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.

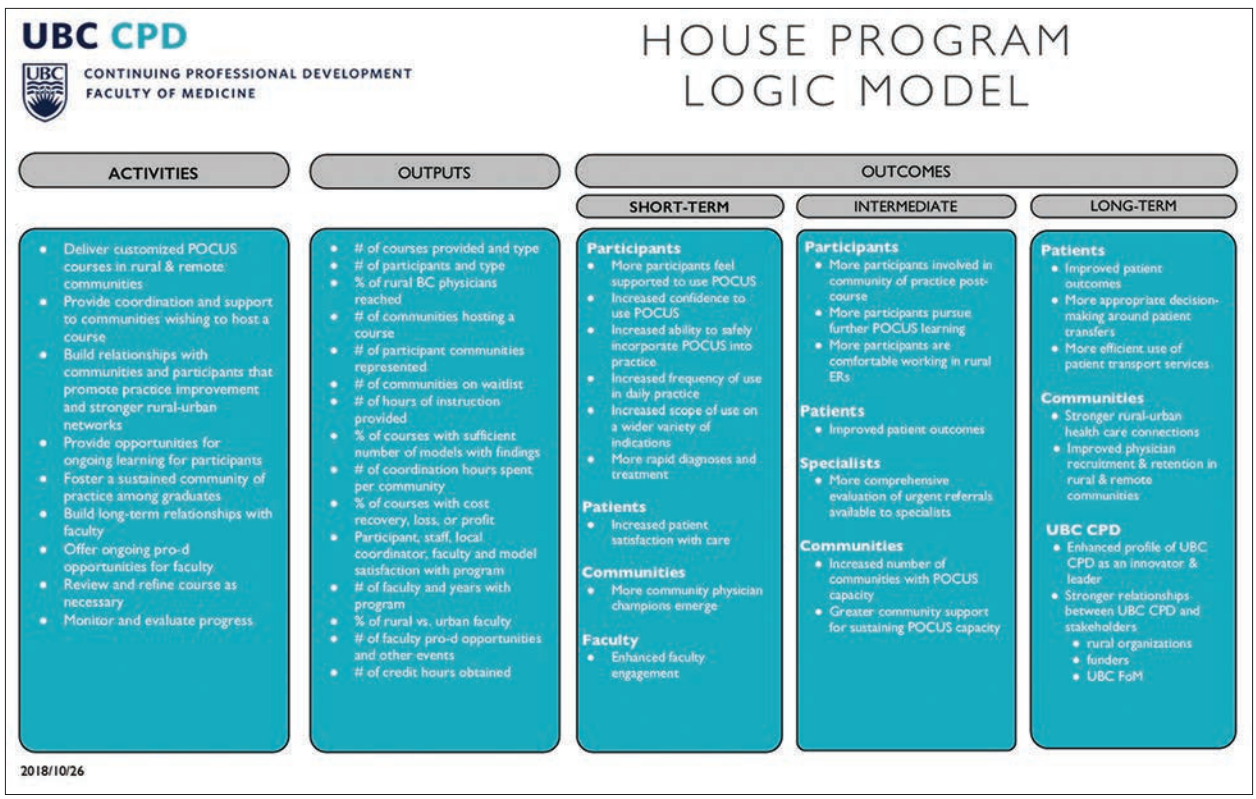


Figure 1: Hands-On Ultrasound Education logic model.

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.
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