factors promoting their adherence, physical rehabilitation and psychosocial well-being.

In our study, participants attending the RECaPS exercise programme experienced a positive improvement in their psychological and physical condition. One of the defining psychosocial benefits of the programme for rural residents was the sense of community support. Participants felt the programme extended beyond physical rehabilitation, evolving into a socially supportive structure centred around skill-building. Previous studies have similarly shown how the exercise programme was not just an 'individual phenomenon' or 'subjective experience' but one of social involvement and group positivism.^{35,48} Cancer carries its own complex, emotional toll, often fueling isolation and functional limitations, which are particularly acute for rural survivors. Social communities built around physical autonomy help bridge this gap. In Luoma *et al.*'s

work, breast cancer survivors described shared exercise as fostering acceptance and empathy, described as 'being in the same boat'. Chemo Club participants observed that peer support helped reduce pressure on family members, highlighting the value of community-based programming beyond individual participants.^{31,46} Psychosocial services and cancer-specific programming are especially limited in rural settings compared to that of urban centres; therefore programmes that foster community around a shared sense of recovery are vital for these subpopulations.^{21,40,42}

Individual programming and instruction

The importance of individualised programming and competent, compassionate care cannot be overstated in the literature of exercise oncology. Structured, yet flexible programming is highly valued by participants across the cancer care continuum.⁴⁸ This facilitates the rebuilding of physical capacity in a safe and informative way. RECaPS participants found the supportive instruction, along with relevant modifications, crucial in facilitating their physical and individual needs. As noted in 2 studies, knowledgeable instructors were informative and reassuring towards participants by helping them set clear, manageable expectations.^{48,49} In separate studies, participants reported feeling no need to explain reduced capacity, which minimised shame and a sense of inferiority post-treatment.^{35,37} Across literature, instructors were characterised as 'encouraging', 'comforting' and attentive to individual needs, overlapping with RECaPS findings that instructor support was a major motivator.^{50,51} Overall, cancer-specific, individualised instruction affirmed participants' needs and fostered a sense of safety and recognition beyond generic interventions, which is in alignment with RECaPS participant feedback.^{51,52}

Multiple RECaPS participants described tangible improvements in their fitness, whether through improved treadmill endurance or increasing progressive loading. These findings coincide with existing qualitative literature on oncology exercise interventions, which reported a range of physical benefits such as improving functional capacity and energy levels.^{38,51-53} Similar quantitative studies demonstrate that significant physiological gains

followed structured exercise for cancer patients.^{54,55} Exercise also helped in mitigating health-related side effects while reducing fatigue and pain management – similar to the benefits reported by RECaPS participants.^{29,55} These physical milestones, big or small, improve self-efficacy by motivating participants and help in creating positive associations, bodily autonomy and seeing themselves as strong rather than vulnerable.⁵⁰ Furthermore, these personal improvements in health are sources of confidence and allow a re-engagement with lifestyle activities before cancer.⁵⁰

Alongside physiological gains, RECaPS participants detailed a more layered process of reintegration with their bodies, conceptualised as embodiment. Previous studies have communicated similar embodiment processes, as exercise encourages an affirming connection with post-treatment bodies, helping survivors rebuild and redefine their physical identity.^{53,55} In 1 study, on breast cancer survivors who underwent a programme similar to RECaPS, they discussed entering into a space where the effects of treatment on their appearance, such as scarring and alopecia, was normalised and less of a worry, allowing them to reconnect and experience their bodies beyond the fear of social scrutiny.⁵⁴ In addition, it mentions how instructors, again, were encouraging, helping them evolve from 'patients' to 'healthy women' suggesting a similar pattern of re-embodiment.⁴⁸ These positive outcomes could be especially impactful in rural contexts, with limited reach to rehabilitative care, furthering the need for supportive, flexible programmes like RECaPS for recovering lost function and agency through a holistic integration of wellbeing.

As previously discussed, the post-treatment period of survivorship is marked by a reduction in bodily confidence, which was addressed in the RECaPS guided, instructor-led programme, valuing safe and effective physical activity. The skill-building process combined with supportive instruction encouraged autonomy, more specifically in learning proper machine use, interpreting heart rate data and how to challenge oneself cautiously. As shared by RECaPS participants, confidence in acquiring these skills builds more sustainable empowerment through comprehension as opposed to simple performance, allowing them to make informed choices while exercising. This is highly valuable, especially

for rural participants, if access to exercise isn't always available, allowing them to confidently access exercise where formal programming may not always be an option. RECaPS programming enables participants to carry these skills into their daily lives.

These findings overlap with the broader literature, on how structured, supportive exercise restores a sense of empowerment by reducing fear. Physical activity also helped transition survivors from an illness mindset to one of wellness, offering a respite whilst empowering survivors.^{29,31,48} This relates to previous observations on how post-treatment exercise can be a form of identity transformation from a passive to an active agent in one's recovery.³⁷ One study noted that the attentive and thoughtful approach by instructors encouraged them to feel safe and empowered to test their physical boundaries, and transition from passive victim to active involvement in their health.⁵¹

Having a positive experience in exercise programming often emerges from the integration of physiological, psychological and social processes rather than from a single source alone. RECaPS participants described the programme as positive, noting how group and instructor dynamics encouraged an affirming environment by boosting morale whilst reducing isolation, a finding reported in other qualitative studies.^{35,38} One study noted how experiencing personal positive changes was highly motivational and closely associated with perceptions of positivity around their illness.⁵⁴ In addition, positive experiences were attributed to how physical activity was seen as helpful for their cancer recovery, reflecting a shift in how exercise is understood and valued during diagnosis and treatment.⁵⁴ This overlaps with RECaPS participants' perceptions of positivity, as RECaPS was described as being meaningful across different stages of illness and recovery, stressing the importance of its availability. Taken together, these findings suggest that positive exercise experiences may play an important role in promoting motivation and supporting adherence.^{22,51}

In spite of the positive outcomes, participants did face barriers throughout the programming, including long travel distances, work conflicts, injuries and treatment-related side effects. Although transportation obstacles were noted

by a minority of participants, these observations align closely with existing literature on rural survivorship, underscoring the importance of developing programmes with these rural challenges in mind.⁴¹⁻⁴³

Limitations

Programme delivery during daytime hours likely made it more difficult for individuals who were employed, which may have influenced enrolment capacity. As a result, the participant sample was predominantly older adults with a mean age of 65.5 years. While this may be related to greater schedule flexibility among retired individuals, this age group also represents a high proportion of the local community. In addition, the sample size included significant geographic dispersal and the small population of these rural communities, limiting the findings within a specific rural context.

CONCLUSION

This study contributes to the growing body of evidence on community-based, individualised exercise programmes, which could significantly enhance the quality of life of rural cancer survivors. By centring the experiences of survivors, RECaPS showcases how supportive programming that is individualised, adaptive and flexible engages in a dual process of psychological and physiological recovery. This enhances their psychosocial well-being, self-efficacy, physical confidence and recovery. Future research should be geared towards focussing on adapting and scaling similar models to create rural equity across dispersed survivor populations, notably in rural Ontario.

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Locally delivered: Identifying factors sustaining rural Northern Ontario's remaining obstetric programmes – A qualitative study

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Abstract

Introduction: Over the past 2 decades, rural Northern Ontario has experienced widespread closure of obstetric care services, leaving only 9 sites operational. As a result, many pregnant persons in the region now face substantial travel times to access care, increasing the risk of adverse maternal and fetal outcomes. Understanding how the remaining obstetric programmes continue to operate within the same healthcare environment that has contributed to closures elsewhere in rural Northern Ontario offers insight into factors enabling programme sustainability.

Methods: A qualitative study design was used. Semi-structured interviews were conducted with physicians, nurses and administrators from the 9 rural Northern Ontario hospitals that continue to provide obstetrics. Interview guides were informed by previous research on rural obstetric closures and designed to explore the factors participants considered important to programme sustainability. Interviews were analysed using Braun and Clarke's thematic analysis framework to identify the supports, approaches and practices perceived to enable programme continuity.

Results: Twenty-three participants were interviewed. Analysis revealed 4 overarching themes participants perceived as important for supporting the continuity of rural obstetrics: (1) passion and commitment, (2) workforce capacity and sustainability, (3) collaborative systems and support and (4) adaptive and safe practices.

Conclusions: Sustainability factors identified in rural Northern Ontario's remaining obstetric programmes appear to address challenges linked to programme closures elsewhere, including workforce shortages, declining provider competence and limited structural support. Integrating these sustainability factors into programme design may strengthen current services, reduce risks of closure and guide re-establishment of obstetric care in communities where it has been lost.

Keywords: Fetal health, maternal health, Northern Ontario, obstetrics, programme sustainability, qualitative research, rural health services

Résumé

Introduction: Au cours des deux dernières décennies, le Nord rural de l'Ontario a connu de nombreuses fermetures de services obstétricaux, au point où seulement

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neuf sites demeurent en activité. Par conséquent, plusieurs personnes enceintes de la région doivent maintenant parcourir de longues distances pour accéder aux soins, ce qui augmente le risque d'issues défavorables pour la mère et le fœtus. Comprendre comment les programmes obstétricaux encore en place réussissent à fonctionner dans le même environnement de soins qui a mené à des fermetures ailleurs dans le Nord rural de l'Ontario permet de mieux cerner les facteurs qui favorisent leur pérennité.

Méthodes: Une étude qualitative a été réalisée. Des entrevues semi-dirigées ont été menées auprès de médecins, d'infirmières et d'administrateurs provenant des neuf hôpitaux ruraux du Nord de l'Ontario qui offrent encore des soins obstétricaux. Les guides d'entrevue s'appuyaient sur des recherches antérieures portant sur les fermetures de services obstétricaux en milieu rural et visaient à explorer les facteurs que les participants jugeaient importants pour assurer la pérennité des programmes. Les entrevues ont été analysées selon le cadre d'analyse thématique de Braun et Clarke afin de dégager les formes de soutien, les approches et les pratiques perçues comme favorisant la continuité des programmes.

Résultats: Vingt-trois participants ont été interviewés. L'analyse a fait ressortir quatre grands thèmes jugés importants pour soutenir la continuité des soins obstétricaux en milieu rural: (1) la passion et l'engagement; (2) la capacité et la pérennité de la main-d'œuvre; (3) les systèmes collaboratifs et le soutien; et (4) des pratiques adaptatives et sécuritaires.

Conclusions: Les facteurs de pérennité recensés dans les programmes obstétricaux encore en place dans le Nord rural de l'Ontario semblent répondre à des défis associés aux fermetures survenues ailleurs, notamment les pénuries de main-d'œuvre, l'érosion des compétences des fournisseurs de soins et le manque de soutien structurel. L'intégration de ces facteurs dans la conception des programmes pourrait renforcer les services actuels, réduire les risques de fermeture et guider le rétablissement des soins obstétricaux dans les communautés où ils ont été perdus.

Mots-clés: services de santé ruraux, obstétrique, santé maternelle, santé fœtale, pérennité des programmes, Nord de l'Ontario, recherche qualitative

INTRODUCTION

Over the past 2 decades, rural Northern Ontario has experienced widespread closure of obstetric care services.¹⁻⁴ In 1999, 20 rural hospitals across the region offered obstetrics; by 2025, only 9 remain.¹⁻³ As a result, many pregnant persons living in the rural North now face substantial travel times to give birth, with an estimated 636 travelling 1–2 h and 577 travelling 2–4+h each year.⁴ These travel times limit access to care, increase the risk of adverse outcomes and create emotional and financial burdens for pregnant persons.^{4,5}

The relationship between travel time and adverse outcomes is well established. For fetal health, residing more than 4 h from obstetric services is associated with a 3-fold increase in perinatal mortality, while living more than 2 h away is linked to higher rates of stillbirth, preterm birth and large-for-gestational-age deliveries.⁵⁻⁸ For maternal health, delays in access are associated with a 2-fold increase in severe morbidity, compared to those with local access.^{9,10} Beyond clinical risks, travel also imposes emotional and financial burdens. Pregnant persons who travel

more than an hour for care are 7 times more likely to experience moderate-to-severe stress and often must pay out-of-pocket for transportation and accommodation.^{5,6}

These impacts underscore the consequences of losing local obstetric access. Recent research examining obstetric programme closures in rural Northern Ontario has identified 3 factors contributing to service loss: (1) declining provider competence and confidence in obstetrics, (2) a shortage of obstetric health human resources and (3) limited system-level support for rural obstetrics.³ Collectively, these challenges have created an environment in which sustaining rural obstetrics has become increasingly difficult.

Nine rural Northern Ontario hospitals continue to provide obstetrics, suggesting the presence of supports, approaches and practices that enable sustainability. By capturing the perspectives of healthcare providers and administrators involved in supporting these programmes, this study aims to identify factors underlying service sustainability. Understanding how these programmes remain operational, despite pressures that have contributed to closures elsewhere, may inform

efforts to strengthen current services, reduce risks of closure and guide re-establishment of obstetrics in communities where it has been lost.

METHODS

This qualitative study used semi-structured interviews to explore factors supporting the sustainability of obstetric programmes in rural Northern Ontario. Healthcare providers (physicians and nurses) and administrators from the 9 hospitals in rural Northern Ontario providing obstetrics were recruited using purposive sampling through professional networks. Study invitations were emailed and prospective participants received a study information letter and a consent form.

Interviews were conducted between June and August 2025 using a semi-structured interview, developed based on findings from a previous study on the factors contributing to rural obstetric programme closures.² To ensure contextual relevance, it was refined by a physician with over 30 years of experience providing obstetrics in rural Northern Ontario (EO). Questions explored participants' experiences supporting obstetrics and the enablers, challenges and strategies for maintaining continuity of service. All interviews were conducted via Zoom (Zoom Video Communications Inc., San Jose, CA, USA). Before each interview, verbal informed consent was obtained, including permission to audio-record. Upon completion, participants received a \$100 honorarium.

Data were analysed using Braun and Clarke's thematic analysis framework.¹¹ In brief, members of the research team independently reviewed transcripts and generated codes using NVivo 14 (Lumivero, Denver, CO, USA). Codes were organised into themes, which were refined through discussion with the research team until consensus was reached. Thematic saturation was reached when the team determined that no additional themes emerged from the data, indicating that all thematic elements related to programme sustainability had been captured.

Ethics approval was obtained from the Lakehead University Research Ethics Board (#1471057).

RESULTS

Twenty-three participants were interviewed, representing 9 physicians, 7 nurses and 7 administrators from the 9 rural Northern Ontario hospitals providing obstetrics [Table 1]. Interviews ranged from 23 to 59 min.

Across interviews, participants described factors supporting the sustainability of rural obstetric programmes. Analysis uncovered 4 overarching themes: (1) passion and commitment, (2) workforce capacity and sustainability, (3) collaborative systems and support and (4) adaptive and safe practices.

Theme 1: Passion and commitment

'You need very passionate people who are willing to go beyond their way to keep the [obstetric] programmes going.'

- (Physician 7)

Across groups, a passion for obstetrics emerged as a central driver of programme sustainability. Providers often described obstetrics as one of the most meaningful and rewarding parts of their practice. This passion motivated them to maintain their skillset, take on additional responsibilities and advocate for keeping programmes operational.

Passion for practice: Participants described passion as a driving force behind the continued operation of rural obstetrics. As 1 participant explained, this passion is directly tied to programme continuity:

'... our providers are pretty passionate about it [obstetrics] and really want it to stay. And so, I think that plays a role in the fact that we're still open.'

- (Nurse 1)

For others, obstetrics was a central reason for remaining in rural practice:

'I would be gone tomorrow if it was like, 'We're not doing this [obstetrics] anymore,' and they would lose the other OB provider.'

- (Physician 6)

Participants also recognised how passion contributed to programme sustainability, with team members going beyond their clinical responsibilities to advocate for keeping services operational:

'So [the physicians] are very passionate about the programme, and they push us to, you know, even if it's hard, we should still try to keep it open.'

- (Admin 3)

Table 1: Participants' occupation and location of employment

Category	Role	Northeastern Ontario (n=4 programmes)	Northwestern Ontario (n=5 programmes)	Total
Administrator	Obstetric manager	1	3	4
	CNO	2	1	3
Healthcare worker	Nurse	4	3	7
	Physician	4	5	9
Total		11	12	23

CNO: Chief nursing officer

Commitment to learning: Passion was also demonstrated through a commitment to ongoing learning and professional development. Participants described training and skill maintenance not only as a professional duty but as a personal commitment to sustaining obstetrics:

'We've made a personal or professional commitment to keep our ALARM [Advances in Labour and Risk Management]'.

- (Physician 3)

Theme 2: Workforce capacity and sustainability

'So, our plan now is to do onsite training as much as possible, because our reality is very different than they'll see in larger hospitals'.

- (Admin 3)

Sustaining rural obstetrics was described as being dependent on having a skilled, confident and supported workforce. Participants emphasised that building and maintaining this workforce required accessible, context-specific training, staffing models that ensured adequate obstetric coverage and opportunities for medical learners to develop competence in rural obstetrics.

Local obstetric training: Locally offered, rural-specific training was seen as important for maintaining obstetric competence, with participants viewing it as both more practical to access and more relevant to the clinical realities providers encounter in rural settings.

'So, kind of being this hub...where these tertiary hospitals come in and do surgeries with the local OSS [Obstetrical Surgical Skills] staff to help increase their skills and do CME [continuing medical education]... so that people can get their volumes and maintain their skills and bring that back to their home community... So sometimes there's government programmes to provide that type of training. But knowing that it's best if it can be brought into the local

communities because it takes so long to travel... because some of these programmes are not funded knowing the challenges of rural differences'.

- (Physician 8)

Staffing Models for Sustainability: Reliable coverage was consistently cited as critical to programme sustainability. Participants described strategies such as ensuring multiple providers were available for deliveries and implementing call systems to reduce the risks and pressures of single-provider deliveries. At some sites, workforce sustainability was strengthened by integrating midwives into obstetric teams through the *Expanded Midwifery Care Model*, which helps distribute workload and provides additional on-call support:

'Our primary care midwife... she's absolutely invaluable to the [obstetric] call burden that we've been carrying'.

- (Physician 3)

'I instituted a system... that we would have 2 doctors on call for obstetrics, one as a backup, and they would have to attend the delivery because... what drives people out of obstetrics is being on your own in the middle of the night with a disaster'.

- (Admin 7)

Training learners: Hands-on exposure for medical learners helped build a sustainable obstetric workforce. Clerkship and residency placements in rural hospitals providing obstetrics allowed learners to gain the experience and confidence needed to pursue rural obstetric practice, and for some sites, functioned as an effective recruitment pathway:

'The person that's doing obstetrics with me now... she was one of our 4 medical students, and then she was our full-time resident and now she's doing obstetrics with me... We knew that she had an interest in obstetrics, so we were really keen on that. Then we made sure that she had the training needed while she was a resident, so that she'd be ready to do obstetrics when she's done'.

- (Physician 7)

Theme 3: Collaborative systems and support

I know our administration is working ridiculously hard to maintain the service. It's not something that anybody wants to see go at the end of the day'.

- (Nurse 7)

Collaboration and support across professional, organisational and system levels were viewed as essential to sustaining rural obstetrics. Participants emphasised that programme continuity was not solely dependent on individual effort, but on collaboration among providers, hospital administrators, local communities and system partners.

Team-based collaborative care:

Interprofessional collaboration fostered strong relationships and a shared sense of responsibility for both patient outcomes and programme sustainability. Participants described how small, tight-knit teams with open communication created a supportive culture.

'The communication and the relationships we have with the physicians and management is huge... If I get a text from a nursing supervisor saying 'We have 5 in labour. Do you mind coming in and helping out'... I will likely go in to help out my colleague'.

- (Nurse 6)

Supportive leadership and administration:

Support from hospital administrators was also viewed as critical to sustaining obstetrics. Participants described actions such as supporting training opportunities and covering locum costs when government support fell short as central to keeping programmes operational.

I think our administration has bent over backwards, recognizing the risk in not having it [obstetrics], and in days where they could have just abandoned it... They didn't'.

- (Nurse 7)

'The hospital has been paying the locums out of its own budget because otherwise no one's gonna come because no one's going to work for free'.

- (Physician 7)

Community voice: Community commitment reinforced the value of maintaining local obstetrics. Participants described how families valued the option of local delivery, particularly given the risks and burdens of long-distance travel. For some, this provided the motivation and justification for sustaining service.

'We know that the community we serve, the community wants to make sure that there is a local obstetrical programme'.

- (Physician 7)

'I mean to have to travel an hour and a half at the least to get to another OB department... doesn't sound great to me ... And these are Northern Ontario Highways. As we all know, it's not a great highway to travel'.

- (Nurse 2)

Government and Financial Support: Government programmes and funding were recognised as important system-level supports that helped sustain obstetrics. Participants noted that targeted investments in training helped keep providers competent:

'We received some funding recently from the Ministry that we were able to really provide a lot of NRP [Neonatal Resuscitation Programme] certifications to our nurses... that helped really kind of get everyone back to where they should be'.

- (Admin 1)

In addition to training, government programmes were seen as essential to ensuring adequate compensation for the demanding on-call responsibilities of rural obstetric providers. The Hospital On-Call Coverage (HOCC) programme, designed to provide physician on-call compensation, was identified as one such programme that helped sustain physician engagement in obstetrics:

'They've [hospital] divvied up the HOCC money, some of it going directly to the doctors who are providing OB. So that's been helpful to keep physicians providing OB'.

- (Physician 5)

Theme 4: Adaptive and safe practices

'It's just kind of not an option to close, that has been communicated from the physicians... It's not happening so our leadership has kind of been like, 'Yeah, we'll do whatever we can to make sure it [obstetrics] doesn't [close]'.

- (Admin 6)

The ability to adapt while prioritising patient safety emerged as a defining feature of sustainable rural obstetric programmes. Participants described adaptability as built into everyday operations, enabling teams to function within a challenging healthcare environment. Adaptation

was not viewed as a temporary response but as an ongoing process of anticipating risks and adjusting to maintain access.

Adaptability and resilience strategies:

Participants emphasised that sustainability depended on proactive planning. Succession planning, strategic staffing and anticipating skill gaps helped ensure service continuity in the face of staff turnover and provider shortages.

'We definitely need to be strategic about the people who are coming in to do obstetrics... being honest and open about when people are leaving, and what is the skill set they take with them. So what do we need to try to replace?'

- (Physician 4)

'Switching to the midwifery model, I think, is number one. Without that change, without having the physicians committing to that, our programme would have been dead 5 years ago.'

- (Admin 3)

Risk Management and Safety Focus: Patient safety was also described as central to decisions about sustaining rural obstetrics. Participants described that closure would create risks for patients, which reinforced the importance of maintaining local access to care.

'If we didn't have our programme continue, it would be a huge risk to our population. So, I find that both the physicians, the nurses and members of the healthcare team really advocate to make sure we're able to keep it up and running.'

- (Nurse 6)

Backup and Referral Systems: Strong referral systems were described as important safeguards, with larger hospitals serving as safety nets to ensure urgent cases could be rapidly transferred when local resources were insufficient.

'Any bigger centre that recognizes the urgency. They just accept them [the patient], even if they're on the cusp of being within their capacity, because they just realize that they're a bigger centre, and they can manage it [delivery] easier until more help comes.'

- (Nurse 7)

At sites with surgical services, relationships with nearby hospitals helped support programme sustainability by ensuring backup during periods of local workforce shortages. These partnerships reduced patient risk and allowed programmes to remain operational.

'Generally, what we do is a call out to all of the providers to let them know that there's no C-section provider, and that's usually known well in advance. We reach out

to [community] just an hour and a half away, and see if [physician] is available, and if [physician] is, then it's a short transfer for a C-section'.

- (Physician 4)

DISCUSSION

Our study examined factors underlying the sustainability of obstetric programmes in rural Northern Ontario, based on the perspectives of physicians, nurses and administrators at 9 hospitals that continue to provide obstetric care. Four key elements were identified: (1) passion and commitment, (2) workforce capacity and sustainability, (3) collaborative systems and support and (4) adaptive and safe practices. These factors address many of the challenges linked to obstetric programme closure identified in previous research.³

Passion and commitment

A unique finding of our study was the role of passion in sustaining rural obstetric services. Across all participant groups, but especially among providers, obstetrics was described as one of the most meaningful aspects of practice. This motivation often translates into expanded team capacity reflected in a willingness to maintain high on-call demands, pursue ongoing training and work beyond clinical duties to advocate for programme continuation.

However, reliance on passion alone carries risk. Programmes dependent on a few committed and passionate individuals are vulnerable to burnout, retirement and turnover. While passion appears to expand team capacity, it is unlikely to be sustainable without structural support.¹² Notably, sites that have maintained obstetrics typically have such support in place, including efforts to develop workforce capacity and sustainability, strengthen collaborative systems and remain adaptable. Whether these are successful in sustaining passion or buffer against burnout is less clear.

Workforce capacity and sustainability

Workforce capacity and sustainability emerged as important in maintaining rural obstetrics programmes. Previous research has identified declining obstetric competence and confidence as a contributor to programme closures.³ In contrast, participants described strategies designed to

address this risk. Training was prioritised to maintain obstetric competence and confidence, with sites making deliberate efforts to deliver education locally and ensure staff had ongoing access to learning opportunities. Even programmes with delivery volumes perceived as adequate for skill retention, CME and ongoing training remained a priority. These findings suggest that access to education is important for maintaining provider competence and confidence, and given its link to programme closures, represents a key facet of sustainability.³

Participants also emphasised that sustainability depends not only on maintaining provider competence, but also on an adequately staffed obstetric workforce to provide consistent coverage, distribute workload and reduce the risks of single provider deliveries. In response, participants described strategies aimed at strengthening workforce capacity. Rural clerkship and residency placements were described as important for building the future obstetric workforce, exposing learners to the realities of rural obstetrics and, in some cases, served as an effective recruitment pathway.¹³ Workforce capacity was also strengthened through the integration of new provider roles, namely the incorporation of midwives into obstetrical teams through the *Expanded Midwifery Care Model*. Participants noted this approach helped redistribute workload, reducing reliance on physicians for continuous on-call coverage and improving continuity of care for patients. Taken together, these findings suggest that investment in both training pathways and innovative workforce models represents key elements in maintaining and expanding workforce capacity and is therefore an important factor in the sustainability of rural obstetric services.

Sites also implemented adaptive staffing models tailored to the realities of rural practice. These included scheduling 2 providers for deliveries, assigning a dedicated obstetrics nurse per shift and structuring call coverage to ensure physician backup coverage. While the specific strategies varied by site, their design was aimed at addressing pressures such as isolation and limited support that often drive providers to leave. By addressing these strains, adaptive staffing models may represent an important strategy for supporting provider retention and, in turn, the sustainability of rural obstetric services.

Collaborative systems and support

Collaborative systems and organisational support emerged as enablers of programme sustainability. While previous research has shown that limited system-level support contributes to rural obstetric programme closures, participants in the study described collaboration and support across multiple levels that helped to maintain local services.³

Institutionally, interprofessional collaboration was a key factor. Participants described small, tight-knit teams with open communication that fostered trust, mutual support and shared responsibility for both patient outcomes and programme continuity. This culture of collaboration helped teams adapt and redistribute responsibilities to maintain consistent coverage, even with limited staffing capacity.

Hospital administrations' support for obstetrics was also identified as a critical factor in sustaining local services. Their commitment provided reassurance to providers and helped mitigate the broader system-level lack of support that has contributed to rural obstetric closures elsewhere in Northern Ontario.³ Specifically, investments in training opportunities and the willingness to cover locum costs when government funding fell short were cited by participants as some of the actions the administration took that enabled services to remain operational.

At the community level, local engagement often helped to reinforce the importance of maintaining obstetrics, particularly given the risks and burdens associated with travelling for obstetric care.⁵

Government support was identified as a necessary enabler of programme sustainability. Targeted investments, such as funding for ongoing obstetrics training, were viewed as important supports.

Adaptive and safe practices

Adaptability while maintaining safety emerged as a crucial factor in sustaining rural obstetric programmes. Participants described adaptability as embedded in day-to-day operations. Proactive succession planning, flexible staffing and backup systems were highlighted as strategies that enabled sites to anticipate risks, respond to workforce shortages and maintain continuity of

obstetric cases. The ability to adapt appeared to be a common characteristic of programmes that have remained operational, potentially enabling them to withstand pressures that contributed to obstetric closures elsewhere. This finding aligns with previous research, which has identified adaptability as a protective factor for rural health services, underscoring its importance in service sustainability.¹⁴

Safety was equally central to sustainability. Strong referral networks with larger hospitals and reliable physician backup were viewed as essential. These systems ensured timely transfers if complications were to arise and strengthened provider confidence by eliminating the likelihood of managing emergencies in isolation. By reducing the sense of vulnerability associated with rural practice, these supports help address factors such as professional isolation that have been shown to contribute to provider attrition and programme closure. Strong safety systems may help strengthen workforce stability and service continuity, further strengthening the sustainability of rural obstetric programmes.

Limitations

The analysis reflects perspectives on sustainability from physicians, nurses and administrators; however, obstetric care also involves other key stakeholders, including allied health professionals, patients and community members, whose insights may have offered different or broader perspectives on programme sustainability. Future research should incorporate these perspectives to inform a more complete understanding of the factors driving the sustainability of rural obstetric care.

While participants identified several factors that they perceived as supporting programme sustainability, these cannot be directly attributed to the continued operation of obstetric programmes. Further research should examine how these factors function in practice, including their impact on measurable outcomes such as provider retention, service continuity and patient safety.

CONCLUSION

The sustainability of rural obstetric programmes in Northern Ontario is driven by 4 key factors: (1)

passion and commitment, (2) workforce capacity and sustainability, (3) collaborative systems and support and (4) adaptive and safe practices. Together, these elements foster resilience within a healthcare environment challenged by declining provider competence and confidence, health human resource shortages and limited system-level support.

While passion remains a powerful driver of sustainability, it cannot offset systemic gaps. It appears that sustaining rural obstetric programmes requires ongoing investment in learning and training pathways, workforce capacity, strong collaborative systems and adaptability. Together, these elements form a foundation for programme continuity and should guide future efforts to re-establish obstetric services in communities where it has been lost.

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Barriers and facilitators to rural clinical trials: A rapid review

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Abstract

Introduction: Canada's rural population faces higher rates of chronic disease, worse health outcomes and limited access to health services compared with urban residents. Clinical trials (CTs) can improve equity by expanding access to novel treatments and building healthcare infrastructure. However, rural participation in CTs remains limited. This review aimed to identify barriers and facilitators to the delivery of CTs in rural settings in high-income countries, with a focus on informing the Canadian rural research landscape.

Methods: A rapid review was conducted following Cochrane rapid review methods guidelines, incorporating input from key health system partners. Searches were performed in MEDLINE, CINAHL and Cochrane CENTRAL for studies published within the past five years. Inclusion criteria were peer-reviewed, empirical studies from high-income countries describing barriers to and/or facilitators of rural CT delivery. Screening and data extraction were completed using Covidence, with narrative synthesis of results.

Results: Twenty-five studies were included. Barriers included geographic isolation, lack of research infrastructure, provider inexperience, regulatory complexity and patient-level challenges such as misconceptions and comorbidities that limit eligibility. Facilitators included community engagement, technology to support decentralisation, professional networks, provider education and financial support. Multiple definitions of rurality were identified, underscoring the lack of standardisation.

Conclusion: Rural residents face unique barriers that restrict their participation in CTs, despite evidence of willingness and interest. Expanding rural CT programmes through professional networks, community engagement, technology integration and decentralisation of trial activities could reduce these barriers and help address persistent health inequities.

Keywords: Clinical trial, remote, rural, rural health equity

Résumé

Obstacles et facteurs facilitants à la réalisation d'essais cliniques en milieu rural: une revue rapide

Introduction: Au Canada, les populations rurales présentent des taux plus élevés de maladies chroniques, de moins bons résultats de santé et un accès plus limité aux services de santé que les populations urbaines. Les essais cliniques peuvent

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contribuer à une plus grande équité en élargissant l'accès à de nouveaux traitements et en renforçant les infrastructures de soins. Toutefois, la participation des populations rurales aux essais cliniques demeure limitée. Cette revue visait à cerner les obstacles et les facteurs facilitants liés à la réalisation d'essais cliniques en milieu rural dans les pays à revenu élevé, afin d'éclairer plus particulièrement le contexte de la recherche rurale au Canada.

Méthodes: Une revue rapide a été menée selon les lignes directrices de Cochrane pour les revues rapides, avec la contribution de partenaires clés du système de santé. Des recherches ont été effectuées dans MEDLINE, CINAHL et Cochrane CENTRAL afin de repérer les études publiées au cours des cinq dernières années. Les critères d'inclusion visaient les études empiriques, évaluées par les pairs, provenant de pays à revenu élevé et décrivant les obstacles ou les facteurs facilitants liés à la réalisation d'essais cliniques en milieu rural. Le tri des articles et l'extraction des données ont été réalisés à l'aide de Covidence, puis les résultats ont fait l'objet d'une synthèse narrative.

Résultats: Vingt-cinq études ont été retenues. Les obstacles relevés comprenaient l'isolement géographique, le manque d'infrastructures de recherche, le manque d'expérience des fournisseurs de soins en recherche, la complexité réglementaire ainsi que des défis propres aux patients, notamment certaines idées fausses et la présence de comorbidités limitant l'admissibilité aux essais. Les facteurs facilitants comprenaient la mobilisation des communautés, l'utilisation de technologies pour soutenir la décentralisation, les réseaux professionnels, la formation des fournisseurs de soins et le soutien financier. Plusieurs définitions de la ruralité ont été recensées, ce qui met en évidence l'absence de standardisation dans ce domaine.

Conclusion: Les personnes vivant en milieu rural font face à des obstacles particuliers qui limitent leur participation aux essais cliniques, malgré des données suggérant leur volonté et intérêt à y prendre part. Le développement de programmes d'essais cliniques en milieu rural, appuyés par des réseaux professionnels, la mobilisation des communautés, l'intégration des technologies et la décentralisation des activités de recherche, pourrait contribuer à réduire ces obstacles et à s'attaquer aux iniquités persistantes en santé.

Mots-clés: Milieu rural, région éloignée, essai clinique, équité en santé rurale

INTRODUCTION

Canada's rural population, totalling 6.6 million in 2021, experienced the fastest increase in its rural population growth compared to other nations in the G7 in 2021.¹ Unfortunately, these Canadians experience worse health outcomes and have a higher prevalence of risk factors and chronic diseases compared to those residing in urban or metropolitan areas.²⁻⁴ Furthermore, rural residents are less likely to receive routine care, have a family physician and have access to certain healthcare services.³ It is also well recognised that a range of definitions of 'rural' and 'remote' exist in Canada.⁵ Thus, the scope of the burden of disease and health disparity in this population may be underestimated.

Clinical trials (CTs), particularly randomised controlled trials, have been demonstrated to contribute to healthcare systems by promoting evidence-based practices, building healthcare infrastructure and allowing patient access to novel treatments or interventions.^{3,6} However, rural residents are frequently underrepresented in CTs and face various barriers to participation.^{7,8} Increasing attention

has been placed on the importance of designing human-centred CTs to promote health equity and research participation among rural populations.⁷ One commonly proposed solution is decentralisation, in which some trial activities occur outside of traditional research sites.⁵ Under this model, actions such as virtual consults, direct-to-patient medication delivery and use of local clinicians, laboratories and imaging, help reduce travel burden and associated barriers that rural patients face.⁹ Implementing these approaches and improving rural inclusion in clinical research can further strengthen the generalisability of trial results and ultimately improve patient care.¹⁰ Our review explores the various barriers and facilitators faced in conducting CTs in rural communities, with the goal to capture the current clinical research environment in Canada's rural settings.

METHODS

Rapid reviews provide updated and timely evidence to inform health policy decisions. Our review followed guidelines established by the Cochrane rapid review methods group.

The research questions and search protocol were developed by the reviewers, with input and refinement from key health systems partners. A search query was developed and entered into multiple databases, including MEDLINE, CINAHL and Cochrane CENTRAL. To provide an updated review, results from the last five years were included. Other inclusion criteria included studies from high-income countries, papers describing barriers to and/or facilitators of CTs in rural settings, English language publication and peer-reviewed, empirical research. We did not include research describing trials in exclusive non-rural settings or opinion papers.

Results were imported into Covidence, and dual-reviewer screening of abstracts was completed, with conflicts resolved by a third reviewer. Following abstract screening, the main reviewer completed full-text review and data extraction using a piloted form developed by the research team and iteratively refined during initial data collection to ensure consistency and clarity. The form was designed to capture a minimal set of pre-defined variables relevant to the review objectives, including study characteristics (author, year, country and design), reported barriers and facilitators and definitions of rurality used by included studies. The extracted data were used to complete a narrative synthesis.

RESULTS

Our search of the databases returned 44 studies with duplicates removed, of which 25 were included in the final review [Table 1]. Reasons for exclusion included exclusive non-rural settings, non-research papers (i.e. opinion pieces), texts greater than five years old, studies from low-income countries and failure to describe barriers or facilitators to CTs.

The types of studies in our review were varied and included narrative and systematic reviews, as well as cross-sectional and retrospective studies. Australia, Canada and the United States were the three countries represented in our review. Where specific trials were the focus of the study, these were most often designed around cancer treatment, apart from one study that examined a heart failure trial.

Barriers

Across all studies, the most commonly cited barriers related to geographic factors [Table 2]. Twelve studies mentioned challenges associated with the geographic isolation of rural communities, lack of rural research centres and associated patient burdens such as time commitment, financial cost and fatigue.^{5,11-20} In rural communities where research was implemented, barriers included a lack of appropriate infrastructure and resources, cost burden and a disproportionate burden to incorporate telehealth, for which not all rural sites are equipped.^{5,9,10,14,15,21,22} Several studies also noted provider factors that influenced the success of rural research. A lack of awareness of potential CTs by rural providers was mentioned in six studies, and limited experience with clinical research was noted in three.^{4,5,10,13,14,23} Personnel turnover and regulatory hurdles were also identified as barriers.^{10,22}

From the patient perspective, several barriers were identified. A lack of awareness of available CTs was found to hinder participation.^{5,14} Two studies highlighted that rural patients were less likely to meet eligibility criteria, due to higher rates of chronic conditions such as heart disease and hypertension.^{4,5} Certain attitudes and misconceptions, such as misunderstandings about the purpose of trials, concerns about placebo or fear of being treated as a 'guinea pig', also discouraged participation.¹⁴ Many patients expressed concern about the burden that trial participation would place on their family members.¹⁵ Trial design itself was another barrier. Five studies mentioned a lack of trial options in rural areas, while three others suggested that the uniqueness and characteristics of rural communities were poorly addressed by trial protocols.^{5,12,16,21,24} Two studies also noted a particular lack of early-phase CTs in rural areas.^{12,21}

Facilitators

A common theme in facilitating rural clinical research was community engagement, which was mentioned in 15 studies [Table 3]. Several engagement strategies were suggested, including involving or employing community members, following shared decision-making principles, encouraging community feedback, utilising local spaces and events and taking time to learn

Table 1: Included papers with key extracted data				
Study ID	Country	Study type	Key barriers	Key facilitators
Abdel-Rahman O, 2023	Canada	Observational	Geographic isolation	Health-mandated quotas for rural participation in CTs
Afzal M. <i>et al.</i> , 2023	USA	Observational	Rural patients not given option to participate Cost, frequent travel, worry about placebo	Overall rural patient interest in trials
Bharucha A. <i>et al.</i> , 2021	USA	Observational (retrospective cross-sectional)	Rural patients travel further than urban to access CTs	
Brockman T. <i>et al.</i> , 2023	USA	Narrative review	Issues relating to recruitment (personnel turnover, absence of educational programmes, ineffective recruitment via faith-based organisations)	Involve/employ community personnel, elicit feedback, customise recruitment materials, remuneration, utilise local spaces and events Relevant research, build trust and partnership
Caston N. <i>et al.</i> , 2022	USA	Observational (retrospective cohort)	Rural patients less likely to be offered a CT	Patients in rural areas preferred a shared decision-making style
Ebrahimi H. <i>et al.</i> , 2024	USA	Cross-sectional survey	Fewer trials available in community and rural sites Limited staffing Physician non-participation Non-relevant trials	Increase early-phase trial availability in rural areas
Farris P. <i>et al.</i> , 2023	USA	Qualitative (protocol implementation)		Community engagement (feasibility forms, stakeholders review and approve potential trials, provide feedback, hiring local research coordinator) Researchers learn about the rural communities Role of multidisciplinary teams
Ferguson L. <i>et al.</i> , 2021	USA	Qualitative (brief report)		
Friedman D. <i>et al.</i> , 2024	USA	Observational	Lack of available CTs in rural areas	
Gordon E. <i>et al.</i> , 2024	USA	Report	Lack of available CTs in rural areas	
Greer M. <i>et al.</i> , 2023	USA	Report		Effective informatics - modify existing local infrastructure, utilise open-source tools
Hu S. <i>et al.</i> , 2022	USA	Quantitative/experimental		Use of technology and social media advertising
Luiten-Apirana P. <i>et al.</i> , 2023	Australia	Mixed methods	Degree of rurality positively correlated with the cost of participation in CTs Long travel time and associated burdens	Financial assistance for travel and accommodation
McPhee N. <i>et al.</i> , 2022	Australia	Scoping review	Structural (travel and distance, cost, workload, protocol unavailable) Physician (attitudes, lack of knowledge, paperwork requirements, do not provide the option) Patient (attitude, knowledge – view trials as last resort, ‘guinea pig’, more worried about placebo)	Structural (multidisciplinary tumour board meetings, larger hospitals, reimbursement) Other patients on trial involved in decision process, sharing preliminary results Utilise CT networks, telemedicine General willingness of rural patients to participate and travel Altruistic intentions, perception of CTs as good care

Contd...

Table 1: Contd...

Study ID	Country	Study type	Key barriers	Key facilitators
McPhee N. <i>et al.</i> , 2024	Australia	Observational (cross-sectional)	Travel burden - 3/4 of rural participants attended the metropolitan site Reduced rural availability of early-phase trials - less access to emerging, beneficial therapies No rural CT availability for certain cancer types	
Mudaranthakam D. <i>et al.</i> , 2022	USA	Observational (comparative survey)	Rural cancer patients less likely to be eligible for CT Physician did not offer CT	Health-mandated quotas for rural participation in CTs
Nelson J. <i>et al.</i> , 2024	USA	Observational (retrospective chart review)	Fewer research centres in rural areas Lower awareness of research	
Ring K. <i>et al.</i> , 2024	USA	Narrative review	Lack of facilities and providers, infrastructure Travel, financial burden Physician did not offer Knowledge barrier Provider knowledge, attitudes, beliefs, awareness Eligibility criteria that are more likely to exclude rural patients CT protocol not conducive to rural participation	Decentralisation of trials - partial or full Addressing provider bias through education Include patients with lived CT experience in protocol development
Sedhai Y. <i>et al.</i> , 2021	USA	Observational	Immature digital infrastructure Limited experience Perception of regulatory barriers	Telemedicine/technology - training, recruitment, enrolment, safety monitoring done remotely
Sedhai Y. <i>et al.</i> , 2022	USA	Observational		Telemedicine Uniform/shared access to electronic health records Remote monitoring
Stout N. <i>et al.</i> , 2024	USA	Observational	Disproportionate burden placed on small sites to incorporate telehealth Lack of resources, staff, knowledge, clinic space/ infrastructure Time and distance, burden on family	Decentralisation Visit requirement adaptations Electronic health record systems Classify rurality of participants Financial support
Sundquist S. <i>et al.</i> , 2021	Canada	Narrative review and workshop	Financial costs associated with establishing trial, training, study drug distribution/handling, oversight and monitoring	Develop criteria to assess site readiness, identify specific training needs Provide templates and tools Decentralisation Telemedicine Engage rural patients and clinicians in trial design

Contd...

Table 1: Contd...

Study ID	Country	Study type	Key barriers	Key facilitators
Wercholak A. <i>et al.</i> , 2022	USA	Narrative review	Travel distance, geographic isolation Financial burden on patients	Help with transportation (e.g. public transport, rideshare partnerships) Use lay navigators Decentralisation Improve infrastructure Utilise professional networks Promote collaboration, leadership and culture
Woollett A. <i>et al.</i> , 2023	Australia	Report		Personal contact between staff members and participants (e.g. cookouts, community events) Peer referral Local advertising
Young A. <i>et al.</i> , 2020	USA	Qualitative/ RECRUITMENT strategies		

CT: Clinical trial

Table 2: Summary of identified barriers to rural clinical trial delivery

Barriers	Number of studies mentioning, <i>n</i>
Geographic factors	
Isolation and associated burdens (time, cost and fatigue)	9
Fewer research centres in rural areas	3
Infrastructure/resource-related factors	
Lack of facilities, resources and infrastructure	5
Disproportionate burden on small sites to incorporate telehealth	1
Costs associated with running a clinical trial	1
Provider factors	
Rural providers unaware of potential clinical trials	6
Limited experience and/or knowledge with clinical research	3
Perception of regulatory barriers	1
Personnel turnover	1
Patient factors	
Rural patients less likely to meet eligibility criteria	3
Lack of awareness of clinical trials	2
Burden of participation on family members	1
Language and cultural barriers	1
Trial/protocol factors	
Fewer options available in rural regions	5
Heterogeneity/uniqueness of rural sites poorly addressed by trial protocols	2
Reduced availability of early-phase rural clinical trials	2
Trial design not conducive to rural participation (e.g. frequent visits required)	1

about and build trust with the local community [Table 4].^{9,22,23,25} The use of technology was described as a facilitator on 9 occasions in the literature, particularly to facilitate decentralisation and aid in advertising and recruitment.^{9,10,14,15,17,26-29}

Another common recommendation was to provide multidisciplinary training for potential rural research sites.^{4,5,9} Two studies explored the utility of professional networks in the sharing of resources and expertise, while others recommended providing education to rural providers on available trials.^{4,14,26} Providing financial incentives was also mentioned as an effective measure in 2 studies.^{15,18} Multiple studies demonstrated a strong interest in CT participation among rural populations.^{13,14,20,23}

Rural definitions

Across included studies, at least 6 distinct definitions of rurality were identified. These ranged from simple intuitive criteria, such as population size or physical distance to a trial site, to government-defined classifications. The latter included Australia's Remoteness Index and Modified Monash Model and the United States Rural–Urban Commuting Area codes and Rural–Urban Continuum Codes. In a study on CT enrolment in cancer studies, Ring and Duska suggested that there are at least 8 methods of establishing rurality in the USA alone.⁵

DISCUSSION

The most frequently documented barrier to rural CT delivery in the examined studies was

Table 3: Summary of identified facilitators to rural clinical trial delivery

Facilitators	Number of studies mentioning, <i>n</i>
Community engagement	
Involve/employ community members, follow shared decision-making principles	4
Elicit community feedback	2
Include experienced patients in protocol development	2
Researchers learn about community characteristics, values	2
Customise recruitment materials for the community	2
Utilise local spaces and events	1
Build trust with the community (e.g. cookouts and information sessions)	1
Use exemplars in recruitment materials	1
Technology	
Utilise telemedicine	6
Social media advertising	1
Ensure access to shared electronic health records	1
Leverage pre-existing resources	1
Training	
Educate rural providers on available clinical trials	2
Identify training needs/perform site assessments	2
Utilise professional networks	2
Address provider bias	1
Provide templates and tools	1
Outreach/inclusivity	
Encourage decentralisation (including satellite sites and outreach clinics)	4
Facilitate transportation (public, hospital-based, rideshare agreements)	2
Provide financial assistance	2
Use multidisciplinary teams	1
Adapt requirements for rural participants	1
Use lay navigators to address non-clinical sources of patient distress (e.g. financial and travel concerns)	1

geographic isolation, which poses many logistical challenges to potential participants. Patients are required to travel further, which demands greater investments of time and money. There is also an emotional cost, as patients worry about disruptions to their everyday life and leaving behind family and friends.¹⁵ Limited access to reliable public transportation further compounds these challenges. Depending on trial type and the frequency of visits required, this can significantly deter participation. While several

Table 4: A synthesis of key recommendations from the literature for improving clinical trial capacity in rural areas

Key recommendations
Establish trial sites within or near rural communities to reduce geographic disparities and travel burdens
Prioritise community engagement and adapt trial design to the unique needs and values of rural communities
Utilise technology to facilitate accessibility and decentralisation of trials
Assess potential trial sites for research capability and provide training to address areas of need
Expand trial eligibility criteria to improve rural inclusion
Participate in clinical trial networks to facilitate mentorship and the sharing of resources and expertise

potential solutions are suggested in the literature and outlined in this review, the underlying issue remains the scarcity of CTs delivered in rural areas. The most effective solution, then, may be to build CT capacity within, or closer to, these geographically isolated communities.

Technology plays an increasingly important role in access to both clinical research and medical care. Advancements such as wearable devices, mobile applications and electronic health records can significantly enhance access to and efficiency of CTs.⁵⁰ Utilisation of technology can also facilitate the decentralisation of trials, allowing rural communities to participate locally while remaining connected to larger, more established trial sites. Key activities such as enrolment, training, safety monitoring and certain follow-up visits can be conducted remotely. This lowers the operational burden and reduces the need for large on-site teams.¹⁰ It has also been suggested that this decentralisation promotes leadership and engagement, thereby increasing the quality of CTs.⁵¹ Technological integration is not without its challenges, however. Stout *et al.* found that smaller sites, which are often less technologically experienced, frequently bore a disproportionate and sometimes unrealistic burden to incorporate telehealth.¹⁵ As such, proper resource assessments, infrastructure investment and targeted training may be critical in easing this burden and supporting the push for decentralisation.⁹

CT networks were mentioned specifically as a facilitator. The rationale behind their use shares many key elements with decentralisation, leaning on those with key expertise or resources to overcome barriers related to staffing, experience and resources.^{14,32} While some networks described

in the literature were established on a national scale, others consisted of a collection of rural sites sharing resources to create a single-affiliate trial site.³³ Alston *et al.* found that establishing research units at rural hospitals not only increased research capacity but also fostered a culture of research.³⁴ Staff perceived these units as beneficial, providing valuable career development opportunities. While these networks have the potential to facilitate rural research, it is important to note that they require significant financial investment to establish. A more complete understanding of their benefit would be a wise direction for future studies.

Community engagement can be an effective approach to improving access to CTs and addressing the heterogeneity and diverse needs of rural communities. Studies have consistently found that the unique circumstances of rural trial participants are often overlooked by CT protocols and that, at times, non-relevant trials are offered.^{14,23,21} However, engagement strategies such as customising recruitment materials, hosting community events, gathering feedback and sharing preliminary results can help to build trust, strengthen relationships and discover community values. Several studies also recommend directly involving community members by offering employment opportunities, engaging participants and local clinicians in trial design and applying shared decision-making principles.^{20,22,25,35,36} Wercholak *et al.* further highlighted this by suggesting the value of using community navigators to address non-clinical concerns, such as financial and travel constraints, that might impede participation.¹⁶

Interestingly, several studies found that rural residents are less likely to meet eligibility criteria for CTs compared to their urban counterparts.^{4,5} This can be attributed to the fact that rural populations generally have higher rates of chronic conditions such as hypertension, obesity and heart disease, which are often exclusion criteria for CTs. Paradoxically, it can be argued that these individuals stand to benefit the most from access to emerging therapies, highlighting a need to improve rural inclusion.³⁷ Mudaranthakam *et al.* proposed that one solution could be government- or institution-mandated quotas for rural representation in trials.^{4,17}

While lower participation rates in CTs among rural populations may be assumed to reflect a

lack of interest, this was not supported in the literature. Multiple studies demonstrated that there was no difference in interest levels between rural and urban residents.^{14,20,23,13} This suggests that given equal opportunity and education, rural populations would be equally willing to participate. Physicians play a pivotal role in facilitating access to CTs, and unfortunately, rural patients are less likely than those in urban areas to be given this option.^{4,5,13,23} Contributing factors may include provider attitudes, limited experience with trials and patient misconceptions. Concerns such as trials being a 'last resort', fears of being a 'guinea pig' or greater worry about a placebo tend to be more common in rural populations and can further deter enrolment.^{13,14} Despite these established challenges, a systematic review and meta-analysis of cancer trials by Unger *et al.* found no difference in treatment outcomes between rural and urban groups.³⁸ Together, these findings propose that rural research participation is limited by supply rather than demand and suggest that by addressing the numerous barriers described here and in the literature, rural health disparities can be reduced.

A limitation of this review lies in the wide range of definitions of rurality used in the included studies. There is a well-documented lack of consensus around a standardised definition of rurality, and this makes it difficult to draw conclusions about the experiences, attitudes and preferences of rural communities. Data were also only included from three high-income countries, and in the English language, limiting its applicability to other regions. Cancer trials are also heavily represented in the data, and this has the potential to influence the results and conclusions drawn. Finally, the use of the rapid review methodology sacrifices some comprehensiveness and rigour for speed.

CONCLUSION

Rural health disparities continue to be a significant concern and are exacerbated by the limited accessibility of CTs in rural regions. Evidence indicates that rural populations are both interested in and willing to participate in research, despite established barriers. Our review highlights that expanding rural CT programmes, through strategies such as decentralisation, professional networks, community engagement and technology

integration, can help overcome these challenges and lessen existing health inequities.

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Lepidopterism misdiagnosed as herpes zoster

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INTRODUCTION

Lepidopterism refers to the spectrum of human adverse reactions resulting from contact with *Lepidoptera* species (moths, butterflies, cocoons and larvae) or their derivatives, such as urticating hairs (known as setae) or scales [Figure 1]. Although they are widespread across Canadian forests and wilderness regions, lepidopterism remains sparsely reported in the medical literature.¹ This likely reflects underreporting, diagnostic oversight or the generally mild and self-limiting nature of most cases. However, in sensitised individuals or following exposure to specific species, reactions may be severe or even life-threatening.

We report the case of a rural Canadian patient who developed an acute pruritic eruption following accidental contact with a cocoon, which was initially misdiagnosed as herpes zoster. This case highlights the diagnostic challenge posed by lepidopterism in rural clinical settings and emphasises the importance of environmental exposure history in the assessment of vesicular eruptions.

CASE REPORT

A 65-year-old previously healthy Caucasian male residing in a rural community in Central

Ontario, Canada, presented in mid-October with a unilateral, linear vesiculopapular eruption distributed along the anterior aspect of the right upper arm extending into the axilla [Figure 2]. The lesions were intensely pruritic and mildly painful. The patient reported no fever, malaise or other systemic symptoms. His medical history was unremarkable. At a community walk-in clinic, an initial diagnosis of cutaneous herpes zoster was made, and oral antiviral therapy was prescribed. Several hours later, upon removing his shirt at home, the patient noted an adherent cocoon affixed to the inner surface of his right sleeve. As pruritus and localised swelling progressed, he sought further medical evaluation at the local rural emergency department.

On examination, there was a linear array of erythematous vesiculopapular lesions with surrounding oedema corresponding to the area of contact with the cocoon. No mucosal involvement or regional lymphadenopathy was noted. The clinical picture was inconsistent with herpes zoster and was more characteristic of lepidopterism. Antiviral therapy was promptly discontinued. The patient was treated with topical corticosteroid, oral

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Figure 1: The left panel shows the larval stage of the hickory tussock moth (*Lophocampa caryae* Harris), characterised by white dense urticating hairs. The right panel displays its cocoon stage adjacent to a Canadian one-cent coin for scale, exhibiting fine urticating scales. Source: Author's personal collection.



Figure 2: Clinical presentation of lepidopterism. The left panel shows a linear, vesiculopapular eruption on the anterior aspect of the patient's right upper arm. The right panel demonstrates a similar but grouped eruption extending into the right axillary region.

antihistamine and local cold compresses. Pruritus subsided within 48 h, and complete resolution of the eruption occurred within seven days without residual scarring or pigmentary change.

DISCUSSION

Lepidopterism

Direct contact with caterpillar hairs or cocoons is typically required for symptom onset of lepidopterism. In many instances, the hairs rest superficially on the skin and can be brushed away without consequence. However, handling or pressing against the caterpillar may drive the barbed hairs deeper into the epidermis, explaining the variability in symptom severity among exposed individuals.

Lepidopterism encompasses a wide clinical spectrum, from mild dermatitis and urticaria to

more severe manifestations such as angioedema, ocular involvement, oropharyngeal mucosal irritation, arthralgia, angioedema and, rarely, anaphylaxis.² The pathogenic mechanisms involve both direct mast cell irritation and, in certain individuals, immunoglobulin E-mediated hypersensitivity responses.²

Histopathological examination is generally unnecessary, as findings are non-specific—commonly demonstrating epidermal oedema, superficial perivascular lymphocytic infiltrates with eosinophils and occasionally epidermal necrosis or vasculitis when spines are embedded.²

Ocular exposure to urticating hairs causes ophthalmia nodosa. Such diagnosis requires a high index of suspicion with acute onset of conjunctival injection, ophthalmoplegia and pruritus in cases of potential *Lepidoptera* exposure.³ Because these hairs are resistant to dissolution, they may persist in tissues; rare cases have documented ocular spines remaining visible for up to a year after exposure.³

Ingestion of caterpillars or their cocoons is relatively uncommon and occurs predominantly in paediatric populations. Such exposures are often clinically significant, as urticating hairs may become embedded in the oral cavity, pharynx or oesophagus, resulting in dysphagia, drooling, oedema and, in severe cases, airway obstruction.⁴

Management of lepidopterism

The cornerstone of management is the prompt mechanical removal of spines and hairs to prevent further symptom progression. This can be accomplished by gently wiping the affected area, applying adhesive tape to extract residual spicules, and, when necessary, using fine forceps for more precise removal. Supportive therapy with oral non-sedating antihistamines and topical corticosteroids is effective in reducing pruritus and inflammation. In cases of ocular exposure, copious irrigation should be followed by ophthalmologic evaluation for the removal of retained setae. When ingestion occurs, early airway protection and endoscopic removal of embedded setae from the upper gastrointestinal tract may be indicated; however, some cases have been successfully managed with systemic corticosteroids alone, resulting in complete recovery.²

CONCLUSION

This case highlights the need to consider lepidopterism in the differential diagnosis of acute vesicular or papular eruptions following outdoor exposure – particularly in rural or remote settings where environmental contact is frequent. Because it can clinically mimic herpes zoster, attention to distinguishing features such as intense pruritus rather than pain, a non-dermatomal distribution, and a clear exposure history is critical for diagnostic accuracy. Enhanced clinician awareness, detailed environmental history-taking and public education on avoiding caterpillar contact during late summer and autumn can help prevent misdiagnosis, reduce unnecessary antiviral use and promote appropriate symptomatic management for improved patient outcomes.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form,

the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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A doctor's last call: Reflections on primary care, failures, hopes and what must change in Nova Scotia

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As I prepare to retire after 44 years in medicine, countless shifts in emergency departments, years of on-the-ground practice in rural communities, consultations with governments and a lifetime witnessing the systemic inequities in health care, I find myself compelled to reflect on what I have seen, what I have said in those years and what this province still urgently needs.

From my earliest days practising in Arichat in the 1980s to the last decade of teaching, advising, providing palliative care and writing, I have been struck by one persistent truth: if primary health care falters, the entire health system collapses under its strain. That is not rhetoric; it is the lived reality for patients, for clinicians and for communities in every corner of Nova Scotia, indeed in all of Canada.

LOOKING BACK: CONSISTENT THEMES

Over the last 20 years, national and regional media have documented the same painful trends that informed my own writing and advocacy:

Growing primary care shortages

Nova Scotia's *Need a Family Practice Registry* ballooned to record levels in recent years, giving rise to thousands of people without consistent care, a problem widely reported across the media.

Emergency departments carrying the load

When primary care access is lacking, patients with chronic or preventable conditions show up in emergency rooms. Providers and media alike highlighted the resulting overcrowding and "bed-blocking," where patients stay in acute care settings simply because there are no community resources or long-term beds available.

Workforce challenges

Retirement of seasoned physicians, difficulty in recruiting new ones to rural areas and rigid regulatory barriers for international graduates have been recurring themes in discussions of healthcare reform.

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These themes echo the concerns I have voiced in columns, consultations and interviews over decades: health system planning that ignores predictable workforce gaps and rural inequities will only create deeper crises. There is no mystery here; it is simply repeated failure to act on known evidence.

WHAT THE HOUSTON GOVERNMENT HAS PROMOTED

Since 2021, *Tim Houston's government* has framed its health plan around transformation, investment and access. Media reporting and government-issued columns outline this strategy, including:

- Expanding access via virtual care, mobile clinics and pharmacy-based services
- Recruiting more doctors, nurses and other health professionals, including internationally trained providers, via accelerated assessment programs
- Building a new medical school campus in Cape Breton to train locally and encourage rural practice
- Investing in digital infrastructure like One Person One Record to improve clinical efficiency and information sharing
- Reporting recent reductions in the doctor waitlist and increases in appointments available through innovative service models.

These are sincere efforts toward solutions, but intent and investment do not always translate into the deep, structural change the primary care system requires.

WHERE THE PLAN ALIGNS WITH MY LONG-STANDING VIEWS

There are aspects of the province's strategy that resonate with what I have long advocated:

Multidisciplinary, team-based models

Centralising care in teams that include nurse practitioners, pharmacists, social workers and physicians aligns with evidence on improved access and continuity of care.

Removing barriers for internationally trained clinicians

Shorter pathways to practice will help increase the workforce, provided quality and integration into community practice are safeguarded.

Training physicians locally with rural focus

The new Cape Breton medical school campus is a promising step toward producing physicians who understand the distinct challenges of rural Nova Scotia.

These initiatives reflect components of the solution, but isolated improvements cannot substitute for a coherent, system-wide reform that puts primary care at the centre of health policy, resource allocation and accountability.

WHERE THE PLAN FALLS SHORT

Despite these positive directions, media and independent reporting have shown that fundamental issues persist:

- Waitlists remain historically high, and progress has been uneven
- The Collaborative Care Model of care remains an elusive goal
- Virtual care is helpful but not sufficient, often serving as a band-aid rather than a long-term attachment to a care team
- Emergency departments continue to struggle with patients who should have been managed in primary care settings
- Workforce recruitment gains are real, but *retention* and equitable distribution, especially in rural regions, are not fully resolved.

These issues are no surprise; they are exactly what I and many of my colleagues have pointed out for years. What has been missing is a true reorientation of public policy that recognises primary care as the organising core of the health system. There is no need to reinvent any wheels; other jurisdictions have solved this problem.

A FINAL PRESCRIPTION: WHAT MUST CHANGE NOW

As I step away from practice, I offer this

prescription to the leaders who will carry this work forward:

Guarantee continuity of care through team-based longitudinal practice

More than walk-in or episodic services, Nova Scotians need a *medical home*; a team that knows their history, integrates care and follows their journey over time.

Align compensation with outcomes and continuity

Fee-for-service models often incentivise volume over quality. Shift to blended capitation with quality bonuses that reward continuity.

Invest in rural pathways

Rural practice cannot be an afterthought. Education, incentives, housing, schooling and infrastructure must be designed to attract and retain clinicians in smaller communities.

Measure what matters and be transparent

Report on actual patient outcomes, attachment rates and equity indicators, not just appointment counts.

Build capacity in community and home care

To reduce pressure on hospitals and emergency departments, robust community services must be fully resourced.

The stories reported in our newspapers, the persistent waitlists and ED pressures and the lived experiences of patients and clinicians all confirm what we already know: mere spending increases are not enough without structural transformation that places primary care at the centre of policy, planning and the hearts of informed governance.

My hope for Nova Scotia is that future leaders will not simply react to crisis but build a system that anticipates needs, listens deeply to front-line expertise and secures equitable access for every community from Halifax to Cape Breton, from the Valley to rural shores.

This is not rhetoric. It is the lesson I have learned in 44 years at the bedside.

Dr. Robert Martel practised as a rural family physician in his home village of Arichat, Nova Scotia, for 15 years, then as an emergency room physician in the Annapolis Valley and Halifax before returning to Arichat as a palliative care physician in 2017.

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Rural EM Journal Club



Wed. Oct 14, 2026



2PM ET 11AM PT



Michael Howlett,
Suneel Upadhye, Rahim Valani



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