



COMMENTARY

Rural health research capacity building: an anchored solution

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ABSTRACT:

Rural physicians face many challenges with providing rural health care, which often leads to innovative solutions. Despite their creativity with overcoming barriers, there is a lack of support for rural health research – an area of health care where research makes great impacts on small communities. Rural research capacity building (RRCB) is essential to support rural physicians so that they can conduct relevant research, but RRCB programs are sparse. Thus, our team at Memorial University of Newfoundland, Canada, has created an RRCB ecosystem through the *6for6* and *Rural360* programs, which outline a pathway for rural physicians to make meaningful contributions to their communities through research. This article describes the RRCB ecosystem and explains how the *6for6* and *Rural360* programs address the need for RRCB. Designed to train six rural physicians over six sessions per year, *6for6* fosters learning of research practices through a conceptual framework that envelops complexity science, systems thinking, and

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Introduction

Canada's vast geography is a considerable healthcare challenge because limited services are dispersed across a substantial land mass. As a result, under-resourced rural communities^{1,2} are unable to lean on large neighboring centers for support¹⁻⁴. Locally relevant research is indispensable in these contexts; rural physicians intimately understand community barriers and needs, and their ability to create robust and evidence-informed solutions through academic pursuits is well recognized¹. Yet, facilitating this research is no easy task; rural health research has been described as lacking order³ and requires a programmatic intervention to surmount considerable challenges.

Research capacity building is 'a funded, dynamic intervention operationalised through a range of foci and levels to augment the ability to carry out research or achieve objectives in the field of research over the long-term, with aspects of social change as an ultimate outcome'⁵. RRCB programs are exceedingly rare, perhaps due to the same myriad issues that have long suppressed the voice of rural scholarship. At a time when science is increasingly interdisciplinary and the expectations of journals are more rigorous than ever, academic resources in rural areas are scarce. Designing and delivering an RRCB that effectively fosters research capacity despite these overwhelming odds is a logistical chimera that few scholars worldwide have achieved. How can a program support high-caliber academia in locations where there are no scholarly institutions, extreme distances between team members, poor communication technology, no mentors, and countless other barriers?

In Canada, our team has taken decisive action by developing a RRCB ecosystem comprising the *6for6* and *Rural360* programs that is made possible by a unique anchored delivery model. In this article we describe how this model allows us to overcome the significant challenges of rural scholarship and achieve the features of an effective research capacity building program while catering

anchored instruction. The use of this framework allows the learning to be grounded in issues that are locally relevant for each participant and follows guiding principles that enable many types of learning. *Rural360* continues the pathway by providing an in-house funding opportunity with an iterative review process that allows participants to continue developing their research skills and, ultimately, secure funding for their project. This anchored delivery model of RRCB programming is made possible through many support systems including staff, librarians, instructors, the university, and other stakeholders. It has successfully helped form communities of practice, promotes collaboration both between learners and with third parties, encourages self-organization with flexibility for learners outside of the in-house sessions, and ultimately drives social accountability in addressing local healthcare issues.

to a rural audience.

6for6 and *Rural360*: background

6for6 is a research skills training program where rural physicians learn the fundamentals of research. The program is named after its unique format where six physicians attend six sessions comprising two graduate-level university courses covering topics such as scholarly writing, study design, team building, research conduct and qualitative and quantitative research. Participants (30 to date) also pursue a single capstone research proposal throughout the courses, meeting one-on-one with an expert academic mentor assigned to coach them through the process of research formulation, execution, and eventual publication. More details on *6for6*, including mentorship and curriculum design and development through a rigorous needs assessment and curriculum development approach, are available in prior articles^{2,6}. Articles demonstrating the high research productivity rates (eg grants, articles) and increased research competency (ie knowledge, attitudes, skills) of *6for6* participants⁷, and delineating the program logic and plan for a rigorous evaluation⁸, have been submitted for publication.

In 2017, we supplemented *6for6* with an in-house funding initiative called *Rural360* that provides grants for research by physicians in northern Newfoundland and coastal Labrador. This program is designed to provide continued support for participants from this particularly isolated region to complete their projects. A previous article by Asghari and colleagues⁹ outlines the *Rural360* program in further depth and provides preliminary evidence of its success in helping participants bring their projects to fruition.

Defining an anchored delivery model

An anchored delivery model is a centralized approach to RRCB, where a program harnesses the resources at an academic institution (the 'anchor') to foster research capacity in jurisdictions

where those resources (eg funding, expertise, mentorship) are not available. The model is grounded in a conceptual framework that includes complexity science, systems thinking and anchored instruction, which facilitate scientific progress and knowledge translation. Multiple programs can be linked under an anchored delivery model to create an ecosystem for RRCB that yields scholarship and builds toward health system change.

6for6 and Rural360: an anchored RRCB 'ecosystem'

The *6for6* and *Rural360* programs complement each other and form an RRCB pathway catalyzed by a surrounding support network and sustained advocacy. The pathway builds toward research capacity by recruiting rural physicians, providing them with education in research fundamentals (*6for6*) to expand their capabilities, and funding their research projects (*Rural360*). This facilitates research that contributes to evidence-informed change within the health system, which then inspires other physicians to make research part of their portfolios as they observe its value for both rural practice and patients. Together, the programs work as a research incubator that nourishes rural physicians with support so they can develop a community of research and move toward being rural research leaders.

Conceptual framework

Complexity science, systems thinking, and anchored instruction models are core concepts that power our anchored RRCB ecosystem, spurring scientific progress and knowledge translation¹⁰.

Complexity science is a conceptual framework for change. It describes the complex relationships between systems and groups, how they behave, and how they adapt to change¹¹. Implementing such change is largely influenced by context¹², a dynamic and changing element in itself that can adapt with interventions. The rural context offers great opportunity for healthcare research because of its unique groups and subsequent need for unique interventions. Complexity science can assist in understanding how rural communities behave, and what researchers can do to appropriately adapt healthcare system interventions with regard for all the groups within the context.

Systems thinking is a holistic approach that articulates the components of a system, their interrelationships, and how smaller systems work within larger systems and over time. RRCB programming uses purposive systems (those with an end goal over a period of time¹³) to iterate the importance of building a research plan and attaining it throughout the course of the program.

Anchored instruction is a major paradigm in learning where a small group of people work together to comprehend and resolve lifelike problems. In this approach, the learning materials are presented in the context of a real-life event relevant to the learners, which helps to anchor or situate the materials. It enables learners to identify and define problems while exploring the content from several viewpoints. Anchored instruction provides opportunities for

instructors and learners to work cooperatively in shared experiences^{14,15}. This is an essential component of teaching in an RRCB.

Application of conceptual framework in practice

To envision how the complexity of rural health could be supported by generating and integrating knowledge, we identified different components of a rural healthcare research program and how it could work over time and within the larger system. Our RRCB ecosystem allows learners to participate in active learning, enables them to identify room for change within their current systems, and allows the program to grow with the learners over time (ie continuance of research projects through support and *Rural360* opportunities).

Rural health complexities were the primary anchor or focus of this program. We established learning objectives to train participants, making them competent in investigating contextually important health problems. The use of rural health issues as the anchor encouraged rural physicians to see the anchor from their own perspectives, creating a narrative for their learning. These narratives were real-world issues brought to the table by every participant. This enabled an element of personal experience that facilitated learning links by exploring the problems identified through their clinical practice. Addressing the barriers of geographic isolation and lack of resources to conduct rural health research in situ, we supported participants with access to librarians, research assistants, mentors, subject matter experts, and graduate students from the main Memorial University campus. Another crucial component of the anchored delivery model was installing a dedicated staff member at the institution to act as a point of contact between the institution and the participants, connecting participants with resources and troubleshooting barriers to access. We also encouraged engagement of communities and citizens as partners during the program. We have articulated these components using logic models in our previous work.

Changes in participants' understanding were developed through the introduction of new ideas by the instructors, from the learning resources, and from their peers. The instructors mainly worked as facilitators, supporting learners by developing instructional frameworks¹⁶ and helping them define their own learning goals. Learning plans were made to be suitable for busy rural practice with limited access to resources in remote areas. The learners were responsible for monitoring their own progress using the instructional framework and being involved in peer feedback. Learning in a group of six individuals, they were able to provide multiple opinions and suggest several solutions to each problem presented.

The entire anchored delivery process occurs within an environment of sustained advocacy for rural research with stakeholders and decision-makers, and support. Table 1 describes each of the guiding principles through which this is achieved and explains how each is actioned by our RRCB.

Table 1: Guiding principles of an anchored delivery model

Principle	Theoretical processes	Example from 6for6 and Rura360
Face-to-face interaction	Systems thinking/complexity science	6for6 sponsors six rural physicians to attend six weekends of onsite training at Memorial University's St John's campus, where they complete a curriculum that is tailored to their needs via a needs assessment. Additionally, the learners meet with subject-matter experts and mentors who guide them in this learning experience.
Generative learning format	Anchored instruction	Rural physicians identify the problems, take ownership and are actively involved in finding solutions. We selected the anchor based on learning progression theories. It includes (1) upper anchor, the ultimate learning goals and learning outcomes, and (2) a lower anchor, defining the learners' ideas about rural health research when they enter the program. To link these two anchors, we defined intermediate levels of achievement. To monitor the achievements, we measure research competencies and productivity as progress variables.
Narrative format	Anchored instruction	The anchor is presented in a narrative format. It is a story about rural health issues identified by a physician who practiced in a rural area. For participants, this reinforces that they are addressing a real problem and not responding to a class assignment or quiz. The narrative format also makes it easier for participants who do not have any research experience when they enter the program.
Problem complexity	Anchored instruction/complexity science	The rural health issues have a high level of complexity, which stimulates learner engagement during the sessions. This also helps in merging the anchor with rural physicians' experiences. Moreover, these issues are appropriate anchors as they need many steps to be addressed. To link learning to the learners' personal experience, we use roundtable and peer discussion. This approach not only creates an interactive learning environment but also helps learners share their experience around the anchor.
Interactive multimedia resources/online community	Anchored instruction/systems thinking	We use an online content delivery system for course content, which also houses discussion forums as the default avenue for idea generation online. This allows participant interaction to extend beyond the face-to-face training sessions at no cost to them. We also built a package of multimedia resources accessible to learners via this online content delivery system. These interactive learner-centered multimedia include e-texts, PowerPoint presentations, animations, videos, and audio. Learners can browse, navigate, and analyze the resources by searching and indexing features. The virtual learning environment facilitates collaboration and real-time communication between learners and instructors. Although face-to-face is the ideal learning venue so that participants can retreat from the demands of practice to focus on research, supplementing the program with an online platform allows for flexibility and continuous learning on their own time. Fortunately, this online platform ensured the program was prepared for the shift to distance learning during the COVID-19 pandemic.
Embedded data design	Anchored instruction/complexity science	The rural health problems in this program contain embedded data. Many rural physicians can access the clinical and population health data related to the rural health problem they are focusing on. Learners can conduct a small-scale audit to support and guide their critical thinking and generate hypotheses. Using this data, the learners can better define their research question to conduct an appropriate literature search and plan for next steps.
Opportunities for transfer	Anchored instruction/complexity science	This format appeals to rural physicians who have busy schedules and do not have time to read and study long and complex health research textbooks. It allows them to transfer their clinical skills to research skills in parallel topics. Using their clinical knowledge as tools enhances deep learning and assists participants in expanding on their anchor and solving the problems they are examining.
Integration	Anchored instruction/systems thinking	This step specifically refers to knowledge integration or merging ideas to change the status quo of the way we work. The capstone project for 6for6, a research proposal, sees each participant combine the teachings from the entire program to conceptualize a research project around a community-relevant healthcare issue. The ultimate goal is for each participant to conduct their project and implement the findings into practice to spur healthcare change. We can then use our resources and expertise to assist them in overcoming external barriers they may encounter.
Working through the continuum: from competency to capacity building	Complexity science/systems thinking	Capacity building is much broader than developing skills and competencies through a training program. Capacity building strategies should involve individuals, institutions and systemic level activities. This needs assessment helped us to identify barriers to participation, such as organizational barriers, access to resources, and isolation. Choosing the main campus as the context for this program helps bring the participants to the resources and experts on a pre-determined schedule that is compatible with their practice. Given there are several health authorities across the province, organizational factors remain that are beyond the control of the program. In such cases, the research team's role is continued advocacy for matters such as research attention, funding, and education for rural areas, and to provide learners with as many resources as possible to sustain their research efforts. Also, the research team is led by physicians who have spent decades conducting research under the umbrella of the university and practicing medicine both in rural communities and within the jurisdictions of the various regional health authorities of the province. This allows our team to be highly adaptive, anticipating organizational and contextual challenges for participants, and in some cases presenting solutions before any issues arise.
Evaluation and continuous improvement	Systems thinking	6for6 is continuously evaluated and improved using pre-post surveys, end-of-program focus groups, spidergrams to measure social capital, narrative examination of minutes from the group discussions, and interviews with key informants. Our team also engages with participants on an individual level at all stages to iteratively improve the program based on their feedback. The biggest example is the Rura360 funding program, which is available to rural physicians from Northern Newfoundland and Coastal Labrador communities. Following previously developed frameworks and to support capacity development, the Rura360 program functions as a research incubator and assists rural physicians with research support and funding. This funding opportunity was created where feedback indicated a gap for rural research inclusion. Rura360 offers cyclical feedback so that rural researchers can improve their projects to receive funding and additional support. Ultimately, this program allows participants to further their research project and move toward being a rural research leader through academic partnerships, committed resources and enthusiasm. Through the development of professional connections and team building, 6for6 and Rura360 also promote the development of local communities of research practice in rural areas.

Outcomes of the anchored delivery model

The anchored delivery model enables key components of research capacity building typically precluded by the nature of rural areas. For example, geographical and professional isolation in rural areas⁷ restricts mentoring, networks, and collaborations; access to infrastructure; training; and research facilitators. Research funding, another crucial component, is also limited in rural areas^{1,17}. By hardwiring the RRCB program to a resource pool where these elements are available, the anchored delivery model removes these barriers and facilitates research leadership and the prioritization of research objectives by research-inclined rural physicians. This results in important contributions to research priorities. Below are some specific outcomes of our anchored delivery model:

- *Community of research practice*: Communities of practice represent a critical mass of people or organizations working on a particular matter^{18,19}. One of the goals of 6for6 is to generate a community of rural research practice across Memorial University's jurisdiction. This community of practice can then leverage the resources, professional connections and training opportunities from Memorial University where they are more readily available. The end result is rural physicians who can conceptualize research with a broader scope, rigor and impact than normally possible due to local limitations. They develop a network of collaborators who can assist with their research project and continue to enhance communities of rural research practice after completing the training program. They ultimately develop the skills and confidence to contribute to and influence priority healthcare decisions.
- *Self-organized group learning*²⁰: 6for6 participants schedule the training weekends as a group according to their

availability and the bulk of learning is completed in-person to address geographical and professional isolation issues characteristic of rural life.

- *Collaborative decision making and participatory action research*²¹: The intimacy of the doctor–patient relationship in rural settings²² puts physicians’ fingers on the pulse of community and patient issues. *6for6* participants’ research projects are inspired by these relationships and, in a sense, are crowdsourced by triangulating numerous, rich conversations with patients to determine the issue that needs investigating²³. Many participants involve citizens as project team members in varying capacities and disseminate their findings back to the public.
- *Social accountability*⁹: A central idea behind *6for6* is that participants apply the skills they learn to conceptualize and eventually conduct a research project that addresses a local healthcare issue. Overall, the impetus for these projects is physicians’ own empathy for their communities. This passion drives their learning and motivation and is enhanced through dialogue with other participants as they gain perspectives from other regions and knowledge of situations therein.

Discussion

The anchored delivery model can be used as a delivery approach for RRCB programming to help rural physicians harness academic skills and resources, and it has been an effective method of delivery for our ecosystem across several years. The many components of our model work together to create a personalized and effective learning environment and increase the opportunities for impactful results in rural communities that need it most. Overcoming research challenges associated with rural disparities is the underlying motivation of this particular delivery approach. We feel our work thus far may be useful for addressing the barriers and recommendations recently made by Lionis and colleagues²⁴ for enhancing health research capacity.

The anchored delivery model is just one option. There have been a modest few other attempts around the world to provide rural health researchers with a framework of support²⁵⁻²⁷, including

Schmidt and Kirby’s ‘modular’ Rural Research Capacity Building Program in Australia²⁸, and Matsubara and colleagues’ academic consultation and referral service in Japan²⁹. Schmidt and Kirby’s modular approach²⁸ offers advantages (eg greater context by delivering the RRCB program in situ) and disadvantages (eg reduced access to resources due to delivery in low resource area) relative to the anchored design. However, by focusing on similar fundamentals as *6for6* and *Rural360* (eg resource allocation, partnerships, leadership) their Rural Research Capacity Building Program, also described by Webster and colleagues in 2011²⁵, succeeded in empowering rural physicians to conduct research relevant to their community and practice, and emphasizes the importance of in situ research to the rural research capacity building process.

By contrast, Matsubara and colleagues’²⁹ consultation approach includes elements of the anchored model but operates differently than described here; rural physicians correspond remotely with an expert who provides feedback on their work. This program also shares core concepts of resource allocation, partnerships and leadership with our programming, although the nature of email correspondence may be limiting compared to what is available in *6for6* and *Rural360*.

With many needs to be addressed in rural health research, we wish to encourage dialog about this exciting new area so that it may grow from a strengthened foundation of scientific discussion. Ultimately, there are pros and cons to any design, and models should be selected based on what best meets local needs.

Conclusion

Rural Canadians have long dealt with major health challenges and disparities³⁰. As the historically under-appreciated matter of RRCB garners interest^{24,31}, we hope attention will be paid to the factors that enable or prevent rural physicians from researching the required solutions. However, this growing emphasis on rural scholarship will occur in a system that has at times questioned its merit³². The anchored delivery model is a solution to empower rural physicians to break this mold to become researchers, scholarly practitioners, and purveyors of change.

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