Orlando *et al.*
Health Research Policy and Systems (2025) 23:44
https://doi.org/10.1186/s12961-025-01318-8

Health Research Policy and Systems

RESEARCH

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Increasing research capacity in Canadian community hospitals: an intrinsic descriptive case study

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Abstract

Background Canada's clinical research landscape is limited by minimal community hospital engagement. However, research participation in community hospitals may increase the speed of trial enrolment, enhance the generalizability of results and accelerate knowledge translation to community hospitals, where most Canadians receive care. Two identified barriers to community hospital participation are limited financial support and a lack of research mentorship.

Methods This study is an intrinsic descriptive case study describing the impact of 1 year of research funding from the Canadian Critical Care Trials Group (CCCTG) and creation of a community of practice on research participation in 19 community hospitals. Thematic analysis was used to systematically identify themes from semistructured interviews and documents.

Results A total of nine individuals (physician research lead, $n=7$; research staff, $n=2$) participated in semistructured interviews between April and September 2023. Community of practice meeting minutes ($n=7$), emails ($n=22$), status reports ($n=21$) and field notes ($n=7$) were analysed alongside interview transcripts. Funding enabled community hospitals to hire research staff, sustain research programs, increase the number of clinical trials they were running and develop research policies. The community of practice facilitated reciprocal learning and networking that positively impacted research programs and produced a tangible output: a toolkit to help community hospitals build clinical research programs. Contextual influences on community hospital research activities were identified as: (1) system characteristics, (2) clinical trial design, (3) local context and (4) individual characteristics.

Conclusions The perception of participants was that the CCCTG funding and community of practice positively influenced research activities in community hospitals. Lessons learned include the need to: (1) leverage the power of connections among community hospitals to expand linkages, enabling further knowledge transfer, (2) work with trialists on clinical trial design to facilitate implementation and (3) create resources to support community hospitals with building and sustaining research programs, including resources to foster engagement in hospitals without historic research participation. Our findings highlight the importance of context, including local populations, organizational research culture, provincial health systems and research funding structures, which need to be considered during research program implementation.

Keywords Research capacity, Community hospitals, Clinical trials, Research infrastructure, Community of practice

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Background

The coronavirus disease 2019 (COVID-19) pandemic has brought attention to longstanding limitations within Canada's clinical research landscape. In Canada, hospitals are broadly classified as academic (teaching) or community (nonteaching) hospitals, the latter of which represent over 90% of the 602 hospitals in Canada [1]. While academic hospitals have a mandate for research and medical education, community hospitals do not have such mandates and are primarily focused on patient care [2]. The Canadian clinical research landscape is limited by this minimal engagement of community hospitals in research [3–5], despite the fact that these hospitals provide care for most of the Canadian population. To illustrate this shortcoming, in Ontario, the most populous Canadian province, during the first three waves of the pandemic, over 70% of critically ill COVID-19 patients in Ontario were cared for in community hospitals [6, 7]. Yet, only a small proportion of these hospitals were participating in COVID-19 research [8]. For example, the Canadian Treatments for COVID-19 (CATCO) trial only recruited patients from 22 community hospitals in Canada [9], representing 4% of community hospitals. In contrast, the United Kingdom's Randomized Evaluation of COVID-19 Therapy (RECOVERY) trial recruited in 80% of National Health Service hospital systems, a scope that included many community hospital sites [10]. Because of widespread enrolment into the trial, RECOVERY was the first to show that corticosteroids could improve outcomes from COVID-19 and that hydroxychloroquine [11] and lopinavir–ritonavir were not beneficial [12]. This case illustrates how widespread hospital participation in research in the United Kingdom, including at community hospitals, increased the speed of enrolment, trial completion and identification of clinical practice change. This highlights the importance of increasing clinical research capacity in Canadian hospitals, including community hospitals, as a means to improve the generalizability of study results and the speed of trial completion and to enhance equitable access to novel therapies by ensuring more of the population is able to participate in clinical research.

Although community hospitals in Canada have not traditionally participated in clinical research, there is substantial interest in research reported among community hospital professionals [8]. Prior research has shown that many new graduates working in community hospital intensive care units (ICUs) have formal research training and may also have university affiliations owing to the role of community hospitals in distributed medical education [13]. However, there are many barriers to starting and sustaining research programs in community ICUs, including a lack of preexisting research infrastructure, a lack of start-up funding and a lack of trained research staff [8, 14].

In 2021, the Canadian Critical Care Trials Group (CCCTG) received funding from the Canadian Institutes of Health Research (CIHR) to create the COVID-19 Network of Clinical Trials Networks (NoN), now known as the CCCTG NoN, with a mandate to speed up COVID-19 research and create a durable infrastructure for clinical trials in acute and critical care [15]. Recognizing the important role of community hospitals in hastening the identification of new knowledge on COVID-19 through their participation in research, in 2023, the CCCTG NoN created the Community Acute and Critical Care Community of Practice (CACC COP) to represent community hospitals. Furthermore, the CCCTG NoN provided 60 Canadian hospitals, including 19 community hospitals, with financial support to help build and/or sustain their clinical research programs. At the start of the study period, 14 community hospitals were offered funding. At the end of the study period, 19 community hospitals had been offered funding.

The CCCTG NoN is focused on increasing research capacity and activity in community hospitals across Canada through the establishment of the CACC COP, the development of research tools and other support mechanisms and financial investment. Given the previous identification of limited financial support [8, 14] and lack of research mentorship [8, 14] as barriers to community hospital participation, this study sought to understand the impact of providing these resources to community hospitals through the actions of the CCCTG NoN.

Methods

The purpose of this case study was to describe the impact of the CCCTG NoN funding and CACC COP on research capacity and activities in the CCCTG NoN-funded community hospitals over a 1 year period in 2023. The secondary objectives were: (i) to identify the lessons learned that will help focus future efforts to support research activities in Canadian community hospitals and (ii) to understand the contextual factors influencing the CACC COP and community hospital research programs.

Study design

We used an intrinsic descriptive case study methodology to investigate the phenomenon of the CCCTG NoN, including the CACC COP, within its real-life context, making a concerted effort to understand the contextual factors influencing the group, its activities and how CCCTG NoN funding was used [16, 17]. The case was bound as the social group of the CCCTG NoN, including the CACC COP. The case was also bound by time over a 1 year period.

Data collection

Data were collected from multiple text sources including meeting minutes, emails, status reports and field notes as well as through semistructured interviews with physician research leads and research staff of CCCTG NoN-funded community hospitals. We used a convenience sampling technique in an effort to maximize participation in the individual interviews. A neutral representative of the CCCTG NoN used electronic correspondence to invite all physician research leads and research coordinators of CCCTG NoN-funded sites to participate in an interview. The primary researcher (E.O.) conducted all interviews virtually using a semistructured interview guide that was pilot tested at the primary researcher's home institution to assess duration and structure. The interview guide is available as a supplemental file. Interviews were conducted, recorded and transcribed using Microsoft Teams. The interviews lasted between 38 and 59 min. Field notes were collected by the primary researcher during CACC COP working group meetings and during individual interviews.

Data analysis

Data were analysed using thematic analysis, which provides a systematic method for identifying themes from qualitative data generated from multiple sources [18]. Initial coding of the data included an inductive, data-driven coding process to systematically note features of interest across all datasets. Codes were then aggregated into larger groups of themes. Themes were then reviewed to ensure detailed codes were accurately represented. A thematic map was created as a visual depiction of the relationships between codes and themes. The entire study team then reviewed the thematic map to refine the themes and relationships among the codes; discussion occurred about the rationale for focusing on certain codes and how the codes influenced the themes. This occurred until there was consensus among the team.

The final step in data analysis was to refine the themes through a two-step process. The first stage was to review all codes within a theme to ensure consistency and internal homogeneity [19]. This verifies that all codes within a theme represent the same phenomena of interest. The second stage is a validity check of the themes relative to the entire dataset, which helps to establish external heterogeneity [20]. Data coding and analysis were managed within qualitative data management software NViVo 14 [21].

Ethical and confidentiality considerations

There are important ethical and confidentiality considerations to acknowledge given the primary researcher (E.O.) and coauthors (A.B. and J.T.) were situated within the case as members of the CCCTG NoN and CACC COP. Additionally, at the time of the study, E.O. was a postdoctoral fellow with the CCCTG NoN. According to Langley and Royer [19], case study methods have their foundation in the belief that knowledge and data are best when the researcher is close to the participants and data. This can create situations in which the researcher has more in-depth knowledge or understanding about certain individuals; however, it can also create the potential for vulnerability among participants. To address this, participants in the case are given the opportunity to decide whether to participate in the interview portion of the inquiry. In this study, we used a written informed consent process for the individual interviews, thereby providing members of the group with the opportunity to decline participation in an individual interview. Participants who consented to an interview were advised of their ability to withdraw from the study up until 2 weeks after the interview was conducted. This study was approved by the Hamilton Integrated Research Ethics Board (no. 15749). This study was reported in accordance with the consolidated criteria for reporting qualitative research (COREQ) guidelines (Supplementary Material File 2) [22].

Results

Data analysed included CACC COP meeting minutes ($n=7$), emails ($n=22$), status reports submitted to the CCCTG NoN ($n=21$), field notes ($n=7$) and semistructured interviews with physician research leads ($n=7$) and research staff ($n=2$) of CCCTG NoN-funded community hospitals. During the interview period, there were 14 funded hospitals, and therefore, 50% of physician research leads participated in the interviews. The number of research staff was not accounted for, and therefore, a proportion cannot be reported. All 19 funded hospitals were represented in the data collected. A thematic map was produced to depict the themes arising from the analysis, illustrating the interconnectivity between the themes and subthemes (Fig. 1). The colours of the subthemes are used to denote patterns within and across subthemes, reinforcing interconnectivity among important topics.

Impact of CCCTG NoN funding and the CACC COP

From the interviews and textual data sources, participants largely described the impact of the CCCTG NoN support as significant and positive for their research programs. The funding provided by the CCCTG NoN enabled community hospitals to hire new research staff, increase the number of active clinical trials and develop necessary supportive materials such

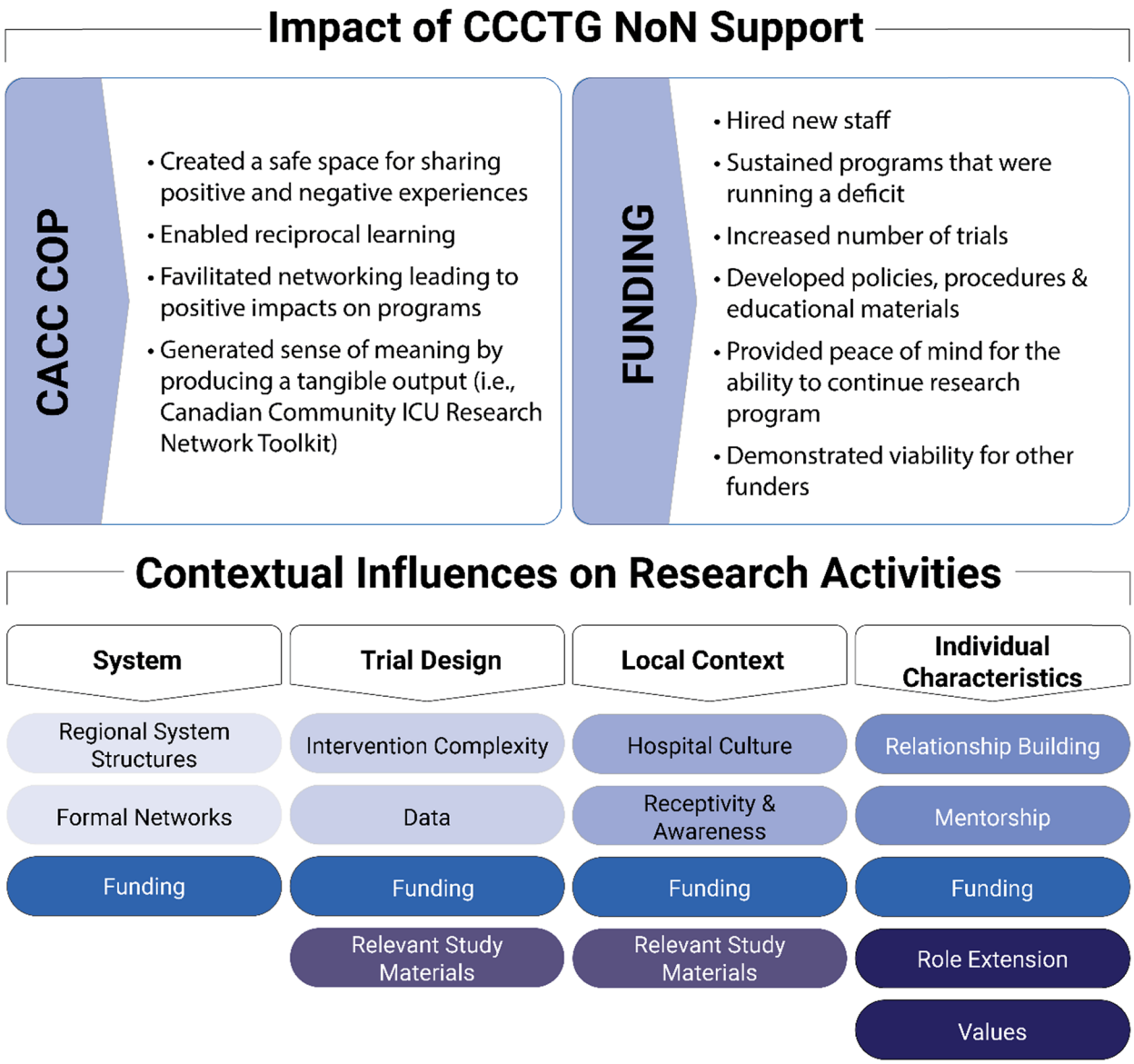

Fig. 1 Thematic map

as policies, procedures and educational materials. The funding also served to sustain programs that were otherwise in a financial deficit with participants using terms such as "a godsend" and "world of difference" to describe the impact of the funding on their program. For other research programs, it also provided peace of mind for the research teams to be able to focus on conducting research rather than trying to generate revenue from other sources to cover program expenses.

Several sites were able to use the CCCTG NoN funding to demonstrate research program viability to potential funders. This enabled the programs to generate additional funding from new sources, such as hospital foundations. Participant 6 described this:

> *"And so having the funding, probably the most important thing beyond having money to do research was that it showed our [hospital] foundation and other potential investors or grantors that we have some money in it. Basically, other people were supporting us too, and then that made them more comfortable contributing their own [funds]".*

Hospital B echoed a similar sentiment in their status report to the CCCTG NoN, indicating:

> *"These funds helped us showcase that research is important for patient care, organization visibility, as well as the unit and clinical team members as a way to remain engaged in a nonclinical role [...] As a result, [Provincial Health System B] has given us some small temporary funding that helps fund part of a research coordinator which at least helps".*

Hospital E also described how the increased research activities stimulated by the CCCTG NoN translated into the hospital committing financial support for human resources in the form of a dedicated research pharmacy technician.

The second component of the CCCTG NoN support was the creation of the CACC COP. Participants of the CACC COP reflected on how it provided a safe, comfortable space for sharing positive and negative experiences while generating opportunities for reciprocal learning about the successes and challenges of running a community hospital research program. This is described by Participant 1, reflecting "I think it's very exciting that we are doing something together as a team and everybody's growing and learning from everybody else's experience".

Furthermore, the CACC COP facilitated networking that some respondents described as positively impacting their research programs by being connected to new clinical trials and developing relationships as articulated by Participant 9, "So I think participating in different networks and different people [from the CACC COP] recommending our site as a good site for recruitment…I think really helped us".

Additionally, participants were enthusiastic about being part of a group that worked collectively to produce a tangible output (that is, the Community ICU Research Toolkit: A Guide to Building a Community Hospital Clinical Research Program [4, 23]) and were grateful for the opportunity to contribute to a project that may benefit other research programs. Many respondents reflected that other community hospitals could have benefited from participating in the CACC COP and suggested that the group consider how to create a broader reach and integrate community hospitals beyond the CCCTG NoN-funded sites.

Contextual influences on community hospital research

A second set of themes and subthemes emerged that describe contextual influences on research activities in community hospital sites. These themes and subthemes illustrate that the differing contexts in which community hospitals operate influence their ability to start and sustain research activities. The four main themes were: (i) systems, (ii) trial design, (iii) local context and (iv) individual characteristics.

Systems

Participants described variations among provincial and local health systems that influenced how research programs operated. The subthemes emerging to describe these variations included: regional system structures and formal networks and funding.

Regional system structures and formal networks

Participants identified that differential care delivery structures influenced how they operationalized their research programs. This includes formalized networks connecting academic and community hospitals. An example of this is in Manitoba, where academic and community hospitals are formally connected through their care delivery structures, creating channels for shared human resources and mentorship. In a CACC COP meeting, Participant 1 noted that this model of shared human resources for patient care also translated to shared human resources for research. In this instance, a research coordinator may be hired for a specific site but can easily be redeployed or moved to another site on the basis of need.

Another participant described a province-wide research department in British Columbia (B.C.), though they were unclear on how the centralized department could support their day-to-day operations in a community hospital. In contrast, a participant from Alberta described how being part of the provincial health service delivery structure meant that the research teams were provided with office space and laptops at no cost while allowing the community hospital autonomy in the day-to-day operations of the clinical research.

In addition to reported differences between the provinces, participants also illuminated within-province variations, such as Participant 7 describing how geographic proximity to a medical school can facilitate or hinder research activities at a community site by facilitating access to faculty status:

> *"[…] even within community hospital centres, there are the haves and have nots, and a lot of it is just geographic luck and you know, [if] you happen to have a satellite medical school and so all of your community hospital staff are faculty in that".*

Participant 6 described further provincial variations in the overall purview of clinical research during medical school training:

> *"I did all my training in B.C. and just going through, like, research never really appeared*

valued in medical school. Like, there will be this like kind of nod to "oh, I should do a research project" but like nobody cares and looks at it. You don't really have good mentorship. I don't have many people that collaborate, and there aren't many people to be mentors…and then, you know, I've done electives in like Calgary and Toronto and even like [through] short exposures there you can see it's totally different".

Funding

Throughout the interviews participants mentioned the health system research funding models for community hospitals, often times noting the models as a challenge because community hospitals receive no dedicated funding for research and rely on payments from specific studies. Participant 2 articulates this, stating "[…] the current funding model for community hospitals is actually unsustainable". Dialogue with many other participants reinforced this sentiment, with participants highlighting the lack of dedicated research funding and uncertainty regarding income to support their research activities. Participant 2 elaborated by stating:

"There's no research money per se coming to the hospital, so the hospital gets its global budget and none of that is earmarked to research […]. I don't think this ad hoc funding strategy is going to work. We can't run a money losing research program. There's no buffer. The hospital is not going to cover our losses".

Participant 9 made a connection between care delivery structures and research funding, offering the following statement:

"We have, unfortunately, 10 different health systems in our country, so the federal government doesn't have that much control over how each province embeds research into its clinical practice. But I think something like that has to be thought of as we move forward [...]sort of a model where research is funded through the health systems in which we all work, or else it won't be sustainable, it just won't".

Participant 6 offers a final illustration of interprovincial differences in research funding by describing their observation about clinician-researcher roles:

"When I was initially looking for work, there were [...] some opportunities in Alberta and the position, like, you were given a salary and expected to do research [...] you're given a salary for it versus, I wanna say, nobody [in B.C]".

Trial design

Transitioning from broader systemic, structural influences on community hospital research programs, participants also collectively highlighted that the design of clinical trials is important to the likelihood of successful operation and financial viability of research in a community hospital setting. This led to the identification of several key subthemes including: intervention complexity, data, funding and relevant study materials.

Intervention complexity

Many participants shared a sentiment that the ability of a community hospital to have a successful research program was contingent on the complexity of the clinical trial(s). For example, Participant 3 notes that "ICU studies are very labour-intensive", and Participant 9 notes, "we're severely running deficits on all of our projects because of just the fact that a lot of the projects weren't easy to start up". Participant 2 echoed similar concerns, suggesting that "…encouraging investigators to keep things as simple as possible" would assist with the ability to successfully run trials in community hospitals.

A trial-specific example was described by Participant 9, stating that "[Study A" is a great example of how complicated […] how a complex intervention […] can be hard to implement". Participant 9 goes on to describe needing to connect with and convince external departments in the hospital to deliver the intervention and to train evaluators to assess the study outcomes. They note that this resulted in "a lot of working with the healthcare system locally to get the study accepted locally". After providing another example, Participant 9 summarized with the following statement illustrating how they perceived the intervention as influencing the ability to successfully conduct research, stating, "there's a lot of KT [knowledge translation] that needs to be done just to embed interventions into clinical practice, and that takes a lot of time as well".

Data

In addition to describing challenges associated with implementing the intervention in some trials, participants described how data collection requirements could influence their research program. For example, Participant 3 described ongoing challenges with recruiting enough patients to generate sufficient revenue to cover the cost of a research coordinator to perform the work, noting:

"I think it's a challenge unique to any study that pays that amount [...], because of the volume of data entry

that you need to do, the data captures, the amount of time you spend, you know, not only collecting but taking the source data. Like, even minimal, decent source [data] that can stand an audit, right?"

Participant 2 also described how data requirements changed and increased over time without a subsequent increase in the per-patient payment:

"We contributed a huge number of patients [...] Again, the CRF [case report form] kept getting longer and longer and longer and we finally went back to the investigators and said we cannot do the data collection that you're expecting for $250. Like, we've already run out of the money that you gave us to do this study. So they ended up providing the research coordination remotely to go through our EMR [electronic medical record] and pull the data".

Participants noted reliance on manual data extraction as another challenge. For example, Participant 9 suggests that "having access to the data and not having necessarily to manually extract it would definitely be another way that we need to facilitate research [in community hospitals]", further noting that "clinical trials are such a hard endeavour to run […] it takes a lot of manpower to […] manually extract that [data] out".

Funding

Participants also discussed the funding associated with running a clinical trial as another component of design. For example, Participant 2 describes how per-patient funding models may not always align with the significant volumes of data required. They note this is particularly relevant because data requirements often increase over time, thereby illustrating how it becomes reportedly implausible for a small team to be sustainable. They go on to note other operational activities that per-patient payment funding models do not account for:

"Most studies, they pay you for the patients that consent, but they don't pay you for the 10 patients it took to get to the patient that consented, right? So if you have low consent rates, then all that time of screening and consenting is taking up a huge amount of time. All those consenting counters without earning".

A report submitted by Hospital B similarly describes this, acknowledging that the CCCTG NoN funding filled a gap in funding required to conduct investigator-initiated studies in the community hospital context:

"This kind of funding particularly supports our ability to run Canadian investigator-initiated studies as the economics of these studies are unfortunately too low to complete in a nonacademic site where funding is not otherwise available. The funding has really permitted us to support these trials and we believe that it is important for us to support Canadian investigators and their trials – it is just unfortunate that without this type of external support, it is simply not feasible".

In their report, Hospital B also acknowledges that trial-funding models are notably different by discipline suggesting, "ICU trials are very hard in themselves to make the finances work, but we are lucky at our site to have Cardiology trials to help". Hospital B goes on to note that in the absence of viable funding associated with the trial, "[…] ensuring that investigator-initiated trials are pragmatic, especially if not well-funded, we believe is key."

Relevant study materials

Several participants also illustrated differences in resources (human and infrastructure) available at community hospitals that may render study materials, such as laboratory collection requirements or drug storage requirements, less feasible at a community hospital compared with an academic hospital. Furthermore, participants noted that for implementation to be successful, even seemingly simple trial interventions require staff training, and the study sponsor does not often provide this training. Participants noted that in the infrequent instances where study sponsors provide staff training, the training might not be relevant to a community hospital running very few clinical trials when they had originally designed it for a well-supported, large team which is accustomed to performing many clinical trials. This also provides insight as to why per-patient payment models with low start-up fees are often insufficient, as they do not offset the intensive efforts required to initiate studies in community sites, including the investment in training staff to deliver the trial intervention. Hospital C's report notes that resources which allow for "sharing study implementation tools in many contexts especially, helping smaller centres with less academic support" would enhance the start-up of new trials or new domains in the context of platform trials.

Along with the additional time and resources required to support staff and infrastructure readiness for a clinical trial in a community hospital setting, patient-facing materials for clinical trials may also require adaptation. For example, sites may require translation of study materials to another language, which can be very costly, increasing the time and in-kind costs incurred by the community hospital. Furthermore, many trials are

designed to answer a question of scientific interest and may not reflect a research question that is of interest or relevance to the local community, which has implications for enrolment as highlighted by Participant 2:

> *"When we're approaching them [patients] about other studies where they've never heard of the medication, they've never heard of the intervention. They don't really know what research is. We're not offering them something that they're asking for. You know, it's just so hard to get people into studies".*

Local context

The local context in which community hospital research programs operate is another relevant factor, from the hospital itself, to the role of the community served by the hospital. The subthemes emerging to describe the local context include: receptivity and awareness of clinical research, funding, relevant study materials and hospital culture.

Receptivity and awareness

As described in the theme of trial design, the community can influence recruitment into clinical trials. This extends to the community's general receptivity and awareness regarding research. Participant 2 reflected on the experience of another community hospital whereby internal and external communications focused on positive research related messaging to facilitate receptivity:

> *"But that being said [...] when the hospital talks nonstop about research that will filter through the community eventually, right? [...] and I don't know that you could really measure the impact that it's had, but I can't imagine it's had anything other than a positive impact. So, I think creating more of a community awareness of the research at the hospital would be very valuable and something that we should probably work on".*

Participant 2 reflected that this awareness among the community positively influenced the ability of the site to successfully recruit patients into clinical trials and noted this as an opportunity for other community hospitals to pursue.

Funding

Community awareness of and receptivity toward clinical research in their local hospital may have positive implications for study recruitment as well as for potential sources of revenue through donations to hospital foundations. Several participants described their hospital foundation as a source of financial support for their research programs, highlighting the importance of this key funding source. This included Participant 7 who states:

> *"[...] we do get a lot of funding, relatively speaking, from our foundation to support research and our foundation is incredibly vital and supportive of the work we do [...] so they've been a great partner. And I think looking at relationships between the foundation and community hospitals [...] are super key".*

Participant 6 echoed the role of the hospital foundation in providing funding locally, noting that it was important to demonstrate efforts at financial sustainability to continue to receive funds, stating, " […] hopefully showing the foundation that even if we're not fully self-sustainable, we're working towards it and so that they can continue contributing".

Hospital culture

While participants described the relationship between the hospital and the foundation as pivotal to the acquisition of community donations to support research activities, they also noted that the general hospital culture influenced research programs. For example, Participant 4 describes a culture that supports research at multiple levels and how this expedites research activities:

> *"[...] and with our site, I know different departments like pharmacy, respiratory [therapists], investigators, [the] nursing team, our clinical trials team and even our senior leadership team are very supportive of research and you know, on our end we [can then] usually do things very quickly".*

Participant 5 describes a similarly supportive culture, stating:

> *"But this is something that comes from the top. And you know, if you have a research [project], they support you. Yeah, if you have an idea, they support you and they will help you to actually do your research".*

While these quotes illustrate cultures that enable research through support at multiple levels, Participant 6 provides a contrasting experience in which the research culture is less mature. Here, hospital leadership articulates support for research but does not follow through with actions to support research activities:

> *"[...] If you ask them [leadership], 'Should we do research?', 'Can we do research?' they'll say 'Yes.' [But] it's not a priority for them. So they're not gonna go out of their way to, kind of, remove barriers and*

things, but they're also not putting up barriers".

Individual characteristics

The final theme emerging from the analysis reflects common characteristics among the individuals participating in the CCCTG NoN and CACC COP as well as among collaborators in other institutions that contribute to the success of community hospital research programs. These characteristics include a drive to help others, a passion for research and a willingness to extend themselves beyond their physician roles. This alludes to the need for research leads to have certain personal characteristics that facilitate creating and sustaining community hospital research programs. The subthemes emerging related to individual characteristics include: relationship building and mentorship, role extension, values and funding.

Relationship building and mentorship

Several participants described relationships with fellow research teams that helped them build and sustain their research programs. This included community hospital research team members seeking out, or being receptive to, building relationships with new partners, and it also included receptivity from academic hospitals to provide guidance when community hospitals seek it. For example, Participant 5 describes a relationship that they established with another site to whom they continue to reach out to for ongoing support:

"So there are some communities you know outside of our centre that they would share their knowledge. They would share their, you know, studies in terms of how to run clinical trials [...] so when we hit that wall and we have... we need help, we usually go to that centre".

Participants also noted that peer mentorship was important, whereby fellow community hospital physicians offering mentorship through the CCCTG NoN and CACC COP is vital, as it provides a different kind of mentorship than that offered by established physician researchers at academic hospitals. Participant 4 described this when discussing what they saw as the most valuable aspect of the CACC COP:

"[...] Mentorship, I think. 'Cause the mentorship that you can get, I can get, for example, from Academic Researcher A is very different: He works at an academic center. He writes a grant with his eyes closed [...] it's not the same as what we're dealing with at a community site. As much as he's very insightful and all of that, [...] he's not gonna deal with, you know, the funding shortages because they have a different funding program at Academic Hospital A or things like that, versus talking to a group with community intensivists: you can see that the struggle is there and that they struggle with the same, the same issues that we do here".

Role extension

For those physicians leading research activities in community hospitals, many described a drive to do research work, often without compensation, outside their formal physician roles. For example, Participant 7, who notes that "I've just made a decision to commit a certain amount of time to doing research but that's not very common", or Participant 6, who states that "… it might be nice to have some research funding for […] me or the PI […] but again, it's not that onerous to me and clearly I'm passionate about doing this which is why I'm doing it".

For some physicians, extending themselves beyond their clinical role to perform research work could be overwhelming, as illustrated by Participant 9, who states that "I'd have to duplicate myself to be able to do everything that I'm doing", or Participant 1, who describes trying to sustain research across three interconnected community hospital sites, stating that "I'm also the main PI for the three hospitals. So basically, I run the three hospitals [research program] and they call me from every hospital, every day, to enrol people. It's kind of stressful". Participant 6 similarly articulates being the lone individual responsible for the research activities at their site, stating "I'm carrying all of the [research] load, not just a little bit, all of it".

Participant 7 echoes similar sentiments, reflecting that finding the time to conduct research in a community hospital is challenging and requires a commitment to using personal time, stating:

"You're talking about then securing time, and time is a very difficult thing to secure, even with lots of funding. Like, it's really a difficult thing to do in a community setting unless people just commit their own time [...] like for me, that's what I've always done".

Values

This altruistic nature of individuals involved in supporting community hospital research programs is notable: many team members are extending themselves beyond their expected role, highlighting shared values about the importance of research in community hospitals. Participant 7 notes that the like-minded members of the CCCTG NoN and CACC COP share this purview but notes that it is not reflective of all individuals

practising in community hospitals. Participant 7 also illuminates some of the values underpinning the reason some physicians choose to extend themselves for the purposes of conducting research in community hospitals:

> *"I've just made a decision to commit a certain amount of time to doing research, but that's not very common, right? You know, when I do research I do it's 'cause I'm interested. I think it might improve the care of my patients. I have no ambitions of tenure or anything, you know? These are not the reasons why I need to do research or why I want to do research".*

Participants also shared sentiments about selecting research studies on the basis of scientific merit and on the basis of the topic being important to both the hospital and the community. Participant 2 describes this:

> *"It's not worth it, to me, to do a study that we don't think is really worthwhile because that just generates sort of bad feelings about the research program and, like, we need the staff and the patients and everybody to be kind of on board that what we're doing is worthwhile and then important".*

In some cases, this process of selecting studies illuminated a conflict between personal values and creating a financially sustainable research program. Participant 6 illustrates this:

> *"I've always kind of battled with this idea of like, should I really just like have to have that mercenary approach where you just, like, get studies that give you the highest yield rather than the kind of more purist [approach]: we should do research that we care about and that we're passionate about?"*

The common value of ensuring that research is done in community hospitals for the benefit of patients was shared by the participants; however, several participants also noted how a similar value is held by some researchers working at academic hospitals. In fact, some academic hospital researchers were specifically highlighted by several of their peers at community hospitals for actively seeking to support research in community sites. For example, Participant 2 describes one such academic hospital researcher who differentiates herself and her studies by designing them to facilitate community hospital participation:

> *"One of [Academic Researcher B]'s priorities is making sure that the hospitals that are participating in her study are able to do so. Like, I think she's very concerned about 'what can we do to help?' Like, it's not just that... she's not doing you a service by agreeing to allow you to conduct her study, it's [that] you are helping her by enrolling for her study".*

Funding

Academic Researcher B was also described by multiple study participants (for example, 2, 3 and 9) for not only supporting community hospitals through mentorship and effective trial design but also acting as a source of revenue through the allocation of personal research funds to several community hospitals. This repetitive mention of a specific individual highlights how key individuals who value research in a community setting may be pivotal to the success of community hospital research programs. It also illustrates the benefit of networks and relationships, particularly the connection to the broader CCCTG network in this case. Participants also mentioned two additional individuals from academic sites who gave their own resources to support community hospital research programs. This further illustrates the interconnectivity between individual characteristics, values, relationships and funding as mechanisms influencing community hospital research programs.

Discussion

Our findings highlight that the CCCTG NoN actions of providing funding and creating the CACC COP positively influenced research activities in community hospitals over 1 year. Furthermore, our findings illustrate that the context in which community hospitals function may influence the success of research programs as well as future strategies to increase research activities. The provincial health systems and research funding structures, design of clinical trials, local context and characteristics of individuals involved in research programs emerged as important contributing factors to creating and sustaining community hospital research programs. This corroborates and enhances existing research about community hospital research capacity [5, 8, 14, 24, 25]. Here, we highlight three key lessons learned from our case, illustrating their connection to existing knowledge to inform considerations for future actions to improve community hospital research capacity.

Lesson one: leveraging the power of connections among community hospitals

Our analysis illustrates that the connections between community hospitals and other organizations, peers and professional networks has an influence on research program implementation. For example, the structures of the provincial healthcare systems create connections between academic and community sites because of geographic proximity or because of care delivery structures; these connections subsequently influence

the implementation of research programs. Our analysis suggests that when connections exist between hospital sites for care delivery or administrative purposes, or because of proximity, community hospitals can leverage these connections to create supportive, research-focused relationships. These relationships may result in research knowledge and/or resource sharing, the absence of which are both reported as barriers to the successful implementation of community hospital research programs [8, 14]. Concerted efforts to make connections between community and academic sites or nascent and established research sites that are either geographically proximal or part of the same care delivery structure, could capitalize on the power of partnerships. In addition, they could reduce the variable influence of context that arises between different healthcare systems. Previous literature has demonstrated that connecting less experienced research sites with more experienced research sites is beneficial [14, 26]. Existing research networks with a stake in community hospital research participation (for example, CCCTG NoN) could lead such efforts, as was done by the National Cancer Institute Community Cancer Centres Program in the United States [26], or community sites eager to implement or enhance their research program may seek out these opportunities.

Previous research has elaborated on the benefits of collaborative networks, such as the CCCTG NoN, describing networks as social capital that contributes to greater scientific output and research productivity [27] and enhanced research culture [26]. Therefore, an important strategy is continuing to support collaborative research networks, such as the CCCTG NoN, and by extension, the CACC COP, focused on community hospital research programs. Additionally, focused efforts are required to bring new researchers into existing networks to continue growth and extend the benefits of participation.

Beyond the CCCTG NoN, Snihur et al. describe other networks such as the Canadian Clinical Trials Coordinating Centre (CCTCC) as having benefits for research programs including decreasing start-up delays by streamlining contracts at the network level [5]. Similarly, Lamontagne et al. [25] describe clinical research networks in Alberta and Québec that are targeting the enhanced coordination of research activities. This is important, given that start-up processes have been shown to take longer in community hospitals than in academic hospitals [9]. In the United Kingdom, the National Institute for Health and Care Research (NIHR) exemplifies the potential merits of formalized research networks at a national level. The NIHR is a longitudinally funded network borne of the need to restructure previously disparate healthcare and health research funding and streamline the infrastructure for running clinical trials [28]. The benefits of this coordinated system of health research infrastructure were apparent during the COVID-19 pandemic when the RECOVERY trial was able to move from protocol development to recruitment in 9 days, with 132 United Kingdom hospitals participating with 1000 patients randomized within 23 days [29].

In Canada, we have many national networks similar to CCCTG NoN that are concentrated in specific disciplines (for example, Canadian Cancer Trials Group (CCTG), multiple Strategy for Patient Oriented Research (SPOR) Networks, Canadian Nephrology Trials Network, Canadian Venous Thromboembolism Research Network (CanVECTOR) and so on) and subnetworks such as the Canadian Community ICU Research Network (CCIRNet), focused on community hospital research capacity building. Such networks are vitally important to clinical trials knowledge sharing and implementation of research programs. However, if we look to the United Kingdom example, a coordinated national research network may be beneficial to provide an overarching and streamlined approach to clinical trials delivery. A similar structure may enhance networking and collaboration across disciplines as well. A recently implemented pan-Canadian example of this is the Accelerating Clinical Trials (ACT) Consortium, borne out of the Canadian Institutes of Health Research (CIHR) Clinical Trials Fund focused on strengthening the clinical trials sector nationally [30, 31]. This has the potential to reduce existing barriers to implementation of community hospital research programs, such as lack of funding, skilled staff and mentorship.

In addition to the collaborations occurring at network level, the individual connections arising through these networks (for example, CACC COP, CCCTG or proximity to academic sites) are also paramount to collaboration that can optimize research program implementation. For example, limited research experience has been cited as a barrier to community hospital research participation, with the suggestion that mentorship between academic and community hospitals can alleviate this barrier [8]. Finding a strong mentor to guide new researchers is also reiterated [32] by Davis et al. and Lebus and Collinge [33], the latter of whom note the importance in a nonacademic setting.

Our findings also highlight that individual connections contributed to tangible support being given to community hospital sites, including funding and staffing. These connections occurred because of formal mentorship, because of relationship building through new networks such as the CACC COP and on

the basis of shared values among individuals seeking to grow community hospital research. Many physicians participate in research because of their individual values of viewing research as important for patient care [8, 14, 34]. This emphasizes the importance of using existing networks to enhance program level collaborations and individual mentorship opportunities. These networks are likely to provide a platform to leverage individuals who are already engaged in research and are known to value it, thereby creating opportunities to connect on the basis of shared values.

Lesson two: optimizing clinical trials design

One of the primary components of a research program are the clinical trials that the program is running. Our analysis suggests that the features of clinical trials influence the likelihood of a community hospital site being able to successfully operationalize a trial as part of a research program. This corroborates research on barriers to optimal clinical trial implementation [35–37].

Community hospital sites have unique and differing resources (for example, human, infrastructure and/or process) [8, 9, 14] that necessitate the tailoring of study start-up materials and overall trial design to the local setting in an effort to maximize feasibility. This includes items such as adapting training materials for staff on the basis of familiarity with clinical trials and/or the specific clinical intervention being tested, designing interventions with the clinical workflow in mind and considering minimally necessary data requirements for case report forms (CRFs) [35, 36]. These considerations speak to the need for integrated knowledge translation within clinical trials, where each aspect of the trial considers the knowledge users, including those who are participating in delivering the intervention [38].

Expanding on this, our findings highlight increasing demands on research teams implementing clinical trials as it relates to study tasks such as data collection and intervention delivery. This aligns with literature that suggests a trend toward increasingly complex trials [37, 39]. Specifically, there is an upward trend in the frequency of procedures per study protocol as well as the volume of requirements on CRFs. Simultaneously, there were reported decreases in study performance as measured by patient recruitment, retention, time for data collection and conduct of the trial, along with increases in serious adverse events in the same studies as protocol complexity increased [37]. Additionally, the implementation of pragmatic trials may add to such challenges because even though they are designed to achieve results that are more representative of real-world effectiveness, they often have complex interventions and rely on more members of the interdisciplinary care team to deliver said interventions [40]. Again, this highlights an opportunity for clinical trialists to consider the community hospital context when designing clinical trials, not only to optimize the likelihood of successful implementation in the community hospital setting but also to increase key performance metrics such as protocol adherence and reduce risks to patients and study integrity.

When considering clinical trial design, we must also acknowledge the role of funding. In particular, for ICU trials, many are investigator-initiated trials, funded through granting agencies such as the CIHR. Our findings illustrate that many such clinical trials rely on per-patient payments for each patient enrolled that are often insufficient to account for the amount of time it requires to screen, consent and collect data [39, 41]. Additionally, consistent with findings in our study, it has been noted that some programs implement industry trials specifically for the purpose of offsetting the revenue loss from running investigator-initiated trials. This can create ethical concerns for some researchers regarding choosing between trials that will benefit patients and those that will generate revenue [14, 41]. Although operating in a different context, a Swiss study found that 75% of investigator-initiated trials were reportedly underfunded, with contributing factors identified as inaccurate budget estimates and limited funding sources with "unrealistic expectations" [42]. This example illustrates that there may be a disconnect between funders and clinical trialists that translates to insufficiently funded clinical trials. Recently, efforts have been made by CIHR to revitalize the clinical trials funding system, providing more consistent clinical trials funding opportunities, support for innovative trial designs and funding focused on training and mentorship [31, 43, 44]. Our findings reinforce the importance of continuing this type of investment into the clinical trials ecosystem in Canada. Furthermore, our analysis suggests that revisions to funding models occur through thoughtful and accurate assessment of costs depending on key trial design factors such as the implementation setting, data requirements and intervention complexity.

Lesson 3: fostering research engagement in the local context

Finally, we must consider the important role of the local context. This includes organizational culture, or the shared norms, values and beliefs that guide how work, including research, is done in hospitals [45]. Previous research [14, 24, 26, 46, 47] acknowledges that culture plays a significant role in how research is viewed and valued, specifically in community hospitals, thereby influencing likelihood of successful research program implementation.

The capacity of an organization to participate in research has been described as reciprocal to research culture, with each contributing to the enhancement of the other [46], reiterating the importance. Existing literature documents a traditional purview of research as disparate from healthcare delivery which has been described as the root of the inadequate Canadian research infrastructure [25]. Such literature highlights a potential disconnect as it pertains to the importance of implementing research programs wherein organizations and members see research as less valuable than clinical care. Positioning research as complimentary to, and of equal value to, clinical care in the organization, may be a means to focus on relative advantage as a lever to influence culture.

As a complex multilevel construct, the notion of building research culture may seem daunting. However, previous research, combined with our findings, illuminates strategies for organizations to initiate a research-focused culture shift. For example, it has been noted that through organizational commitment to research, such as by including research in the strategic plan, a research culture can be reinforced [24, 47, 48], with additional literature [25, 39, 48, 49] highlighting the absence of organizational commitment to research as a barrier to successful uptake of research activity. To facilitate organizations articulating outward commitment to research, including in their strategic plan, actions such as changing accreditation requirements for community hospitals to participate in research may assist with greater organizational commitment to research.

The existence of incentive systems and available resources (that is, funding, space, materials and knowledge) also falls within the purview of individual organizations and, to some extent, broader systems to address. There is a connection between establishing a research culture within the organization and shifting access to internal financial support [26, 48]. In our study, we note that external funding from the CCCTG NoN acted as a catalyst for some sites to receive internal financial support, and although Snihur describes that external funding supports clinical research, infrastructure costs, including development of organizational policies and procedures, and operating costs may need to be provided by the organization [48]. However, it is important to note that in the absence of an organization's ability to commit financial support, incentives may also be intangible in nature [50]. We therefore suggest that organizations and systems should consider both financial and intangible (for example, recognition and accreditation) incentives for successfully implementing research programs as a mechanism to increase likelihood of implementation success.

Finally, within our inquiry, we acknowledge the important role of the local community in facilitating the successful implementation of research programs in community hospitals. For example, the local community may be more inclined to participate in a clinical trial designed to answer a question relevant to them, and an engaged community may even advocate for access to certain types of clinical trials. Choosing trials that are of interest to the local population and relevant to their care needs is key [26, 32]. We note that some of our participants described great success when there was a so-called "pull" for research from the community served by the hospital as well as a sense of obligation for community sites to perform research relevant to the local community. This aligns with the important drive towards methods such as community-based participatory research (CBPR). CBPR is intended to meet the interests of the community and actively involve the community to identify research priorities, design and conduct research studies and, importantly, to use findings for improving community health outcomes [51]. Other considerations include working with the local community to understand barriers to participation in clinical trials and codevelop locally and culturally relevant recruitment strategies [26].

Limitations and strengths

There are several limitations and strengths to the research undertaken in this study. First, the small sample size in the individual interviews may bias results, since those who hold positive views of these issues might be more likely to participate. However, we acquired rich, descriptive data illuminating the positive outcomes of the CCCTG NoN actions and identifying actionable areas for continued growth in the Canadian research landscape. Additionally, we acknowledge that there was limited representation from some provinces in the individual interviews, including a lack of representation from some provinces. This may influence the interpretation of findings regarding how care delivery structures influence research program implementation in community hospitals; however, we collected data from multiple sources to strengthen the credibility of our data and found that the other data sources corroborated information from the interviews, supporting triangulation [52].

While our data collection occurred over a 1-year period, it represents a cross-sectional assessment of a complex subject and intersects with a changing research landscape across the year. An example is the increasing number of community hospital sites funded by the CCCTG NoN between the time we started data collection and preparing this manuscript (that is, from 14 to 19); however, this increase represents a positive trajectory of impact of the CCCTG NoN and CACC

COP through the inclusion of more hospitals. A benefit of the prolonged period of data collection is the extended interaction of the researcher within the case, contributing to the overall credibility of the findings [53].

Finally, we acknowledge that the CCCTG NoN funded this study, and therefore, participants may have perceived the need to participate and/or give positive feedback, given that the CCCTG NoN provided their organizations funding to initiate or grow their research programs. To mitigate this, questions focused on challenges or negative experiences were included in the interviews and the status reports to encourage a fulsome description of experiences.

Conclusions

The perceptions of study participants are that CCCTG NoN funding and the CACC COP have positively influenced research activities in participating Canadian community hospitals. Actionable lessons learned from this case include the need to: (1) leverage the power of connections among community hospitals to create further connections, sharing knowledge and experience, (2) work with trialists on optimizing clinical trial design to facilitate implementation in a community hospital setting and (3) create resources to support community hospitals with building and sustaining research programs, including resources to foster engagement in communities without historic research participation.

There are implications from our findings for both Canadian and international clinical research audiences. Clinical trialists running international multicentre clinical trials may seek Canadian site participation in their trials. Therefore, the ability of Canadian community hospitals to operationalize clinical trials successfully and broadly is foundational to the efficiency and effectiveness of clinical research globally.

The lessons learned may be transferable to research program start-up in countries where there is limited participation in clinical research, including those with limited research resources, given the parallels with the current state of clinical research in Canadian community hospitals. Specifically, transferring our findings about how to leverage partnerships and networks as well as focusing on receptivity and awareness within the local community may be beneficial strategies.

Finally, we note there are policy implications arising from our findings. This includes aligning funding structures with optimized study design and payments that consider localized start-up needs for clinical trials. It also includes reconsidering research funding streams for community hospitals, given the dearth of options in the current state. Policy implications also relate to our findings on the importance of networks. Specifically, policy makers might consider whether and how existing networks (for example, professional or care delivery structure) can be leveraged to create sustainable research program structures. Additionally, policy makers should consider whether and how lessons from the United Kingdom can be adapted to the Canadian context to create a unified research network that facilitates broader, more responsive and lasting research participation across all types of Canadian hospitals.

Abbreviations

CCCTG	Canadian Critical Care Trials Group
COVID-19	Coronavirus disease 2019
CATCO	Canadian treatments for COVID-19 trial
United Kingdom	United Kingdom
RECOVERY	Randomized evaluation of COVID-19 therapy trial
ICUs	Intensive care units
CIHR	Canadian Institutes of Health Research
CCCTG NoN	Canadian Critical Care Trials Group Network of Networks
CACC COP	Community Acute and Critical Care Community of Practice
B.C.	British Columbia
KT	Knowledge translation
CFR	Case report form
EMR	Electronic medical record
CCTCC	Canadian Clinical Trials Coordinating Centre
NIHR	National Institute for Health and Care Research
CCTG	Canadian Cancer Trials Group
SPOR	Strategy for patient oriented research
CanVECTOR	Canadian Venous Thromboembolism Research Network
CCIRNet	Canadian Community Intensive Care Unit Research Network
CBPR	Community-based participatory research
CFIR	Consolidated framework for implementation research

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12961-025-01318-8.

Additional file 1.

Additional file 2.

Acknowledgements

The authors acknowledge Dr. Madelyn Law for her support in the initial discussions about this study, as well as Brenda Lucas, Executive Director and Mary-Ellen Rayner, Manager of Operations and Communications of the Canadian Critical Care Trials Group for their support with study logistics. Additionally, the authors thank Brenda Lucas for her thoughtful review of the final manuscript and Jessica Thompson for her support in creating the figure.

Author contributions

E.O., J.T. and A.B. conceived the study. E.O. conducted the interviews and analysed the data. All authors participated in interpretation of some or all of the results. E.O. prepared the manuscript. All authors critically appraised and revised the manuscript. All authors read and approved the final manuscript.

Funding

E.O. and J.T. received funding for this study from the Canadian Critical Care Trials Group (CCCTG) through the Network of Clinical Trials Networks, NCN-174189.

Availability of data and materials

Portions of the dataset used and analysed in this study (that is, individual interview transcripts) are available from the corresponding author on reasonable request. Portions of the dataset are not publicly available owing

to identifying information (for example, email correspondence and status reports).

Declarations

Ethics approval and consent to participate

Ethics approval for this study was received from the Hamilton Integrated Research Ethics Board (study 154749). Written informed consent was obtained from all individuals participating in individual interviews.

Consent for publication

Not applicable.

Competing interests

E.O. is a research manager working in a Canadian community hospital. J.T. and A.B. are clinician-scientists and clinical research program leads working in Canadian community hospitals with established research programs. J.T. is the executive director and chief scientist of a community hospital-based research institute. A.B. leads the Critical Care Research Program at a community hospital. Both A.B. and J.T. are cofounders and cochairs of the Canadian Community ICU Research Network. A.B. and J.T. are members of the CCCTG NoN and led the CACC COP.

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Received: 30 January 2025 Accepted: 19 March 2025
Published online: 07 April 2025

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