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VOLUME 26, NO. 4, FALL 2021

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Under the Hood

Peter Hutten-Czapski, MD[1]

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The medical publishing field can be opaque. For many readers, that is of little concern; they just need to trust in the process that provides the article that they are reading. But should you?

It is instructive to follow the money. There are journals out there that will publish anything if the author gives them enough money. As a direct result, these predatory journals prove thin in quality. Others are big enough names to draw advertising and institutional subscriptions and hide "intellectual property" from readers with paywalls. Their quality may be high, but they are unlikely to print many rurally relevant articles. We at the CJRM depend on volunteers, and intentionally do not charge authors, or readers (we are freely licensed under creative commons) but are supported by funding from Society of Rural Physicians of Canada membership fees.

Authors upload their work to our manuscript management system at cjrm.ca. Some of the articles are screened out initially due to being out of scope, that is being not relevant to our core readership of Canadian rural generalist physicians.

Suzanne Kingsmill (our managing editor) takes the articles and assigns them to our assistant editors and other reviewers for analysis. Care is taken to ensure that the authors are anonymous and that the editorial process is unbiased. Our reviewers examine each article, determine its strengths and faults and pass on their recommendations to either me as scientific editor or the associate scientific editor (Gordon Brock) for a decision.

Much of the time the reviewers and scientific editor find issues with the work. Often, the rural locale has to be better identified (with rural context being everything) and often, it is best to identify the community (or communities). Other common faults include lack of rural insight. After all, the mere fact that the case occurred in a rural setting does not make the case rural unless there is a description on how rural circumstances altered management.

After scientific review (and successful revision), our managing editor does an English review ensuring that the intent of the writing is clear and follows the proper scientific presentation for a research paper.

After translation (if applicable), the article gets copyedited and sent to be typeset by our printers. A PDF mock-up of the article (lacking only the DOI and page numbers) is sent to the author for final review. Once all questions are answered and the proof is approved, it moves to publication. In the case of the CJRM, this involves both web copies and hard copies that are mailed to subscribers who pay extra.

If you have read this far and you want to contribute articles, or want to apply to become an assistant editor, please contact me.

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Sous le capot

Peter Hutten-Czapski, MD[1]

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Le domaine de la publication médicale est parfois bien opaque. Pour de nombreux lecteurs, ce n'est pas un problème; il suffit de faire confiance au processus qui produit l'article qu'ils lisent. Mais est-ce sage?

Suivre l'argent est très instructif. Il existe des revues scientifiques qui publient tout ce qui leur tombe sous la main si l'auteur les paie suffisamment. En conséquence directe, ces revues scientifiques prédateurs sont de très faible qualité. Le nom d'autres est assez connu pour attirer publicité et abonnements institutionnels et cacher la " propriété intellectuelle " de la vue des lecteurs à l'aide de verrous d'accès payants. Leur qualité est peut-être grande, mais il est improbable qu'elles publient beaucoup d'articles pertinents aux régions rurales. Le CJRM dépend de bénévoles et a pris la décision de ne pas faire payer les auteurs ni les lecteurs (nous sommes titulaires d'une licence libre de creative commons), mais nous sommes financés par les cotisations des membres de la SMRC.

Les auteurs téléversent leur travail dans notre système de gestion des manuscrits dont le lien apparaît sur cjrm.ca. Certains articles sont éliminés dès le départ, car le sujet n'est pas pertinent à notre lectorat composé de généralistes canadiens des régions rurales.

Suzanne Kingsmill (notre rédactrice en chef) répartit les articles à nos rédacteurs adjoints et autres réviseurs aux fins d'analyse. Ils prennent le soin d'assurer l'anonymat des auteurs et l'impartialité du processus éditorial. Nos réviseurs examinent chaque article, en déterminent les points forts et les points faibles, et envoient leurs recommandations à moi, l'éditeur scientifique, ou à l'éditeur scientifique adjoint (Gordon Brock) pour prendre une décision.

La plupart du temps, les réviseurs et l'éditeur scientifique découvrent des problèmes dans l'article. Souvent l'emplacement rural doit être mieux identifié (le contexte rural étant primordial) et souvent, il vaut mieux nommer la communauté (ou les communautés). Une autre faute courante est l'absence de perspective rurale. Après tout, le seul fait qu'un cas SE soit produit dans un contexte rural ne signifie pas que le cas soit rural à moins qu'il y ait une description de la façon dont les circonstances rurales ont altéré la prise en charge.

Après une revue scientifique (et révision), notre rédactrice en chef révise la version anglaise pour s'assurer que le message écrit soit clair et respecte la présentation scientifique d'un rapport de recherche en bonne et due forme.

Après traduction en français (le cas échéant), l'article est copié-collé et mis en page et notre imprimeur relit l'épreuve. Une maquette pdf de l'article (qui ne manque que le DOI et la pagination) est envoyée à l'auteur pour un dernier coup d'œil. Après avoir répondu à toutes les questions et avoir approuvé l'épreuve, l'article est publié. Dans le cas du CJRM, cela inclut une version en ligne et des versions papier qui sont postées aux abonnés qui paient un supplément.

Si vous avez lu jusqu'ici et souhaitez soumettre des articles, ou poser votre candidature pour être rédacteur adjoint, veuillez communiquer avec moi.

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President's Message. Rural Advocacy

The theme of the cancelled 2020 R and R conference was 'Rural Physician Advocacy'. Our organisation exists because of the powerful advocacy of rural physicians. Over the years, the SRPC and its members have punched above their weight to improve health care for rural Canadians. Through the difficulties of the pandemic, we have continued to make advancements in some important areas of rural health care. These include national physician licensure, virtual care and rural patient transfer.

For several years, the SRPC and our allies have advocated for national physician licensure. Many rural and remote communities depend on physicians from other jurisdictions to provide virtual care and locum relief. This advocacy has continued through the pandemic. In May 2021, the SRPC and other physician groups circulated a letter to all ministers of health calling for action on a national approach to licensure. We also submitted a brief to the House of Commons Standing Committee on Health. This work appears to be garnering attention from decision-makers. The pandemic may prove to be a tipping point in the ongoing work for a system of national licensure.

Virtual care changed our practises significantly over the past year and a half. Many of the improvements are likely to become permanent parts of how we work. While virtual care has improved access for many patients, the rapid uptake has raised important questions. What conditions are most appropriate for virtual care? What platforms work best? How can virtual care support continuity of care for rural patients? These need to be answered with a rural lens and in the context of infrastructure and bandwidth deserts that remain widespread across rural Canada. SRPC has been represented on a national Virtual Care Taskforce and at a recent virtual care stakeholder summit.

The need for patient access to COVID-related critical care has highlighted the reliance on and gaps within the transfer systems for many rural and remote communities. The inadequacies of existing medical transportation infrastructure often leave patients waiting in underserved areas for too long and cause stress for patients, families and transferring physicians. [1] Following the release of our joint *recommendations for improving patient transfer,* [2] the SRPC is planning the next steps in advancing this issue through research and advocacy.

I hope that we can capitalise on the opportunities for change that the pandemic has given us. Canada's post-pandemic rural health care will be better as a result.

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Message du président. Promotion Rurale

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Le thème de la mouture 2020 de la conférence de médecine rurale et éloignée qui a été annulée était "Promotion du médecin rural". Notre organisation doit son existence à la puissante promotion et sensibilisation des médecins en région rurale. Au fil des ans, la SMRC et ses membres ont déployé un énorme effort pour améliorer les soins de santé aux Canadiens vivant en régions rurales. Malgré les obstacles de la pandémie, nous avons continué de progresser dans des domaines importants des soins ruraux, notamment le permis national d'exercer, la télémédecine et le transfert des patients ruraux.

Depuis plusieurs années, la SMRC et nos alliés font campagne en faveur du permis national d'exercer. De nombreuses communautés rurales et éloignées dépendent en effet de médecins d'autres provinces pour assurer les soins virtuels et les remplacements. Ce travail de sensibilisation s'est poursuivi durant la pandémie. En mai 2021, la SMRC et d'autres groupes de médecins ont fait circuler une lettre à tous les ministres de la Santé appelant à l'action dans le dossier du permis national d'exercer. Nous avons également soumis un mémoire au Comité permanent de la santé de la Chambre des communes. Ces efforts semblent attirer l'attention des décideurs. La pandémie serait-elle le moment décisif des efforts continus en faveur d'un permis national d'exercer?

Depuis les 18 derniers mois, la télémédecine a significativement changé nos pratiques. Beaucoup de ces améliorations seront dorénavant permanentes dans notre travail. Alors que la télémédecine a amélioré l'accès de beaucoup de patients, son adoption rapide a soulevé d'importantes questions. Quelles affections sont le plus appropriées à la télémédecine? Quelles plateformes fonctionnent le mieux? De quelle façon la télémédecine peut-elle favoriser la continuité des soins des patients en milieu rural? Il faut répondre à ces questions à travers un filtre rural et dans le contexte du désert d'infrastructure et de largeur de bande toujours répandu dans les régions rurales du Canada. La SMRC a siégé à un groupe de travail national sur les soins virtuels et à un récent sommet des intervenants en télémédecine.

Le besoin d'accès des patients à des soins critiques liés à la COVID-19 a mis en lumière notre dépendance aux systèmes de transfert et leurs lacunes dans de nombreuses communautés rurales et éloignées. Les déficiences de l'infrastructure actuelle de transport médical laissent souvent les patients attendre trop longtemps dans les régions mal desservies, ce qui est stressant pour le patient, la famille et le médecin qui demande le transfert[1]. Après la publication conjointe de nos *recommandations pour améliorer le transfert de patients*[2], la SMRC planifie les étapes suivantes pour faire progresser le dossier en recherche et sensibilisation.

J'espère que nous pourrons tirer profit des occasions de changement que la pandémie nous a offertes. Les soins de santé ruraux canadiens après la pandémie n'en seront qu'améliorés.

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Original Article

Patient satisfaction with a pharmacist-led best possible medication discharge plan via tele-robot in a remote and rural community hospital

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This article has been peer reviewed.

Abstract

Introduction: Medication reconciliation (MedRec) reduces the risk of preventable medication-related adverse events (ADEs). A best possible medication discharge plan (BPMDP) is a revised list of medications a patient will take when discharged from hospital; a pharmacist review ensures accuracy. For many hospitals, on-site pharmacists are non-existent. Extension of a visual presence via a mobile robotic platform with real-time audiovisual communication by pharmacists to conduct MedRec remains unstudied. This study explored patient perceptions of a pharmacist-led BPMDP using a telepresence robot. Time requirements, unintentional discharge medication discrepancies (UMD), programme inefficiencies/barriers and facilitators involved in pharmacist review of the discharge medication list and patient interviews were also described.

Methods: This prospective cohort study enrolled adult patients admitted to a 12-bed community hospital at high risk of an ADE. Remote pharmacists reviewed the discharge prescription list, identified/resolved UMDs, and interviewed/counselled patients using a telepresence robot. Thereafter, patients completed an anonymous satisfaction questionnaire. Prescriber discharge UMDs were classified, and barriers/inefficiencies and facilitators were documented.

Results: Nine patients completed an interview, with a 75% interview agreement rate. All patients were comfortable with the robot and 76% felt their care was better. With a median of 11 discharge medications/patient, the UMD rate was 78%; 71% had omitted medications, 43% involved a cardiovascular medication, 88% were due to a hospital system cause, and 43% were specifically due to an inaccurate best possible admission medication history. Median times for interview preparation, interview and UMD/drug therapy problem resolution were 45, 15 and 10 min, respectively.

Conclusion: Using a telepresence robot to provide pharmacist-led BPMDPs is acceptable to patients and an innovative, effective solution to identify/resolve UMDs.

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Keywords: Hospital, medication reconciliation, pharmacist, robot, rural, telemedicine

Résumé

Introduction: Le bilan comparatif des médicaments (BCM) réduit le risque d'événements indésirables liés aux médicaments pouvant être évités. Le meilleur schéma thérapeutique possible (MSTP) désigne une liste révisée de la médication qu'un patient devra prendre au congé de l'hôpital; l'examen du pharmacien en assure l'exactitude. Malheureusement, de nombreux hôpitaux n'ont pas de pharmacien sur place. Aucune étude n'a porté sur l'expansion d'une présence visuelle par plateforme robotique mobile avec communication audiovisuelle en temps réel des pharmaciens pour réaliser le BCM. Cette étude a porté sur la perception des patients à l'égard d'un MSTP dirigé par un pharmacien par l'entremise d'un robot de téléprésence. L'étude s'est aussi penchée sur le temps nécessaire, les erreurs liées aux médicaments, les inefficacités ou obstacles du programme et les modérateurs qui sont intervenus dans le BCM et les entrevues auprès des patients.

Méthodes: Cette étude de cohorte prospective a inscrit des adultes à risque élevé d'événement indésirable lié aux médicaments ayant été admis dans un hôpital communautaire de 12 lits. Des pharmaciens ont révisé à distance la liste des ordonnances au congé, relevé et résolu les erreurs liées aux médicaments et ont interviewé/renseigné les patients à l'aide d'un robot de téléprésence. Les patients ont ensuite répondu anonymement à un questionnaire de satisfaction. Les erreurs liées aux médicaments ont été classifiées, et les obstacles ou inefficacités et les modérateurs ont été identifiés.

Résultats: Neuf patients SE sont soumis à l'entrevue, avec un taux d'acceptation de l'entrevue de 75%. Tous les patients étaient à l'aise avec le robot, et 76% étaient d'avis qu'ils avaient reçu de meilleurs soins. Avec une médiane de 11 médicaments/patient au congé, le taux d'erreurs liées aux médicaments était de 78%; 71% avaient oublié des médicaments, 43% touchaient un médicament cardiovasculaire, 88% étaient causées par le système de l'hôpital et 43% étaient causées précisément par un MSTP inexact. Les délais médians pour la préparation de l'entrevue, l'entrevue, et la résolution des erreurs liées aux médicaments/problèmes de pharmacothérapie étaient respectivement de 45, 15 et 10 min.

Conclusion: Un robot de téléprésence pour réaliser le MSTP dirigé par un pharmacien est acceptable pour les patients et est une solution innovante et efficace pour relever et résoudre les erreurs liées aux médicaments.

Mots-clés: Rural, pharmacien, bilan comparatif des médicaments, télémédecine, hôpital, robot

INTRODUCTION

Up to 67% of patients admitted to a hospital have at least one discrepancy in the hospital documentation of their home medications.[1] Many of these discrepancies remain common at discharge and patients leave the hospital with an inaccurate discharge medication list and an inadequate understanding of their medications.[2-4] Transitional care is a key focus of error reduction[5] as more than 40% of medication errors take place when patients move between different stages and settings of care.[1] For those patients transitioning from hospital to home, medication discrepancies have been linked to increased re-hospitalisation rates.[6]

Medication reconciliation (MedRec) is fundamental to patient safety by supporting safe medication use and reducing the risk of preventable medication-related adverse events (ADEs).[6-9] A formalised process in which health-care providers work together with patients and care providers, MedRec ensures that accurate and comprehensive medication is communicated consistently across all transitions of patient care, at hospital admission, transfer and discharge.[1] The best possible medication history (BPMH) involves a systematic thorough review and documentation of all the medications a patient is currently taking when admitted to a hospital. When the patient is ready for hospital discharge, their BPMH is compared with new

medications initiated, discontinued and/or changed while the patient is in hospital to create a revised and updated medication list – the best possible medication discharge plan (BPMDP). It is critical that the BPMDP is accurate, well understood by the patient, and communicated to all their care providers to optimize medication efficacy, safeguard against preventable medication-related ADEs, decrease re-hospitalisation and promote continuity of care.

Identification of patients who may benefit the most from a BPMDP remains unknown. Canadian data collection has identified several factors that are associated with hospital re-admission, including patient effects, hospital effects and community effects.[10] In the medical population, patients who have been admitted to hospital with a primary diagnosis of heart failure, chronic obstructive pulmonary disease (COPD), digestive system disease, arrhythmias and pneumonia represent the highest rates of readmission, 21%, 18.8%, 15.6%, 12.6% and 12.5%, respectively.[10] In a recent study to determine the impact of pharmacist-provided continuous care on readmissions, patients defined as high-risk were those with an active diagnosis on their electronic health record list for heart failure, acute myocardial infarction, COPD, pneumonia or diabetes.[11] The Institute for Safe Medication Practices developed a list of high-alert medications that have a heightened risk of causing significant patient harm when they are used in error.[12] Polypharmacy, defined according to the World Health Organisation criteria as the, 'routine use of five or more medications'[13] has been shown to be 2.3 times more associated with ADEs in geriatric patients.[14]

Through their unique knowledge, skills, and abilities, pharmacists are well-positioned to lead interdisciplinary efforts and assume key roles in MedRec by designing and supporting MedRec processes, educating health-care providers, and serving as patient advocates through all transitions of care.[5,15] Studies have demonstrated that pharmacists improve MedRec completion rates, accuracy, clinical outcomes and reduce health care utilization.[4,15-18] Pharmacist counselling, which often takes place during communication of the BPMDP with the patient, has been associated with a significantly lower rate of preventable ADEs 30 days after hospitalisation.[19] Moreover, the majority of patients in hospital are satisfied with their interaction with their pharmacist.[20]

While Canada is a developed country with a publicly funded universal healthcare system, not all residents have the same access to care: an on-site pharmacist in many small and rural community hospitals is often non-existent. Although telemedicine applications in the Canadian north were initially conducted with some success, barriers and challenges have impeded the adoption of telemedicine as a strategy for the effective and timely delivery of health care.[21-24] Robotic telepresence takes this a step further; the caregiver's physical presence is virtually extended via a mobile robotic platform with real-time audiovisual communication.[25,26]

Experience in a remote Inuit northern community found deploying a remote-presence robot feasible, cost-effective and highly satisfactory by patients, caregivers, nurses and physicians deeming it as improving patient care, workload, and job satisfaction.[27] Pharmacists have a substantial opportunity to extend their care to patients in underserviced community hospitals by using a mobile robotic platform to care for patients. In addition, due to recent changes in pharmacy practice, because of pandemic-related precautions on distancing and shortage of personal protective equipment, exploring the use of a telepresence robot as an alternative to in-person care may lead to less stress to the system. To our knowledge, evaluating the patient experience with a pharmacist using a telepresence robot to conduct a BPMDP in a remote community hospital setting has not been studied.

Our primary objective was to explore high-risk patients' perceptions of pharmacist-led real-time BPMDP using telepresence robot technology during hospital discharge from a small remote/rural community hospital. Our secondary objectives were to report times required for a pharmacist to complete a BPMDP, address discharge medication discrepancies and patient interviews and to classify unintentional discharge medication discrepancies (UMD). Programme inefficiencies/barriers and facilitators were also described.

METHODS

Study design

This prospective cohort pilot study was conducted in a small 12-bed community hospital in Northern

Ontario, Canada from September 2017 to January 2019. During daily routine assessment of admission orders, pharmacists reviewed all patient hospital admissions for study eligibility. A consecutive patient master file was created to track all eligible patients. A nurse provided eligible patients with a letter of information describing the pharmacist BPMDP interview.

The study site's standard hospital patient discharge process involved the creation of discharge prescriptions using the pharmacy software system (Meditech). The physician would handwrite which medications taken prior to hospitalisation were to continue, stop or change, and any new medications started in hospital that would continue on discharge. The discharge prescriptions were then scanned by nursing into the virtual platform (Docuscripts). The pharmacist reviewed the discharge prescriptions then incorporated the changes into the pharmacy software system. Pharmacist review of discharge prescriptions is not currently mandatory in the hospital discharge process; however, if the pharmacist receives the discharge medication prescriptions prior to the patient leaving hospital, the pharmacist will review the discharge prescriptions and address UMDs with the provider. Usual hospital discharge process involves the nurse providing a verbal review of the discharge medication prescriptions with the patient. The discharge prescriptions are then faxed to the community pharmacy and family physician.

For this study, from Monday to Friday, the pharmacist contacted the charge nurse to identify patients who were scheduled for a discharge. Subsequently, nursing staff, in collaboration with the pharmacist and in agreement with eligible patients and their caregivers, set an appointment for the interview before the discharge.

Preceding the patient discharge interview, pharmacists created a BPMDP using the BPMH, hospital medication administration record, and the physician discharge medication list. The pharmacist addressed UMDs before the patient interview. The pharmacist-patient interview used a mobile robotic platform with real-time audiovisual communication (Double Robotics®) in the patient's hospital room or private room. Hospital nursing staff provided support if required and family members/caregivers were invited to participate in the interview. Pharmacists reviewed the patient's discharge medications, provided patient counselling and a hard copy of the BPMDP to the patient, and encouraged patients and caregivers to ask questions about their medications. Immediately following the interview, patients completed an anonymous 10-question satisfaction survey via kiosk on a computer tablet or paper hard copy. Survey questions were adapted, equally phrased as both positive and negative and scored on a 5-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree). Discharge medication discrepancies were classified using a validated instrument for pharmacists to characterise unintentional medication discrepancies.[28] Throughout the study period, pharmacists documented inefficiencies, barriers and facilitators in patient recruitment, interview processes and discrepancy resolution. Pharmacists recorded time requirements for interview preparation (BPMDP), discrepancy resolution and interview with the patient.

Patients

All adults admitted to hospital with an anticipated length of stay >72 h were assessed for eligibility by the pharmacist. Eligible patients were those with a high risk of ADEs (taking more than 5 medications for chronic conditions, on a high-risk medication), or had a principal diagnosis of cancer, a chronic condition: COPD, stroke, heart failure, diabetes, or had a previous hospital admission within the previous 6 months.

Tele-robot

The Double® (robot) is a mobile, self-driving, self-balancing, two-wheeled base that uses the video and wireless connectivity features of the Apple iPad, housed on a metal motorised height-control stem to create a telepresence robot. The robot can be accessed remotely from anywhere via Google Chrome. The robot uses the iPad's audio and visual functions to create a real-time virtual telecommunication experience for the users by wirelessly connecting to the Robot via Bluetooth. Video protocol was standards-based WebRTC (video component in HTML5), video encryption with 123-bit AES end-to-end, not stored or recorded. Network requirements were Wi-Fi or 4G/LTE (cellular

network). Internet connectivity was obtained directly from the Wi-Fi router/access point/repeater directly to the iPad used as the robot's 'head'. The robot was powered by a lithium-ion battery with a charge time of 3–4 h providing 8–10 h of usage.

Data collected

Data collected included patient age, gender, primary reason for hospitalisation, number of medications, and UMDs. BPMDP discrepancies were classified as: medication anatomical main group, type (omission, addition, other) and cause (patient level or medication system level).[28] Pharmacist intervention rate, level of intervention (health-care provider, patient, medication or other) and type (medication started, stopped, dose changed, other) were documented. Time for interview preparation (including the BPMDP interview) and discrepancy resolution time requirements were recorded. Pharmacists documented BPMDP process barriers, inefficiencies and facilitators. Survey responses were collected and collated using Survey Monkey®.

Descriptive statistics were used for data analyses. The collected data were described using relative frequencies (percentage) for categorical variables and medians with interquartile range (IQR) for numerical variables. All completed surveys were included in the analysis. The data were presented as the percentage for each response option. In addition, percentages of all responses that were positive ('Agree' and 'Strongly Agree') were presented along with negative ones ('Disagree' and 'Strongly Disagree'). Computations were performed using MS Excel 2016 (Microsoft Corp. Redmond, Washington).

This study was approved by Research Review Board Inc. December 16, 2016.

RESULTS

Forty-seven of the 368 patients assessed for eligibility were included in the study. Of those, 23 patients were offered a discharge interview, 9 patients were no longer eligible on discharge, 5 presented a language barrier, and an additional 5 who were eligible were not made aware of the opportunity to partake in a pharmacist interview. Of the remaining 24 patients, 15 were excluded: 6 due to technical problems (internet connectivity, robot connectivity), 6 patients declined participation, 2 patients had a language barrier and 1 patient could not be contacted to arrange the interview [Figure 1]. Demographic characteristics of participants are presented in Table 1. The results of the 9 pharmacist BPMDP interviews that were conducted are shown in Table 2. There was an 89% (8 of 9) survey completion rate. Overall, 80% of patient survey results were positive, 13% undecided and 7% negative [Table 2]. The pharmacists found 78% (7 of 9 patients) had at least 1 UMD discrepancy in their BPMDPs. Medication from the cardiovascular system class represented 43% (3/7) of discrepancies [Figure 2a], and most frequently (71% or 5/7) the UMD was due to omission from the BPMDP [Figure 2b]. The medication system level was the attributed cause for most discrepancies (86% or 6/7) compared to at the patient level (14% or 1/7). When the discrepancies due to medication system level causes were characterised, the most frequent cause was incomplete or inaccurate BPMH (43% or 3/7) [Figure 2c]. The discharge medication list required pharmacist intervention in 67% (2/3) of patients, at the healthcare professional level that represents 15% (3/20) of all observed required interventions to solve the UMD [Figure 3]. On a medication level (n = 6), interventions included drug started/stopped (50% or 3/6), dose changed (17% or 1/6) or other (33% or

Table 1: Demographic characteristics of participants (n=9)

Characteristics	Value
Gender, *n* (%)	
Males	55
Females	45
Age	
Median (IQR)*, years	76 (73-80)
Primary reason for hospitalisation, *n* (%)	
Cardiovascular	44
Respiratory	22
Musculoskeletal	11
Gastrointestinal	11
Other	11
Number of medications	
Median (IQR)*	11 (9-13)
Rate of eligible patient participation, *n* (%)	37.5

IQR: Interquartile range

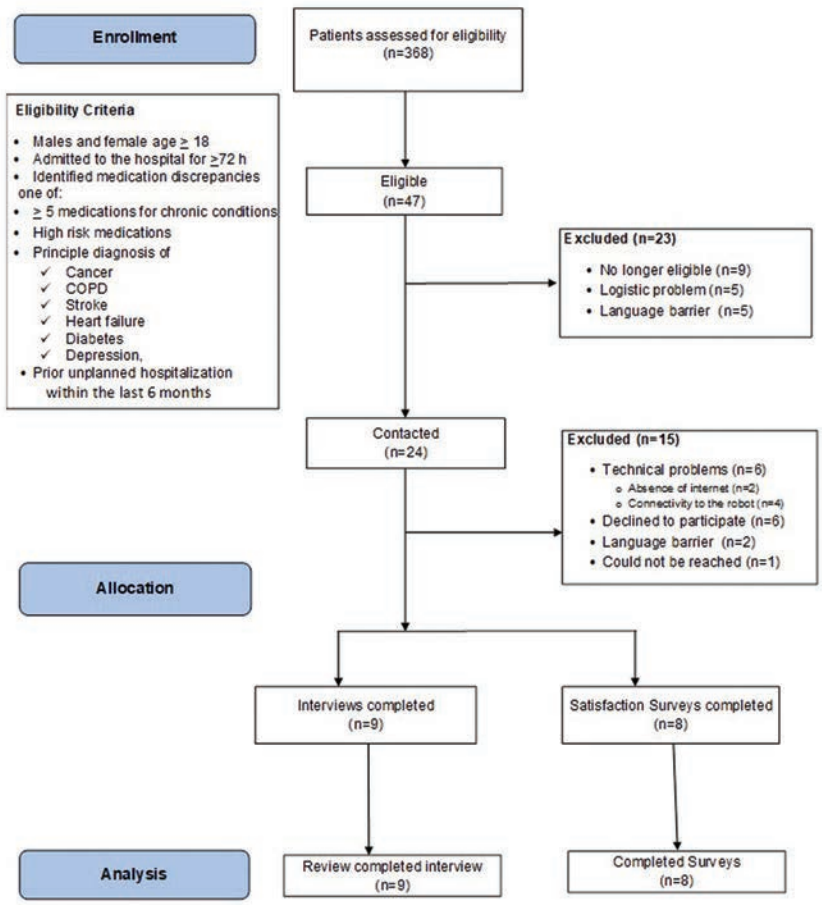

Figure 1: Study flow chart.

2/6). In resolving the BPMDP discrepancies, pharmacists most commonly provided suggestions to, or requested information from, the provider 33% (1/3) and 67% (2/3) of the time, respectively.

The median total time to complete a BPMDP interview was 60 min (IQR 50–80) with preparation, interview delivery, resolution times 45 (IQR 40–45), 15(IQR 10–20) and 10 (IQR 0–13) minutes, respectively. From a pharmacist's perspective, technical issues with robot connectivity (Wi-Fi) and operation, last minute notification of patient discharge and unavailable discharge prescriptions to create a BPMDP were identified as inefficiencies in BPMDP interview completion. Nursing discretion in patient selection (not a mandatory process), inconsistent pharmacy software system's ability to generate discharge prescription lists and lack of on-site support for robot maintenance were described as barriers. Positive nursing/staff support during patient interviews, once the interview time was established, facilitated a successful interview.

DISCUSSION

During their hospital discharge from a small rural community hospital, patients at high risk for preventable ADEs perceived their experience as positive and felt their care was better with a pharmacist-led real-time BPMDP using telepresence robot technology. Our study ascertained most patient discharge medication lists had unintentional discrepancies requiring a pharmacist to intervene to address incorrect discharge medication prescription lists. Pharmacists described conducting interviews as feasible, however, they faced challenges with available technology, bandwidth and lack of on-site support for the robot which often hindered interview success. Although exclusion criteria did not include language barriers, 7 patients were either not offered, or were not scheduled for a pharmacist BPMDP interview determined to be due to a language barrier. Given the pharmacist BPMDP was not mandatory, eligible patient selection for the interview

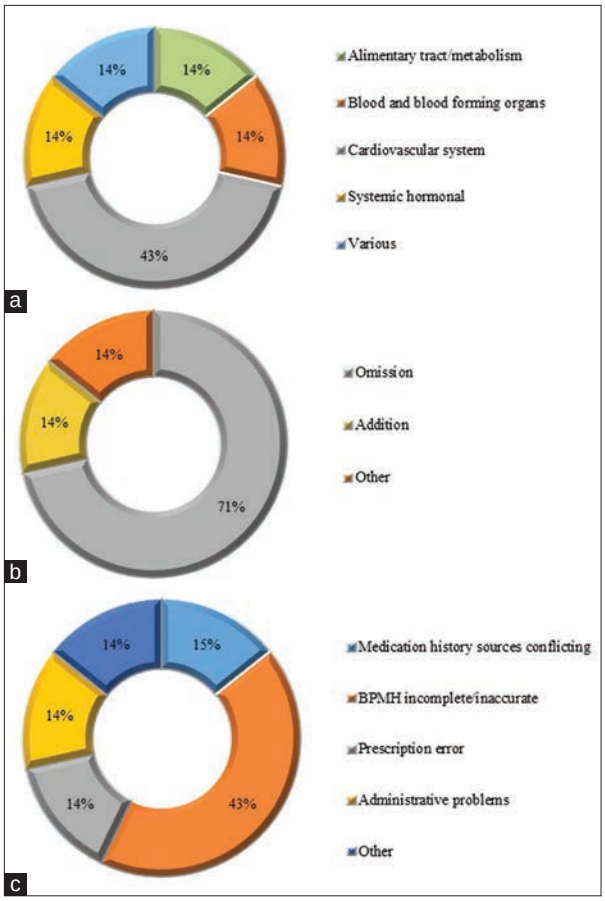

Figure 2: Unintentional discharge medication list discrepancies (*n* = 7, rate = 0.78). (a) Anatomical main group. (b) Type of medication discrepancy. (c) Discrepancy causes medication system level.

was based on nursing discretion. Mitigation strategies to ensure all eligible patients have the opportunity for a pharmacist BPMDP could be inclusion of the interview as part of the mandatory processes required upon discharge, and identification of patients who may require interpreter assistance (non-English speaking, hard of hearing) on admission, allowing time to ensure interpreter support. Interpreter support could be a pre-identified hospital staff member and/or family members.

Our exploration of patient satisfaction with patient/pharmacist interaction with the telepresence robot discovered an experience similar to reported results of physicians providing health care via telepresence robot in a northern rural community hospital study.[27] As well, the high rate of unintentional admission and hospital discharge medication list discrepancies found in the literature[1-3] resembled our results.

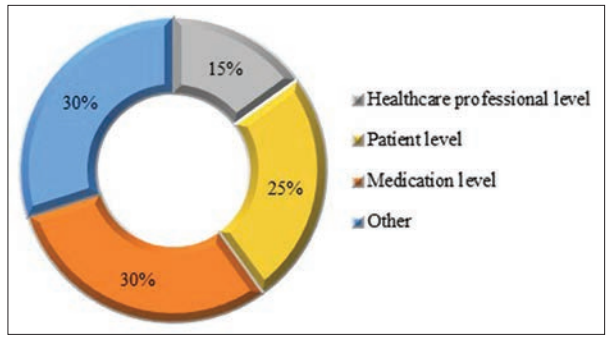

Figure 3: Pharmacist interventions to solve medication list discrepancies (*n* = 20, rate = 0.67).

Limitations

This study represented a small cohort of patients, and pharmacist BPMDP interviews were not a mandatory part of the patient discharge process. The potential for patient selection bias may have been twofold: patient eligibility was determined by pharmacist risk assessment of potential ADEs and nursing patient selection for interviews grounded on anticipated need or appropriateness. Due to staffing restrictions, patients discharged outside usual workday hours did not have the opportunity to interact with a pharmacist for the discharge medication interview. The study hospital did not have a pharmacist BPMDP interview either in-person or by telephone as part of the routine discharge process. Our study, is based upon a single patient cohort from a single centre. Future studies in a larger patient cohort from multiple centres are needed to validate our observations and conclusions. We are also cognizant that the clinical outcome assessment was not evaluated. The present study was focussed on the patient acceptance of pharmacist-led BPMDP via tele-robot in a remote and rural community hospital along with a description of medical discrepancies found by the pharmacist in a patient's BPMDP.

Assessment of the feasibility and patient satisfaction of pharmacist-enhanced care using a tele-robot, telephone, video or usual nurse medication review may be appropriate for future study.

When compared to interactions via phone, telepresence robot allows sharing of visual stimuli, evaluation of non-verbal responses, encourages recall, thoughts, and improves the collaborative process. Gathering all visual and

Table 2: Survey responses (*n*=8)					
Percentage	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
I feel my care is going to be better because the hospital pharmacist uses robot to see me	13	63	13	13	0
I feel comfortable with the hospital pharmacist visiting me using the robot	13	88	0	0	0
I feel that the hospital pharmacist cared less about me by visiting me with the robot instead of in person	13	0	0	63	25
Communication with the hospital pharmacist using the robot is easy	25	63	0	0	13
I support the hospital's use of 'the robot' for the pharmacist to teach about medications	25	50	25	0	0
The robot makes it more difficult for me to communicate the way I would like to	13	0	0	63	25
When the hospital pharmacist is not in the hospital, I prefer to communicate using the phone instead of the robot	0	13	50	25	13
I feel that the robot is annoying	0	0	13	63	25
The use of the robot for hospital pharmacists to interview patients should be a regular practice	25	25	38	13	0
I am concerned the hospital pharmacist cannot properly discuss my medications using the robot	13	0	13	75	0
Overall evaluation					

Evaluation	Percentage
Negative	7
Not decided	13
Positive	80

verbal information during the interview using telepresence may be more accurate and efficient. However, due to internet connectivity issues with the telepresence robot, and often the need for staff escort to ensure appropriate navigation to the correct patient room, interviews via a tablet/iPad or on a patient room telephone may be more reliable and efficient. Addressing technological deficiencies such as increasing hospital Wi-Fi bandwidth may increase the likelihood of successful telepresence interviews.

CONCLUSION

Reduction of ADEs, both in hospital and following discharge, by conducting MedRec, improves patient care and decreases health care utilisation. This creates a tremendous opportunity for pharmacists to broaden their reach and share their skills, abilities and knowledge to lessen the gap in the provision of care for patients in remote, rural and underserviced communities, as well as support hospitals with on-site pharmacists. Our study has demonstrated that pharmacists are able to interact with patients in a hospital setting using a telepresence robot to review their medications upon hospital discharge and that patients view this experience as positive and helpful. Bandwidth and internet reliability in remote locations is clearly a barrier and must be considered for this technology to be effective.

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Conflicts of interest: All authors are employed by Northwest Telepharmacy Solutions however, the matter did not have an impact on the outcome of the study presented.

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ORIGINAL ARTICLE

The prevalence and patterns of use of point-of-care ultrasound in Newfoundland and Labrador

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Abstract

Introduction: Point-of-care ultrasound (POCUS) is used for diagnostic and procedural guidance by physicians in Newfoundland and Labrador (NL). POCUS use is largely limited to urban locations and the training is variable amongst physicians. The primary aim of this study was to determine the prevalence of POCUS devices in NL and the secondary aim was to characterise the patterns of POCUS use amongst physicians in NL.

Methods: This is a mixed-methods cross-sectional study. We determined the prevalence of POCUS devices from purchase records and the patterns of POCUS use through theme-based interviews. The interviews were transcribed, coded and analysed using standardised qualitative methods.

Results: Ten physicians (3 females, 5 rural) participated in the interviews. The overall prevalence of POCUS devices in NL was 12.5/100,000 population. Participants in urban areas had more access to POCUS training and devices. Participants used POCUS on a daily or weekly basis to rule in or out life-threatening conditions and improve access to specialist care. The benefits of POCUS included expedited investigations, decreased radiation and increased patient satisfaction. The barriers to using POCUS were lack of training, time, devices, image archiving software, difficulty generating and interpreting images and patient body habitus.

Conclusion: This is the first study to our knowledge to report the prevalence of POCUS devices in Canada. Physicians who practise in rural NL have limited access to POCUS devices and have identified barriers to POCUS training. Connecting physicians in rural areas with POCUS experts through a province-wide POCUS network may address these barriers and improve healthcare access.

Keywords: Competency framework, continuing medical education, point-of-care testing, rural health services, ultrasound

Résumé

Introduction: L'échographie ciblée est utilisée par les médecins de Terre-Neuve-et-Labrador (T.-N.-L.) pour guider le diagnostic et certaines

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interventions. L'échographie ciblée est grandement limitée aux régions urbaines et la formation des médecins sur son utilisation est variable. Cette étude visait en premier lieu à déterminer la prévalence des appareils d'échographie ciblée à T.-N.-L. et en deuxième lieu, à caractériser les habitudes d'utilisation de l'échographie ciblée chez les médecins de T.-N.-L. **Méthodes:** Il s'agit d'une étude transversale à méthodes mixtes. Nous avons déterminé la prévalence des appareils d'échographie ciblée à partir de registres d'achat, et les habitudes d'utilisation de l'échographie ciblée à partir d'entrevues thématiques. Dix médecins (3 de sexe féminin, 5 de régions rurales) ont participé aux entrevues. Les entrevues ont été transcrites, codées et analysées à l'aide de méthodes qualitatives standardisées.
Résultats: La prévalence générale des appareils d'échographie ciblée à T.-N.-L. était de 12.5/100 000 populations. Les participants des régions urbaines avaient un meilleur accès à la formation sur l'échographie ciblée et aux appareils. Les participants utilisaient l'échographie ciblée tous les jours ou toutes les semaines pour inclure ou éliminer les affections potentiellement mortelles et améliorer l'accès aux spécialistes. Les bienfaits de l'échographie ciblée étaient l'accélération des examens, la réduction des rayonnements et une meilleure satisfaction des patients. Les obstacles à l'échographie ciblée étaient l'absence de formation, de temps, d'appareils et de logiciel d'archivage des images, la difficulté à générer et à interpréter les images, et les caractéristiques physionomiques du patient.
Conclusion: À notre connaissance, il s'agit de la première étude à avoir rapporté la prévalence des appareils d'échographie ciblée au Canada. Les médecins qui pratiquent dans les régions rurales de T.-N.-L. ont un accès limité aux appareils d'échographie ciblée et ont identifié des obstacles à la formation sur l'échographie ciblée. Pour faire tomber ces obstacles et améliorer l'accès aux soins de santé, il serait utile de relier les médecins des régions rurales à des spécialistes d'échographie ciblée dans un réseau provincial d'échographie ciblée.

Mots-clés: Échographie, examen ciblé, services de santé ruraux, formation médicale continue, cadre de compétences

INTRODUCTION

Point-of-care ultrasonography (POCUS) is a portable ultrasound technology that physicians can use at the patient's bedside to diagnose a disease or guide a procedure.[1] POCUS has been integrated into many clinical areas including emergency departments and outpatient clinics in both urban and rural settings.[2,3] It has become a valuable tool in the recent COVID-19 pandemic as physicians can rapidly assess a patient's lungs, volume status and cardiac function at the bedside.[4]

The province of Newfoundland and Labrador (NL) is home to approximately 500,000 people distributed across 405,000 km^2. A combination of geography and inclement weather often makes transportation of patients to secondary and tertiary centres difficult, and physicians practising in many of the province's isolated communities often have little in the way of technological or personnel support. The largely rural population in NL may benefit from having physicians and nurses trained in POCUS connected together to mentor one another. POCUS is ideally suited for locations with limited resources, including war zones and on board the International Space Station.[2] Most emergency departments in Canada use POCUS and the Canadian Association of Emergency Physicians has published guidelines on the use of POCUS.[5] In addition, POCUS has been introduced into undergraduate medical education in Canada[6] and is well established in many postgraduate residency programmes.[7-9] In NL, physicians and nurses have been using POCUS in their practice increasingly for the past 20 years.[10]

Despite the increased use of POCUS in clinical practice, its prevalence has never been reported in Canada to our knowledge. Knowing where and how POCUS is used in NL is important if we want to plan healthcare services and educational programmes that respond to the health needs of our aging population. The purpose of this study was to determine the prevalence of POCUS

devices in NL. The secondary objective of the study was to understand the patterns of POCUS use amongst physicians who use it regularly in NL. Finally, our research group also wanted to explore physician attitudes about a province-wide network for POCUS training and practice.

METHODS

Data were collected in 2 phases with a combination of quantitative and qualitative methods.

In the first phase, we determined the prevalence of POCUS devices in NL using purchase orders obtained under the Access to Information and Protection of Privacy Act (ATIPPA) from the 4 provincial regional health authorities (RHA). The total number of POCUS devices within the geographic limits of the 4 RHAs was cross verified through E-mail or telephone with respective administrative officers. For the purposes of this study, we excluded all Statistics Canada Census Agglomerations and Census Metropolitan Areas from the rural category. This excluded the communities of St. John's, Gander, Grand Falls-Windsor and Corner Brook.[11,12]

In the second phase, we studied the patterns of POCUS use amongst physicians practising in NL in 2 steps. First, we developed a questionnaire for physicians to rate their level of confidence in using POCUS during regular clinical practice on a 5-point Likert scale. Second, we recruited physicians who use POCUS in NL to participate in an interview to discuss the patterns of POCUS use in their clinical practice. We used a combination of purposive and convenience sampling to reflect diversity in gender, rural and urban healthcare settings, clinical training, experience and years of POCUS use. Research team members (AJD and CC) who had no prior training or knowledge about POCUS conducted semi-structured theme-based interviews. The interviews were conducted using an interview guide through telephone. The interviews were audio recorded, transcribed verbatim, anonymised and coded by key aspects of the conversations. They were analysed using an interpretive paradigm to identify emerging themes. The code words were operationally defined during the data extraction process to reflect the essence of the data and were consistently applied. The codes were placed into broader themes as they emerged based on their conceptual properties.

Two assessors (AJD and CC) extracted data from the interview recordings for each participant separately. After interviewing the first 3 participants, a peer debriefing with research team members who had experience using POCUS (GS) and who had qualitative method expertise (MN) determined the emergence of common codes or tentative themes. The preliminary themes were refined and revised by collapsing and consolidating codes in consultation with the research team members. A similar iterative process was carried out after coding the sixth and the tenth participants to determine whether saturation was reached. To ensure no further sampling was necessary, recruitment was continued until no new themes emerged over 2 consecutive interviews. The qualitative data analyses of the interviews were performed using NVIVO software package (version 12, QSR International, Doncaster, Victoria, Australia). In an effort to include the patient's perspective on POCUS use in NL, we engaged with a patient partner throughout the study, from data collection to manuscript preparation.

This was a cross-sectional, mixed-methods study approved by the NL Health Research Ethics Board (Reference # 2019.084).

RESULTS

Prevalence of point-of-care ultrasonography devices

The overall prevalence of POCUS devices in NL was 12.5 per 100,000 population [Table 1]. The prevalence of POCUS devices in Western, Labrador-Grenfell, Central and Eastern health

Table 1: The prevalence of point-of-care ultrasound devices in Newfoundland and Labrador

Location	Population*	Devices per region	Devices per 100,000
NL, total	519,716	65	12.5
Western	77,687	12	15.4
Labrador-Grenfell	36,072	14	38.8
Central	92,690	4	4.3
Eastern	313,267	35	11.2

*Statistics Canada. 2016 Census Profile. NL: Newfoundland and Labrador

authorities in NL was 15.4, 38.8, 4.3 and 11.2 per 100,000 population, respectively [Table 1]. The POCUS devices were used in both urban (n = 4) and rural (n = 19) geographic locations in NL. The urban locations included the city of St. John's, the towns of Gander and Grand Falls-Windsor and the city of Corner Brook. The rural locations included Carbonear, Old Perlican, Burin, Clarenville, Bonavista, Twillingate, Baie Verte, Fogo Island, Botwood, Stephenville, Port Saunders, Norris Point, St. Anthony, Happy Valley-Goose Bay, Labrador City, Postville, Nain, Flower's Cove and Roddickton. The prevalence of POCUS devices in urban centres in NL was 20.0 devices per 100,000 versus 12.6 per 100,000 in rural NL.

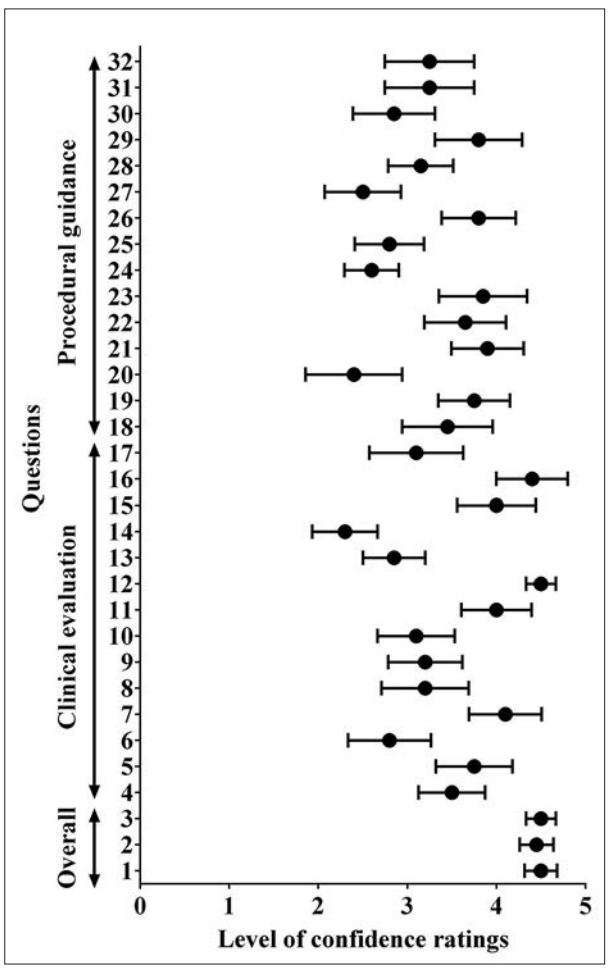

Figure 1: Level of confidence in using point-of-care ultrasonography. X-axis represents average scores of the level of confidence rated on a 5-point Likert scale: 1 – disagree, 2 – mostly disagree, 3 – neutral, 4 – mostly agree and 5 – agree. Y-axis represents items from the level of confidence questionnaire. For questions 1–32 on Y-axis, please refer to Table 3.

Descriptive characteristics of interview participants

The characteristics of the 10 participants (3 females, 5 rural) in this study are listed in Table 2. Nine participants were trained in family medicine or family medicine with special competence in emergency medicine and only one participant was a specialist.

Level of confidence in using point-of-care ultrasonography

All of the participants were confident in their overall ability to acquire and interpret images, and operate the ultrasound device [Table 3]. The self-reported level of confidence for using POCUS to evaluate clinical conditions and perform procedures varied widely [Figure 1].

Participants were least comfortable overall with diagnosing testicular torsion, pneumonia and deep vein thrombosis (average scores <3.0) [Table 3]. Participants were most comfortable using POCUS to perform Focused Assessment with Sonography in Trauma, early pregnancy assessment and to diagnose pneumothorax, aortic aneurysm and ascites (average scores of 4.0 or greater) [Table 3]. Participants were least confident conducting ultrasound-guided procedures such as pericardiocentesis, peripheral nerve blocks, peritonsillar abscess drainage, lumbar puncture and peripherally inserted central catheter (PICC) line insertion (average scores of <3.0) [Table 3]. Participants felt most confident performing central

Table 2: Participant characteristics

Participant characteristics	**Mean (SD) or *n***
Age	47.8 (10.3)
Gender (male/female)	7/3
Practice setting (rural/urban)	5/5
Level of education (generalist/specialist)	9/1
Total years of clinical practice	18.9 (11.4)
Total years of POCUS practice	7.8 (6.2)
Number of hours of POCUS training	
<50 h	5
≥50 h (but<100 h)	2
≥100 h	3
POCUS use during clinical practice	
Daily	3
At least once a week	7

SD: Standard deviation, POCUS: Point-of-care ultrasound

Table 3: The level of confidence in using point-of-care ultrasound

Areas of expertise	Level of confidence ratings (1–5)									
Location of practice	R	U	U	R	R	R	U	U	R	U
I am confident in general image acquisition skills	4.5	5	5	4	4	4	3.5	5	5	5
I am confident in general image interpretation skills	5	5	5	4	4	4	3.5	4	5	5
I am confident in machine operations	5	5	5	5	4	4	4	4	5	4
I am confident in evaluation skills for:										
Cardiac systolic function	4	4	3	4	3	3	1	3	5	5
Inferior vena cava	4.5	4	5	4	4	3	1	2	5	5
Deep vein thrombosis	4	1	4	3	1	4	1	2	3	5
Pneumothorax	5	4	5	5	4	3	1	4	5	5
Pulmonary oedema	5	2	3	5	3	3	1	1	4	5
Cholecystitis	3	1	4	4	3	4	1	4	3	5
Hydronephrosis	4	1	4	4	2	3	1	4	3	5
Aortic aneurysm	4	4	5	5	4	4	1	3	5	5
Ascites	5	4	5	5	4	4	4	4	5	5
Pneumonia	4.5	2	2	3	2	3	1	4	3	4
Testicular torsion	3	1	1	2	2	3	1	2	4	4
Early pregnancy assessment	4.5	5	5	5	4	2	1	5	4	4.5
Focussed abdominal sonography in trauma	5	5	5	5	4	4	1	5	5	5
Retinal detachment	4	1	4	4	4	2	1	1	5	5
Procedural guidance										
Arterial line placement	5	1	2	3	4	4	4.5	1	5	5
Peripheral intravenous line placement	5	1	3	3	4	4	4.5	3	5	5
Peripherally inserted central catheter	5	1	2	1	1	4	1	1	3	5
Central line	5	2	3	5	3	4	5	2	5	5
Thoracocentesis	5	1	4	5	2	4	4.5	2	4	5
Paracentesis	5	1	4	5	4	4	4.5	1	5	5
Pericardiocentesis	3	1	3	3	2	3	3	1	3	4
Peripheral nerve block	4	1	3	3	2	4	1	2	4	4
Abscess drainage (general)	5	3	4	5	3	4	1	3	5	5
Peritonsillar abscess drainage	4	1	3	3	2	2	1	1	3	5
Foreign body detection	4	2	3	4	2	3	1	4	4	4.5
Jugular vein pulse assessment	5	1	4	4	4	4	5	1	5	5
Lumbar puncture	4.5	1	3	4	2	2	1	2	4	5
Fracture reduction	4	1	4	5	2	2	1	4	5	4.5
Joint aspiration	5	1	3	5	2	3	1	3	5	4.5

R: Rural, U: Urban

lines, arterial lines, peripheral intravenous lines, paracentesis, thoracocentesis, abscess drainage and jugular venous pressure assessment (average scores of 3.5 or more) [Table 3].

Themes

A word frequency analysis of interview transcripts showed training, patterns of use, barriers, benefits, limitations and network as the 6 main themes of POCUS in participants' clinical practice.

Thirty subthemes and 491 codes also emerged from the interviews.

Point-of-care ultrasound training

This study found that participants completed their POCUS training at formal courses offered through professional societies such as the Canadian Point of Care Ultrasound Society, at academic conferences such as the Canadian Association of Emergency Physicians Conference or in medical school or residency. Some participants also used online POCUS content to supplement their training. While the duration of formal POCUS courses is about 100 h, participants believed it took a total of 300–400 h to become competent in using POCUS.

Since all participants had similar types of POCUS training, we did not identify any differences in interview attitudes amongst them. Participants were aware of the recommendations about the use of POCUS within their own discipline but highlighted the need for continuing education to learn about new applications of POCUS.

The challenges to POCUS training included travel costs, difficulty getting time off work, a lack of institutional support and a lack of available POCUS devices. Participants from rural settings could not access enough physicians who were competent in POCUS with 'Independent Practitioner Status' to mentor them to become certified in POCUS. Rural participants had difficulty acquiring the number of ultrasound images required to obtain and maintain competence. In addition, there was little institutional support or financial incentives for POCUS training.

Patterns of use

Participants used POCUS on a daily or weekly basis to rule in or out life-threatening conditions, guide procedures and improve access to diagnostic imaging or specialist consultation. Participants shared several clinical scenarios to explain their patterns of POCUS use. Participants thought archiving POCUS images would be a valuable addition to the patient's chart as it can provide 'a huge amount of information' for consultants. Participants stated that patients were very receptive to POCUS, noting that it provided 'peace of mind'. To improve the quality of care, participants supported the use of POCUS according to clinical practice guidelines and suggested there be a 'well-developed quality control programme' for POCUS use.

Benefits of use

Participants described POCUS as an 'essential' part of patient care. Benefits for patients included expediting investigations, decreased radiation and increased patient satisfaction. Most participants highlighted patient safety and comfort as further benefits of POCUS, especially when it was used for procedures like PICC lines. Additional benefits for patients included timely access to a correct diagnosis, especially in rural areas where technicians must be called in after hours for formal diagnostic imaging. A number of participants highlighted the potential cost savings for patient care in rural and remote communities by lowering the cost to the system by not having to call in a technician. Furthermore, all participants reported that none of their patients declined the use of POCUS during clinical assessments.

Barriers to use

Participants in the early stages of learning POCUS stated that image generation and interpretation were difficult for them. Participants stated that 2 patient factors, body habitus and perceived patient discomfort, impeded image generation or interpretation with POCUS. Several participants stated that lack of access to an ultrasound machine prevented them from using POCUS. One participant had purchased their own portable ultrasound device to address this problem. However, we did not include this POCUS device in our calculations, as the purpose of this study was to estimate the prevalence of POCUS units purchased and used within the public healthcare settings in NL. At 1 urban centre, physicians were denied access to an endocavitary probe because they could not access their institution's sterilisation equipment.

Participants who were emergency physicians described the pressure on them to maintain adequate patient flow as a barrier to POCUS use. One emergency physician described lack of compensation as a barrier. Another physician described situations where the POCUS image was not adequate to make a diagnosis, necessitating appropriate formal diagnostic imaging.

Participants described an overall lack of familiarity with clinical practice guidelines related to POCUS as a barrier to its use. One participant who was familiar with the guidelines felt they were already outdated. The final barrier to POCUS use was a lack of image-archiving software which allows users to store POCUS images and share them with other clinicians.

Limitations of point-of-care ultrasonography use

Ultrasound image generation and interpretation is dependent on the training and proficiency of the operator. Participants described acquiring these

skills as a limitation to using POCUS. Participants also saw POCUS leading to more diagnostic imaging. Some participants felt POCUS increased the cost of care for patients. While others, who practised in rural settings, thought POCUS saved time and money by preventing unnecessary travel to and from urban hospitals. Finally, 1 participant recalled a negative cardiac POCUS scan during a trauma that in their view delayed a thoracotomy. However, the participant described the importance of knowing their own limitation with respect to interpreting POCUS images and discussing the limitations of POCUS with patients to avoid false or implied reassurance.

Point-of-care ultrasonography network

Participants of this study supported the idea of a province-wide network, where a community of experts would mentor physicians. A major concern for participants was the importance of setting standards for POCUS training both in terms of quality assurance and patient safety. They felt it was important to build on other POCUS courses already in place instead of creating new training standards. Some were particularly interested in short and intensive courses that teach advanced skills and suggested delivering this content in the form of weekend seminars, online courses or conferences with oversight from advanced POCUS users and specialists.

Participants listed resident physicians, physician POCUS experts, specialists, ultrasound technicians, hospital administrators and nurses as potential stakeholders in a POCUS network. One participant reported that nurses on the coast of Labrador have been generating images with ultrasound for many years with a physician interpreting images via telemedicine. While some physicians felt it was outside the scope of practice for a nurse to interpret their own POCUS images, the majority of physicians felt that nurses and, in particular, nurse practitioners had a lot to offer by using POCUS. Furthermore, they wanted to see support from generalists and specialists in the development and maintenance of the network.

DISCUSSION

The objectives of this study were to determine the prevalence and patterns of POCUS use in NL. To our knowledge, this study is the first to report the number of POCUS devices available within a provincial public healthcare setting in Canada. By accessing purchase records, we found that there were 12.5 POCUS devices per 100,000 population in NL, Canada. When asked to explain the patterns of POCUS use during routine clinical practice, participants reported the benefits, barriers and limitations of POCUS through theme-based interviews.

In this study, participants who were physicians in NL listed several benefits of using POCUS compared to other portable technologies such as diagnostic ultrasound or portable X-rays. Several protocols have been developed using POCUS in recent years to improve diagnostic accuracy in a range of diseases. For example, the Bedside Lung Ultrasound in Emergency protocol has been demonstrated to have a diagnostic accuracy of 90% for determining the causes of respiratory failure in patients admitted to critical care units.[13] In this study, physicians were aware of the recommendations about the use of POCUS within their own discipline but highlighted the need for continuing education to learn about new applications of POCUS.

Adherence to clinical guidelines and technological advancements

Despite the increasing use of POCUS, there was a general lack of awareness of clinical guidelines and recent developments related to POCUS amongst participants. For instance, even though lung POCUS performs better than chest X-rays for the diagnosis of heart failure, emergency physicians do not use lung POCUS regularly.[14,15] Critics of POCUS point out that its use in the breathless patient is operator dependent and that there is a lack of general consensus or an evidence-based approach to how lung ultrasound is conducted.[16] It is essential that a group of experts comprised of experienced POCUS users keep track of these developments in order to keep pace with rapid technological advancements, and we suggest that a province-wide training network could possibly help with dissemination of knowledge and skills related to POCUS use within the public health system in NL.

Potential solution through training network

The concept of a network of teaching hospitals and clinics working together with a university-based department to provide specialty training for physicians has existed since the early 1900s in Canada.[17] At the turn of the 21st century, training initiatives such as the Multi-Specialty Community Training Network (MSCTN) were established using competency-based frameworks such as 'Canadian Medical Education Directives for Specialists' (CanMEDS) in Ontario. [18] The MSCTN network, which involves 10 medical school departments and 7 rural communities, provided an excellent learning experience for specialty residents who opted to improve their rural competence.[19] In this study, most participants identified the need to set up a similar training network for POCUS education. Participants were also interested in setting up an online network to facilitate the sharing of POCUS knowledge, similar to the successful virtual communities of practice in Australia.[20] In a complex healthcare system with ever-increasing challenges, it is essential for physicians who are experts in a specific domain to engage in stewardship through teaching and training. Telemedicine has been used to deliver healthcare and education in NL for many years.[10,21] While teleguidance for ultrasound mentoring is in its infancy, it may eventually provide a solution for training rural practitioners in POCUS and needs further investigation.[22,23] Implementing POCUS training by engaging both rural and urban centres using competency-based frameworks such as CanMEDS may provide excellent learning experiences for residents and nurse practitioners in NL.

Limitations

We estimated the prevalence of POCUS devices in NL using information requested from ATIPPA.

We may have over- or underestimated the prevalence of POCUS devices in NL as the authorities in 1 RHA reported fewer POCUS devices during cross verification of the purchase orders. Informal discussions with physicians in another RHA, outside of the study protocol, revealed that 2 more POCUS machines were in use that were not described in the purchase orders.

Due to the nature of the data collection method, using theme-based interviews, there were threats to external validity and reliability of findings. Although we employed strategies to recruit physicians with diversity in gender, rural and urban practice, clinical training, experience and years of POCUS use, we were unable to recruit an adequate number of female physicians and specialists. Furthermore, the Western RHA was not represented amongst our participants. The exclusion of Western RHA might skew the findings from this study. Finally, there was a lack of adequate focus on the analysis of negative consequences of using POCUS. In order to better understand the benefits of setting up a POCUS training network in NL, pragmatic studies engaging potential stakeholders with systematic *a priori* considerations of threats to external validity are necessary.[24]

CONCLUSION

In this study, we are, to our knowledge, the first to report the prevalence of POCUS devices in Canada. The prevalence of POCUS devices in NL was 12.5 per 100,000 population. The majority of the POCUS equipment is located in urban locations. In our interviews with physicians, we found that there were significant barriers in training and acquiring competence in POCUS, especially for rural physicians. The majority of physicians in NL described the importance of POCUS training, especially for emergency physicians, and for continuing medical education as it relates to POCUS. The physicians in this study endorsed the idea of developing a province-wide POCUS network. Finally, physicians described the importance of being able to share their POCUS images with other healthcare providers to ensure safe patient care

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ORIGINAL ARTICLE

Building point-of-care ultrasound capacity in rural emergency departments: An educational innovation

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Abstract

Introduction: Point-of-care ultrasound (POCUS) use is the standard of care in emergency medicine (EM), but rural physicians face barriers to obtaining and retaining this skill and cite low confidence in their use of POCUS. Without access to high-quality educational opportunities, this important clinical tool may not be used to its full potential in rural hospitals. The Hands-On Ultrasound Education (HOUSE) programme, launched in 2015 by the University of British Columbia's (BC) Division of Rural Continuing Professional Development, is a rurally focused POCUS training and education programme that travels to rural and remote communities and aims to build a rural POCUS community of practice within BC. In this study, we present and evaluate the HOUSE programme.

Methods: The HOUSE programme is described. A comprehensive qualitative evaluation of semi-structured interviews pertaining to HOUSE was conducted in the 4th year of the programme to assess participant experience and programme outcomes.

Results: Results from 52 semi-structured interviews indicate that there is a significant increase in self-reported confidence on specific POCUS applications and increased POCUS use after completion of the course, and we report positive experiences with the HOUSE programme.

Conclusion: By providing a customizable, accessible, hands-on training opportunity, the HOUSE programme removes barriers to POCUS training and education for physicians in rural and remote BC. The rurally focused elements have contributed to education for rural participants that demonstrates increased confidence and the use of POCUS as a clinical tool.

Keywords: Point-of-care ultrasound, medical education, rural emergency medicine

Résumé

Introduction: L'échographie ciblée est la norme de soins en médecine d'urgence, mais les médecins des régions rurales ont de la difficulté à acquérir et à retenir cette compétence, et affirment avoir peu d'assurance à utiliser l'échographie ciblée. Privés d'activités d'apprentissage de bonne qualité, les médecins des hôpitaux

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ruraux n'utilisent pas pleinement cet important outil clinique. Le programme Hands-On Ultrasound Education (HOUSE), lancé en 2015 par la division de formation professionnelle continue en milieu rural de l'Université de la Colombie-Britannique, est un programme de formation axé sur la pratique rurale portant sur l'échographie ciblée. Le programme se déplace dans les communautés rurales et éloignées et il vise à créer une communauté de pratique rurale sur l'échographie ciblée en Colombie-Britannique. Dans cette étude, nous présentons et évaluons le programme HOUSE.

Méthodes : Description du programme HOUSE. Une évaluation qualitative complète d'entrevues semi-structurées portant sur HOUSE a été réalisée durant la quatrième année du programme dans le but d'évaluer l'expérience des participants et les résultats du programme.

Résultats: Les résultats de 52 entrevues semi-structurées indiquent que la confiance rapportée à l'égard de certaines applications d'échographie ciblée a significativement augmenté, et que l'utilisation de l'échographie ciblée a augmenté après le cours, et nous rapportons des expériences positives envers le programme HOUSE.

Conclusion: En offrant des activités d'apprentissage personnalisables, accessibles et pratiques, le programme HOUSE fait tomber les obstacles à la formation sur l'échographie ciblée des médecins des régions rurales et éloignées de la C.-B. Les éléments axés sur les régions rurales ont contribué à l'éducation des participants ruraux qui démontrent une plus grande confiance et une plus grande utilisation de l'échographie ciblée comme outil clinique.

Mots-clés : échographie ciblée, formation médicale, médecine d'urgence en milieu rural

INTRODUCTION

Point-of-care ultrasound (POCUS) use is the standard of care in emergency medicine (EM) and improves patient care by expediting the diagnosis and treatment of traumatic and medical conditions.[1] Although limited, existing literature suggests that POCUS is a valuable clinical tool in rural emergency departments, which often lack immediate access to formal diagnostic imaging and definitive specialist care.[2,3] While most rural hospitals in British Columbia (BC) have access to POCUS units,[4] research from other rural areas in Canada suggests that the technology is not being used to its full potential.[3]

Rural practitioners face multiple barriers to acquiring POCUS skills, including the cost and time to travel for education. Further, POCUS skills can be difficult to retain without ongoing practice and mentorship support.[5] Rural practitioners are typically "generalist" family physicians who combine family medicine with hospital-based practices such as obstetrics, EM and inpatient care. They often work in low-volume settings with few opportunities to use POCUS for clinical care, and most do not have access to local POCUS mentorship.[6] While POCUS training opportunities exist in Canada,[7] they generally do not meet the unique learning needs of rural physicians. As a result, many rural physicians lack confidence in their POCUS skills.[8]

The HOUSE programme, launched in 2015 by the University of BC Division of Rural Continuing Professional Development, aims to provide education that addresses barriers to skill acquisition for rural physicians, and empower them to safely and effectively integrate POCUS into patient care. It also aims to build local POCUS capacity by supporting regional networking and ongoing education opportunities for rural POCUS practitioners and educators, thereby creating a POCUS community of practice across rural BC. In this study, we present and evaluate the HOUSE programme.

Programme description

Overview

The HOUSE programme was developed to address gaps in POCUS education for rural physicians in BC, which include a lack of community-based POCUS support for learners, the need to travel away from home for ultrasound education, and the need for education specific to the rural context and responsive to a community's unique educational needs. The programme is led by a rural physician with expertise in POCUS and coordinated by an administrative team located in Vancouver, BC. The course accommodates between 3 and 16 participants and is offered at a standard cost per participant, thus enabling smaller and more isolated communities to host courses.

Course planning and agenda selection

Once a community requests a course, a planning meeting consisting of a HOUSE medical lead, a HOUSE course coordinator and a local community physician is initiated to gather information about the community setting, pre-existing POCUS skill set and POCUS educational goals. A local coordinator is hired from within the community to help with course planning and on-site logistics, minimising workload for the local physicians.

A customised course agenda is created as a collaboration with local physicians and HOUSE medical leads based on the specific needs of the community. Agendas are developed from a menu of clinically focused learning modules (e.g., shock, trauma and dyspnoea) in addition to individual POCUS applications (such as advanced cardiac, musculoskeletal and deep vein thrombosis). The agenda also includes clinical cases designed to teach the clinical integration of POCUS into patient care (e.g., when, and how to do a shock scan when caring for an unstable patient). The course agenda also emphasises POCUS pitfalls, and each course includes a discussion on how to create individual quality assurance processes for feedback on performance, with a broader aim of safe integration of POCUS into patient care.

Pre-course learning

Using a flipped classroom approach, participants are required to complete a series of online learning modules prior to attending a course, allowing the learners to focus on hands-on skill acquisition during in-person training. Overarching learning objectives for the online modules include the acquisition of theoretical POCUS knowledge and its use for specific applications, with an emphasis on using POCUS safely. The customised online content is presented in a variety of formats including text, videos and POCUS images, as well as optional supplemental readings. Each module concludes with a quiz, to demonstrate knowledge acquisition. The online modules are hosted on a Learning Management System (Moodle version 3.5.5) and remain available to learners after the course.

Course delivery

HOUSE faculty are a mix of rural physicians, POCUS fellowship-trained physicians and sonographers. While each instructor has something unique to offer, the rural physician educator is a key role model for rural physicians, representing a peer who successfully uses POCUS in their own practice. Faculty travel to the community for the course and skills are taught on a combination of HOUSE-owned ultrasound units as well as local ultrasound units, enabling participants to develop familiarity with their own machines. The courses have a 1:2 instructor-to-learner ratio in order to maximise time for hands-on instruction. Instructors are encouraged to customise their bedside teaching to meet the specific needs of each learner. The course agenda may be adjusted during the course, by expanding or collapsing the time for specific modules, to better meet the needs of the community of learners. The course also includes information on further resources to assist with post-course ongoing learning, including instructor contact details, bcpocus.ca (a resource we developed to provide easy access to short online videos as a refresher prior to performing POCUS), a facilitated email listserv on POCUS topics of interest and further opportunities for supervised POCUS scanning.

METHODS

Programme evaluation

Course evaluations

In keeping with the College of Family Physicians of Canada's requirements for a three credit per hour course, the usual course evaluation consists of a pre-course needs assessment, post-course programme evaluation and a follow-up reflective exercise one month after the course. This includes the collection of pre- and post-course self-reported confidence on specific POCUS applications, feedback on overall learning experience, post-course learning needs and stories on how POCUS has changed provider experience and patient management.

Comprehensive programme evaluation

A comprehensive qualitative evaluation study was conducted during 2018–2019 to assess the impact and experience of the HOUSE programme over the preceding 4 years.[8] The evaluation examined the impact of the HOUSE programme on practitioner confidence and POCUS use, facilitators and barriers to POCUS skill acquisition and retention, the most effective elements of the programme and self-reported impact on rural communities and patient care. Participants included past course participants, local physician planning leads, local course coordinators, HOUSE instructors, HOUSE administrative staff, course models, regional specialists and provincial level stakeholders, all recruited via email invitation. Formal research ethics was not obtained as per Article 2.5 of the Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans. Informed consent was obtained from all participants and anonymity was guaranteed.

The evaluation framework was developed by an evaluation specialist and the HOUSE programme team focused on identifying key inputs, outputs and outcomes of the programme. Figure 1 presents the evaluation logic model used to determine programme impact and participant experience. Interview protocols were developed through an iterative process with the evaluation expert, research assistant and the HOUSE project team and medical lead.[8]

Data collection and analysis

Semi-structured interviews (30 min–one h in duration) were conducted between March and May 2019. Interviews were conducted over the phone by a research assistant and then audio recorded and transcribed. To function as a guide, overarching themes that aligned with the goals of the study and interview protocol were identified prior to analysis. The interview transcripts were reviewed and manually coded by a research assistant and evaluation specialist to develop a codebook. The codebook was then reviewed by the project team to gain consensus, and, once finalised, a research assistant coded all transcripts (using NVivo version 11) to identify key themes and sub-themes.

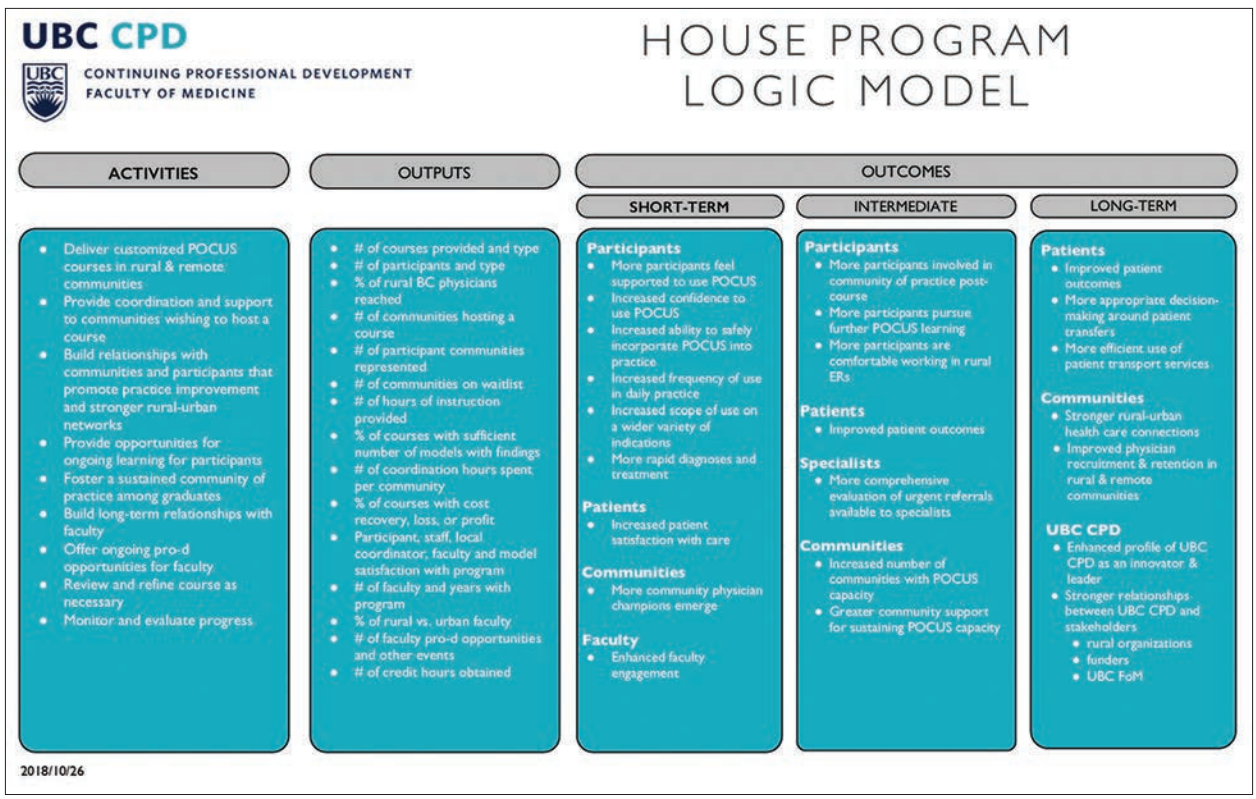

Figure 1: Hands-On Ultrasound Education logic model.

RESULTS

Since its inception in 2015, HOUSE has delivered 52 courses in 43 communities. The majority of courses (n = 26; 50%) have been delivered in Rural Subsidiary Agreement (RSA) level A communities, those communities considered by the BC Ministry of Health to be the most isolated. The remaining courses have been delivered in RSA level B and C communities and at rural-focused medical education conferences. Virtual follow-up sessions have been piloted; however, the technology required to participate in real-time online educational sessions proved to be a barrier for participants.

Participants

A total of 466 participants have attended HOUSE courses. Of those participants, 388 were family physicians, 7 were general practice anaesthetists, 5 were specialist physicians, 32 were rural family practice residents, 3 were nurse practitioners and 2 were registered nurses. Fifty-two participants were interviewed for this study.

Pre- and post-course evaluation

Results from the pre- and post-course evaluation surveys indicate that there is a significant increase in self-reported confidence on specific POCUS applications after completion of the course (P < 0.001). The post-course reflective survey results indicate the majority of learners (91%) used ultrasound more frequently after completion of the course. Further, 86% of respondents indicated they felt more confident using POCUS after the course. Changes were not observed for some learners, who site lack of time to practise and lack of access to POCUS as significant barriers.

Quotes from participants on how POCUS facilitated patient care are included in Table 1.

Comprehensive programme evaluation

Participants reported very positive experiences with the HOUSE programme, with almost all participants indicating they would be involved in the programme again and recommend it to others. Participants particularly valued the HOUSE programme for teaching in community, the low instructor-to-student ratio, the practical hands-on time using ultrasound on real models, the opportunity to tailor course content to community needs and the ability of instructors to use a flexible teaching approach to meet the needs of a diverse set of learners. When asked about limitations of the course, many participants questioned the extent to which the skills learned were retainable. Specific quotes and feedback from the comprehensive programme evaluation are given in Table 2.

Table 1: Quotes on point-of-care ultrasound and patient care (course participants)

'After the HOUSE course I used ultrasound to diagnose and treat a cardiac tamponade due to a stab wound that went into the left ventricle. The patient survived'
'I recently had an operating room case on a four year old with a BMI >40 after gaining IV access in the foot only through ultrasound. I otherwise would have had to cancel her case and send the patient 1000 km away for the surgery'
'I have diagnosed appendicitis in a child I was considering sending home'
'I was rather impressed to find somebody with hydronephrosis in the week after the course. I would not have been able to find this condition by ultrasound before doing the course. The management of the patient was certainly quicker and more focused due to this finding'
'I feel that I now manage trauma and critically ill patients better and can develop a better management path'
'I saw a young man who had recurrent presentations for chronic cough, who was treated with a number of courses of antibiotics. When I had a look at his heart on ultrasound, I could easily see his severely impaired cardiac function, and so I was able to provide appropriate treatment for heart failure'
'Diagnosing a ruptured spleen early in a paediatric bicycle injury patient with minimal clinical findings or symptoms'

HOUSE: Hands-On Ultrasound Education, BMI: Body mass index

DISCUSSION

Although there are other POCUS educational programmes in Canada, they do not address the unique barriers faced by rural physicians. The HOUSE programme addresses these barriers directly, by offering low instructor-to-student ratios, adaptable bedside teaching based on learner needs, a community approach to choosing agenda topics, strong logistical support for implementation, education that emphasises the clinical integration of POCUS and a commitment to providing ongoing learning opportunities.

Results from the programme evaluation demonstrate that programme participants highly

Table 2: Quotes from comprehensive evaluation

'I have much more confidence using the point of care ultrasound in practice. Previously, I would look at it sitting around and think, 'it would be nice to know how to use that right about now'. Now I confidently wheel it over and start scanning' – course participant
'Prior to the programme, I never really used ultrasound. Now I use it at least once during every shift' – course participant
'I don't recall having another course where it was a two-to-one (learner to instructor) ratio… I think it's maximizing the potential of learning in a day' – course participant
'There aren't many people (other than HOUSE) that are willing to…travel to some of our really rural and remote communities' – regional CME coordinator
'I thought it was very positive, pretty easy for me…my job was really to find local (pathology model) examples, and other than that they took care of everything' – community physician lead
'I think that the impact is community…UBC comes and they deliver all this amazing information and we're building capacity at a local level, closer to home, you're building …the community up. So, the community of physicians is stronger' – regional CME administrator
'HOUSE... has certainly increased provider and physician confidence... but sometimes it also challenges doctors to identify gaps in their skills and knowledge and to show them that if you create the right curriculum, that you administer a curriculum in a course that is unique to their own needs in their community, the receptiveness and the outcomes are just so much greater. And I think that, again, in my mind, positions HOUSE as being truly one of the more innovative and class leaders in adult medical education' – provincial stakeholder

HOUSE: Hands-On Ultrasound Education, CME: Continuing Medical Education, UBC: University of British Columbia

value these features of the programme, and would recommend the programme to their rural colleagues. In addition, the majority of participants felt more confident implementing POCUS into their practice and this resulted in increased use of the tool.

Challenges with POCUS skill retention and ongoing learning were identified by participants. POCUS knowledge and skills are best acquired and maintained by ongoing learning, as opposed to one-time educational events.[5] The programme continues to pilot longitudinal learning opportunities aimed at supporting ongoing learning post course, with varying degrees of success. Regular scanning sessions with a local or regional physician mentor are ideal, but skilled mentors often do not exist locally. Follow-up sessions with visiting instructors are helpful but costly. As mentioned, virtual follow-up pilot sessions were unsuccessful due to technological barriers. These barriers are rapidly diminishing in the era of COVID-19, as the use of videoconferencing technology becomes ubiquitous and comfort and proficiency with virtual technology increases. Further, the recent availability of personal POCUS devices in Canada is increasing our ability to offer more flexible, virtual learning opportunities. Based on this feedback, and as part of the continuous quality improvement efforts of the HOUSE programme, opportunities for embedding ongoing learning remain a top priority for future iterations of the course.

To further mitigate these barriers, the HOUSE programme created a web-based point-of-care resource (BCPOCUS.ca), and all course participants are also invited to join a listserv that hosts facilitated discussions on POCUS cases and new developments. A continued focus on educational innovation, network building and the use of technological advances will be necessary to overcome the significant barriers to providing ongoing learning support to rural communities.

Limitations

The evaluation process had some limitations. Interviewees may not have participated in a HOUSE course recently, and therefore were recalling information from a number of years prior to the interview. Further, qualitative evaluation data do not enable us to demonstrate improved patient outcomes, the overall goal of our programme. Despite this, participants were able to offer valuable contributions based on their overall impression of the course and the impact it had over time on their practice.

The HOUSE course is logistically complex to develop and administer. Significant administrative staff time is required to manage the demands of planning multiple travelling courses from a distance. In addition, an engaged medical lead and teaching faculty are required for programme success. Although the courses are run on a cost-recovery basis, the programme benefited from funding from the Joint Standing Committee on Rural Issues (JSC) to support the initial course development and ongoing improvements.

CONCLUSION

The HOUSE programme was created to address

a recognised gap in rural POCUS education and empower rural physicians in BC to safely and effectively integrate POCUS into their practice. Its focus on in-community delivery, community customisation and low participant-to-instructor ratio is part of the programme's success. Evaluation results demonstrate that HOUSE is a valued educational programme that meets the needs of rural practitioners in BC and has led to increased use of POCUS in rural emergency departments. Continued innovation to support virtual and ongoing learning opportunities is needed to ensure that POCUS skills are retained and continuously developed.

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Conflicts of interest: There are no conflicts of interest.

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The SRPC would like to express our support for all of those responding to COVID-19 committed to providing safe and quality care to patients across Canada.

Join the RuralMed and or Rural Anesthesia Listservs. A lot of useful, detailed COVID-19 information has come from these email lists and has proven to be a great resource.

A working group with representatives from all the provinces and territories with isolated fly-in communities has been formed to share concerns and offer advice. We will keep you posted on further initiatives.

Together we can work towards keeping everyone connected, safe, and up to date.
Visit the SRPC.CA home page to find links to these pages.
COVID-19 RESOURCE GUIDE
COVID-19 RURAL MED LISTSERV RESOURCES
COVID-19 PATIENT RESOURCE PAGE

ORIGINAL ARTICLE

Evaluation of a pilot rural mentorship programme for and by pre-clerkship medical students

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Abstract

Introduction: While medical school interventions can help address rural physician shortages, many urban Canadian medical students lack exposure to rural medicine. The Rural Mentorship Programme (RMP) is a 4-month pilot initiative designed by medical students to bridge this gap by pairing preclerkship medical students at an urban medical school with rural physician mentors to provide exposure to rural careers.

Methods: A realist-influenced methodology evaluated perceived benefits and challenges of RMP, assessed how RMP influenced mentee perceptions and intentions towards rural careers, and investigated factors leading to success. Quantitative and qualitative data were collected through evaluative pre-, post-, and 4-month post intervention surveys, mentor interviews and a mentee focus group. Likert scales assessed satisfaction, attainment of objectives and mentee changes in perceptions and intentions.

Results: 18/23 mentees and 11/15 mentors completed at least 1 survey; 5 mentees joined the focus group and 3 mentors were interviewed. Most mentees were of non-rural backgrounds and initially neutral about pursuing rural practice. RMP helped mentees better understand rural careers. They especially valued the mandatory community clinical visit and forming relationships with mentors. Mentors enjoyed teaching, reflecting on their careers and demonstrating the merits of rural practice. Transportation and scheduling were major programme challenges.

Conclusions: This pilot suggests that structured mentorship programmes can improve understanding of, and provide exposure to, careers in rural medicine for urban medical students. Results will inform future programme development.

Keywords: Medical student, medical student interest groups, mentorship, programme evaluation, rural medicine, undergraduate medical education

Résumé

Introduction: Alors que les interventions des écoles de médecine peuvent contrer la pénurie de médecins en régions rurales, beaucoup d'étudiants

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en médecine des régions urbaines du Canada ne sont pas exposés à la médecine rurale. Le *Rural Mentorship Programme* (RMP) est une initiative pilote de 4 mois conçue par des étudiants en médecine pour combler cette lacune en appariant des étudiants d'une école de médecine urbaine n'ayant pas encore fait leur stage clinique à des médecins-mentors des régions rurales pour exposer les étudiants à une carrière en milieu rural.

Méthodes: Une méthode influencée par la réalité a évalué les bienfaits et les difficultés perçus du RMP, a évalué comment le RMP influait sur les perceptions et intentions des mentorés envers une carrière en région rurale et s'est penchée sur les facteurs de réussite. Des données quantitatives et qualitatives ont été recueillies par enquêtes évaluatives avant, après et 4 mois après l'intervention, par entrevues avec les mentors et par un groupe cible composé de mentorés. Des échelles de Likert ont évalué la satisfaction, l'atteinte des objectifs et la variation des perceptions et intentions des mentorés.

Résultats: Dans l'ensemble, 18 mentorés sur 23 et 11 mentors sur 15 ont répondu à au moins 1 enquête; 5 mentorés SE sont joints au groupe cible et 3 mentors ont été interviewés. La plupart des mentorés étaient d'origine non rurale et étaient initialement neutres à l'idée d'une pratique rurale. Le RMP a aidé les mentorés à mieux comprendre la carrière en milieu rural. Ils ont surtout apprécié la visite clinique obligatoire en communauté et la relation qu'ils ont formée avec leur mentor. Les mentors ont valorisé enseigner, réfléchir sur leur carrière et démontrer les mérites de la pratique rurale. Le transport et les horaires étaient les grands défis du programme.

Conclusions: Ce projet pilote laisse croire que les programmes de mentorat structurés améliorent la compréhension des étudiants en médecine des régions urbaines à l'idée d'une carrière en médecine rurale et exposent ces étudiants à la médecine rurale. Les résultats éclaireront l'élaboration de futurs programmes.

Mots-clés: Mentorat; étudiant en médecine; médecine rurale; éducation médicale de premier cycle; évaluation du programme; groupes d'intérêts d'étudiants en médecine

INTRODUCTION

Rural Canadians are less likely to have a family doctor.[1] While 17.6% of Canadians live outside urban centres, only 8.2% of physicians live in rural areas.[2,3] Fortunately, physicians in rural communities have a broad range of clinical practice and work long hours to serve diverse populations distinct from those in cities (e.g., higher proportion of Indigenous Peoples).[4,5] Nonetheless, residents of rural regions experience a higher burden of disease[5,6] and increasing access to health care providers remains an important strategy to alleviate inequities between urban and rural Canadians.[7]

Strategies to mitigate rural physician shortages have included financial incentives for staff, rural exposure and curriculum enhancement for trainees, and increasing medical school enrolment of rural candidates and those with an interest in rural medicine.[8-17]

Despite these efforts, many medical students – particularly those in large urban institutions – lack exposure to rural medicine. In 2017, our student-run Rural Medicine Interest Group (RMIG) informally surveyed undergraduate medical students at the University of Toronto; 73% (61/84) of responding students in years one to three had an interest in rural medicine, but only 40% (50/84) had participated in a rural medical placement. This mismatch between interest and curriculum opportunity, along with the known deficit in rural practitioners, led to our development of the Rural Mentorship Programme (RMP).

Rural Mentorship Programme description

The RMP [Figure 1] is delivered by RMIG medical students at the University of Toronto. The programme pairs first-and second-year medical students with a staff or resident physician mentor working in one of 4 rural communities outside Toronto. Rural sites were within a 2 h drive and were associated with our institution's Rural Residency Programme (Midland, Orangeville,

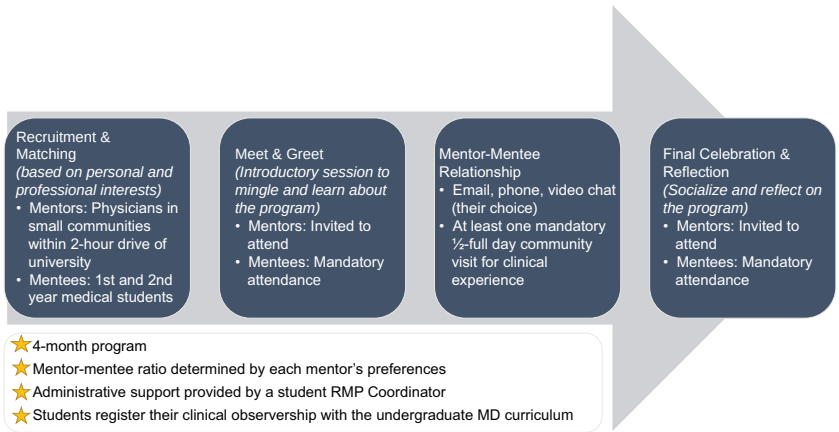

Figure 1: Process overview of the rural mentorship programme.

Orillia and Port Perry). We used the Rural and Northern Healthcare Panel definition of "rural" when establishing this mentor network: 'A rural community is one that has a population of <30,000 people and is located >30 min in travel time from a larger community'.[18] Mentor-mentee matches are based on the described personal and professional interests of both parties. One mentor can take on as many mentees as desired. Within our 4-month programme, student mentees attend an on-campus orientation meeting, communicate with their mentor, participate in one mandatory clinical visit in their mentor's community, and reflect on their experience after programme completion. The pilot launched in Fall 2018, with mentor-mentee interactions taking place between October 2018 and February 2019.

Programme evaluation

Our accompanying programme evaluation aimed to assess the mentorship experiences of participating students and physicians by evaluating: (1) how RMP influenced students' perceptions and intentions for rural careers; (2) the perceived benefits and challenges of the programme and (3) factors leading to RMP success. This information aimed to help establish how mentorship can practically assist urban medical schools like ours in providing rural exposure that may influence career selection.

Methods

The RMP is a complex and context-specific educational intervention where participants and broader institutional and socio-cultural contexts together influence its success.[19] We therefore used a realist-influenced methodology to dissect how and why the unique RMP structure and setting affected the experiences of rural physician mentors and urban pre-clerkship medical students interested in exploring rural medical practice.[20,21]

A mixed methods approach using surveys with Likert scales and narrative comments, interviews and a focus group was employed. Physician mentors and student mentees were recruited to participate in the programme evaluation via E-mail and verbal announcements. Participation was voluntary and did not impact their ability to participate in RMP. All participants provided informed written or verbal consent. This project received institutional Research Ethics Board approval.

Instruments

Surveys

Quantitative and qualitative data were collected from mentees and mentors through evaluative surveys at (1) programme entry, (2) programme exit and (3) 4 months' post programme (mentees only). Both entry surveys gathered demographic information (e.g., rural upbringing) and motivations to participate. The mentee entry survey included ratings of perceived importance of programme objectives. Mentors were asked about anticipated challenges. Both exit surveys included programme satisfaction, levels of agreement with programme objectives and intentions for ongoing mentor-mentee relationships. Narrative responses investigated perceived benefits and challenges. The mentee follow-up survey asked

about maintenance of mentoring relationships and intentions for rural careers.

Focus group/interviews

A 60-min in-person mentee focus group and 20-min web-based or telephone interviews with mentors were conducted.

Data collection

Entry surveys were distributed to all participants on programme commencement. Exit surveys were distributed immediately following programme completion and follow-up surveys 4 months thereafter. Each was completed within 3–4 weeks of distribution.

Immediately following programme completion, all mentees were invited to participate in the focus group. Mentor interviews were conducted within 8 weeks of programme completion. All were digitally recorded and transcribed verbatim.

Data analysis

Each participant was assigned a unique identifier, and data were de-identified before analysis. Incomplete surveys (<50% complete) were removed.

Qualitative

Qualitative data from surveys, focus groups and interviews underwent descriptive thematic content analysis.[22,23] Transcripts were individually reviewed by at least 2 researchers who generated initial codes using a line-by-line inductive approach. A joint preliminary coding framework was developed and shared with the research team, agreed on, applied to all transcripts and modified accordingly until all data relevant to the research questions were accounted for. Methodological triangulation of surveys, interviews and focus groups was used.[24,25]

Quantitative

Descriptive statistics (i.e., mean, median, mode and proportions) were performed using Microsoft Excel.

RESULTS

The RMP was a 4-month pilot running from October 2018 to January 2019. We matched

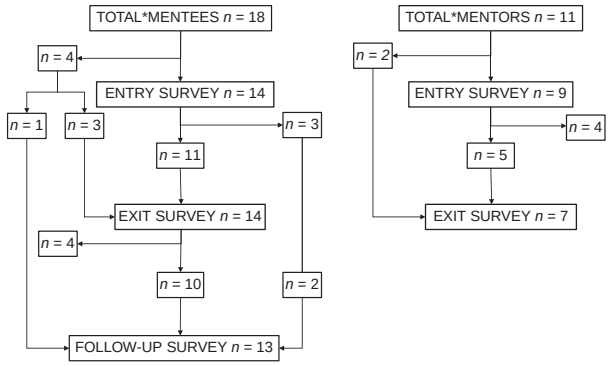

Figure 2: Flow of survey completion. *TOTAL = number of unique mentees/mentors completing at least one survey.

15 rural physician mentors with 23 first-and second-year medical student mentees. Eight mentors each took on 1 mentee; the remainder had 2 or 3 mentees each.

Participants

At least one survey was completed by 18 unique mentees (n = 14 entry, n = 14 exit and n = 13 follow-up) and 11 unique mentors (n = 9 entry and n = 7 exit), resulting in strong overall response rates (mentees: 78%, mentors: 73%) [Figure 2]. Several participants were lost to follow-up; some completed only the exit and/or follow-up surveys; 11 mentees and 5 mentors completed both entry and exit surveys, and 8 mentees completed all surveys [Table 1].

Five mentees participated in the post-programme focus group and 3 mentors participated in phone interviews. Most mentees completing the exit survey (86%, 12/14) participated in one community clinical experience, and 14% (2/14) participated in > 2 clinical experiences (max = 3). A discrepancy in the left-to-right arrangement of Likert scales in the Mentor Exit Survey led to inconsistent responses and necessitated quantitative data exclusion from analysis.

Programme objectives

Table 2 summarises how mentees perceived the importance of each programme objective and if the programme helped them to achieve that objective. All objectives were at least 'somewhat important', and 6 were achieved at least 'very well'. Objectives 3 and 5 were less effectively achieved.

Table 1: Demographic characteristics of survey participants

	Entry		Exit*		Follow-up*
	Mentees (*n*=14), *n* (%)	Mentors (*n*=9), *n* (%)	Mentees (*n*=11), *n* (%)	Mentors (*n*=5), *n* (%)	Mentees (*n*=10), *n* (%)
Year of study					
1	5 (36)	-	4 (36)	-	2 (20)
2	9 (64)	-	7 (64)	-	8 (80)
Gender					
Male	6 (43)	4 (44)	5 (45)	3 (60)	5 (50)
Female	8 (57)	5 (56)	6 (55)	2 (40)	5 (50)
Racial/ethnic background†					
White	9 (64)	7 (78)	8 (73)	4 (80)	8 (80)
South Asian	3 (18)	1 (11)	2 (18)	1 (20)	0
East Asian	2 (12)	0	1 (9)	0	2 (20)
First Nations/ Indigenous	0	0	0	0	0
Other	0	3 (33)	0	1 (20)	0
Rural upbringing‡					
0	10 (71)	1 (11)	8 (73)	1 (11)	8 (80)
<25	1 (7)	1 (11)	1 (9)	0	0
25-49.9	1 (7)	1 (11)	1 (9)	0	1 (10)
50-74.9	0	1 (11)	0	1 (11)	0
75-99.9	0	0	0	0	0
100	2 (14)	5 (56)	1 (9)	3 (60)	1 (10)

*Only participants completing the entry survey are reported, as demographics were not collected in the exit and follow-up surveys, †To preserve participant anonymity, ethnicities represented by only 1 participant are reported in aggregate groups. Two mentors selected 2 groups for racial/ethnic background, ‡Approximate time spent living in a rural community during first 18 years of life. Rural=Population <30,000 and>30 min away in travel time from a community of >30,000 people. All data are reported as *n* (%)

Mentee satisfaction

Mentees were very satisfied with the programme [Table 3]. Two mentees indicated dissatisfaction with some aspects (i.e., overall programme, suitability of their mentor match, communication with their mentor and visit to their mentor's community); these participants did not complete a clinical experience and/or had difficulty communicating with their mentor.

Perceived benefits

Perceptions of rural medicine

The RMP helped mentees develop stronger understandings of rural family medicine careers and lifestyles. Numerous students described greater appreciation for the broad scope, skill sets, and variety of roles of rural family physicians. One noted: 'My preceptor started with emerge but shifted to family but also doing hospital. You might not hear their scope of practice being so broad'. Some learners commented that rural family physicians have strong relationships with patients and their communities. Overall, students and mentors stated the programme provided new perspectives about the experience of rural practice.

Intentions for a rural career

Half of mentees entered the RMP with an intention to practise rurally (21% [3/14] 'Very likely'; 28% [4/14] 'Likely'); half were undecided (50% [7/14] "Neutral"). Mentees described RMP as a helpful professional and career development opportunity that provided direction for future practice and training. 'I learned how I can seek opportunities in my training to develop the skills necessary to practise family medicine in emergency and hospital settings without necessarily having to do a plus one (i.e., enhanced skills) programme'. Several students said the experience confirmed their pre-existing interest in rural family medicine. RMP supported medical knowledge

Table 2: Mentee programme objectives

Objectives	Median, mode	
	Perceived importance	Achievement of objective
Demonstrate an understanding of social, cultural, economic, and environmental factors influencing health in rural settings	5, 5	4, 4
Discuss challenges and approaches to practicing medicine in lower resourced settings	5, 5	4, 4
Develop awareness of the diverse and changing needs of rural communities and how to address them	5, 5	3, 3
Differentiate between the scope of practice of physicians in rural and urban contexts	4, 4	4, 4
Describe nuances of navigating personal and professional relationships in the context of rural medical practice	4, 4	3, 2
Reflect on your personal and professional development goals and values.	4, 4	4, 5
Discuss relevant lifestyle considerations in career development	4.5, 4.5	5, 5
Reflect on your potential role in a rural practice setting.	4, 4	4.5, 5

Likert scale (perceived importance of each programme objective): 1-Not important at all, 2-Somewhat unimportant, 3-Neutral, 4-Somewhat important, 5-Very important, Likert scale (self-reported achievement of programme objectives): 5-Extremely well, 4-Very well, 3-Moderately well, 2-Slightly well, 1-Not well at all. *n*=14 for all objectives in both entry and exit

acquisition and allowed students to network in rural settings. Mentors believed RMP inspired mentees to consider future rural training or practice.

Value for mentors

Mentors volunteered with RMP because they enjoy teaching and wanted to help students and promote rural medicine. They also valued reflecting on their lifestyle and practice and were proud of their careers and accomplishments. One mentor explained, 'I was inspired by the incredible medical students that I met. The experience also gave me renewed pride in my community and helped to remind me of the reasons I chose to work in a rural practice'. In general, mentors enjoyed sharing the benefits of careers in rural medicine.

Factors leading to programme success

Clinical experience

Mandatory community visits and clinical experiences were considered the most valuable programme components. Mentees observed clinical practice in the context of a small community, often as their 'first rural shadowing experience.' Many felt the experience was more 'hands-on' than their urban clinical experiences, given fewer mentee numbers, and with mentors who encouraged active involvement in clinical care. The clinical exposure helped mentees contrast urban and rural practice.

Authentic mentor-mentee relationship

An authentic mentor-mentee relationship was key to programme satisfaction. Mentees appreciated that mentors were invested in delivering positive experiences, were receptive to individual learning goals, and offered practical lifestyle and career insights. One mentor described the importance of relationship-building to create a supportive environment: 'A lot of things you talk to a mentor about are things that you need advice about or things you would ask in a trusting relationship. And a trusting relationship is one that you have to build'.

Balance of structure and flexibility

All participants wanted a programme with sufficient structure to limit organisational and administrative burden and enough flexibility to ensure clinical experience was scheduled at mutually agreeable times. Mentors liked the flexibility of offering clinical exposure tailored to mentee learning goals. They simultaneously appreciated provision of clear role expectations and suggestions for mentorship approaches (e.g., conversation starters provided to mentors and mentees). One mentee shared that the programme 'was an easy opportunity and low work on my part to

Table 3: Mentee programme satisfaction rating summary

Programme element	Median	Mentees rating 4 or 5, *n* (%)
Overall programme	5	12 (86)
Amount of information you were given about the programme	4.5	13 (93)
Online registration process	5	14 (100)
Suitability of mentor match	5	13 (93)
Meet and greet	4	13 (93)
Programme coordination	4.5	12 (86)
Communication with your mentor	5	13 (93)
Visit to your mentor's community	5	12 (86)

Likert scale: 1=Extremely dissatisfied, 2=Somewhat dissatisfied, 3=Neither satisfied nor dissatisfied, 4=Somewhat satisfied, 5=Extremely satisfied. *n*=14 mentees for all programme elements

make connections'. A mentor cautioned that too many administrative tasks (e.g., recruiting other mentors and completing several evaluation forms) may reduce interest from busy rural physicians.

Ongoing relationship

In the Exit survey, 79% of mentees (11/14) agreed with the statement 'I feel comfortable communicating with my mentor if I have questions'. However, in follow-up surveys, 45% (5/11) of those mentees reported 'our relationship ended when the programme was over'; 36% (4/11) maintained some degree of ongoing relationship with their mentor (2/11 were lost to follow-up). Of mentees reporting they would 'likely return for future clinical experiences' in the Exit survey (36%, 5/14), one person visited their mentor prior to the follow-up survey.

Challenges and tensions

Degree of rurality and transportation

Transportation to rural communities was the most prevalent barrier. Mentees without cars faced financial and logistical difficulties despite some public transportation availability, carpooling support, and a small travel stipend. Similarly, mentors were unable to travel into the city for the Meet and Greet and Final Celebration. Despite these transportation challenges, many mentees commented that they desired experiences in even more rural or remote communities than those available in the RMP.

Scheduling and availability

Scheduling clinic visits was another major programme challenge. Student availability did not necessarily align with physician clinical hours; thus, 2 mentees were unable to visit their mentor's community. Furthermore, limited public transportation options and long travel times hindered students' ability to arrive at distant clinics.

DISCUSSION

We found that RMP mentees gained a stronger understanding of the work and life of rural physicians and achieved programme objectives. This group of pre-clerkship medical students were mostly of non-rural backgrounds and began the programme either neutral or already interested in rural medicine. They were satisfied with the programme, especially the clinical visit. Although most had positive mentor relationships, these relationships did not generally continue beyond programme completion. Transportation and scheduling were the main programme challenges. Positive satisfaction ratings, improved understanding of rural medicine and achievement of learning objectives provided strong encouragement for programme continuation.

The rural community visit and clinical experience were resoundingly the most valuable RMP element for both groups. Large group gatherings, in contrast, were less valued. Similarly, the Northern Ontario School of Medicine's Remote and Rural Community Placements evaluation found 1st year students placed little value in non-clinical community activities.[26] When developing rural curricula, clinical exposure should be prioritised as essential; positive learning experiences in rural communities attract physicians to rural practice.[12,13]

A meaningful mentor-mentee relationship was also key to RMP success. Supportive mentors and role models facilitate valuable medical learning experiences and positive perceptions of rural medicine.[27-30] Furthermore, programme factors RMP mentees noted as helpful (i.e., engaged and available mentors, lifestyle and career insights and

professional development) are consistent with a review of medical student mentorship programmes.[31] Several such programmes have positively influenced residency and specialty choice,[32] suggesting that structured rural mentorship could have a similar downstream impact.

Despite mentees' intentions to maintain mentor contact post programme, 4-month follow-ups indicated this did not generally occur in spite of general participant satisfaction with their mentor-mentee match. Our 4-month RMP appears to successfully introduce students to rural medicine for learning and career exploration; however, to increase rural physician recruitment and retention, a longer structured programme or protected curriculum time for longitudinal mentoring may be necessary. Other studies demonstrate that more intensive and longitudinal rural clinical exposure influences rural practice location more effectively than brief community experiences.[15,17,33]

Our physician mentors also benefited from this RMP. In addition to promoting opportunities and challenges of careers in rural medicine, mentors perceived advantages similar to those described previously, including: Opportunities to improve teaching skills, reflect on values and work practices, and garner satisfaction from supporting students.[34,35] Limiting administrative tasks like evaluative surveys appears to promote programme success, which may partly explain the paucity of published physician mentor data. Advertising physician participation benefits may attract additional rural physicians into RMPs.

A major programme challenge was transportation. We chose rural sites already associated with our institution's postgraduate curriculum and accessible within a 2-h drive. Unfortunately, as a student-run programme with limited funding and administrative capacity, we were unable to adequately support the transportation needs of all mentees, and several desired more remote rural clinical experiences. While exposing urban students to a wider range of remote and rural locations can generate stronger interest in rural practice,[36] it would be logistically and financially challenging for the RMP. Greater faculty and medical school programme involvement and community funding are being pursued. Virtual medicine offers a promising avenue for medical students to explore remote clinical care, especially given telecare's increasing relevance in both rural healthcare and medical education during the COVID-19 pandemic; however further research is needed.[37,38]

Our RMP is one of a few formal medical student RMPs in Canada and appears to be the first thoroughly evaluated. Internationally, medical schools with comprehensive 'rural tracks' (i.e., including a mentorship component) note similar benefits to RMP, but these intensive programmes are not easily comparable to our extracurricular programme being delivered by and to urban-based students.[30,39] Given its potential value, strategising for rural medical student mentorship is an area requiring further exploration.

Limitations

Study limitations include being underpowered for comparative statistics, despite a strong overall response rate. Loss to follow-up, failure to complete the entry survey, and an exit survey error led to data exclusion. However, our mixed methods approach and data triangulation facilitated thorough exploration of the research questions. Finally, the value of RMP may be inflated because it was a voluntary rather than mandatory programme.

Future research should include a greater number of participants, longer follow-up time, and assessment of eventual mentee practice location. Future RMP improvements may include lengthening the structured programme, increasing the number of required clinical experiences, and broadening the programme to involve more remote community mentors. Our major ongoing challenge is lack of transportation to the rural communities. Increased funding, protected curriculum time, enhanced administrative capacity, and involvement of virtual medicine may address such limitations.

CONCLUSIONS

The RMP effectively helped these urban preclerkship medical students gain a stronger understanding of rural medicine. Clinical exposure and authentic mentoring relationships were key to programme success. This programme is now delivered annually by the student-run RMIG. Although its standalone impact on career

decisions cannot yet be determined, we are hopeful that this early positive experience may influence learners to pursue further rural training during clerkship and residency. This study suggests that urban medical schools can provide rural exposure through structured mentorship programmes to improve student understanding and consideration of possible careers in rural practice. To corroborate our findings, further research on rural medical student mentorship is needed.

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PROCEDURAL ARTICLE

The occasional dental fracture

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INTRODUCTION

Approximately 6 million Canadians avoid visiting the dentist each year due to financial restrictions and often rely on emergency department (ED) physicians for the management of their acute dental complaints.[1] Painful dental problems typically seen in rural EDs include dental caries, trauma and abscesses.[2] Dental traumas, such as tooth fractures caused by sports-related injury, facial/intraoral trauma, or increased pressure to teeth with pre-existing dental caries, are often amenable to temporary filling performed by the emergency room physician (ERP) with timely follow-up with a dental professional.[3] That being said, many Canadian physicians do not feel adequately prepared to manage dental emergencies due to poor access to dental emergency supplies, lack of training and minimal dental emergency consultant support–especially in a rural setting.[4] The main goals of the ERP when treating a patient with a dental emergency include controlling pain, decreasing infection risk and preserving function.[5] This article provides simple guidelines for the management of dental fractures/fillings in the ED using the modified International Association of Dental Traumatology (IADT) description-based fracture classification system [Table 1].

ANATOMY

A clear understanding of dental anatomy plays a significant role in the appropriate management of dental emergencies. Dental tissues described from most external to internal include [Figure 1]:[7]

1. Enamel: White calcified protective external surface
2. Dentin: Majority of tooth tissue, provides support for enamel and periodontal ligament insertion
3. Cementum: Very thin layer that protects the roots of the tooth
4. Pulp: Connective tissue containing neurovascular supply.

Dental caries and fractures tend to impact the enamel and dentin and lesions are only considered emergent when the pulp is affected. [9]

Modified international association of dental traumatology description-based classification system

The 2012 IADT guidelines outline 9 types of dental fractures with complex diagnostic and management recommendations.[10] In 2016, Chauhan *et al.* published modified

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Table 1: Summary of dental fractures using a descriptive injury system modified from the international association of dental traumatology guidelines

Injury type	Description	Management
Infarction [Figure 1: A]	Incomplete fracture of the enamel (crack). Not sensitive to temperature stimuli	File with emery board
Uncomplicated crown fracture [Figure 1: B]	Fracture of dentin and/or enamel without pulp exposure. Sensitive to temperature stimuli	Enamel only: File with emery board Enamel + dentin: File + fill with temporary cement (CaOH/ZnO) or 2-octyl cyanoacrylate (dermabond™)
Complicated crown fracture [Figure 1: F]	Fracture of dentin and enamel with pulp exposure. Pulp involvement is typically demonstrated by the presence of blood. Sensitive to temperature stimuli	File+fill with temporary cement (CaOH/ZnO) or 2-octyl cyanoacrylate
Uncomplicated crown-root fracture [Figure 1: G]	Fracture of enamel, dentin and cementum without pulp exposure. Painful and tender to palpation/ temperature stimuli	File + fill with temporary cement (CaOH/ZnO) or 2-octyl cyanoacrylate
Complicated crown-root fracture [Figure 1: H]	Fracture of enamel, dentin and cementum with pulp exposure. Pulp involvement is typically demonstrated by the presence of blood. Painful and tender to palpation/temperature stimuli	Pulp capping (CaOH/ZnO)/partial pulpotomy

In all cases, ensure appropriate pain management and consider tetanus immunization administration[6]

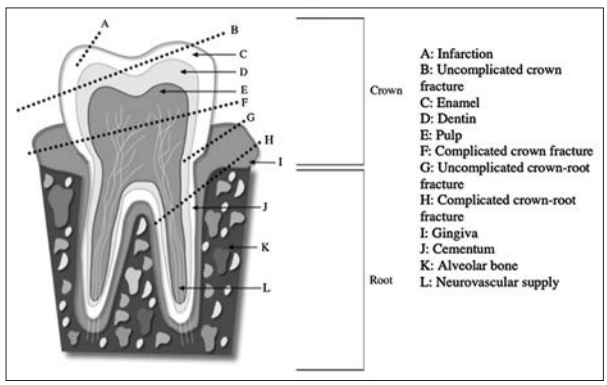

Figure 1: Dental anatomy including modified International Association of Dental Traumatology classification system. Based on Encyclopædia Britannica, Inc. [8]

IADT description-based guidelines simplifying the diagnosis and management of dental traumas[11] as described in [Table 1 and Figure 1].

If tooth mobility is noted on examination a temporary splint using 2-octyl cyanoacrylate + foil or metal nasal bridge from the mask can be applied as described below

Tetanus prophylaxis

Tetanus status should be determined, and prophylaxis should be considered for patients with dirty lacerations in the area surrounding the affected tooth.[12]

Considerations[13]

- Assess for associated injuries to the surrounding structures (mandible, facial bones, neck, etc.)
- Recognise situation as an opportunity to provide a tetanus shot
- Recognise patients with increased risk for aspiration: intoxicated, altered mental status, decline in functional capacity, significant facial trauma[14]
- Recognise signs of intimate partner/child abuse
- Arrange follow-up with a dental professional as soon as possible.

When to image

The treatment of most dental emergencies is not changed by the information provided by radiographs.[15] X-rays (chest and facial views) or ultrasonography should be considered if a tooth fragment is missing and there are concerns about fragment aspiration or lodging in the surrounding mucosa.[13] If a tooth fragment is located below the diaphragm on X-ray, there is no need to remove it; however, if it is located in a bronchus or the oesophagus, removal is

necessary through bronchoscopy or endoscopy. [16] If there are concerns about facial bone trauma such as a mandibular fracture, or further assessment of dentition is required, a panoramic radiograph/orthopantomogram, limited facial series X-ray and/or a skull X-ray (Townes view) are recommended, if available. [15]

Pain management

Depending on the type of fracture and the patient's level of comfort, a dental block may be required for adequate pain management. [13] If the affected tooth is located in the maxillary (upper) region, a supraperiosteal/infiltration block can be performed to directly target the individual tooth. If the affected tooth is located in the mandibular (lower) region, an inferior alveolar nerve block should be considered. In both scenarios, a mixture of lidocaine 1%–2% with epinephrine and bupivicaine is recommended. The total period of pain relief with using this combination is approximately 8 h. Contraindications for these procedures include an allergy to the anaesthetic being used, cardiac congenital abnormalities and an infected injection site. [17]

Refer to these videos for further instructions

i. Supraperiosteal/infiltration block: https://www.youtube.com/watch?v = jNAQUSqfK1A[18]
ii. Inferior alveolar nerve block: procedural explanation starts at 3:30 https://www.youtube.com/watch?v=4-7WvBxQWn8[19] or at 0:15 https://www.youtube.com/watch?v=r-ZucSksS07w[20]

Temporary filling materials

Temporary filling materials such as calcium hydroxide (CaOH) and zinc oxide (ZnO) are commonly used for the repair of dental traumas due to their antibacterial, antifungal and remineralisation properties. [21] They are also relatively inexpensive, simple to use and provide a smooth surface to prevent damage to the tissues surrounding the affected tooth. In Canada, 3M Cavit G temporary filling material (or equivalent) is available from dental supply houses such as *Frontier Dental* or *Patterson Dental*.

Procedures

Equipment required for most standard dental procedures

- Gloves and appropriate personal protective equipment
- Headlamp for adequate visualisation
- Normal saline/water for cleansing/irrigation
- Gauze to create a bite block
- Local anaesthesia (lidocaine 1%–2% with epinephrine and bupivicaine)
- Five mL syringe and 25 gauge (or smaller) 1.5 inch-long needle
- Temporary filling material (CaOH, Dycal™) or ZnO
- Mixing board or any sterile flat surface (round bowl, kidney basin, metal tray)
- Stainless steel spatula or metal tissue forceps or a scalpel handle
- Aluminium foil
- Suction catheter and tubing.

Equipment required for dental procedures mentioned below

- 2-Octyl Cyanoacrylate (2-OCA)
- Oxygen mask or N95 respirator
- Bone file or grip on a set of tissue forceps
- One percentage or 2% lidocaine with epinephrine and bupivacaine (mix 1:1).

GENERAL RECOMMENDATIONS

- Palpate the affected tooth and surrounding areas to assess for tooth and/or tooth fragment mobility[22]
- Once the tooth fragment is accounted for, preserve the fragment in either 50% dextrose, egg white, or saliva, as it can potentially be reattached[23]
- Instruct the patient to hold suction to the area surrounding the affected tooth to ensure that the tooth remains dry enough to allow the proper adhesion of the temporary reparative materials[24]
- If an object, for instance a gloved finger, gauze or equipment, becomes adhered to the patient's wound, apply pressure to the patient's skin adjacent to the edge of the object and gently roll the object away. [25] To avoid

unintentional adhesion to the patient's wound, use instruments such as a scalpel handle and wear 2 pairs of gloves in order to remove the top glove if it becomes stuck.

The use of 2-octyl cyanoacrylate or temporary filling material (calcium hydroxide/ zinc oxide) to protect pulp and manage pain [Figure 2a and b]

Using 2-octyl cyanoacrylate

Procedure[24]

1. Cleanse tooth, tooth fragment and surrounding areas with normal saline/water-soaked gauze
2. Dry tooth and surrounding area with gauze and allow patient to suction excess fluids from their mouth
3. Coat the lesion and associated tooth with 2-OCA to cover exposed dentin/pulp
4. If able, reattach tooth fragment by applying 2-OCA to both the fragment and the associated tooth, then push them together for approximately 20 s
5. Coat the area (tooth + reattached fragment) with 2-OCA
6. Roll up a piece of gauze to create a bite block and position it away from the affected tooth
7. Instruct patient to lightly bite down on gauze roll to prevent patient from disrupting the 2-OCA
8. Allow 2-OCA to dry for approximately 10 min.

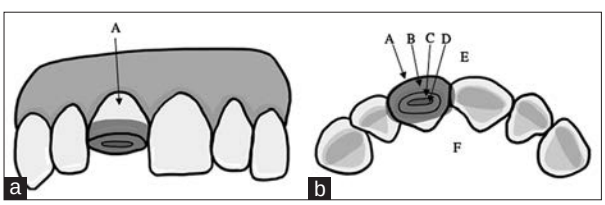

Figure 2: (a) Front view of a complicated fracture of the maxillary right central incisor with pulp involvement repair with 2-Octyl Cyanoacrylate or temporary filling material. Based on Dental Care Professionals.[26] (b) Upper occlusal view of a complicated fracture of the maxillary right central incisor with pulp involvement repair with 2-Octyl Cyanoacrylate or temporary filling material. Based on Bunkerhill Dentistry.[27] A: Maxillary right central incisor, B: Enamel, C: Dentin, D: Pulp, E: Labial/Buccal surface, F: Lingual/palatal surface

Using calcium hydroxide or zinc oxide

Procedure[28]

1. Cleanse tooth, tooth fragment and surrounding areas with normal saline/ water-soaked gauze
2. On a mixing board, mix equal parts of the catalyst (if available) and base using a spatula for approximately 20–40 s (until mixture thickens)
   - The amount of mixture prepared should be enough to cover the entire lesion
3. Dry tooth and surrounding area with gauze and allow patient to suction excess fluids from their mouth
4. Scoop up mixture using the flat blade of the spatula and apply it to the dental lesion using the spatula to cover the exposed dentin and pulp. Remove excess filling material to ensure appropriate shape and rounded edges
5. Roll up a piece of gauze to create a bite block and position it away from the affected tooth
6. Instruct patient to lightly bite down on gauze roll to prevent patient from disrupting the temporary filling material
7. Allow cement to dry for approximately 10–15 min.

Create temporary flexible bridge/splint — to be used in scenarios where the tooth is not only fractured, but also mobile within the socket[29] [Figure 3a and 3b]

Procedure[29]

1. Cleanse tooth and surrounding areas with normal saline/water-soaked gauze
2. Dry tooth and surrounding area with gauze and allow patient to suction excess fluids from their mouth
3. Apply 2-OCA to either edge of the affected tooth and the gingiva in order to adhere the affected tooth to the surrounding teeth
4. Remove the metal nasal bridge from a N95 respirator or oxygen mask
5. Measure and cut the metal nasal bridge to the desired size (long enough to cover one or more teeth on either side of the affected tooth)
6. Round the edges of the metal nasal bridge using a bone file to prevent further injury

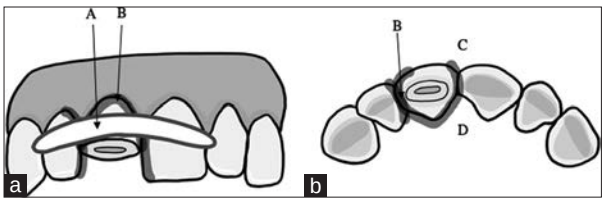

Figure 3: (a) Front view of a complicated fracture of the maxillary right central incisor with pulp involvement repair demonstrating 2-octyl cyanoacrylate and a metal nasal bridge splint application. Based on Rosenberg.[29] (b) Upper occlusal view of a complicated fracture of the maxillary right central incisor with pulp involvement repair demonstrating 2-octyl cyanoacrylate and a metal nasal bridge splint application. Based on Bunkerhill Dentistry.[27] A: Metal nasal bridge splint to upper labial/buccal surface, B: 2-Octyl cyanoacrylate, C: Labial/buccal surface, D: Lingual/palatal surface

7. Apply 2-OCA to the metal nasal bridge, affected tooth and the neighbouring teeth
8. Adhere the bridge to the affected and neighbouring teeth
9. Hold splint under pressure for approximately 1 min.

The splint can be applied to either the lingual/palatal (inner) surface or the labial/buccal (outer) surface, depending on the location of the injury and the patient's occlusion. If the injury is to the upper teeth and the patient's occlusion is normal, or the injury is to the lower teeth, a splint applied to the lingual/palatal surface is preferred. If the injury is to the upper teeth and the patient's occlusion is tight, a splint applied to the labial/buccal surface would prevent increased pressure to the splint from further damaging the patient's dentition.

CONCLUSION

Initial management of dental fractures can be successfully accomplished in a rural ED or clinic environment using equipment commonly found in a community setting. The previously described procedures provide temporary relief but it is essential that a prompt follow up with a dental professional is scheduled.

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Conflicts of interest: There are no conflicts of interest.

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Business as usual

Kyle William Carter, MD, CCFP(EM)

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This article has been peer reviewed.

My heart sinks as I read the admission history and physical dictated on Mr. F that morning. He was admitted under my care yesterday evening by one of the physicians within my group who has an interest in palliative care. He is under my care for the next 2 weeks awaiting medical assistance in dying (MAID). I do not know why I have a sense of uneasiness and apprehension to care for Mr. F, but I avoid visiting his room until all my other patients have been seen, the nurse's issues have been addressed and I have spent some time teaching the junior residents for the morning.

When I first enter Mr. F's room, he does not appear as I had envisioned in my mind – a man awaiting his death due to agony or suffering. He appears quite well, pleasant and even happy. He is lying in his hospital bed wearing the hospital-required gown. His hair is clean and he is shaven. I notice no evidence of disease, cachexia, wasting, malodour or jaundice. I introduce myself and explain my role as his physician while he is here in the hospital. His handshake is strong and direct. We discuss his cancer that has spread from his prostate to his spine, lungs and liver. His goal is to have no pain and experience no suffering.

'I'm ready to die, can we just get on with it', he says, without missing a step. I can feel the tension in my back as we discuss the process of MAID. I explain that I do not participate in the actual process, but his palliative care physician has made the referral and that there is a 14-day waiting period before the procedure. 'So, you'll keep an eye on me until its time to go eh?', he says. I agree.

Each morning for the next 14 days, I visit Mr. F. He has no complaints during those weeks. I see him up walking in his room, grooming himself and visiting with friends. His spirits always seem high. He very rarely complains of anything, pain, dyspnoea or anxiety. He leaves me with nothing to do and nothing to treat. I am left with the conversation about the world and specifically his life. I wish he had something to treat, something else to focus on or something that helps me understand this part of his life, awaiting death.

What I do learn is that he was never married and has no siblings. He became close with his neighbour over the years who had three kids. His passion was farming and flying. He was the 'cool uncle' to his neighbours' children. 'They would run down the road after school and visit him. Thirty minutes later, the parents would hear the sound of his airplane overhead and knew that he was up there with at least one of the kids.' I learned that he travelled all over the world in a small

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single-engine airplane, including the West coast of Canada and Central America.

On the morning of his 14th day, I do my rounds as usual. It is a Saturday and the hospital is full. I go in to see Mr. F. I realise that over the weeks, I have really gotten to know him, what his life is about, how he views himself and how he views death. However, I have not obtained clarity regarding his wish to die. This is the dilemma that physicians face caring for those who suffer when suffering is individual. I spend some time with him. I say goodbye. He is alone.

An hour later, I see a physician doing paperwork at the physician's desk. I do not know him but know the physician who completed the MAID travelled from the nearby tertiary centre. I am struck by the business-like regard that this strange physician has completing the paperwork. I realise Mr. F has just died. The medical world has not slowed to reflect or acknowledge the passing of this patient. Nurses continue to nurse, patients continue to be ill and the doctors continue to doctor. I, however, feel the loss of this patient. I question the practice of ending the life of a man who had no external signs of suffering. The stoical do not suffer less and what role should physicians play in judging another's struggle? I contemplate my lack of ability to find or understand his internal suffering. I question the role physicians should play in this and what role I have played in Mr. F's death. I have been left with questions.

Financial support and sponsorship: Nil.

Conflicts of interest: There are no conflicts of interest.

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Intravenous iron therapy in a rural hospital

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Dear Editor,

We would like to share our ideas on the publication, 'Intravenous iron therapy in a rural hospital: A retrospective chart review'.[1] Kattini et al. concluded that *'we recommend iron maltoside for efficient intravenous iron replacement in non-pregnant patients and single or multiple doses of 200 mg iron sucrose during pregnancy'*.[1] In our setting in rural Asia, anaemia is common and iron supplementation is routinely used for the management of the problem. However, intravenous iron therapy is rarely used. In our area, anaemia in pregnancy is complex. The anaemia might be due to iron deficiency disorder or inherited haemoglobin disorder (such as thalassaemia).[2,3] In some cases, both iron deficiency disorder or inherited haemoglobin disorder cause anaemia. In these cases, the iron therapy is very hard since the patient usually has a trend of developing haemochromatosis due to inherited haemoglobin disorder. The oral iron supplementary is more preferable, and it is easier to monitor the pregnant patient than using intravenous therapy. In addition, it is necessary to rule out co-existence between iron deficiency anaemia and inherited haemoglobin disorder before starting iron therapy.

Financial support and sponsorship: Nil.

Conflicts of interest: There are no conflicts of interest.

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RESPONSE

The purpose of our study was to identify the clinical options for providing intravenous iron therapy when indicated. Participants were

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predominantly preoperative patients or women near the end of their pregnancy, patients for whom the limited time frame prompted a consideration of intravenous therapy.

The profile of anaemia was beyond the scope of our study, but we will respond to the authors' clinically relevant comments. In our setting, microcytic anaemia likely reflects iron deficiency anaemia (IDA). The prevalence of IDA in Indigenous women of child-bearing age in Canada has been documented as high as 23%. [1,2] Other causes of microcytic anaemia: chronic disease, thalassaemia, and sideroblastic anaemia can be ruled out with the measurement of serum ferritin, iron concentration, transferrin saturation and iron-binding capacity. Deciding on who requires iron replacement therapy will always be an individualised clinical decision and will be context and patient dependent.

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Sioux Lookout, ON, Canada

Erratum: The occasional maternal cardiac arrest

In the article titled The occasional maternal cardiac arrest, published on pages 128-33, Issue 3, Volume 26 in Canadian Journal of Rural Medicine[1], the term HYPERmagnesaemia was misspelled as Hypomagnesaemia on page 130, Table 2, left column, 2nd row of content, under table column heading Aetiology.

The correct word should be read as HYPERmagnesaemia

REFERENCE

1. Jakubow AN. The occasional maternal cardiac arrest. Can J Rural Med 2021;26:128-33.

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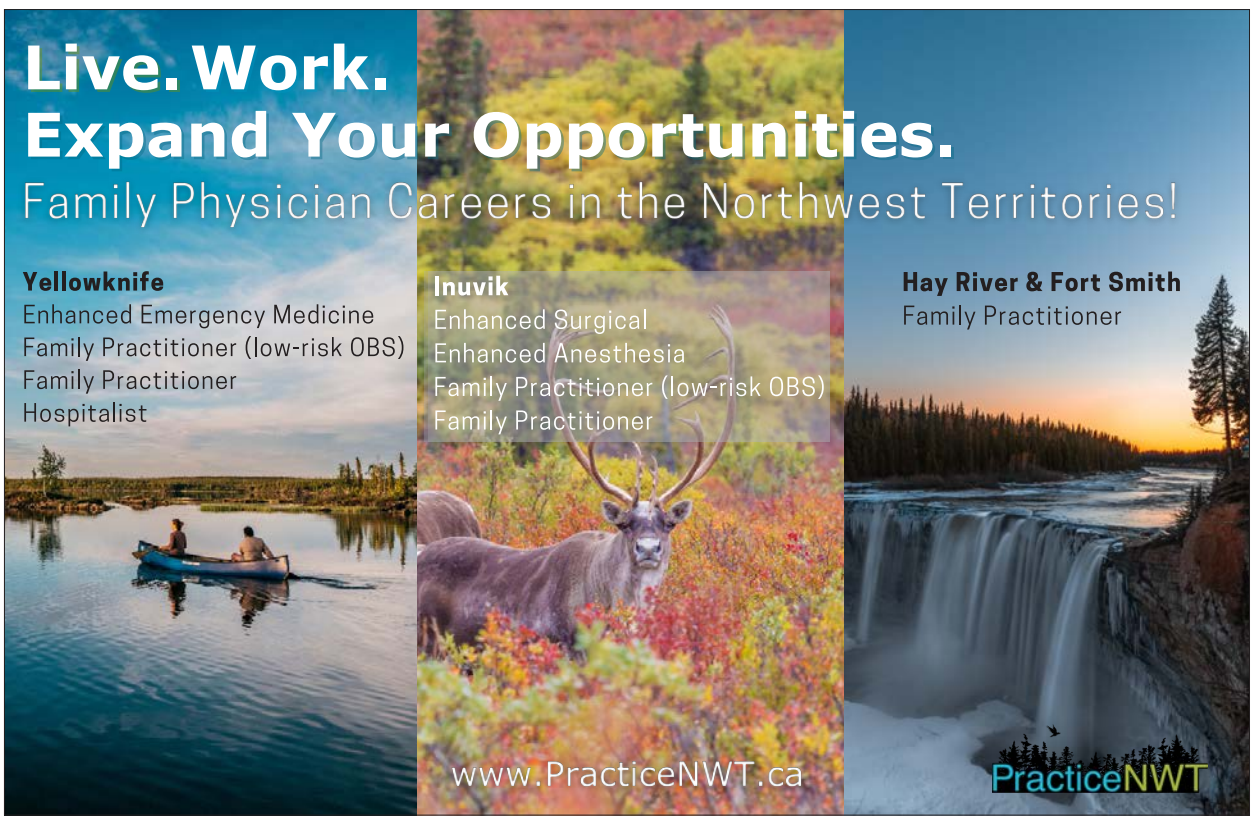

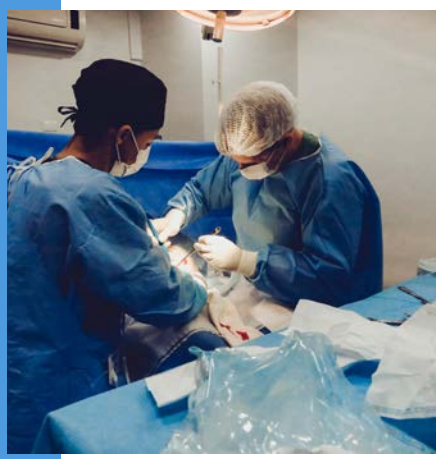

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The Weeneebayko ("Two Bays" - James Bay and Hudson's Bay) Area Health Authority (WAHA) provides all facets of medical care within 6 predominantly First Nation's communities along the west coast James Bay and Hudson's Bay. Population served—12,000

Moose Factory, Moosonee, Fort Albany, Kashechewan, Attawapiskat and Peawanuck

Position: Full-time permanent family practitioner with ER/OB experience

Weeneebayko Area Health Authority
19 Hospital Drive, P.O. Box 664,
Moose Factory, ON

For more information contact:
Jaime Kapashesit
Physician Services Coordinator
jaime.kapashesit@waha.ca
705 658-4544 ext. 2237

Skills Requirement: Must hold a medical degree and be licensed or eligible for licensure through the College of Physicians and Surgeons of Ontario

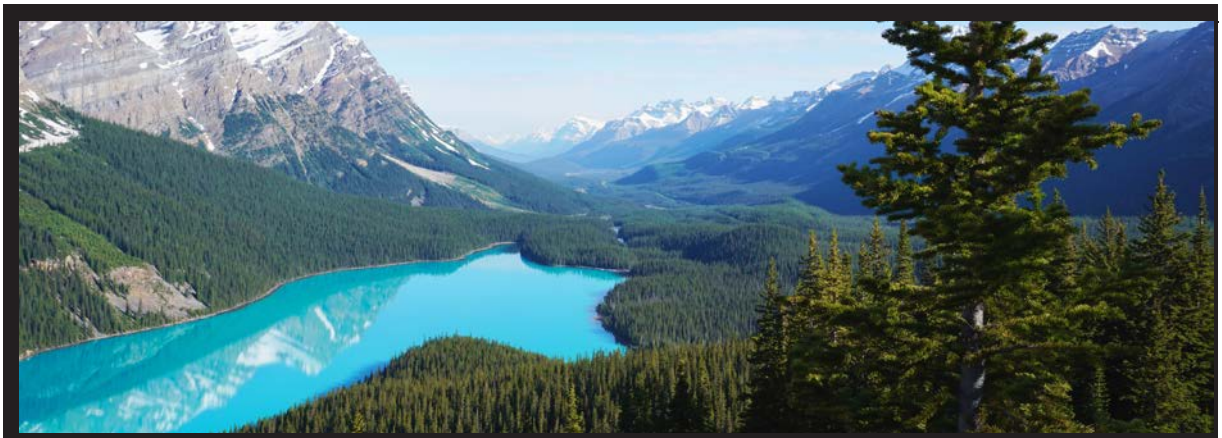
Language of work: English

Remuneration:

- Generous compensation package with yearly travel allowance and remote medicine funding bonuses
- Housing in Moose Factory provided with all amenities included

Job Duties

- Examine patients and take their histories, order laboratory tests, X-rays and other diagnostic procedures and consult with other medical practitioners to evaluate patients' physical and mental health
- Prescribe and administer medications and treatments
- Provide acute care management
- Advise patients on health care including health promotion, disease, illness and accident prevention
- Coordinate and manage primary care to remote First Nations communities
- Faculty appointment at Queen's, NOSM, U of T, U of O, with a well developed teaching practice program
- Become a member of a multidisciplinary team with full-time surgical and Anaesthesia



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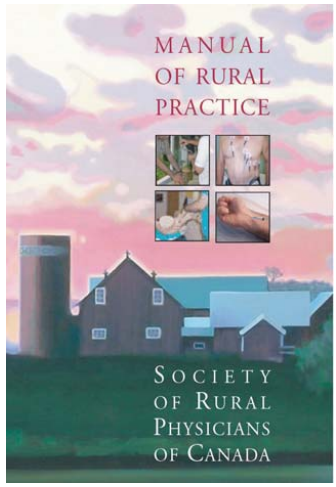
Manual of Rural Practice – The Second Printing

A text for all seasons

The Manual of Rural Practice is written for rural doctors, by rural doctors who understand the context of rural practice in which we are called upon to do a wide variety of procedures. These procedures can sometimes be lifesaving, and occasionally are required in stressful, difficult and isolated conditions. The Manual of Rural Practice provides clear practical directions for 40 rural practice procedures, ranging from rapid sequence intubation to ingrown toenail removal, with more than 320 illustrations. The articles are adapted in part from the "Occasional" series, published regularly in the Canadian Journal of Rural Medicine. The book is divided into 6 sections:

- Airway (e.g., management, laryngeal mask airway)
- Cardiac/Pulmonary (e.g., arterial lines, chest tube insertion, cardioversion)
- Nervous system (e.g., lumbar puncture, Bier block)
- Integument (e.g., extensor tendon repair, fishhook removal, breast cyst aspiration)
- Musculoskeletal (e.g., Colles' fracture, casting, knee aspiration)
- Genitourinary/Maternity (e.g., shoulder dystocia, suprapubic catheterization)



The format for each procedure is quick and easy to grasp, starting with an equipment list, step-by-step instructions and ending with a procedure summary. The text is clearly written, and the illustrations are helpful.

This book is especially recommended for both practising rural doctors and rural doctors in training. Every rural hospital and training program should make a copy easily accessible. Rural doctors will also find the equipment lists (there is even an appendix that details part numbers and suppliers) valuable in ensuring that their hospital and clinic procedure rooms have the required equipment readily available when needed.

Edited by P. Hutten-Czapski, G. Magee and J. Wootton. November 2006. Society of Rural Physicians of Canada.
Hardcover, 280 pp. Illust. ISBN 10: 0-9781620-0-5.

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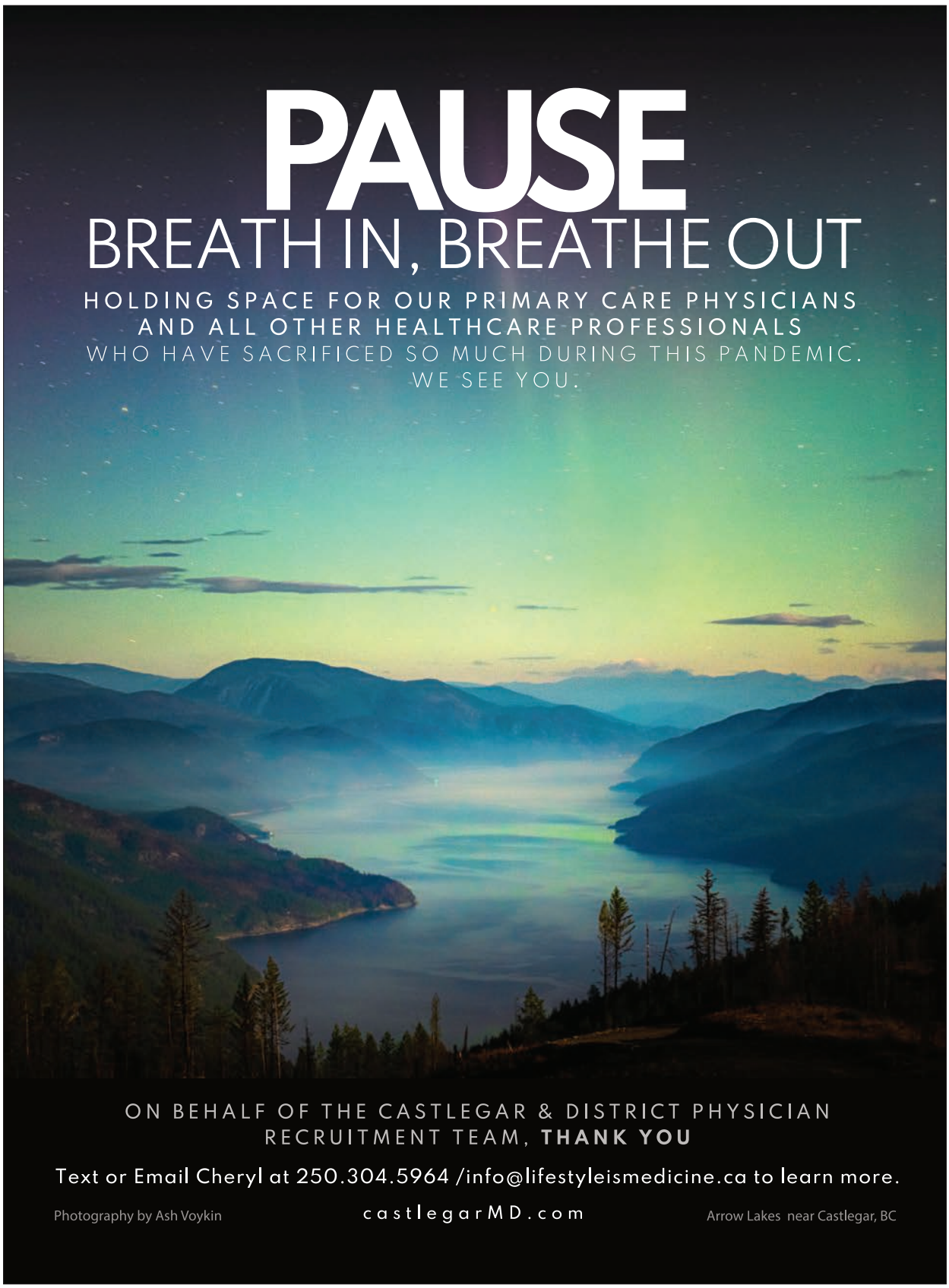
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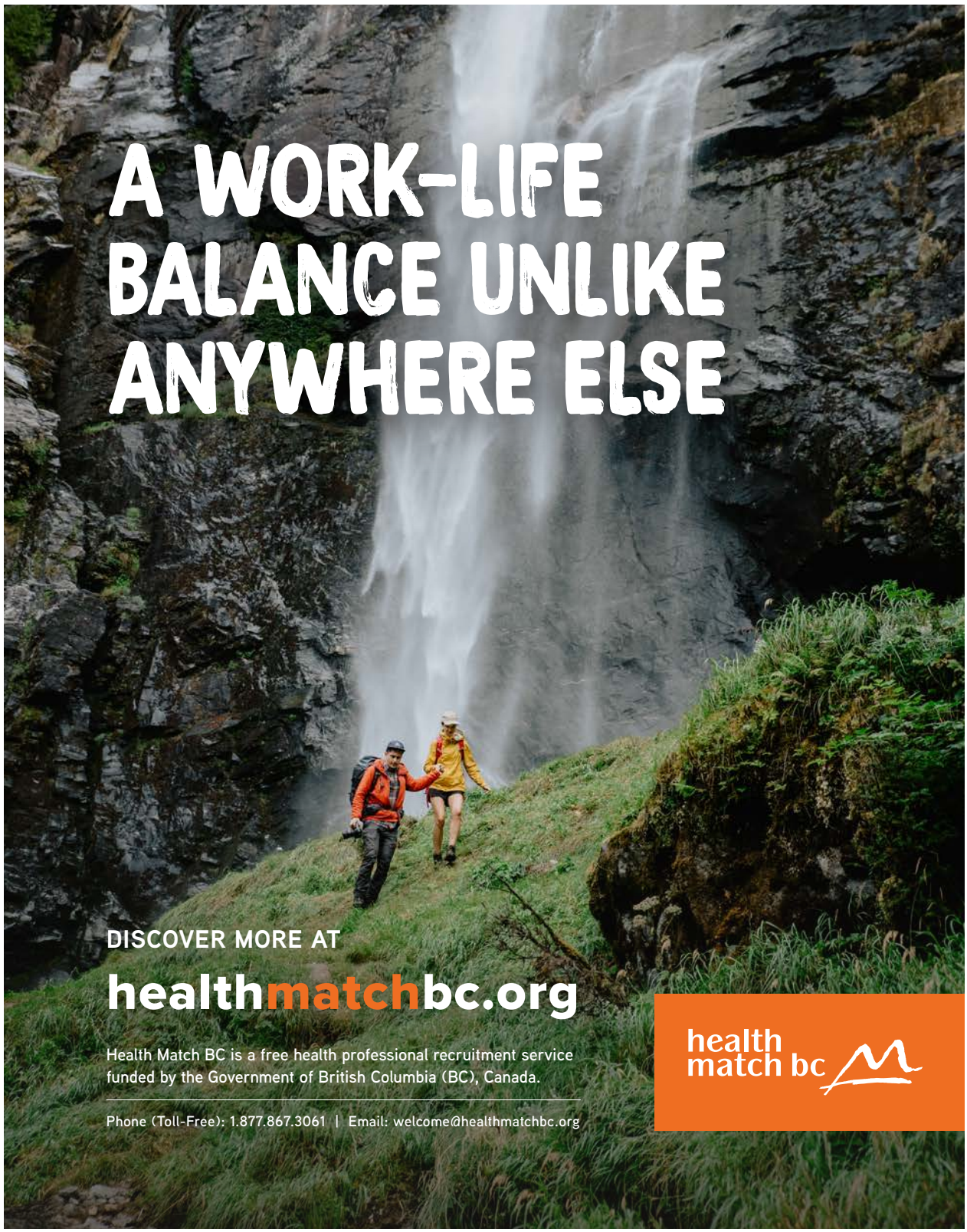
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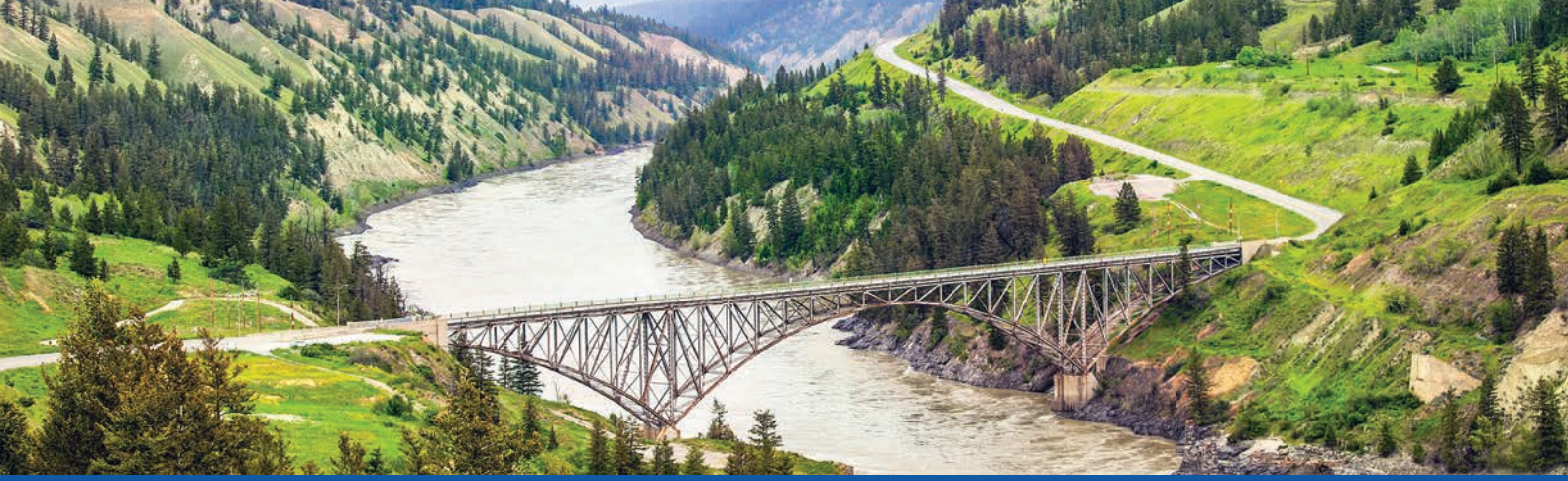

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