BMJ Open

# An evaluation of an interprofessional primary healthcare team in Quebec: a protocol for an effectiveness-implementation hybrid study

| | |
|---|---|
| Journal: | *BMJ Open* |
| Manuscript ID | bmjopen-2023-072006 |
| Article Type: | Protocol |
| Date Submitted by the Author: | 18-Jan-2023 |
| Complete List of Authors: | Côté, Nancy; VITAM Research Center on Sustainable Health, Sociology; Université Laval, Faculty of Social Sciences<br>Frikha, Yasmine ; Université Laval Faculté de médecine, readaptation<br>Freeman, Andrew; Université Laval Faculté de médecine, Département de réadaptation<br>Cortez Ghio, Sergio; VITAM Centre de recherche en santé durable<br>Laberge, Maude; Universite Laval Faculte de medecine, Operations and Decision Systems<br>Isabelle, Maripier; Université Laval Faculté des sciences sociales<br>Duhoux, Arnaud; Université de Montréal<br>Denis, Jean-Louis ; Université de Montréal<br>Jean, Emmanuelle; Public Health Agency of Canada<br>Binette, Sébastien; VITAM Centre de recherche en santé durable |
| Keywords: | PRIMARY CARE, Health Services Accessibility, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, QUALITATIVE RESEARCH, HEALTH ECONOMICS |
| | |

# Title page

An evaluation of an interprofessional primary healthcare team in Quebec: a protocol for an effectiveness-implementation hybrid study

**Authors**

1. **Nancy Côté, PhD**
   **(Corresponding Author)**
   Department of Sociology (Faculty of Social Sciences)
   Pavillon Charles-De Koninck
   1030, Avenue des Sciences-Humaines, Université Laval
   Québec (Québec), Canada G1V 0A6
   Telephone number: 418-663-5313 poste 12232
   Email address: nancy.cote@soc.ulaval.ca

2. Yasmine Frikha, M.Erg, PhD. Candidate
   Université Laval
   Québec (Québec), Canada

3. Andrew Freeman, PhD, erg.
   Department of Rehabilitation (Faculty of Medicine), Université Laval
   Québec (Québec), Canada

4. Sergio Cortez Ghio, PhD
   VITAM : Centre de recherche en santé durable
   Québec (Québec), Canada

5. Maude Laberge, PhD
   1. Department of Operations and Decision Systems (Faculty of Administrative Sciences), Université Laval
   Québec (Québec), Canada
   2. VITAM : Centre de recherche en santé durable
   Québec (Québec), Canada

6. Maripier Isabelle, PhD
   Department of Economic (Faculty of Social Sciences), Université Laval
   Québec (Québec), Canada

7. Arnaud Duhoux, PhD
   Faculty of Nursing Sciences, Université de Montréal
   Montréal (Québec), Canada

8. Jean-Louis Denis, PhD
Department of Health Management, Evaluation and Policy (School of Public Health), Université de Montréal
Montréal (Québec), Canada

9. Emmanuelle Jean, PhD
Agence Santé Publique Canada
Ottawa (Ontario), Canada

10. Sébastien Binette
VITAM : Centre de recherche en santé durable
Québec (Québec), Canada

**Word count: 3517**

## Keywords

Primary care, interprofessional team, advanced practice nursing, access, person-centredness, efficiency

## Abstract

**Introduction:** One Family Medicine Group (FMG) in Quebec (Canada) has commenced a five-year pilot project, which is herein referred to as the *Archimède* model, to implement a patient-centred model based on interprofessional care and the optimal use of healthcare providers' practice scopes. A research project will be conducted to: (1) assess this model's effect on the FMG's operational performance, and its users' resource utilization at the public health system level; (2) investigate its optimization with respect to professional roles, interprofessional teamwork, and patient-centredness; and (3) document

users' experience with the model. The aim of this article is to describe the protocol that will be used for this research.

**Methods and analysis:** A hybrid implementation approach (type 2 model) will be used. We will collect both quantitative and qualitative data. Regarding the quantitative dimension, and because this is a single-unit intervention study, we will use synthetic control methods and one-sample generalized linear models for analyses at the FMG level. To evaluate the broader impact of *Archimède* on the public health system, we will use mixed-effects models and propensity score matching methods. Regarding the qualitative research dimension, using an interpretative descriptive approach, we will document users' experience and identify the factors that optimize professional scopes of practice, collaborative practices, and patient-centredness. We will conduct individual in-depth semi-structured interviews with healthcare providers, administrative staff, stakeholders involved in the *Archimède* model implementation, and patients.

**Ethics and dissemination:** This study has been approved by the Ethics Committee of the Sectoral Research in Population Health and Primary Care of the Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale (#2019-1503). The results of the investigation will be presented to the stakeholders involved in the advisory committees and at several scientific conferences. Manuscripts will be submitted to peer-reviewed journals.

**Strengths and limitations of the study**

- This study will advance understanding about the effects of a team-based model of care within a FMG that is in a disadvantaged area and whose clientele presents complex biopsychosocial problems.
- This study will advance understanding about the efficiency of primary care models, thus responding to the need to better evaluate primary care reforms.
- Although our study focuses on only one FMG, conducting this project will permit the testing of an ambitious methodology to quantitatively assess the performance of the FMG, and an in-depth exploration of the influences of the implementation context on the deployment of the project.
- The involvement of multiple actors both in the data collection and on the advisory committee should help to mitigate the potential limitations of the Type 2 effectiveness-implementation hybrid study (e.g., poor adoption and fidelity of the implementation strategy).

# INTRODUCTION

## Context of the study

The aim of the protocol presented in this article is to evaluate the implementation of a new model of primary care. This model differs from the practices in many medical clinics because of its diversified interprofessional team (e.g., primary health nurse practitioners, registered nurses, social workers, physiotherapist), the close collaborations between health and social professionals, and the access to non-physician-centric care.

Primary care, which is patients' first point of contact with the health care system (1), provides early care for health problems, chronic disease management, and preventive services. Various models of interprofessional primary care are being created to address human resource shortages in health systems, control health care costs, and reduce overuse of emergency departments visits (2-4). These models are also designed to address the biopsychosocial needs of patients and improve access, continuity of care, and quality of care (5-9).

In the early 2000s, in response to inconsistent primary care access, Canadian provinces and territories began developing various initiatives (10, 11), one of these being the creation of interprofessional primary care teams. In Quebec, these teams are called *Groupes de médecine familiale* [Family Medicine Groups (FMGs)], within some of which physicians, nurses, and other health and social services professionals collaborate to deliver health care based on contractual agreements with the provincial government (10). Although the FMGs are private clinics (albeit financed within Quebec's public insurance system), they have direct collaborative links with the *Centres intégré universitaire de santé et de services sociaux (*CIUSSS) [Integrated university health and social services centres]; many

of the professionals who work in the FMGs are employees of the CIUSSS. The Ministry for Health and Social Services (MSSS) establishes the rules for the distribution of professional and administrative resources.

In 2017, the Saint-Vallier FMG in Quebec City, situated within the CIUSSS-Capitale Nationale (CN) territory, commenced a five-year pilot project, titled *Archimède (12)*. Threatened with closure in 2015 due to the retirement of its physicians and the difficulties of medical recruitment in this district, in which it has not always been easy to recruit healthcare personnel, the pilot project enabled the FMG to maintain its activities, and to continue to meet the complex and diversified needs of the population. Due to the COVID-19 pandemic, which necessitated significant changes in both how services could be provided and staff availability, the pilot project period was extended by two years. This project, which was developed in collaboration with relevant stakeholders (e.g., MSSS, CIUSSS-CN), seeks to implement a patient-centred model based on interprofessional care and the optimal use of healthcare providers' scopes of practice. The *Archimède* project is anticipated to improve access to primary care and, given the lower remuneration associated with the services provided by nurses and other health and social services professionals compared to that of physicians, to reduce costs. Also, arising partly from a more efficient allocation of patients across the various professions within the clinic, the improved access is anticipated to reduce hospital utilization (e.g., emergency department visits), thus contributing to health system efficiency (1, 2).

Our investigation aims to identify areas of improvement, formulate recommendations to improve the model's functioning, ensure its utility to stakeholders, and foster its sustainability and potential for scaling up. Specifically, this study seeks to

determine whether the *Archimède* model is efficient regarding patient and clinic outcomes and teamwork (e.g., role optimization) in relation to the resources invested. Our objectives are: (1) to evaluate the impact of the *Archimède* model on operational performance at the FMG level as well as user resource utilization at the public health system level; (2) to identify the factors that foster or impede the optimization of professional roles, interprofessional teamwork, and patient-centredness, and (3) to document users' experience with the *Archimède* model.

## Setting

The St-Vallier FMG is in Quebec City's Saint-Sauveur district. This neighbourhood has one of the highest rates of demographic fragility within the CIUSSS-CN territory (13). Although the FMG serves a very broad clientele, a large proportion of its consultations are conducted with users with chronic health problems or in vulnerable psychosocial situations. The clinic's clientele is also characterized by a significant number of immigrants and political refugees. Regarding the FMG's human resources, there are currently 27 employees, including six family physicians (FPs), four primary health care nurse practitioners (PHCNPs), one mental health nurse practitioner (MHNP), five registered nurses (RNs), six health and social services professionals (social worker, nutritionist, physiotherapist, kinesiologist, psychologist, respiratory therapist), and five administrative staff. All services are free of charge for clients registered in the FMG. When making an appointment, users are invited to explain their reason for consultation in order to be directed to the right professional resource by administrative staff, according to predefined care trajectories. Complex health problems are managed as a team. The team also contributes

to facilitating access to various outreach services, including in community resources and the various services offered by the CIUSSS-CN.

# METHOD AND ANALYSIS

## Conceptual framework

This study is based on two frameworks : the *Quadruple Aim* framework (14), which is the Canadian framework used for health care transformation research (15); and the optimization of professional scopes of practice (16). The Quadruple Aim framework is designed to foster change in health care systems through the achievement of four goals : improved population health outcomes; improved care and patient experience; improved provider satisfaction; and lower costs/better value (14, 15). Recently, a fifth aim has been added that recognizes health equity as an important outcome to reduce health disparities and address social determinants of health (17, 18). In primary care, the development of interprofessional teams is a key factor in improving quality to achieve these goals (2).

Regarding the optimization of professional scopes of practice, the Canadian Academy of Health Sciences (CAHS) identified factors of influence at the micro-, meso- and macro-levels (16). Micro-level factors include professional hierarchies, professional cultures, and communication among healthcare professionals. Meso-level factors include communication across multiple care settings, professional protectionism, accountability, and availability of evidence. Macro-level factors include legislation/regulations, payment models, educational needs/requirements, and healthcare professional accountability.

## Design

The research on evidence-based interventions frequently favours a stepwise approach; one of the limitations of this approach is the significant time lag between the development of the interventions and its implementation in the field (19). To address this issue, hybrid designs have been developed to promote the examination of effectiveness and implementation outcomes within a single study. Our research will use a hybrid implementation approach, and specifically the type 2 model, that incorporates a dual focus on effectiveness and implementation outcomes (19). This model permits simultaneous testing or piloting of implementation strategies during an effectiveness trial. Specifically, in this investigation, we will collect both quantitative and qualitative data.

The overall data collection process is presented in Figure 1 and will commence in mid-February 2023.

It is relevant to note that an advisory committee was established at the beginning of the development of the project, the objectives of which are to better understand the broader implementation context, monitor the progress of the research project, discuss methodological and fieldwork aspects and the emerging findings, and develop strategies for knowledge transfer to maximize the impact in the health care system. This committee is composed of members of the research team, and representatives from the management of the St-Vallier FMG, a user partner, and stakeholders from the CIUSSS-CN and the MSSS.

*Insert Figure 1 here*

**Figure 1. Data collection process over a year.**

## Quantitative approach

Our quantitative approach aims to evaluate the impact of the *Archimède* model on operational performance at the FMG level as well as user resource utilization at the public health system level. Because this is a single-unit intervention study, to quantitatively assess the performance of the *Archimède* model at the FMG level (outcomes will include metrics such as *number of patient visits* and *vulnerability-weighted enrollments*), we will use either or both synthetic control methods (20, 21) and one-sample generalized linear models. Synthetic control methods are quasi-experimental and are commonly used in the policy evaluation literature. In the case of our study, this approach will consist of creating a control counterfactual FMG from a weighted average of other FMGs in the Quebec City region. On the other hand, one-sample generalized linear models will be informed by preliminary clustering analyses (such as principal component analysis) for control FMGs' selection, and will allow for hypothesis testing. The choice of methods will heavily depend on data availability, including at what point it is first available, and data structure. The database for the FMG-level analyses will be built from different operational and financial reports of all FMGs in the Quebec City region, including the St-Vallier FMG. These reports are compiled by and will be provided to us by the MSSS and the CIUSSS. We will extract data from reports ranging from 2012 to 2022. A non-exhaustive list of the variables we plan to collect as well as details concerning the reports from which they will be extracted are presented in Table 1.

*Table 1. Non-exhaustive list of FMG-level variables of interest*

| Variable of interest | Additional information | Source |
|---|---|---|
| Year | | |
| Id | | |
| Size | | MSSS's financial report of FMGs |
| Type | Private vs public | MSSS's financial report of FMGs |
| Number of hours worked for each type of healthcare worker | E.g.. nurses, physical therapists, nutritionist, psychologists, etc. | CIUSSS's payroll report |
| Full time equivalents (FTEs) for each type of healthcare worker | E.g., nurses, physical therapists, nutritionist, psychologists, etc. | CIUSSS's payroll report |
| Enrolments | Total unweighted number of patient enrollments | MSSS's 8B report |
| Weighted enrolments | Weights include vulnerability, disadvantage, births, etc. | MSSS's 8B report |
| Number of physicians | | MSSS's 8B report |
| Patient attendance rate | | MSSS's financial report of FMGs |
| Visits | Subdivided into in person visits vs telemedicine. | MSSS's 8C report |
| Funding | Total amount of government funding in CAD | MSSS's financial report of FMGs |

In addition, to evaluate patients' service utilization outside of the FMG, and thus better understand the broader impact of *Archimède* on the public health system, we will use both generalized linear mixed-effects models and propensity score matching methods (22) to compare patients enrolled in the St-Vallier clinic to those enrolled in other FMGs. The outcomes will include metrics such as *number of urgent care admission events* and *length of hospitalization*. Confounding factors will include variables such as *age*, *gender*, and pre-existing health conditions. The database for this portion of the study will be built and anonymized by the *Institut de la Statistique du Québec* (ISQ). A short list of some of

the variables we will be querying, as well as details about the source database from which they will be extracted by the ISQ, are presented in Table 2.

*Table 2. Public health system-level example variables of interest*

| Variable of interest | Additional information | Source database | Source database specifications |
|---|---|---|---|
| ID | Unique patient identifier provided by the ISQ | FIPA | FIPA contains information about patients covered by the public health insurance system |
| Age | | FIPA | |
| Gender | | FIPA | |
| Partial postal code | First three digits | FIPA | |
| Urgent care admission event | | BDCU | BDCU contains information about urgent care admissions |
| Length of hospitalization | | MED-ECHO | MED-ECHO contains information about hospitalizations |
| Service request event | | I-CLSC | I-CLSC contains information about frontline common health and social services |

*Note*. FIPA = Fichier d'inscription des personnes assurées, BDCU = Banque de données commune des urgences. MED-ECHO = Maintenance et exploitation des données pour l'étude de la clientèle hospitalières, I-CLSC = Système d'information sur la clientèle et les services des CSSS - mission CLSC. A list of all available variables that the ISQ can provide can be found at: https://statistique.quebec.ca/research/#/donnees/administratives/sante.

The data will subsequently be transferred to us via a secured remote connection service offered by the ISQ. The final database will comprise upwards of 60 variables for 14,000 randomly selected and uniquely identified patients; 3,500 (25%) will be patients enrolled in the St-Vallier FMG and 10,500 (75%) will be patients enrolled in other FMGs. The experimental population sample of 3,500 patients is based on the lowest number of enrollments in the St-Vallier clinic between 2018 and 2022 (3,924 patients). The 25-75%

split was chosen to maximize the likelihood of successfully building synthetic control patients from weighted averages of patients enrolled in other FMGs to match the experimental group. To be included, patients will have to be over 18 years of age and will need to have been enrolled in the same single FMG between 2018 and 2022.

## Qualitative approach

We will conduct the qualitative research portion of this study using an interpretive description methodology (23). This approach is appropriate for gaining a rich understanding of service providers', stakeholders', and patients' experiences with the *Archimède* model, and their links with meso- and macro-level factors that influence the optimisation of roles, interprofessional collaboration and patient-centredness. To collect this data, we will conduct individual in-depth semi-structured interviews, which will be appropriate given the potentially sensitive data that participants will share, to permit us to capture deeper understanding of the subjective work and patient experience.

### Population: eligibility criteria and sampling strategy

We will use a purposive sample (24) of healthcare providers (FPs, PHCNPs, RNs, various health and social services professionals), administrative staff and managers working in the St-Vallier FMG; stakeholders involved in the *Archimède* model implementation; and patients receiving services at the FMG. All employees from the St-Vallier FMG will be eligible. We will recruit up to five stakeholders who played a key role in the implementation of the *Archimède* model (e.g., representatives from the MSSS, clinical advisor on interprofessional collaboration), depending on the advisory committee's

suggestions. The sample of patients will be based on the main health problems for which patients seek care, which we will determine during recruitment. We aim to include patients with health problems such as chronic diseases, mental health problems, and loss of autonomy. We believe that 20 patients will be sufficient for providing rich data, although the final number will be determined by the attainment of data saturation (25). Patients will be required to be ≥ 18 years old, enrolled with a FP, and considered able to provide informed consent by healthcare providers. All patients enrolled in the study will be asked to complete a socio-demographic form to provide information on their socio-economic status.

## Recruitment strategy

Participation in the individual interviews will be voluntary. For the recruitment of healthcare providers, managers and administrative staff, we will conduct an information session at the Saint-Vallier FMG to present the study and distribute information leaflets. We will also send an email to these personnel categories with detailed information about the study to inform employees who cannot attend the meeting. Employees who are interested in participating in the interviews will be invited to contact us. In addition, we will identify key stakeholders with the help of the advisory committee and contact them directly via email or telephone. For patient recruitment, we will ask healthcare providers to provide them with information leaflets. We will also leave leaflets in the waiting rooms of the FMG. These leaflets, which will inform patients about the entire study so that they have the choice to decline participation, will include a consent form and will inform patients about the $30 to compensate participants for their time. Patients will have the

option to contact the research team directly or leave their contact information in an online form if they are interested in participating in the interviews.

## Interviews

The interviews will be conducted in participants' preferred setting (i.e., home, research centre, FMG, videoconference), albeit adhering as necessary to current public health guidelines. The interview guides for individual interviews, developed in collaboration with the advisory committee, are based on the conceptual framework (see Table 3 for interview themes). These guides will evolve iteratively such that analyses of the results of the first interviews will inform questions during subsequent interviews. The interviews will be audio-taped with participants' consent.

*Table 3. Interview themes*

| | **Themes** |
|---|---|
| **Employees** | Work organization and motives to work in the FMG<br>Impact of *Archimède* on professional role and workload<br>Interdisciplinary teamwork dynamics<br>Level of commitment to work in the FMG<br>Experience and satisfaction with the new FMG's work organization<br>Obstacles to the implementation of the model (micro, meso, macro) |
| **Stakeholders** | Role in the implementation process<br>Context of emergence and the implementation process<br>Operation of the FMG<br>Assessment of the *Archimède* model |
| **Patients** | Reasons for seeking care and healthcare providers seen<br>Impact of *Archimède* on care and ability to get involved in one's own care (Saint-Vallier clinic)<br>Satisfaction with care<br>Likes and dislikes about the FMG's work organization<br>Participation in care decision-making |

## Data analysis

Our analysis of the interview data will be facilitated by using Nvivo software (26). We will follow the stages of thematic analysis: initial coding according to our predefined interview themes and those that emerge during the analysis; categorization; consolidation of categories; linking of categories; and data integration and modeling (27). We will analyze data in light of factors that optimize scope of practice, at the micro, meso, and macro levels, as defined by the CAHS (16). We will give particular attention to the collaboration between healthcare providers, and collaboration between healthcare providers and administrative staff. Furthermore, we will characterize interactions between the micro, meso and macro levels. We will prepare comprehensive summaries of our results and discuss them with the advisory committee group to enhance our interpretation. Subsequently, we will (1) formulate recommendations for optimizing interprofessional collaborative and patient-centred practices and the role of healthcare providers, and (2) highlight the challenges and potential viable solutions related to the sustainability of the *Archimède* project and its potential scaling up in other settings.

# PATIENT AND PUBLIC INVOLVEMENT

Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. The user-partner played a key role from the very beginning of the pilot project through his participation in several meetings of the advisory committee. The governance of the project has been designed to ensure that user-partners are involved in the decision-making processes, which will allow the advisory committee to

remain responsive to user concerns throughout the implementation of the project. Refer to the Methods and analysis section for further details.

## ETHICS AND DISSEMINATION

This project respects the ethics, integrity and responsible research conduct standards defined by the Fonds de recherche du Québec (FRQS) and the CIUSSS-CN. It has received ethical approval from the regional health organization with which the researchers are affiliated (# 2019-1503). Regarding ethical considerations specific to the participants in the interviews, we specified all their rights in accordance with the rules of the sectoral research ethics committee (CER-S) in population health and primary care (e.g., the right of participants to withdraw from the study at any time and to refuse to answer certain questions; the confidentiality obligations of the researchers; the confidentiality obligations of the focus group participants). The results of the investigation will be presented to the stakeholders involved in the advisory committee and at several scientific conferences. Manuscripts will be submitted to peer-reviewed journals.

## DISCUSSION

Interprofessional teams are increasingly being established throughout Canada and elsewhere to improve the access, continuity and quality of services provided to individuals living with complex health problems (e.g., chronic diseases, mental health challenges, comorbidities) (6, 28-32). A variety of models exist, characterised both by the organization and degree of interprofessional collaboration, as well as the type of clients served (33-35).

This project will advance the understanding of the effects of a team-based model of care within a FMG that is in a disadvantaged area and whose clientele presents complex biopsychosocial problems. Various interprofessional primary care models have been developed that are designed to address complex health problems in specific populations identified as vulnerable, for example, older adults, (36), individuals with HIV (37), and veterans (38). However, these models have frequently been presented as intervention programs composed of a predefined interprofessional continuum of care, a care manager, and/or case discussions. In comparison, the *Archimède* model is based on a uniform orientation to the optimization of professional roles (seeing the right professional at the right time), and the use of predefined pathways enacted by administrative staff when making appointments. Furthermore, in this model, referrals are made between professionals, and the continuum of care is facilitated by having an interprofessional team in the same location. Access to this interprofessional approach also is facilitated because no fee is charged. In addition, compared to other reported primary care models (34, 39, 40), there is no preselection of patients, with all patients being eligible for the appropriate professional services. Our research project seeks to understand the experience of users attending a clinic based on this model to assess the relevance of this model for this population.

One of the strengths of our research includes the measure of efficiency with respect to operational performance at the FMG level and the use of health network resources (e.g., emergency room visits) by *Archimède* users. This study will make an important contribution to the understanding of the efficiency of primary care models, thus responding to the need to better evaluate primary care reforms (10, 32).

The originality of our research lies in our focus on the interrelations between the micro, meso and macro levels to better identify the elements that facilitate or hinder the deployment of the model and the optimisation of interprofessional collaboration. Understanding the context of implementation, particularly in relation to the particularity of the dual public and private organisational structures, is an important element in this research project. That is, although the model is deployed in a private clinic, it is publicly funded. As well, some staff are paid by the public health organization. Thus, our approach takes into account: 1) structural issues related to health policies in primary care, types of funding, and resource management; 2) issues related to the organization of the clinic (e.g., dynamics of interprofessional collaboration and management practices); and 3) micro-level issues related to the subjective work experience of professionals and service users' experiences (16). Although our research evaluates only one FMG, the findings from this study could be relevant not only in Quebec but also for other jurisdictions looking to develop interprofessional primary care models that address the social determinants of health, and that optimize the use of health and social care providers' respective scopes of practice.

Regarding the potential limitations of our investigation, there is a possible lack of generalisation in studying only one FMG. Nevertheless, conducting this project will permit us to both test our ambitious methodology to quantitatively assess the performance of the FMG, and to explore in depth the influences of the implementation context on the deployment of the project. A potential limitation of the type 2 effectiveness-implementation hybrid study approach concerns the difficulties that can arise if the

implementation strategy leads to poor adoption and fidelity, as it can compromise the effectiveness trial field (19). In our study, the involvement of multiple actors in the advisory committee should help to mitigate this limitation. A further possible limitation concerns the potential for generalisation to other areas with different demographic profiles, given that the FMG under study is in a disadvantaged area. However, it is unlikely that all patients attending the FMG are in a vulnerable situation; the use of a socio-demographic form will allow to establish a socioeconomic profile of the patients interviewed.

## FUNDING STATEMENT

This work was financially supported by the Quebec Ministry of Health and Social Services (MSSS) and the *Fonds de Recherche du Québec - Santé* (FRQS).

## AUTHORS CONTRIBUTION

All authors reviewed and approved this manuscript.

## COMPETING INTERESTS

None.

## ACKNOWLEDGMENT

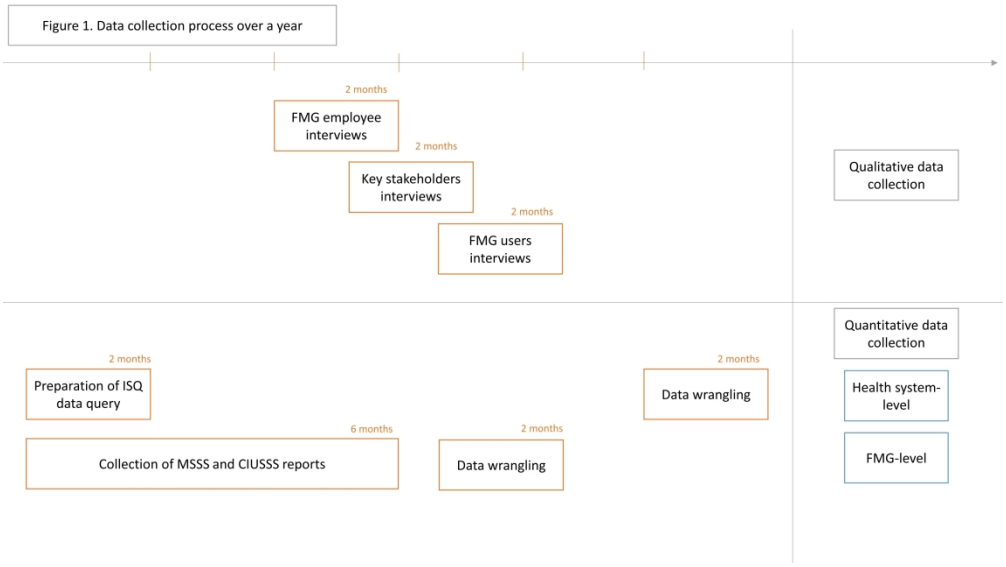
The authors would like to extend special thanks to the user partner who sits on our committee (Monsieur Raynald Savard) and to the participants, users, and health and social professionals, without whom this study would not be possible.

# REFERENCES


1. Starfield B, Shi L, J. M. Contribution of primary care to health systems and health. Milbank Quarterly. 2005;83(3):457-502. doi:10.1111/j.1468-0009.2005.00409.x
2. Aggarwal M, Hutchison B. Toward a primary care strategy for Canada. Ottawa (CA): Canadian Foundation for Healthcare Improvement; 2012.
3. Coleman K, Wagner E, Schaefer J, Reid R, LeRoy L. Redefining primary care for the 21st century. White paper. Rockville, MD: AHRQ Publication; 2016.
4. Bourgeault IL, Mulvale G. Collaborative health care teams in Canada and the USA: Confronting the structural embeddedness of medical dominance. Health Sociology Review. 2006;15(5):481-95. doi:10.5172/hesr.2006.15.5.481
5. Conley VM, Judge-Ellis T. Disrupting the system: An innovative model of comprehensive care. The Journal for Nurse Practitioners. 2021;17:32-6. doi:10.1016/j.nurpra.2020.09.012
6. Ashcroft R, Menear M, Greenblatt A, Silveira J, Dahrouge S, Sunderji N, et al. Patient perspectives on quality of care for depression and anxiety in primary health care teams: A qualitative study. Health Expectations. 2021;24(4):1168-77. doi:10.1111/hex.13242
7. Fitzpatrick SJ, Perkins D, Handley T, Brown D, Luland T, Corvan E. Coordinating mental and physical health care in rural Australia: An integrated model for primary care settings. International Journal of Integrated Care. 2018;18(2):1-9. doi:10.5334/ijic.3943
8. Lyon RK, Slawson JG. An organized approach to chronic disease care. Family Practice Management [Internet]. 2011; 18(3):[27-31 pp.]. Available from: http://www.aafp.org/fpm/2011/0500/p27.html.
9. Metusela C, Usherwood T, Lawson K, Angus L, Kmet W, Ferdousi S, et al. Patient centred medical home (PCMH) transitions in western Sydney, Australia: a qualitative study. BMC Health Services Research 2020;20(285):1-13. doi:10.1186/s12913-020-05123-7
10. Hutchison B, Levesque J-F, Strumpf E, Coyle N. Primary health care in Canada: Systems in motion. Milbank Quarterly. 2011;89(2):256-88. doi:10.1111/j.1468-0009.2011.00628.x
11. Wong ST, Chomienne M-H, Montfort H. IHWC papers: Comparisons of the restructured primary care in the IMWC countries - Canada. 2011.
12. Laliberté C, Dubé G, Fréchette A, Boucher C. La clinique Archimède: L'infirmière, un lever d'excellence (Clinique Saint-Vallier, Québec)2016. Available from: https://docplayer.fr/11842570-La-clinique-archimede-l-infirmiere-un-levier-d-excellence.html.
13. Partenariat Données Québec. Défavorisation combinée 2016 - National (Reg.2). 2019. Available from: https://www.donneesquebec.ca/recherche/dataset/indice-de-defavorisation-du-quebec-2016/resource/8361d460-bba3-409a-a724-8f2c71decede.
14. Bodenheimer T, Sinsky C. From triple to quadruple aim: Care of the patient requires care of the provider. Annals of Family Medicine. 2014;12(6):573-6. doi:10.1370/afm.1713
15. Canadian Institutes of Health Research. Research strategic plan 2021-2026 2021. Available from: https://cihr-irsc.gc.ca/e/52481.html#fig_1.

16. Nelson S, Turnbull J, Bainbridge L, Caulfield T, Hudon G, Kendel D, et al. Optimizing scopes of practice: New models of care for a new health care system. Ottawa (CA): Canadian Academy of Health Sciences; 2014.
17. Nundy S, Cooper LA, Mate KS. The quintuple aim for health care improvement : A new imperative to advance health equity. JAMA. 2022;327(6):521-2. doi:10.1001/jama.2021.25181
18. Itchhaporia D. The evolution of the quintuple aim : Health equity, health outcomes, and the economy. Journal of the American College of Cardiology. 2021;78(22):2262-4. doi:10.1016/j.jacc.2021.10.018
19. Landes SJ, McBain SA, Curran GM. An introduction to effectiveness-implementation hybrid designs. Psychiatry Research. 2019;280(112513). doi:10.1016/j.psychres.2019.112513
20. Abadie A. Using synthetic controls: Feasibility, data requirements, and methodological aspects. Journal of Economic Literature. 2021;59(2):391-425. doi:10.1257/jel.20191450
21. Hollingsworth A, Wing C. Tactics for design and inference in synthetic control studies: An applied example using high-dimensional data2020. Available from: https://ssrn.com/abstract=3592088
22. Stuart EA. Matching methods for causal inference: A review and a look forward. Stat Sci. 2010;25(1):1-21. doi:10.1214/09-STS313
23. Thorne S. Interpretative description : Qualitative research for applied practice. 2nd ed: Routledge/Taylor & Francis Group. ; 2016.
24. Robinson OC. Sampling in interview-based qualitative research: A theoretical and practical guide. Qualitative Research in Psychology. 2014;11(1):25-41. doi:10.1080/14780887.2013.801543
25. Patton MQ. Qualitative research and evaluation methods. 4e ed: SAGE; 2014.
26. QSR International Pty Ltd. NVivo (released in March 2020)2020. Available from: https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home.
27. Miles MB, Huberman AM, Saldaña J. Qualitative data analysis: A methods sourcebook. 3rd ed. Thousand Oaks (CA): SAGE Publications; 2014.
28. Smith-Carrier T, Pham T-N, Akhtar S, Nowaczynski M, Seddon G, Sinha S. "A more rounded full care model": Interprofessional team members' perceptions of home-based primary care in Ontario, Canada. Home Health Care Services Quarterly. 2015;34(3-4):232-51. doi: 10.1080/01621424.2015.1108892
29. Moore A, Patterson C, White J, House ST, Riva JJ, Nair K, et al. Interprofessional and integrated care of the elderly in a family health team. Canadian Family Physician. 2012;58(8):436-41.
30. McElheran W, Eaton P, Rupcich C, Basinger M, Johnston D. Shared mental health care: The Calgary model. Families, Systems & Health. 2004;22(4):424-38. doi:10.1037/1091-7527.22.4.424
31. Kates N, McPherson-Doe C, George L. Integrating mental health services within primary care settings: the Hamilton Family Health Team. The Journal of Ambulatory Care Management. 2011;34(2):174-82. doi:10.1097/JAC.0b013e31820f6435

32. Peckham A, Ho J, Marchildon GP. Policy innovations in primary care across Canada: North American Observatory on Health Systems and Policies; 2018. Available from: https://ihpme.utoronto.ca/wp-content/uploads/2019/08/NAO_RR1.pdf.
33. Collins C, Heuson DL, Munger R, Wade T. Evolving models of behavioural health integration in primary care: Milbank Memorial Fund; 2010.
34. Longhini J, Canzan F, Mezzalira E, Saiani L, Ambrosi E. Organisational models in primary health care to manage chronic conditions: A scoping review. Health & social care in the community. 2022;30(3):565-88. doi:10.1111/hsc.13611
35. Carter R, Riverin B, Levesque J-F, Gariepy G, Quesnel-Vallée A. The impact of primary care reform on health system performance in Canada: A systematic review. BMC Health Services Research. 2016;16(324):1-11. doi:10.1186/s12913-016-1571-7
36. Karia H, Kortejärvi H, Laaksonena R. Developing an interprofessional people-centred care model for home-living older people with multimorbidities in a primary care health centre: A community-based study. Exploratory Research in Clinical and Social Pharmacy. 2022;5(100114):1-8. doi:10.1016/j.rcsop.2022.100114
37. Tu D, Belda P, Littlejohn D, Somlak Pedersen J, Valle-Rivera J, Tyndall M. Adoption of the chronic care model to improve HIV care : In a marginalized, largely aboriginal population. Canadian Family Physician. 2013;59:650-7.
38. Codella N, Kelleya AT, Jonesa AL, Dungana MT, Valentinoa N, Holteya AI, et al. Aims, development, and early results of an interdisciplinary primary care initiative to address patient vulnerabilities. The American Journal of Drug and Alcohol Abuse. 2021;47(2):160-9. doi:10.1080/00952990.2020.1832507
39. Asarnow JR, Rozenman M, Wiblin J, Zeltzer L. Integrated medical-behavioral care compared with usual primary care for child and adolescent behavorial health: A meta-analysis. JAMA Pediatrics. 2015;169(10):929-37. doi:10.1001/jamapediatrics.2015.1141
40. McManus LS, Dominguez-Cancino KA, Stanek MK, Leyva-Moral JM, Bravo-Tare CE, Rivera-Lozada O, et al. The patient-centred medical home as an intervention strategy for diabetes mellitus: A systematic review of the literature. Current Diabetes Reviews. 2021;17(3):317-31. doi:10.2174/1573399816666201123103835




338x190mm (300 x 300 DPI)

**Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0)**
**September 15, 2015**

| Text Section and Item Name | Section or Item Description | |
|---|---|---|
| **Notes to authors** | • The SQUIRE guidelines provide a framework for reporting new knowledge about how to improve healthcare<br>• The SQUIRE guidelines are intended for reports that describe system level work to improve the quality, safety, and value of healthcare, and used methods to establish that observed outcomes were due to the intervention(s).<br>• A range of approaches exists for improving healthcare. SQUIRE may be adapted for reporting any of these.<br>• Authors should consider every SQUIRE item, but it may be inappropriate or unnecessary to include every SQUIRE element in a particular manuscript.<br>• The SQUIRE Glossary contains definitions of many of the key words in SQUIRE.<br>• The Explanation and Elaboration document provides specific examples of well-written SQUIRE items, and an in-depth explanation of each item.<br>• Please cite SQUIRE when it is used to write a manuscript. | **As you review the manuscript, place a checkmark in this column for each SQUIRE item that is appropriately addressed in the manuscript. Remember that not every item is necessary in every manuscript.** |
| **Title and Abstract** | | |
| **1. Title** | Indicate that the manuscript concerns an initiative to improve healthcare (broadly defined to include the quality, safety, effectiveness, patient-centeredness, timeliness, cost, efficiency, and equity of healthcare) | p.1 |
| **2. Abstract** | a. Provide adequate information to aid in searching and indexing<br>b. Summarize all key information from various sections of the text using the abstract format of the intended publication or a structured summary such as: background, local problem, methods, interventions, results, conclusions | pp.2-3 |

| Introduction | *Why did you start?* | |
|---|---|---|
| **3. Problem Description** | Nature and significance of the local problem | p.5-6 |
| **4. Available knowledge** | Summary of what is currently known about the problem, including relevant previous studies | p.5-6 |
| **5. Rationale** | Informal or formal frameworks, models, concepts, and/or theories used to explain the problem, any reasons or assumptions that were used to develop the intervention(s), and reasons why the intervention(s) was expected to work | p.8 |
| **6. Specific aims** | Purpose of the project and of this report | p.7 |
| **Methods** | *What did you do?* | |
| **7. Context** | Contextual elements considered important at the outset of introducing the intervention(s) | p.7 |
| **8. Intervention(s)** | a. Description of the intervention(s) in sufficient detail that others could reproduce it<br>b. Specifics of the team involved in the work | a) p.7<br>b) p.7 |
| **9. Study of the Intervention(s)** | a. Approach chosen for assessing the impact of the intervention(s)<br>b. Approach used to establish whether the observed outcomes were due to the intervention(s) | a) p. 9 |
| **10. Measures** | a. Measures chosen for studying processes and outcomes of the intervention(s), including rationale for choosing them, their operational definitions, and their validity and reliability<br>b. Description of the approach to the ongoing assessment of contextual elements that contributed to the success, failure, efficiency, and cost<br>c. Methods employed for assessing completeness and accuracy of data | pp.10-13 (quantitative)<br>pp. 13-15 (qualitative) |
| **11. Analysis** | a. Qualitative and quantitative methods used to draw inferences from the data<br>b. Methods for understanding variation within the data, including the effects of time as a variable | pp. 10-13 (quantitative)<br>p.16 (qualitative) |
| **12. Ethical Considerations** | Ethical aspects of implementing and studying the intervention(s) and how they were addressed, including, but not limited to, formal ethics review and potential conflict(s) of interest | p.17 |

| Results | *What did you find?* | |
|---|---|---|
| **13. Results** | a. Initial steps of the intervention(s) and their evolution over time (*e.g.*, time-line diagram, flow chart, or table), including modifications made to the intervention during the project<br>b. Details of the process measures and outcome<br>c. Contextual elements that interacted with the intervention(s)<br>d. Observed associations between outcomes, interventions, and relevant contextual elements<br>e. Unintended consequences such as unexpected benefits, problems, failures, or costs associated with the intervention(s).<br>f. Details about missing data | Not appropriate; protocol article |
| **Discussion** | *What does it mean?* | |
| **14. Summary** | a. Key findings, including relevance to the rationale and specific aims<br>b. Particular strengths of the project | a) N/A<br>b) p.4 and pp.18-19 |
| **15. Interpretation** | a. Nature of the association between the intervention(s) and the outcomes<br>b. Comparison of results with findings from other publications<br>c. Impact of the project on people and systems<br>d. Reasons for any differences between observed and anticipated outcomes, including the influence of context<br>e. Costs and strategic trade-offs, including opportunity costs | N/A (protocol article) |
| **16. Limitations** | a. Limits to the generalizability of the work<br>b. Factors that might have limited internal validity such as confounding, bias, or imprecision in the design, methods, measurement, or analysis<br>c. Efforts made to minimize and adjust for limitations | pp.19-20 |
| **17. Conclusions** | a. Usefulness of the work<br>b. Sustainability<br>c. Potential for spread to other contexts<br>d. Implications for practice and for further study in the field<br>e. Suggested next steps | pp.17-20 |
| **Other information** | | |
| **18. Funding** | Sources of funding that supported this work. Role, if any, of the funding organization in the design, implementation, interpretation, and reporting | p.20 |

Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. BMJ Quality & Safety. 2016;25(12):986-92. doi:10.1136/bmjqs-2015-004411

BMJ Open

# An evaluation of an interprofessional primary healthcare team as a new model of primary care in Quebec: a protocol for a type 2 effectiveness-implementation hybrid study

| | |
|---|---|
| Journal: | *BMJ Open* |
| Manuscript ID | bmjopen-2023-072006.R1 |
| Article Type: | Protocol |
| Date Submitted by the Author: | 11-Apr-2023 |
| Complete List of Authors: | Côté, Nancy; VITAM Research Center on Sustainable Health, Sociology; Université Laval, Faculty of Social Sciences<br>Frikha, Yasmine ; Université Laval Faculté de médecine, readaptation<br>Freeman, Andrew; Université Laval Faculté de médecine, Département de réadaptation<br>Cortez Ghio, Sergio; VITAM Centre de recherche en santé durable<br>Laberge, Maude; Universite Laval Faculte de medecine, Operations and Decision Systems<br>Isabelle, Maripier; Université Laval Faculté des sciences sociales<br>Duhoux, Arnaud; Université de Montréal<br>Denis, Jean-Louis ; Université de Montréal<br>Jean, Emmanuelle; Public Health Agency of Canada<br>Binette, Sébastien; VITAM Centre de recherche en santé durable |
| Primary Subject Heading: | Health services research |
| Secondary Subject Heading: | Health economics, Patient-centred medicine, General practice / Family practice |
| Keywords: | PRIMARY CARE, Health Services Accessibility, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, QUALITATIVE RESEARCH, HEALTH ECONOMICS |
| | |

# Title page

An evaluation of an interprofessional primary healthcare team as a new model of primary care in Quebec: a protocol for a type 2 effectiveness-implementation hybrid study

**Authors**

1. **Nancy Côté, PhD**
   **(Corresponding Author)**
   Department of Sociology (Faculty of Social Sciences)
   Pavillon Charles-De Koninck
   1030, Avenue des Sciences-Humaines, Université Laval
   Québec (Québec), Canada G1V 0A6
   Telephone number: 418-663-5313 poste 12232
   Email address: nancy.cote@soc.ulaval.ca

2. Yasmine Frikha, M.Erg, PhD. Candidate
   Université Laval
   Québec (Québec), Canada

3. Andrew Freeman, PhD, erg.
   Department of Rehabilitation (Faculty of Medicine), Université Laval
   Québec (Québec), Canada

4. Sergio Cortez Ghio, PhD
   VITAM : Centre de recherche en santé durable
   Québec (Québec), Canada

5. Maude Laberge, PhD
   1. Department of Operations and Decision Systems (Faculty of Administrative Sciences), Université Laval
   Québec (Québec), Canada
   2. VITAM : Centre de recherche en santé durable
   Québec (Québec), Canada

6. Maripier Isabelle, PhD
   Department of Economic (Faculty of Social Sciences), Université Laval
   Québec (Québec), Canada

7. Arnaud Duhoux, PhD

Faculty of Nursing Sciences, Université de Montréal
Montréal (Québec), Canada

8. Jean-Louis Denis, PhD
Department of Health Management, Evaluation and Policy (School of Public Health), Université de Montréal
Montréal (Québec), Canada

9. Emmanuelle Jean, PhD
Agence Santé Publique Canada
Ottawa (Ontario), Canada

10. Sébastien Binette
VITAM : Centre de recherche en santé durable
Québec (Québec), Canada

**Word count: 4087**

## Keywords

Primary care, interprofessional team, advanced practice nursing, access, person-centredness, efficiency

## Abstract

**Introduction:** One Family Medicine Group (FMG) in Quebec has commenced a five-year pilot project, which is herein referred to as the *Archimède* model, to implement a patient-centred model based on interprofessional care and the optimal use of healthcare providers' practice scopes. A research project will be conducted to: (1) assess this model's effect on the FMG's operational performance, and its users' resource utilization at the public health system level; (2) investigate its optimisation with respect to professional roles, interprofessional teamwork, and patient-centredness; and (3) document users'

experience with the model. The aim of this article is to describe the protocol that will be used for this research.

**Methods and analysis:** A hybrid implementation approach (type 2 model) will be used. We will collect both quantitative and qualitative data. Regarding the quantitative dimension, and because this is a single-unit intervention study, we will use either or both synthetic control methods and one-sample generalized linear models for analyses at the FMG level. To evaluate the broader impact of *Archimède* on the public health system, we will use mixed-effects models and propensity score matching methods. Regarding the qualitative research dimension, using an interpretative descriptive approach, we will document users' experience and identify the factors that optimize professional scopes of practice, collaborative practices, and patient-centredness. We will conduct individual in-depth semi-structured interviews with healthcare providers, administrative staff, stakeholders involved in the *Archimède* model implementation, and patients.

**Ethics and dissemination:** This study was approved by the Ethics Committee of the Sectoral Research in Population Health and Primary Care of the Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale (#2019-1503). The results of the investigation will be presented to the stakeholders involved in the advisory committees and at several scientific conferences. Manuscripts will be submitted to peer-reviewed journals.

**Strengths and limitations of the study**

- The measure of efficiency with respect to operational performance at the FMG level and the use of health network resources (e.g., emergency room visits) by Archimède users is a strength.
- The study's inclusion of the analysis of the interrelations between the micro, meso and macro levels to better identify the elements that facilitate or hinder the deployment of the Archimède model and the optimisation of professional roles and interprofessional collaboration is a strength.
- The possible lack of generalisation associated with studying only one FMG will be mitigated by the use of a methodology to quantitatively assess the performance of the FMG, and an in-depth exploration of the influences of the implementation context on the deployment of the project.
- The potential limitations of the Type 2 effectiveness-implementation hybrid study will be mitigated by the involvement of multiple actors on the advisory committee (e.g., able to be rapidly updated about the results; ability to intervene directly to make necessary adjustments).

# INTRODUCTION

## Context of the study

The aim of the protocol presented in this article is to evaluate the implementation of a new model of primary care. This model differs from the practices in many medical clinics in the sense that access is not automatically through a family physician. Composed of several health and social services professionals, the Archimède model works on the principle of the inverted pyramid. That is, there are more nurses (primary health care nurse practitioners and registered nurses) than physicians, and the clinic relies on the optimisation of professional roles through the close collaborations between health and social professionals.

Primary care, which is patients' first point of contact with the health care system (1), provides early care for health problems, chronic disease management, and preventive services. Various models of interprofessional primary care are being created to address human resource shortages in health systems, control health care costs, and reduce overuse of emergency departments visits (2-4). These models are also designed to address the biopsychosocial needs of patients and improve access, continuity and quality of care (5-9). Various effects of these models have been reported for patients, for example : improved access and reduced stigma, especially for individuals with mental health problems (6, 10, 11); enhanced chronic disease management (12); better treatment adherence and follow-up (7, 13, 14); and improvement in symptoms or functioning (10, 13). Various positive impacts on providers have also been reported, including: upskilling (7, 11, 15); better job satisfaction (7, 8); and redistribution of workloads (8). However, although some organisational and cost savings benefits by ensuring more efficient practices have been

reported (7), limited documentation of the cost-effectiveness of such models has been carried out.

In the early 2000s, in response to inconsistent primary care access, Canadian provinces and territories began developing various initiatives (16, 17), one of these being the creation of interprofessional primary care teams. The access to these teams remained for the most part centred on the family physician. In Quebec, these teams are called *Groupes de médecine familiale* [Family Medicine Groups (FMGs)], within some of which physicians, nurses, and other health and social services professionals collaborate to deliver health care based on contractual agreements with the provincial government (16). In Quebec, some patients have a family doctor and others do not. Those who do have a family physician must be registered with one physician and ideally attend this clinic. However, if they are unable to get an appointment with their family physician, these patients can go to a walk-in clinic. Patients who do not have family physicians have to use walk-in clinics only. Although the FMGs are private clinics (albeit financed within Quebec's public insurance system), they have direct collaborative links with the *Centres intégré universitaire de santé et de services sociaux (*CIUSSS); many of the professionals who work in the FMGs are employees of the CIUSSS. The Ministry for Health and Social Services (MSSS) establishes the rules for the distribution of professional and administrative resources.

In 2017, the Saint-Vallier FMG in Quebec City, situated within the CIUSSS-Capitale Nationale (CN) territory, commenced a five-year pilot project, titled *Archimède (18).* Threatened with closure in 2015 due to the retirement of its physicians and the difficulties of medical recruitment in this district, in which it has not always been easy to recruit

healthcare personnel, the pilot project enabled the FMG to maintain its activities, and to continue to meet the complex and diversified needs of the population. Due to the COVID-19 pandemic, which necessitated significant changes in both how services could be provided and staff availability, the pilot project period was extended by two years. This project, which was developed in collaboration with relevant stakeholders (e.g., MSSS, CIUSSS-CN), seeks to implement a patient-centred model based on interprofessional care and the optimal use of healthcare providers' scopes of practice. The *Archimède* project is anticipated to improve access to primary care and, given the lower remuneration associated with the services provided by nurses and other health and social services professionals compared to that of physicians, to reduce costs. Also, arising partly from a more efficient allocation of patients across the various professions within the clinic, the improved access is anticipated to reduce hospital utilization (e.g., emergency department visits), thus contributing to health system efficiency (1, 2).

Our investigation aims to identify areas of improvement, formulate recommendations to improve the model's functioning, ensure its utility to stakeholders, and foster its sustainability and potential for scaling up. Specifically, this study seeks to determine whether the *Archimède* model is efficient regarding patient and clinic outcomes and teamwork (e.g., role optimisation) in relation to the resources invested. Our objectives are: (1) to evaluate the impact of the *Archimède* model on operational performance at the FMG level as well as user resource utilization at the public health system level; (2) to identify the factors that foster or impede the optimisation of professional roles, interprofessional teamwork, and patient-centredness, and (3) to document users' experience with the *Archimède* model.

## Setting

The St-Vallier FMG is in Quebec City's Saint-Sauveur district. This neighbourhood has one of the highest rates of demographic fragility within the CIUSSS-CN territory (19). Although the FMG serves a very broad clientele, a large proportion of its consultations are conducted with users with chronic health problems or in vulnerable psychosocial situations. The clinic's clientele is also characterized by a significant number of immigrants and political refugees. Regarding the FMG's human resources, there are currently 27 employees, including six family physicians (FPs), four primary health care nurse practitioners (PHCNPs), one mental health nurse practitioner (MHNP), five registered nurses (RNs), six health and social services professionals (social worker, nutritionist, physiotherapist, kinesiologist, psychologist, respiratory therapist), and five administrative staff. All services are free of charge for the clinic's clients. Several elements have been put in place to ensure the deployment and operation of the Archimède model. The use of the right professional according to patients' health needs is facilitated by the use of referral pathways by administrative personnel. The electronic medical record is used to facilitate communication between professionals during the management of common patients. The project manager, middle and senior managers of CIUSSS-CN provide ongoing support to professionals to enhance interprofessional collaboration through training, personalised coaching and frequent meetings. Visual aids for clarifying the roles of each are available for professionals. The treatment of service users with complex problems is also facilitated by joint consultations between professionals, or dyads, for example between RNs and PHCNPs. The team also contributes to facilitating access to various outreach services, including in community resources and the various services offered by the CIUSSS-CN.

# METHOD AND ANALYSIS

## Conceptual framework

This study is based on two frameworks : the *Quadruple Aim* framework (20), which is the Canadian framework used for health care transformation research (21); and the optimisation of professional scopes of practice (22). The Quadruple Aim framework is designed to foster change in health care systems through the achievement of four goals : improved population health outcomes; improved care and patient experience; improved provider satisfaction; and lower costs/better value (20, 21). Recently, a fifth aim has been added that recognizes health equity as an important outcome to reduce health disparities and address social determinants of health (23, 24). In primary care, the development of interprofessional teams is a key factor in improving quality to achieve these goals (2).

Regarding the optimisation of professional scopes of practice, the Canadian Academy of Health Sciences (CAHS) identified factors of influence at the micro-, meso- and macro-levels (22). Micro-level factors include professional hierarchies, professional cultures, and communication among healthcare professionals. Meso-level factors include communication across multiple care settings, professional protectionism, accountability, and availability of evidence. Macro-level factors include legislation/regulations, payment models, educational needs/requirements, and healthcare professional accountability.

## Design

The research on evidence-based interventions frequently favours a stepwise approach; one of the limitations of this approach is the significant time lag between the development of the interventions and its implementation in the field (25). To address this

issue, we are using a hybrid implementation approach, specifically the type 2 model, which permits simultaneous testing or piloting of implementation strategies during an effectiveness trial (25). Specifically in this investigation, we will collect both quantitative and qualitative data to assess the effectiveness and implementation of the Archimède model, consistent with our specific objectives. The overall data collection process (March 2023-February 2025) is presented in Figure 1.

It is relevant to note that an advisory committee was established at the beginning of the development of the project, the objectives of which are to better understand the broader implementation context, monitor the progress of the research project, discuss methodological and fieldwork aspects and the emerging findings, and develop strategies for knowledge transfer to maximize the impact in the health care system. This committee is composed of members of the research team, and representatives from the management of the St-Vallier FMG, a user partner, and stakeholders from the CIUSSS-CN and the MSSS.

*Insert Figure 1 here*

**Figure 1. Data collection process over a year.**

## Quantitative approach

Our quantitative approach aims to evaluate the impact of the *Archimède* model on operational performance at the FMG level as well as user resource utilization at the public health system level. In so doing, we will document the lower costs/better value dimension of the Quadruple aim.

Because this is a single-unit intervention study, to quantitatively assess the performance of the *Archimède* model at the FMG level , we will use either or both synthetic control methods (26, 27) and one-sample generalized linear models. See Table 1 for a non-exhaustive list of outcomes (e.g., *number of patient visits* and *vulnerability-weighted enrollments)*, their components, and their sources. Synthetic control methods are quasi-experimental and are commonly used in the policy evaluation literature. In the case of our study, this approach will consist of constructing a control counterfactual FMG from a weighted combination of other FMGs in the Quebec City region. On the other hand, one-sample generalized linear models, which will be informed by preliminary clustering analyses (such as principal component analysis) for control FMGs' selection, will allow for testing more streamlined outcome comparison either transversally or longitudinally.

The database for the FMG-level analyses will be built from different operational and financial reports of all FMGs in the Quebec City region, including the St-Vallier FMG. These reports are routinely compiled by and will be provided to us by the MSSS and the CIUSSS. Although we plan to extract data from reports ranging from 2012 to 2022, these stakeholders could not confirm that every report would be available for that 10-year range. Since we need several years of pre-implementation data for the synthetic control approach to be feasible, the precise choice of methods for the analyses at the FMG level will depend on how far back the data collected by the MSSS and the CIUSSS go.

*Table 1. Non-exhaustive list of FMG-level variables of interest*

| Variables of interest | Components | Sources |
|---|---|---|
| Year | | |
| Id | | |
| Size | | MSSS's financial report of FMGs |
| Type | Private vs public | MSSS's financial report of FMGs |
| Number of hours worked for each type of healthcare worker | E.g., Nurses, physical therapists, nutritionist, psychologists | CIUSSS's payroll report |
| Full time equivalents (FTEs) for each type of healthcare worker | E.g., Nurses, physical therapists, nutritionist, psychologists | CIUSSS's payroll report |
| Enrollments | Total unweighted number of patient enrollments | MSSS's 8B report |
| Weighted enrollments | Weights include vulnerability, disadvantage, births, etc. | MSSS's 8B report |
| Number of physicians | | MSSS's 8B report |
| Patient attendance rate | | MSSS's financial report of FMGs |
| Visits | Subdivided into in-person visits and telemedicine. Further subdivided into visits from patients enrolled at the FMG, patients enrolled in another FMG, and patients enrolled in no FMG. | MSSS's 8C report |
| Funding | Total amount of government funding in CAD | MSSS's financial report of FMGs |

In addition, to evaluate patients' service utilization outside of the FMG, and thus better understand the broader impact of *Archimède* on the public health system, we will use both generalized linear mixed-effects models and propensity score matching methods (28) to compare patients enrolled in the St-Vallier clinic to those enrolled in other FMGs. The outcomes will include metrics such as *number of urgent care admission events* and *length of hospitalization*. Confounding factors will include variables such as *age*, *gender*, and pre-existing health conditions. The database for this portion of the study will be built

and anonymized by the *Institut de la Statistique du Québec* (ISQ). A short list of some of the variables we will be querying, as well as details about the source database from which they will be extracted by the ISQ, are presented in Table 2.

*Table 2. Public health system-level example variables of interest*

| Variables of interest | Components | Sources database | Source database specifications |
|---|---|---|---|
| ID | Unique patient identifier provided by the ISQ | FIPA | FIPA contains information about patients covered by the public health insurance |
| Age | | FIPA | |
| Gender | | FIPA | |
| Partial postal code | First three digits | FIPA | |
| Urgent care admission event | | BDCU | BDCU contains information about urgent care admissions |
| Length of hospitalization | | MED-ECHO | MED-ECHO contains information about hospitalizations |
| Service request event | | I-CLSC | I-CLSC contains information about frontline common health and social services |

*Note*. FIPA = Fichier d'inscription des personnes assurées, BDCU = Banque de données commune des urgences. MED-ECHO = Maintenance et exploitation des données pour l'étude de la clientèle hospitalières, I-CLSC = Système d'information sur la clientèle et les services des CSSS – mission CLSC. A list of all available variables that the ISQ can provide can be found at: https://statistique.quebec.ca/research/#/donnees/administratives/sante.

The data will subsequently be transferred to us via a secured remote connection service offered by the ISQ. The final database will comprise upwards of 60 variables for 14,000 randomly selected and uniquely identified patients; 3,500 (25%) will be patients enrolled in the St-Vallier FMG and 10,500 (75%) will be patients enrolled in other FMGs. The experimental population sample of 3,500 patients is based on the lowest number of

enrollments in the St-Vallier clinic between 2018 and 2022 (3,924 patients). The 25-75% split was chosen to maximize the likelihood of successfully building synthetic control patients from weighted averages of patients enrolled in other FMGs to match the experimental group. To be included, patients will have to be over 18 years of age and will need to have been enrolled in the same single FMG between 2018 and 2022.

## Qualitative approach

We will conduct the qualitative research portion of this study using an interpretive description methodology (29). This approach is appropriate for gaining a rich understanding of service providers', stakeholders', and patients' experiences with the *Archimède* model, and their links with meso and macro level factors that influence the optimisation of roles, interprofessional collaboration and patient-centredness. To collect this data, we will conduct individual in-depth semi-structured interviews, which will be appropriate given the potentially sensitive data that participants will share, to permit us to capture deeper understanding of the subjective work and patient experience.

### Population: eligibility criteria and sampling strategy

We will use a purposive sample (30) of healthcare providers (FPs, PHCNPs, RNs, various health and social services professionals), administrative staff and managers working in the St-Vallier FMG; stakeholders involved in the *Archimède* model implementation; and patients receiving services at the FMG. All employees from the St-Vallier FMG will be eligible. We will recruit up to five stakeholders who played a key role in the implementation of the *Archimède* model (e.g., representatives from the MSSS,

clinical advisor on interprofessional collaboration), depending on the advisory committee's suggestions. The sample of patients will be based on the main health problems for which patients seek care, which we will determine during recruitment. We aim to include patients with health problems such as chronic diseases, mental health problems, and loss of autonomy. We believe that 20 patients will be sufficient for providing rich data, although the final number will be determined by the attainment of data saturation (31). Patients will be required to be ≥ 18 years old, enrolled with a FP, and considered able to provide informed consent by healthcare providers. All patients enrolled in the study will be asked to complete a socio-demographic form to provide information on their socio-economic status.

## Recruitment strategy

Participation in the individual interviews will be voluntary for all participants. For the recruitment of healthcare providers, managers and administrative staff, we will conduct an information session at the Saint-Vallier FMG to present the study and distribute information leaflets. We will also send an email to these personnel categories with detailed information about the study to inform employees who cannot attend the meeting. Employees who are interested in participating in the interviews will be invited to contact us. In addition, we will identify key stakeholders with the help of the advisory committee and contact them directly via email or telephone. Recruitment will be facilitated by close links between the research team and the actors in the field established through other research activities. In addition, various strategies will be deployed to maximise

recruitment, for example, meetings of the research team at clinic meetings, reminder emails, and participation of some members of the research team on strategic committees.

For patient recruitment, we will ask healthcare providers to provide them with information leaflets. We will also leave leaflets in the waiting rooms of the FMG. These leaflets, which will inform patients about the entire study so that they have the choice to decline participation, will include a consent form and will inform patients about the $30 to compensate participants for their time. Patients will have the option to contact the research team directly or leave their contact information in an online form if they are interested in participating in the interviews.

## Interviews

The interviews will be conducted in participants' preferred setting (i.e., home, research centre, FMG, videoconference), albeit adhering as necessary to current public health guidelines. The individual interview guides, developed in collaboration with the advisory committee, capture the following elements: improved care and patient experience, and improved provider satisfaction (Quadruple aim framework); the micro, meso and macro dimension of the optimisation of scope of practice. See Table 3 for the specific interview themes. These interview guides will evolve iteratively in that analyses of the results of the first interviews will inform questions during subsequent interviews. The interviews will be audio-taped with participants' consent.

*Table 3. Interview themes*

| | Themes | Conceptual frameworks |
|---|---|---|
| **Employees** | Work organization and motives to work in the FMG<br>Level of commitment to work in the FMG<br>Experience and satisfaction with the new FMG's work organization | Quadruple aim: improved provider satisfaction |
| | Impact of *Archimède* on professional role and workload<br>Interdisciplinary teamwork dynamics<br>Obstacles to the implementation of the model (micro, meso, macro) | Optimisation of scope of practice |
| **Stakeholders** | Role in the implementation process<br>Context of emergence and the implementation process<br>Operation of the FMG<br>Assessment of the *Archimède* model | Optimisation of scope of practice |
| **Patients** | Reasons for seeking care and healthcare providers seen<br>Impact of *Archimède* on care and ability to get involved in one's own care (Saint-Vallier clinic)<br>Satisfaction with care<br>Likes and dislikes about the FMG's work organization<br>Participation in care decision-making | Quadruple aim: improved care and patient experience |

## Data analysis

Our analysis of the interview data will be facilitated by using Nvivo software (32). Data from professionals will be aggregated in such a way that each group is made up of a sufficiently large number of participants to preserve their anonymity. We will follow the stages of thematic analysis: initial coding according to our predefined interview themes and those that emerge during the analysis; categorization; consolidation of categories; linking of categories; and data integration and modeling (33). We will analyze data in light of factors that optimize scope of practice, at the micro, meso, and macro levels, as defined

by the CAHS (22). We will give particular attention to the collaboration between healthcare providers, and collaboration between healthcare providers and administrative staff. Furthermore, we will characterize interactions between the micro, meso and macro levels. We will prepare comprehensive summaries of our results and discuss them with the advisory committee group to enhance our interpretation of the results. Using the subsequent findings, we will (1) formulate recommendations for optimizing interprofessional collaborative and patient-centred practices and the role of healthcare providers, and (2) highlight the challenges and potential viable solutions related to the sustainability of the *Archimède* project and its potential scaling up in other settings.

## PATIENT AND PUBLIC INVOLVEMENT

Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. The user-partner played a key role from the very beginning of the pilot project through his participation in several meetings of the advisory committee. The governance of the project has been designed to ensure that user-partners are involved in the decision-making processes, which will allow the advisory committee to remain responsive to user concerns throughout the implementation of the project. Refer to the Methods and analysis section for further details.

## ETHICS AND DISSEMINATION

This project respects the ethics, integrity and responsible research conduct standards defined by the Fonds de recherche du Québec (FRQS) and the CIUSSS-CN. It has received ethical approval from the regional health organization with which the researchers are

affiliated (# 2019-1503). Regarding ethical considerations specific to the participants in the interviews, we specified all their rights in accordance with the rules of the sectoral research ethics committee (CER-S) in population health and primary care (e.g., the right of participants to withdraw from the study at any time and to refuse to answer certain questions; the confidentiality obligations of the researchers; the confidentiality obligations of the focus group participants). The results of the investigation will be presented to the stakeholders involved in the advisory committee and at several scientific conferences. Manuscripts will be submitted to peer-reviewed journals.

## DISCUSSION

Interprofessional teams are increasingly being established throughout Canada and elsewhere to improve the access, continuity and quality of services provided to individuals living with complex health problems (e.g., chronic diseases; mental health challenges; comorbidities) (6, 10, 15, 34-36). A variety of models exist, characterised both by the organization and degree of interprofessional collaboration, as well as the type of clients served (37-39).

This project will advance the understanding of the effects of a team-based model of care within a FMG that is in a disadvantaged area and whose clientele presents complex biopsychosocial problems. Various interprofessional primary care models have been developed that are designed to address complex health problems in specific populations identified as vulnerable, for example, older adults, (40), individuals with HIV (41), and veterans (42). However, these models have frequently been presented as intervention programs composed of a predefined interprofessional continuum of care, a care manager,

and/or case discussions. In comparison, the *Archimède* model is based on a uniform orientation to the optimisation of professional roles (seeing the right professional at the right time), and the use of predefined pathways enacted by administrative staff when making appointments. Furthermore, in this model, referrals are made between professionals, and the continuum of care is facilitated by having an interprofessional team in the same location. Access to this interprofessional approach is also facilitated because no fee is charged. In addition, compared to other reported primary care models (38, 43, 44), there is no preselection of patients, with all patients being eligible for the appropriate professional services. Our research project seeks to understand the experience of users attending a clinic based on this model to assess the relevance of this model for this population.

One of the strengths of our research includes the measure of efficiency with respect to operational performance at the FMG level and the use of health network resources (e.g., emergency room visits) by *Archimède* users. This study will make an important contribution to the understanding of the efficiency of primary care models, thus responding to the need to better evaluate primary care reforms (16, 36).

The originality of our research lies in our focus on the interrelations between the micro, meso and macro levels to better identify the elements that facilitate or hinder the deployment of the model and the optimisation of interprofessional collaboration. Understanding the context of implementation, particularly in relation to the particularity of the dual public and private organisational structures, is an important element in this research project. That is, although the model is deployed in a private clinic, it is publicly funded. As well, some staff are paid by the public health organization. Thus, our approach

takes into account: 1) structural issues related to health policies in primary care, types of funding, and resource management; 2) issues related to the organization of the clinic (e.g., dynamics of interprofessional collaboration and management practices); and 3) micro-level issues related to the subjective work experience of professionals and service users' experiences (22). Although our research evaluates only one FMG, the findings from this study could be relevant not only in Quebec but also for other jurisdictions looking to develop interprofessional primary care models that address the social determinants of health, and that optimize the use of health and social care providers' respective scopes of practice.

Regarding the limitations of our investigation, there is a potential lack of generalisation in studying only one FMG. Nevertheless, conducting this project will permit us to both test our methodology to quantitatively assess the performance of the FMG, and to explore in depth the influences of the implementation context on the deployment of the project. A potential limitation of the type 2 effectiveness-implementation hybrid study approach concerns the difficulties that can arise if there is a problem in the implementation of the Archimède model in the FMG clinic with respect to the optimisation of professional roles and the close collaboration of the professionals; this difficulty can compromise the effectiveness trial field (25). In our study, the involvement of multiple actors in the advisory committee should help to mitigate this limitation by the fact that they will be informed quickly of the results along the way and by their ability to intervene directly within the team to make the necessary adjustments. A further possible limitation concerns the potential for generalisation to other areas with different demographic profiles, given

that the FMG under study is in a disadvantaged area. However, it is unlikely that all patients attending the FMG are in a vulnerable situation; the use of a socio-demographic form will allow to establish a socioeconomic profile of the patients interviewed.

## FUNDING STATEMENT

This work was financially supported by the Quebec Ministry of Health and Social Services (MSSS) and the *Fonds de Recherche du Québec - Santé* (FRQS). Award/Grant number: NA

## AUTHORS CONTRIBUTION

- Substantial contributions to the conception or design of the work (NC, YF, AF, SCG, ML, MI, AD, J-LD, EJ and SB).
- Drafting the work or revising it critically for important intellectual content (NC, YF, AF, SCG, ML, MI, AD, J-LD, EJ and SB).
- Final approval of the version to be published (NC, YF, AF, SCG, ML, MI, AD, J-LD, EJ and SB).
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (NC, YF, AF, SCG, ML, MI, AD, J-LD, EJ and SB).

## COMPETING INTERESTS

None.

## ACKNOWLEDGMENT

The authors would like to extend special thanks to the user partner who sits on our committee (Monsieur Raynald Savard) and to the participants, users, and health and social professionals, without whom this study would not be possible.

## REFERENCES

1. Starfield B, Shi L, J. M. Contribution of primary care to health systems and health. Milbank Quarterly. 2005;83(3):457-502. doi:10.1111/j.1468-0009.2005.00409.x
2. Aggarwal M, Hutchison B. Toward a primary care strategy for Canada. Ottawa (CA): Canadian Foundation for Healthcare Improvement; 2012.
3. Coleman K, Wagner E, Schaefer J, Reid R, LeRoy L. Redefining primary care for the 21st century. White paper. Rockville, MD: AHRQ Publication; 2016.
4. Bourgeault IL, Mulvale G. Collaborative health care teams in Canada and the USA: Confronting the structural embeddedness of medical dominance. Health Sociology Review. 2006;15(5):481-95. doi:10.5172/hesr.2006.15.5.481
5. Conley VM, Judge-Ellis T. Disrupting the system: An innovative model of comprehensive care. The Journal for Nurse Practitioners. 2021;17:32-6. doi:10.1016/j.nurpra.2020.09.012
6. Ashcroft R, Menear M, Greenblatt A, Silveira J, Dahrouge S, Sunderji N, et al. Patient perspectives on quality of care for depression and anxiety in primary health care teams: A qualitative study. Health Expectations. 2021;24(4):1168-77. doi:10.1111/hex.13242
7. Fitzpatrick SJ, Perkins D, Handley T, Brown D, Luland T, Corvan E. Coordinating mental and physical health care in rural Australia: An integrated model for primary care settings. International Journal of Integrated Care. 2018;18(2):1-9. doi:10.5334/ijic.3943
8. Lyon RK, Slawson JG. An organized approach to chronic disease care. Family Practice Management [Internet]. 2011; 18(3):[27-31 pp.]. Available from: http://www.aafp.org/fpm/2011/0500/p27.html.
9. Metusela C, Usherwood T, Lawson K, Angus L, Kmet W, Ferdousi S, et al. Patient centred medical home (PCMH) transitions in western Sydney, Australia: A qualitative study. BMC Health Services Research 2020;20(285):1-13. doi:10.1186/s12913-020-05123-7
10. Kates N, McPherson-Doe C, George L. Integrating mental health services within primary care settings: The Hamilton Family Health Team. The Journal of Ambulatory Care Management. 2011;34(2):174-82. doi:10.1097/JAC.0b013e31820f6435

11. Paquette-Warren J, Vingilis E, Greenslade J, Newnam S. What do practitioners think? A qualitative study of a shared care mental health and nutrition primary care program. International Journal of Integrated Care. 2006;6:e18. doi:10.5334/ijic.164
12. Lawson B, Dicks D, Macdonald L, Burge F. Using quality indicators to evaluate the effect of implementing an enhanced collaborative care model among a community, primary healthcare practice population. Nursing Leadership 2012;25(3):28-42. doi:10.12927/cjnl.2013.23057
13. Blackmore MA, Carleton KE, Ricketts SM, Patel UB, Stein D, Mallow A, et al. Comparison of collaborative care and colocation treatment for patients with clinically significant depression symptoms in primary care. Psychiatric Services. 2018;69(11):1184-7. doi:10.1176/appi.ps.201700569
14. Moore JA, Karch K, Sherina V, Guiffre A, Jee S, Garfunkel LC. Practice procedures in models of primary care collaboration for children with ADHD. Families, Systems & Health. 2018;36(1):73-86. doi:10.1037/fsh0000314
15. McElheran W, Eaton P, Rupcich C, Basinger M, Johnston D. Shared mental health care: The Calgary model. Families, Systems & Health. 2004;22(4):424-38. doi:10.1037/1091-7527.22.4.424
16. Hutchison B, Levesque J-F, Strumpf E, Coyle N. Primary health care in Canada: Systems in motion. Milbank Quarterly. 2011;89(2):256-88. doi:10.1111/j.1468-0009.2011.00628.x
17. Wong ST, Chomienne M-H, Montfort H. IHWC papers: Comparisons of the restructured primary care in the IMWC countries - Canada. 2011.
18. Laliberté C, Dubé G, Fréchette A, Boucher C. La clinique Archimède: L'infirmière, un lever d'excellence (Clinique Saint-Vallier, Québec)2016. Available from: https://docplayer.fr/11842570-La-clinique-archimede-l-infirmiere-un-levier-d-excellence.html.
19. Partenariat Données Québec. Défavorisation combinée 2016 - National (Reg.2). 2019. Available from: https://www.donneesquebec.ca/recherche/dataset/indice-de-defavorisation-du-quebec-2016/resource/8361d460-bba3-409a-a724-8f2c71decede.
20. Bodenheimer T, Sinsky C. From triple to quadruple aim: Care of the patient requires care of the provider. Annals of family medicine. 2014;12(6):573-6. doi:10.1370/afm.1713
21. Canadian Institutes of Health Research. Research strategic plan 2021-2026 2021. Available from: https://cihr-irsc.gc.ca/e/52481.html#fig_1.
22. Nelson S, Turnbull J, Bainbridge L, Caulfield T, Hudon G, Kendel D, et al. Optimizing scopes of practice: New models of care for a new health care system. Ottawa (CA): Canadian Academy of Health Sciences; 2014.
23. Nundy S, Cooper LA, Mate KS. The quintuple aim for health care improvement : A new imperative to advance health equity. JAMA. 2022;327(6):521-2. doi:10.1001/jama.2021.25181
24. Itchhaporia D. The evolution of the quintuple aim : Health equity, health outcomes, and the economy. Journal of the American College of Cardiology. 2021;78(22):2262-4. doi:10.1016/j.jacc.2021.10.018

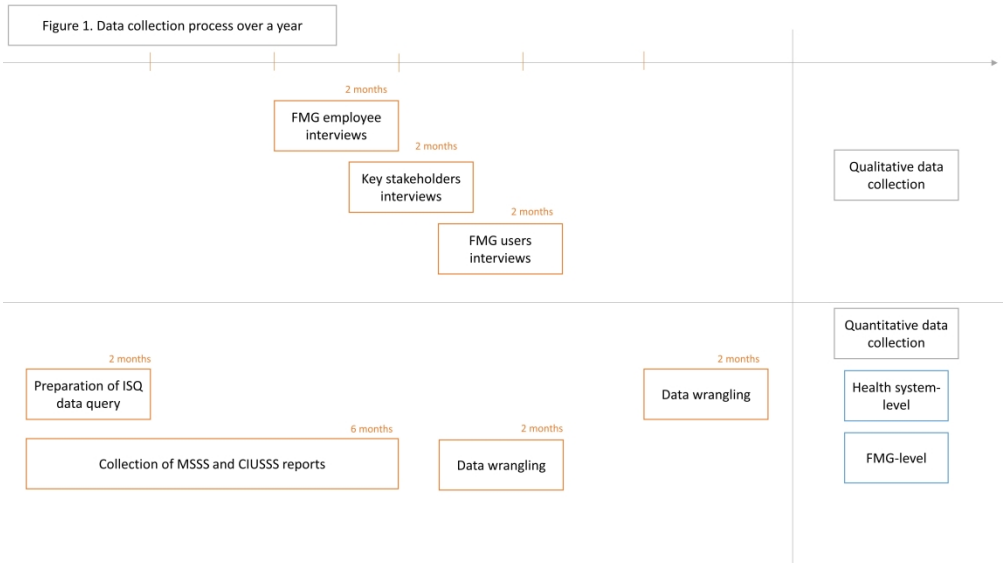
25. Landes SJ, McBain SA, Curran GM. An introduction to effectiveness-implementation hybrid designs. Psychiatry Research. 2019;280(112513). doi:10.1016/j.psychres.2019.112513
26. Abadie A. Using synthetic controls: Feasibility, data requirements, and methodological aspects. Journal of Economic Literature. 2021;59(2):391-425. doi:10.1257/jel.20191450
27. Hollingsworth A, Wing C. Tactics for design and inference in synthetic control studies: An applied example using high-dimensional data2020. Available from: https://ssrn.com/abstract=3592088
28. Stuart EA. Matching methods for causal inference: A review and a look forward. Stat Sci. 2010;25(1):1-21. doi:10.1214/09-STS313
29. Thorne S. Interpretative description : Qualitative research for applied practice. 2nd ed: Routledge/Taylor & Francis Group. ; 2016.
30. Robinson OC. Sampling in interview-based qualitative research: A theoretical and practical guide. Qualitative Research in Psychology. 2014;11(1):25-41. doi:10.1080/14780887.2013.801543
31. Patton MQ. Qualitative research and evaluation methods. 4e ed: SAGE; 2014.
32. QSR International Pty Ltd. NVivo (released in March 2020)2020. Available from: https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home.
33. Miles MB, Huberman AM, Saldaña J. Qualitative data analysis: A methods sourcebook. 3rd ed. Thousand Oaks (CA): SAGE Publications; 2014.
34. Smith-Carrier T, Pham T-N, Akhtar S, Nowaczynski M, Seddon G, Sinha S. "A more rounded full care model": Interprofessional team members' perceptions of home-based primary care in Ontario, Canada. Home health care services quarterly. 2015;34(3-4):232-51. doi: 10.1080/01621424.2015.1108892
35. Moore A, Patterson C, White J, House ST, Riva JJ, Nair K, et al. Interprofessional and integrated care of the elderly in a family health team. Canadian Family Physician. 2012;58(8):436-41.
36. Peckham A, Ho J, Marchildon GP. Policy innovations in primary care across Canada: North American Observatory on Health Systems and Policies; 2018. Available from: https://ihpme.utoronto.ca/wp-content/uploads/2019/08/NAO_RR1.pdf.
37. Collins C, Heuson DL, Munger R, Wade T. Evolving models of behavioural health integration in primary care: Milbank Memorial Fund; 2010.
38. Longhini J, Canzan F, Mezzalira E, Saiani L, Ambrosi E. Organisational models in primary health care to manage chronic conditions: A scoping review. Health & social care in the community. 2022;30(3):565-88. doi:10.1111/hsc.13611
39. Carter R, Riverin B, Levesque J-F, Gariepy G, Quesnel-Vallée A. The impact of primary care reform on health system performance in Canada: A systematic review. BMC Health Services Research. 2016;16(324):1-11. doi:10.1186/s12913-016-1571-7
40. Karia H, Kortejärvi H, Laaksonena R. Developing an interprofessional people-centred care model for home-living older people with multimorbidities in a primary care health centre: A community-based study. Exploratory Research in Clinical and Social Pharmacy. 2022;5(100114):1-8. doi:10.1016/j.rcsop.2022.100114

41. Tu D, Belda P, Littlejohn D, Somlak Pedersen J, Valle-Rivera J, Tyndall M. Adoption of the chronic care model to improve HIV care : In a marginalized, largely aboriginal population. Canadian Family Physician. 2013;59:650-7.

42. Codella N, Kelleya AT, Jonesa AL, Dungana MT, Valentinoa N, Holteya AI, et al. Aims, development, and early results of an interdisciplinary primary care initiative to address patient vulnerabilities. The American Journal of Drug and Alcohol Abuse. 2021;47(2):160-9. doi:10.1080/00952990.2020.1832507

43. Asarnow JR, Rozenman M, Wiblin J, Zeltzer L. Integrated medical-behavioral care compared with usual primary care for child and adolescent behavorial health: A meta-analysis. JAMA Pediatrics. 2015;169(10):929-37. doi:10.1001/jamapediatrics.2015.1141

44. McManus LS, Dominguez-Cancino KA, Stanek MK, Leyva-Moral JM, Bravo-Tare CE, Rivera-Lozada O, et al. The patient-centred medical home as an intervention strategy for diabetes mellitus: A systematic review of the literature. Current diabetes reviews. 2021;17(3):317-31. doi:10.2174/1573399816666201123103835




338x190mm (600 x 600 DPI)

**Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0)**
**September 15, 2015**

| Text Section and Item Name | Section or Item Description | |
|---|---|---|
| **Notes to authors** | • The SQUIRE guidelines provide a framework for reporting new knowledge about how to improve healthcare<br>• The SQUIRE guidelines are intended for reports that describe system level work to improve the quality, safety, and value of healthcare, and used methods to establish that observed outcomes were due to the intervention(s).<br>• A range of approaches exists for improving healthcare. SQUIRE may be adapted for reporting any of these.<br>• Authors should consider every SQUIRE item, but it may be inappropriate or unnecessary to include every SQUIRE element in a particular manuscript.<br>• The SQUIRE Glossary contains definitions of many of the key words in SQUIRE.<br>• The Explanation and Elaboration document provides specific examples of well-written SQUIRE items, and an in-depth explanation of each item.<br>• Please cite SQUIRE when it is used to write a manuscript. | **As you review the manuscript, place a checkmark in this column for each SQUIRE item that is appropriately addressed in the manuscript. Remember that not every item is necessary in every manuscript.** |
| **Title and Abstract** | | |
| **1. Title** | Indicate that the manuscript concerns an initiative to improve healthcare (broadly defined to include the quality, safety, effectiveness, patient-centeredness, timeliness, cost, efficiency, and equity of healthcare) | p.1 |
| **2. Abstract** | a. Provide adequate information to aid in searching and indexing<br>b. Summarize all key information from various sections of the text using the abstract format of the intended publication or a structured summary such as: background, local problem, methods, interventions, results, conclusions | pp.2-3 |

| | | |
|---|---|---|
| **Introduction** | *Why did you start?* | |
| **3. Problem Description** | Nature and significance of the local problem | p.5-6 |
| **4. Available knowledge** | Summary of what is currently known about the problem, including relevant previous studies | p.5-6 |
| **5. Rationale** | Informal or formal frameworks, models, concepts, and/or theories used to explain the problem, any reasons or assumptions that were used to develop the intervention(s), and reasons why the intervention(s) was expected to work | p.8 |
| **6. Specific aims** | Purpose of the project and of this report | p.7 |
| **Methods** | *What did you do?* | |
| **7. Context** | Contextual elements considered important at the outset of introducing the intervention(s) | p.7 |
| **8. Intervention(s)** | a. Description of the intervention(s) in sufficient detail that others could reproduce it<br>b. Specifics of the team involved in the work | a) p.7<br>b) p.7 |
| **9. Study of the Intervention(s)** | a. Approach chosen for assessing the impact of the intervention(s)<br>b. Approach used to establish whether the observed outcomes were due to the intervention(s) | a) p. 9 |
| **10. Measures** | a. Measures chosen for studying processes and outcomes of the intervention(s), including rationale for choosing them, their operational definitions, and their validity and reliability<br>b. Description of the approach to the ongoing assessment of contextual elements that contributed to the success, failure, efficiency, and cost<br>c. Methods employed for assessing completeness and accuracy of data | pp.10-13 (quantitative)<br>pp. 13-15 (qualitative) |
| **11. Analysis** | a. Qualitative and quantitative methods used to draw inferences from the data<br>b. Methods for understanding variation within the data, including the effects of time as a variable | pp. 10-13 (quantitative)<br>p.16 (qualitative) |
| **12. Ethical Considerations** | Ethical aspects of implementing and studying the intervention(s) and how they were addressed, including, but not limited to, formal ethics review and potential conflict(s) of interest | p.17 |

| **Results** | *What did you find?* | |
|---|---|---|
| **13. Results** | a. Initial steps of the intervention(s) and their evolution over time (*e.g.*, time-line diagram, flow chart, or table), including modifications made to the intervention during the project<br>b. Details of the process measures and outcome<br>c. Contextual elements that interacted with the intervention(s)<br>d. Observed associations between outcomes, interventions, and relevant contextual elements<br>e. Unintended consequences such as unexpected benefits, problems, failures, or costs associated with the intervention(s).<br>f. Details about missing data | Not appropriate; protocol article |
| **Discussion** | *What does it mean?* | |
| **14. Summary** | a. Key findings, including relevance to the rationale and specific aims<br>b. Particular strengths of the project | a) N/A<br>b) p.4 and pp.18-19 |
| **15. Interpretation** | a. Nature of the association between the intervention(s) and the outcomes<br>b. Comparison of results with findings from other publications<br>c. Impact of the project on people and systems<br>d. Reasons for any differences between observed and anticipated outcomes, including the influence of context<br>e. Costs and strategic trade-offs, including opportunity costs | N/A (protocol article) |
| **16. Limitations** | a. Limits to the generalizability of the work<br>b. Factors that might have limited internal validity such as confounding, bias, or imprecision in the design, methods, measurement, or analysis<br>c. Efforts made to minimize and adjust for limitations | pp.19-20 |
| **17. Conclusions** | a. Usefulness of the work<br>b. Sustainability<br>c. Potential for spread to other contexts<br>d. Implications for practice and for further study in the field<br>e. Suggested next steps | pp.17-20 |
| **Other information** | | |
| **18. Funding** | Sources of funding that supported this work. Role, if any, of the funding organization in the design, implementation, interpretation, and reporting | p.20 |

Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. BMJ Quality & Safety. 2016;25(12):986-92. doi:10.1136/bmjqs-2015-004411

BMJ Open

# An evaluation of an interprofessional primary healthcare team as a new model of primary care in Quebec: a protocol for a type 2 effectiveness-implementation hybrid study

| | |
|---|---|
| Journal: | *BMJ Open* |
| Manuscript ID | bmjopen-2023-072006.R2 |
| Article Type: | Protocol |
| Date Submitted by the Author: | 04-May-2023 |
| Complete List of Authors: | Côté, Nancy; VITAM Research Center on Sustainable Health, Sociology; Université Laval, Faculty of Social Sciences<br>Frikha, Yasmine ; Université Laval Faculté de médecine, readaptation<br>Freeman, Andrew; Université Laval Faculté de médecine, Département de réadaptation<br>Cortez Ghio, Sergio; VITAM Centre de recherche en santé durable<br>Laberge, Maude; Universite Laval Faculte de medecine, Operations and Decision Systems<br>Isabelle, Maripier; Université Laval Faculté des sciences sociales<br>Duhoux, Arnaud; Université de Montréal<br>Denis, Jean-Louis ; Université de Montréal<br>Jean, Emmanuelle; Public Health Agency of Canada<br>Binette, Sébastien; VITAM Centre de recherche en santé durable |
| Primary Subject Heading: | Health services research |
| Secondary Subject Heading: | Health economics, Patient-centred medicine, General practice / Family practice |
| Keywords: | PRIMARY CARE, Health Services Accessibility, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, QUALITATIVE RESEARCH, HEALTH ECONOMICS |
| | |

# Title page

An evaluation of an interprofessional primary healthcare team as a new model of primary care in Quebec: a protocol for a type 2 effectiveness-implementation hybrid study

**Authors**

1. **Nancy Côté, PhD**
   **(Corresponding Author)**
   Department of Sociology (Faculty of Social Sciences)
   Pavillon Charles-De Koninck
   1030, Avenue des Sciences-Humaines, Université Laval
   Québec (Québec), Canada G1V 0A6
   Telephone number: 418-663-5313 poste 12232
   Email address: nancy.cote@soc.ulaval.ca

2. Yasmine Frikha, M.Erg, PhD. Candidate
   Université Laval
   Québec (Québec), Canada

3. Andrew Freeman, PhD, erg.
   Department of Rehabilitation (Faculty of Medicine), Université Laval
   Québec (Québec), Canada

4. Sergio Cortez Ghio, PhD
   VITAM : Centre de recherche en santé durable
   Québec (Québec), Canada

5. Maude Laberge, PhD
   1. Department of Operations and Decision Systems (Faculty of Administrative Sciences), Université Laval
   Québec (Québec), Canada
   2. VITAM : Centre de recherche en santé durable
   Québec (Québec), Canada

6. Maripier Isabelle, PhD
   Department of Economic (Faculty of Social Sciences), Université Laval
   Québec (Québec), Canada

7. Arnaud Duhoux, PhD

Faculty of Nursing Sciences, Université de Montréal
Montréal (Québec), Canada

8. Jean-Louis Denis, PhD
Department of Health Management, Evaluation and Policy (School of Public Health), Université de Montréal
Montréal (Québec), Canada

9. Emmanuelle Jean, PhD
Agence Santé Publique Canada
Ottawa (Ontario), Canada

10. Sébastien Binette
VITAM : Centre de recherche en santé durable
Québec (Québec), Canada

**Word count: 4140**

## Keywords

Primary care, interprofessional team, advanced practice nursing, access, person-centredness, efficiency

## Abstract

**Introduction:** One Family Medicine Group (FMG) in Quebec has commenced a five-year pilot project, which is herein referred to as the *Archimède* model, to implement a patient-centred model based on interprofessional care and the optimal use of healthcare providers' practice scopes. A research project will be conducted to: (1) assess this model's effect on the FMG's operational performance, and its users' resource utilization at the public health system level; (2) investigate its optimisation with respect to professional roles, interprofessional teamwork, and patient-centredness; and (3) document users'

experience with the model. The aim of this article is to describe the protocol that will be used for this research.

**Methods and analysis:** A hybrid implementation approach (type 2 model) will be used. We will collect both quantitative and qualitative data. Regarding the quantitative dimension, and because this is a single-unit intervention study, we will use either or both synthetic control methods and one-sample generalized linear models for analyses at the FMG level. To evaluate the broader impact of *Archimède* on the public health system, we will use mixed-effects models and propensity score matching methods. Regarding the qualitative research dimension, using an interpretative descriptive approach, we will document users' experience and identify the factors that optimize professional scopes of practice, collaborative practices, and patient-centredness. We will conduct individual in-depth semi-structured interviews with healthcare providers, administrative staff, stakeholders involved in the *Archimède* model implementation, and patients.

**Ethics and dissemination:** This study was approved by the Ethics Committee of the Sectoral Research in Population Health and Primary Care of the Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale (#2019-1503). The results of the investigation will be presented to the stakeholders involved in the advisory committees and at several scientific conferences. Manuscripts will be submitted to peer-reviewed journals.

**Strengths and limitations of the study**

- The measure of efficiency with respect to operational performance at the FMG level and the use of health network resources (e.g., emergency room visits) by Archimède users is a strength.
- The study's inclusion of the analysis of the interrelations between the micro, meso and macro levels to better identify the elements that facilitate or hinder the deployment of the Archimède model and the optimisation of professional roles and interprofessional collaboration is a strength.
- The possible lack of generalisation associated with studying only one FMG will be mitigated by the use of a methodology to quantitatively assess the performance of the FMG, and an in-depth exploration of the influences of the implementation context on the deployment of the project.
- The potential limitations of the Type 2 effectiveness-implementation hybrid study will be mitigated by the involvement of multiple actors on the advisory committee (e.g., able to be rapidly updated about the results; ability to intervene directly to make necessary adjustments).

# INTRODUCTION

## Context of the study

Primary care, which is patients' first point of contact with the health care system (1), provides early care for health problems, chronic disease management, and preventive services. Various models of interprofessional primary care are being created to address human resource shortages in health systems, control health care costs, and reduce overuse of emergency departments visits (2-4). These models are also designed to address the biopsychosocial needs of patients and improve access, continuity and quality of care (5-9). Various effects of these models have been reported for patients, for example : improved access and reduced stigma, especially for individuals with mental health problems (6, 10, 11); enhanced chronic disease management (12); better treatment adherence and follow-up (7, 13, 14); and improvement in symptoms or functioning (10, 13). Various positive impacts on providers have also been reported, including: upskilling (7, 11, 15); better job satisfaction (7, 8); and redistribution of workloads (8). However, although some organisational and cost savings benefits by ensuring more efficient practices have been reported (7), limited documentation of the cost-effectiveness of such models has been carried out.

In the early 2000s, in response to inconsistent primary care access, Canadian provinces and territories began developing various initiatives (16, 17), one of these being the creation of interprofessional primary care teams. The access to these teams remained for the most part centred on the family physician. In Quebec, these teams are called *Groupes de médecine familiale* [Family Medicine Groups (FMGs)], within some of which physicians, nurses, and other health and social services professionals collaborate to deliver

health care based on contractual agreements with the provincial government (16). In Quebec, some patients have a family doctor and others do not. Those who do have a family physician must be registered with one physician and ideally attend this clinic. However, if they are unable to get an appointment with their family physician, these patients can go to a walk-in clinic. Patients who do not have family physicians have to use walk-in clinics only. Although the FMGs are private clinics (albeit financed within Quebec's public insurance system), they have direct collaborative links with the *Centres intégré universitaire de santé et de services sociaux (*CIUSSS); many of the professionals who work in the FMGs are employees of the CIUSSS. The Ministry for Health and Social Services (MSSS) establishes the rules for the distribution of professional and administrative resources.

In 2017, the Saint-Vallier FMG in Quebec City, situated within the CIUSSS-Capitale Nationale (CN) territory, commenced a five-year pilot project, titled *Archimède (18)*. Threatened with closure in 2015 due to the retirement of its physicians and the difficulties of medical recruitment in this district, in which it has not always been easy to recruit healthcare personnel, the pilot project enabled the FMG to maintain its activities, and to continue to meet the complex and diversified needs of the population. Due to the COVID-19 pandemic, which necessitated significant changes in both how services could be provided and staff availability, the pilot project period was extended by two years. This project, which was developed in collaboration with relevant stakeholders (e.g., MSSS, CIUSSS-CN), seeks to implement a patient-centred model based on interprofessional care and the optimal use of healthcare providers' scopes of practice.

This model differs from the practices in many medical clinics in the sense that access is not automatically through a family physician. Composed of several health and social services professionals, the Archimède model works on the principle of the inverted pyramid. That is, there are more nurses (primary health care nurse practitioners and registered nurses) than physicians, and the clinic relies on the optimisation of professional roles through the close collaborations between health and social professionals.

The *Archimède* project is anticipated to improve access to primary care and, given the lower remuneration associated with the services provided by nurses and other health and social services professionals compared to that of physicians, to reduce costs. Also, arising partly from a more efficient allocation of patients across the various professions within the clinic, the improved access is anticipated to reduce hospital utilization (e.g., emergency department visits), thus contributing to health system efficiency and improved population health outcomes (1, 2).

The aim of the protocol presented in this article is to evaluate the implementation of this new model of primary care. Our investigation seeks to identify areas of improvement, formulate recommendations to improve the model's functioning, ensure its utility to stakeholders, and foster its sustainability and potential for scaling up. Specifically, this study seeks to determine whether the *Archimède* model is efficient regarding patient and clinic outcomes and teamwork (e.g., role optimisation) in relation to the resources invested. Our objectives are: (1) to evaluate the impact of the *Archimède* model on operational performance at the FMG level as well as user resource utilization at the public health system level; (2) to identify the factors that foster or impede the optimisation of

professional roles, interprofessional teamwork, and patient-centredness, and (3) to document users' experience with the *Archimède* model.

## Setting

The St-Vallier FMG is in Quebec City's Saint-Sauveur district. This neighbourhood has one of the highest rates of demographic fragility within the CIUSSS-CN territory (19). Although the FMG serves a very broad clientele, a large proportion of its consultations are conducted with users with chronic health problems or in vulnerable psychosocial situations. The clinic's clientele is also characterized by a significant number of immigrants and political refugees. Regarding the FMG's human resources, there are currently 27 employees, including six family physicians (FPs), four primary health care nurse practitioners (PHCNPs), one mental health nurse practitioner (MHNP), five registered nurses (RNs), six health and social services professionals (social worker, nutritionist, physiotherapist, kinesiologist, psychologist, respiratory therapist), and five administrative staff. All services are free of charge for the clinic's clients. Several elements have been put in place to ensure the deployment and operation of the Archimède model. The use of the right professional according to patients' health needs is facilitated by the use of referral pathways by administrative personnel. The electronic medical record is used to facilitate communication between professionals during the management of common patients. The project manager, middle and senior managers of CIUSSS-CN provide ongoing support to professionals to enhance interprofessional collaboration through training, personalised coaching and frequent meetings. Visual aids for clarifying the roles of each are available for professionals. The treatment of service users with complex problems is also facilitated by joint consultations between professionals, or dyads, for example between RNs and

PHCNPs. The team also contributes to facilitating access to various outreach services, including in community resources and the various services offered by the CIUSSS-CN.

# METHOD AND ANALYSIS

## Conceptual framework

This study is based on two frameworks : the *Quadruple Aim* framework (20), which is the Canadian framework used for health care transformation research (21); and the optimisation of professional scopes of practice (22). The Quadruple Aim framework is designed to foster change in health care systems through the achievement of four goals : improved population health outcomes; improved care and patient experience; improved provider satisfaction; and lower costs/better value (20, 21). Recently, a fifth aim has been added that recognizes health equity as an important outcome to reduce health disparities and address social determinants of health (23, 24). In primary care, the development of interprofessional teams is a key factor in improving quality to achieve these goals (2).

Regarding the optimisation of professional scopes of practice, the Canadian Academy of Health Sciences (CAHS) identified factors of influence at the micro-, meso- and macro-levels (22). Micro-level factors include professional hierarchies, professional cultures, and communication among healthcare professionals. Meso-level factors include communication across multiple care settings, professional protectionism, accountability, and availability of evidence. Macro-level factors include legislation/regulations, payment models, educational needs/requirements, and healthcare professional accountability.

## Design

The research on evidence-based interventions frequently favours a stepwise approach; one of the limitations of this approach is the significant time lag between the development of the interventions and its implementation in the field (25). To address this issue, we are using a hybrid implementation approach, specifically the type 2 model, which permits simultaneous testing or piloting of implementation strategies during an effectiveness trial (25). Specifically in this investigation, we will collect both quantitative and qualitative data to assess the effectiveness and implementation of the Archimède model, consistent with our specific objectives. See Table 1 for an overview of the type of data to be collected for the different outcomes. The overall data collection process (March 2023-February 2025) is presented in Figure 1.

*Table 1 Overview of targeted outcomes and data types*

| Type of outcomes | Framework | Target population | Data type |
|---|---|---|---|
| Effectiveness | Quadruple aim: improved population health outcomes | Patients | Quantitative<br>Qualitative |
| | Quadruple aim: improved care and patient experience | Patients | Qualitative |
| | Quadruple aim: improved provider satisfaction | FMG' employees (healthcare providers and administrative staff) | Qualitative |
| Implementation | Optimization of scopes of practice | FMG' employees (healthcare providers and administrative staff)<br>Managers | Qualitative |
| | Quadruple aim: lower costs/better value | FMG/ public health system | Quantitative |

It is relevant to note that an advisory committee was established at the beginning of the development of the project, the objectives of which are to better understand the broader implementation context, monitor the progress of the research project, discuss methodological and fieldwork aspects and the emerging findings, and develop strategies for knowledge transfer to maximize the impact in the health care system. This committee is composed of members of the research team, and representatives from the management of the St-Vallier FMG, a user partner, and stakeholders from the CIUSSS-CN and the MSSS.

*Insert Figure 1 here*

**Figure 1. Data collection process over a year.**

## Quantitative approach

Our quantitative approach aims to evaluate the impact of the *Archimède* model on operational performance at the FMG level as well as user resource utilization at the public health system level. In so doing, we will document the lower costs/better value dimension of the Quadruple aim.

Because this is a single-unit intervention study, to quantitatively assess the performance of the *Archimède* model at the FMG level , we will use either or both synthetic control methods (26, 27) and one-sample generalized linear models. See Table 2 for a non-exhaustive list of outcomes (e.g., *number of patient visits* and *vulnerability-weighted enrollments)*, their components, and their sources. Synthetic control methods are quasi-

experimental and are commonly used in the policy evaluation literature. In the case of our study, this approach will consist of constructing a control counterfactual FMG from a weighted combination of other FMGs in the Quebec City region. On the other hand, one-sample generalized linear models, which will be informed by preliminary clustering analyses (such as principal component analysis) for control FMGs' selection, will allow for testing more streamlined outcome comparison either transversally or longitudinally.

The database for the FMG-level analyses will be built from different operational and financial reports of all FMGs in the Quebec City region, including the St-Vallier FMG. These reports are routinely compiled by and will be provided to us by the MSSS and the CIUSSS. Although we plan to extract data from reports ranging from 2012 to 2022, these stakeholders could not confirm that every report would be available for that 10-year range. Since we need several years of pre-implementation data for the synthetic control approach to be feasible, the precise choice of methods for the analyses at the FMG level will depend on how far back the data collected by the MSSS and the CIUSSS go.

*Table 2. Non-exhaustive list of FMG-level variables of interest*

| Variables of interest | Components | Sources |
|---|---|---|
| Year | | |
| Id | | |
| Size | | MSSS's financial report of FMGs |
| Type | Private vs public | MSSS's financial report of FMGs |
| Number of hours worked for each type of healthcare worker | E.g., Nurses, physical therapists, nutritionist, psychologists | CIUSSS's payroll report |

| | | |
|---|---|---|
| Full time equivalents (FTEs) for each type of healthcare worker | E.g., Nurses, physical therapists, nutritionist, psychologists | CIUSSS's payroll report |
| Enrollments | Total unweighted number of patient enrollments | MSSS's 8B report |
| Weighted enrollments | Weights include vulnerability, disadvantage, births, etc. | MSSS's 8B report |
| Number of physicians | | MSSS's 8B report |
| Patient attendance rate | | MSSS's financial report of FMGs |
| Visits | Subdivided into in-person visits and telemedicine. Further subdivided into visits from patients enrolled at the FMG, patients enrolled in another FMG, and patients enrolled in no FMG. | MSSS's 8C report |
| Funding | Total amount of government funding in CAD | MSSS's financial report of FMGs |

In addition, to evaluate patients' service utilization outside of the FMG, and thus better understand the broader impact of *Archimède* on the public health system, we will use both generalized linear mixed-effects models and propensity score matching methods (28) to compare patients enrolled in the St-Vallier clinic to those enrolled in other FMGs. The outcomes will include metrics such as *number of urgent care admission events* and *length of hospitalization*. Confounding factors will include variables such as *age*, *gender*, and pre-existing health conditions. The database for this portion of the study will be built and anonymized by the *Institut de la Statistique du Québec* (ISQ). A short list of some of the variables we will be querying, as well as details about the source database from which they will be extracted by the ISQ, are presented in Table 3.

*Table 3. Public health system-level example variables of interest*

| Variables of interest | Components | Sources database | Source database specifications |
|---|---|---|---|
| ID | Unique patient identifier provided by the ISQ | FIPA | FIPA contains information about patients covered by the public health insurance |
| Age | | FIPA | |
| Gender | | FIPA | |
| Partial postal code | First three digits | FIPA | |
| Urgent care admission event | | BDCU | BDCU contains information about urgent care admissions |
| Length of hospitalization | | MED-ECHO | MED-ECHO contains information about hospitalizations |
| Service request event | | I-CLSC | I-CLSC contains information about frontline common health and social services |

*Note*. FIPA = Fichier d'inscription des personnes assurées, BDCU = Banque de données commune des urgences. MED-ECHO = Maintenance et exploitation des données pour l'étude de la clientèle hospitalières, I-CLSC = Système d'information sur la clientèle et les services des CSSS – mission CLSC. A list of all available variables that the ISQ can provide can be found at: https://statistique.quebec.ca/research/#/donnees/administratives/sante.

The data will subsequently be transferred to us via a secured remote connection service offered by the ISQ. The final database will comprise upwards of 60 variables for 14,000 randomly selected and uniquely identified patients; 3,500 (25%) will be patients enrolled in the St-Vallier FMG and 10,500 (75%) will be patients enrolled in other FMGs. The experimental population sample of 3,500 patients is based on the lowest number of enrollments in the St-Vallier clinic between 2018 and 2022 (3,924 patients). The 25-75% split was chosen to maximize the likelihood of successfully building synthetic control patients from weighted averages of patients enrolled in other FMGs to match the

experimental group. To be included, patients will have to be over 18 years of age and will need to have been enrolled in the same single FMG between 2018 and 2022.

## Qualitative approach

We will conduct the qualitative research portion of this study using an interpretive description methodology (29). This approach is appropriate for gaining a rich understanding of service providers', stakeholders', and patients' experiences with the *Archimède* model, and their links with meso and macro level factors that influence the optimisation of roles, interprofessional collaboration and patient-centredness. To collect this data, we will conduct individual in-depth semi-structured interviews, which will be appropriate given the potentially sensitive data that participants will share, to permit us to capture deeper understanding of the subjective work and patient experience.

### Population: eligibility criteria and sampling strategy

We will use a purposive sample (30) of healthcare providers (FPs, PHCNPs, RNs, various health and social services professionals), administrative staff and managers working in the St-Vallier FMG; stakeholders involved in the *Archimède* model implementation; and patients receiving services at the FMG. All employees from the St-Vallier FMG will be eligible. We will recruit up to five stakeholders who played a key role in the implementation of the *Archimède* model (e.g., representatives from the MSSS, clinical advisor on interprofessional collaboration), depending on the advisory committee's suggestions. The sample of patients will be based on the main health problems for which patients seek care, which we will determine during recruitment. We aim to include patients

with health problems such as chronic diseases, mental health problems, and loss of autonomy. We believe that 20 patients will be sufficient for providing rich data, although the final number will be determined by the attainment of data saturation (31). Patients will be required to be ≥ 18 years old, enrolled with a FP, and considered able to provide informed consent by healthcare providers. All patients enrolled in the study will be asked to complete a socio-demographic form to provide information on their socio-economic status.

## Recruitment strategy

Participation in the individual interviews will be voluntary for all participants. For the recruitment of healthcare providers, managers and administrative staff, we will conduct an information session at the Saint-Vallier FMG to present the study and distribute information leaflets. We will also send an email to these personnel categories with detailed information about the study to inform employees who cannot attend the meeting. Employees who are interested in participating in the interviews will be invited to contact us. In addition, we will identify key stakeholders with the help of the advisory committee and contact them directly via email or telephone. Recruitment will be facilitated by close links between the research team and the actors in the field established through other research activities. In addition, various strategies will be deployed to maximise recruitment, for example, meetings of the research team at clinic meetings, reminder emails, and participation of some members of the research team on strategic committees.

For patient recruitment, we will ask healthcare providers to provide them with information leaflets. We will also leave leaflets in the waiting rooms of the FMG. These

leaflets, which will inform patients about the entire study so that they have the choice to decline participation, will include a consent form and will inform patients about the $30 to compensate participants for their time. Patients will have the option to contact the research team directly or leave their contact information in an online form if they are interested in participating in the interviews.

## Interviews

The interviews will be conducted in participants' preferred setting (i.e., home, research centre, FMG, videoconference), albeit adhering as necessary to current public health guidelines. The individual interview guides, developed in collaboration with the advisory committee, capture the following elements: improved care and patient experience, and improved provider satisfaction (Quadruple aim framework); the micro, meso and macro dimension of the optimisation of scope of practice. See Table 4 for the specific interview themes. These interview guides will evolve iteratively in that analyses of the results of the first interviews will inform questions during subsequent interviews. The interviews will be audio-taped with participants' consent.

*Table 4. Interview themes*

| | **Themes** |
|---|---|
| **Employees** | Work organization and motives to work in the FMG<br>Level of commitment to work in the FMG<br>Experience and satisfaction with the new FMG's work organization |
| | Impact of *Archimède* on professional role and workload<br>Interdisciplinary teamwork dynamics<br>Obstacles to the implementation of the model (micro, meso, macro) |
| **Stakeholders** | Role in the implementation process |

| | |
|---|---|
| | Context of emergence and the implementation process<br>Operation of the FMG<br>Assessment of the *Archimède* model |
| **Patients** | Reasons for seeking care and healthcare providers seen<br>Impact of *Archimède* on care and ability to get involved in one's own care (Saint-Vallier clinic)<br>Satisfaction with care<br>Likes and dislikes about the FMG's work organization<br>Participation in care decision-making |

## Data analysis

Our analysis of the interview data will be facilitated by using Nvivo software (32). Data from professionals will be aggregated in such a way that each group is made up of a sufficiently large number of participants to preserve their anonymity. We will follow the stages of thematic analysis: initial coding according to our predefined interview themes and those that emerge during the analysis; categorization; consolidation of categories; linking of categories; and data integration and modeling (33). We will analyze data in light of factors that optimize scope of practice, at the micro, meso, and macro levels, as defined by the CAHS (22). We will give particular attention to the collaboration between healthcare providers, and collaboration between healthcare providers and administrative staff. Furthermore, we will characterize interactions between the micro, meso and macro levels. We will prepare comprehensive summaries of our results and discuss them with the advisory committee group to enhance our interpretation of the results. Using the subsequent findings, we will (1) formulate recommendations for optimizing interprofessional collaborative and patient-centred practices and the role of healthcare providers, and (2) highlight the challenges and potential viable solutions related to the sustainability of the *Archimède* project and its potential scaling up in other settings.

## PATIENT AND PUBLIC INVOLVEMENT

Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. The user-partner played a key role from the very beginning of the pilot project through his participation in several meetings of the advisory committee. The governance of the project has been designed to ensure that user-partners are involved in the decision-making processes, which will allow the advisory committee to remain responsive to user concerns throughout the implementation of the project. Refer to the Methods and analysis section for further details.

## ETHICS AND DISSEMINATION

This project respects the ethics, integrity and responsible research conduct standards defined by the Fonds de recherche du Québec (FRQS) and the CIUSSS-CN. It has received ethical approval from the regional health organization with which the researchers are affiliated (# 2019-1503). Regarding ethical considerations specific to the participants in the interviews, we specified all their rights in accordance with the rules of the sectoral research ethics committee (CER-S) in population health and primary care (e.g., the right of participants to withdraw from the study at any time and to refuse to answer certain questions; the confidentiality obligations of the researchers; the confidentiality obligations of the focus group participants). The results of the investigation will be presented to the stakeholders involved in the advisory committee and at several scientific conferences. Manuscripts will be submitted to peer-reviewed journals.

## DISCUSSION

Interprofessional teams are increasingly being established throughout Canada and elsewhere to improve the access, continuity and quality of services provided to individuals living with complex health problems (e.g., chronic diseases; mental health challenges; comorbidities) (6, 10, 15, 34-36). A variety of models exist, characterised both by the organization and degree of interprofessional collaboration, as well as the type of clients served (37-39).

This project will advance the understanding of the effects of a team-based model of care within a FMG that is in a disadvantaged area and whose clientele presents complex biopsychosocial problems. Various interprofessional primary care models have been developed that are designed to address complex health problems in specific populations identified as vulnerable, for example, older adults, (40), individuals with HIV (41), and veterans (42). However, these models have frequently been presented as intervention programs composed of a predefined interprofessional continuum of care, a care manager, and/or case discussions. In comparison, the *Archimède* model is based on a uniform orientation to the optimisation of professional roles (seeing the right professional at the right time), and the use of predefined pathways enacted by administrative staff when making appointments. Furthermore, in this model, referrals are made between professionals, and the continuum of care is facilitated by having an interprofessional team in the same location. Access to this interprofessional approach is also facilitated because no fee is charged. In addition, compared to other reported primary care models (38, 43, 44), there is no preselection of patients, with all patients being eligible for the appropriate professional services. Our research project seeks to understand the experience of users

attending a clinic based on this model to assess the relevance of this model for this population.

One of the strengths of our research includes the measure of efficiency with respect to operational performance at the FMG level and the use of health network resources (e.g., emergency room visits) by *Archimède* users. This study will make an important contribution to the understanding of the efficiency of primary care models, thus responding to the need to better evaluate primary care reforms (16, 36).

The originality of our research lies in our focus on the interrelations between the micro, meso and macro levels to better identify the elements that facilitate or hinder the deployment of the model and the optimisation of interprofessional collaboration. Understanding the context of implementation, particularly in relation to the particularity of the dual public and private organisational structures, is an important element in this research project. That is, although the model is deployed in a private clinic, it is publicly funded. As well, some staff are paid by the public health organization. Thus, our approach takes into account: 1) structural issues related to health policies in primary care, types of funding, and resource management; 2) issues related to the organization of the clinic (e.g., dynamics of interprofessional collaboration and management practices); and 3) micro-level issues related to the subjective work experience of professionals and service users' experiences (22). Although our research evaluates only one FMG, the findings from this study could be relevant not only in Quebec but also for other jurisdictions looking to develop interprofessional primary care models that address the social determinants of health, and that optimize the use of health and social care providers' respective scopes of practice.

Regarding the limitations of our investigation, there is a potential lack of generalisation in studying only one FMG. Nevertheless, conducting this project will permit us to both test our methodology to quantitatively assess the performance of the FMG, and to explore in depth the influences of the implementation context on the deployment of the project. A potential limitation of the type 2 effectiveness-implementation hybrid study approach concerns the difficulties that can arise if there is a problem in the implementation of the Archimède model in the FMG clinic with respect to the optimisation of professional roles and the close collaboration of the professionals; this difficulty can compromise the effectiveness trial field (25). In our study, the involvement of multiple actors in the advisory committee should help to mitigate this limitation by the fact that they will be informed quickly of the results along the way and by their ability to intervene directly within the team to make the necessary adjustments. A further possible limitation concerns the potential for generalisation to other areas with different demographic profiles, given that the FMG under study is in a disadvantaged area. However, it is unlikely that all patients attending the FMG are in a vulnerable situation; the use of a socio-demographic form will allow to establish a socioeconomic profile of the patients interviewed.



## FUNDING STATEMENT

This work was financially supported by the Quebec Ministry of Health and Social Services (MSSS) and the *Fonds de Recherche du Québec - Santé* (FRQS). Award/Grant number: NA

## AUTHORS CONTRIBUTION

- Substantial contributions to the conception or design of the work (NC, YF, AF, SCG, ML, MI, AD, J-LD, EJ and SB).
- Drafting the work or revising it critically for important intellectual content (NC, YF, AF, SCG, ML, MI, AD, J-LD, EJ and SB).
- Final approval of the version to be published (NC, YF, AF, SCG, ML, MI, AD, J-LD, EJ and SB).
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (NC, YF, AF, SCG, ML, MI, AD, J-LD, EJ and SB).

## COMPETING INTERESTS

None.

## ACKNOWLEDGMENT

The authors would like to extend special thanks to the user partner who sits on our committee (Monsieur Raynald Savard) and to the participants, users, and health and social professionals, without whom this study would not be possible.

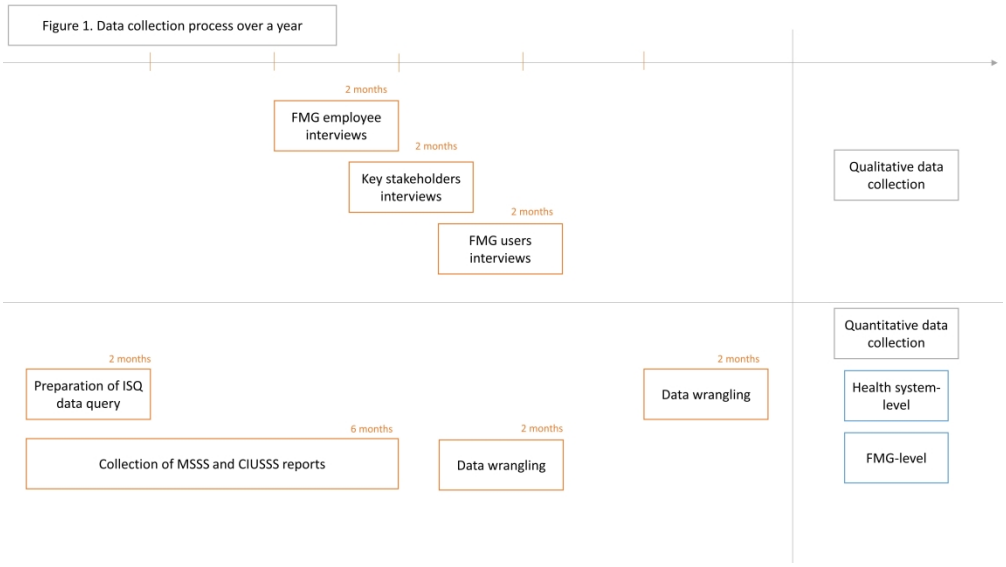
## REFERENCES

1. Starfield B, Shi L, J. M. Contribution of primary care to health systems and health. Milbank Quarterly. 2005;83(3):457-502. doi:10.1111/j.1468-0009.2005.00409.x
2. Aggarwal M, Hutchison B. Toward a primary care strategy for Canada. Ottawa (CA): Canadian Foundation for Healthcare Improvement; 2012.

3. Coleman K, Wagner E, Schaefer J, Reid R, LeRoy L. Redefining primary care for the 21st century. White paper. Rockville, MD: AHRQ Publication; 2016.
4. Bourgeault IL, Mulvale G. Collaborative health care teams in Canada and the USA: Confronting the structural embeddedness of medical dominance. Health Sociology Review. 2006;15(5):481-95. doi:10.5172/hesr.2006.15.5.481
5. Conley VM, Judge-Ellis T. Disrupting the system: An innovative model of comprehensive care. The Journal for Nurse Practitioners. 2021;17:32-6. doi:10.1016/j.nurpra.2020.09.012
6. Ashcroft R, Menear M, Greenblatt A, Silveira J, Dahrouge S, Sunderji N, et al. Patient perspectives on quality of care for depression and anxiety in primary health care teams: A qualitative study. Health Expectations. 2021;24(4):1168-77. doi:10.1111/hex.13242
7. Fitzpatrick SJ, Perkins D, Handley T, Brown D, Luland T, Corvan E. Coordinating mental and physical health care in rural Australia: An integrated model for primary care settings. International Journal of Integrated Care. 2018;18(2):1-9. doi:10.5334/ijic.3943
8. Lyon RK, Slawson JG. An organized approach to chronic disease care. Family Practice Management [Internet]. 2011; 18(3):[27-31 pp.]. Available from: http://www.aafp.org/fpm/2011/0500/p27.html.
9. Metusela C, Usherwood T, Lawson K, Angus L, Kmet W, Ferdousi S, et al. Patient centred medical home (PCMH) transitions in western Sydney, Australia: A qualitative study. BMC Health Services Research 2020;20(285):1-13. doi:10.1186/s12913-020-05123-7
10. Kates N, McPherson-Doe C, George L. Integrating mental health services within primary care settings: The Hamilton Family Health Team. The Journal of Ambulatory Care Management. 2011;34(2):174-82. doi:10.1097/JAC.0b013e31820f6435
11. Paquette-Warren J, Vingilis E, Greenslade J, Newnam S. What do practitioners think? A qualitative study of a shared care mental health and nutrition primary care program. International Journal of Integrated Care. 2006;6:e18. doi:10.5334/ijic.164
12. Lawson B, Dicks D, Macdonald L, Burge F. Using quality indicators to evaluate the effect of implementing an enhanced collaborative care model among a community, primary healthcare practice population. Nursing Leadership 2012;25(3):28-42. doi:10.12927/cjnl.2013.23057
13. Blackmore MA, Carleton KE, Ricketts SM, Patel UB, Stein D, Mallow A, et al. Comparison of collaborative care and colocation treatment for patients with clinically significant depression symptoms in primary care. Psychiatric Services. 2018;69(11):1184-7. doi:10.1176/appi.ps.201700569
14. Moore JA, Karch K, Sherina V, Guiffre A, Jee S, Garfunkel LC. Practice procedures in models of primary care collaboration for children with ADHD. Families, Systems & Health. 2018;36(1):73-86. doi:10.1037/fsh0000314
15. McElheran W, Eaton P, Rupcich C, Basinger M, Johnston D. Shared mental health care: The Calgary model. Families, Systems & Health. 2004;22(4):424-38. doi:10.1037/1091-7527.22.4.424

16. Hutchison B, Levesque J-F, Strumpf E, Coyle N. Primary health care in Canada: Systems in motion. Milbank Quarterly. 2011;89(2):256-88. doi:10.1111/j.1468-0009.2011.00628.x
17. Wong ST, Chomienne M-H, Montfort H. IHWC papers: Comparisons of the restructured primary care in the IMWC countries - Canada. 2011.
18. Laliberté C, Dubé G, Fréchette A, Boucher C. La clinique Archimède: L'infirmière, un lever d'excellence (Clinique Saint-Vallier, Québec)2016. Available from: https://docplayer.fr/11842570-La-clinique-archimede-l-infirmiere-un-levier-d-excellence.html.
19. Partenariat Données Québec. Défavorisation combinée 2016 - National (Reg.2). 2019. Available from: https://www.donneesquebec.ca/recherche/dataset/indice-de-defavorisation-du-quebec-2016/resource/8361d460-bba3-409a-a724-8f2c71decede.
20. Bodenheimer T, Sinsky C. From triple to quadruple aim: Care of the patient requires care of the provider. Annals of family medicine. 2014;12(6):573-6. doi:10.1370/afm.1713
21. Canadian Institutes of Health Research. Research strategic plan 2021-2026 2021. Available from: https://cihr-irsc.gc.ca/e/52481.html#fig_1.
22. Nelson S, Turnbull J, Bainbridge L, Caulfield T, Hudon G, Kendel D, et al. Optimizing scopes of practice: New models of care for a new health care system. Ottawa (CA): Canadian Academy of Health Sciences; 2014.
23. Nundy S, Cooper LA, Mate KS. The quintuple aim for health care improvement : A new imperative to advance health equity. JAMA. 2022;327(6):521-2. doi:10.1001/jama.2021.25181
24. Itchhaporia D. The evolution of the quintuple aim : Health equity, health outcomes, and the economy. Journal of the American College of Cardiology. 2021;78(22):2262-4. doi:10.1016/j.jacc.2021.10.018
25. Landes SJ, McBain SA, Curran GM. An introduction to effectiveness-implementation hybrid designs. Psychiatry Research. 2019;280(112513). doi:10.1016/j.psychres.2019.112513
26. Abadie A. Using synthetic controls: Feasibility, data requirements, and methodological aspects. Journal of Economic Literature. 2021;59(2):391-425. doi:10.1257/jel.20191450
27. Hollingsworth A, Wing C. Tactics for design and inference in synthetic control studies: An applied example using high-dimensional data2020. Available from: https://ssrn.com/abstract=3592088
28. Stuart EA. Matching methods for causal inference: A review and a look forward. Stat Sci. 2010;25(1):1-21. doi:10.1214/09-STS313
29. Thorne S. Interpretative description : Qualitative research for applied practice. 2nd ed: Routledge/Taylor & Francis Group. ; 2016.
30. Robinson OC. Sampling in interview-based qualitative research: A theoretical and practical guide. Qualitative Research in Psychology. 2014;11(1):25-41. doi:10.1080/14780887.2013.801543
31. Patton MQ. Qualitative research and evaluation methods. 4e ed: SAGE; 2014.

32. QSR International Pty Ltd. NVivo (released in March 2020)2020. Available from: https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home.
33. Miles MB, Huberman AM, Saldaña J. Qualitative data analysis: A methods sourcebook. 3rd ed. Thousand Oaks (CA): SAGE Publications; 2014.
34. Smith-Carrier T, Pham T-N, Akhtar S, Nowaczynski M, Seddon G, Sinha S. "A more rounded full care model": Interprofessional team members' perceptions of home-based primary care in Ontario, Canada. Home health care services quarterly. 2015;34(3-4):232-51. doi: 10.1080/01621424.2015.1108892
35. Moore A, Patterson C, White J, House ST, Riva JJ, Nair K, et al. Interprofessional and integrated care of the elderly in a family health team. Canadian Family Physician. 2012;58(8):436-41.
36. Peckham A, Ho J, Marchildon GP. Policy innovations in primary care across Canada: North American Observatory on Health Systems and Policies; 2018. Available from: https://ihpme.utoronto.ca/wp-content/uploads/2019/08/NAO_RR1.pdf.
37. Collins C, Heuson DL, Munger R, Wade T. Evolving models of behavioural health integration in primary care: Milbank Memorial Fund; 2010.
38. Longhini J, Canzan F, Mezzalira E, Saiani L, Ambrosi E. Organisational models in primary health care to manage chronic conditions: A scoping review. Health & social care in the community. 2022;30(3):565-88. doi:10.1111/hsc.13611
39. Carter R, Riverin B, Levesque J-F, Gariepy G, Quesnel-Vallée A. The impact of primary care reform on health system performance in Canada: A systematic review. BMC Health Services Research. 2016;16(324):1-11. doi:10.1186/s12913-016-1571-7
40. Karia H, Kortejärvi H, Laaksonena R. Developing an interprofessional people-centred care model for home-living older people with multimorbidities in a primary care health centre: A community-based study. Exploratory Research in Clinical and Social Pharmacy. 2022;5(100114):1-8. doi:10.1016/j.rcsop.2022.100114
41. Tu D, Belda P, Littlejohn D, Somlak Pedersen J, Valle-Rivera J, Tyndall M. Adoption of the chronic care model to improve HIV care : In a marginalized, largely aboriginal population. Canadian Family Physician. 2013;59:650-7.
42. Codella N, Kelleya AT, Jonesa AL, Dungana MT, Valentinoa N, Holteya AI, et al. Aims, development, and early results of an interdisciplinary primary care initiative to address patient vulnerabilities. The American Journal of Drug and Alcohol Abuse. 2021;47(2):160-9. doi:10.1080/00952990.2020.1832507
43. Asarnow JR, Rozenman M, Wiblin J, Zeltzer L. Integrated medical-behavioral care compared with usual primary care for child and adolescent behavorial health: A meta-analysis. JAMA Pediatrics. 2015;169(10):929-37. doi:10.1001/jamapediatrics.2015.1141
44. McManus LS, Dominguez-Cancino KA, Stanek MK, Leyva-Moral JM, Bravo-Tare CE, Rivera-Lozada O, et al. The patient-centred medical home as an intervention strategy for diabetes mellitus: A systematic review of the literature. Current diabetes reviews. 2021;17(3):317-31. doi:10.2174/1573399816666201123103835




338x190mm (600 x 600 DPI)

**Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0)**
**September 15, 2015**

| Text Section and Item Name | Section or Item Description | |
|---|---|---|
| **Notes to authors** | • The SQUIRE guidelines provide a framework for reporting new knowledge about how to improve healthcare<br>• The SQUIRE guidelines are intended for reports that describe system level work to improve the quality, safety, and value of healthcare, and used methods to establish that observed outcomes were due to the intervention(s).<br>• A range of approaches exists for improving healthcare. SQUIRE may be adapted for reporting any of these.<br>• Authors should consider every SQUIRE item, but it may be inappropriate or unnecessary to include every SQUIRE element in a particular manuscript.<br>• The SQUIRE Glossary contains definitions of many of the key words in SQUIRE.<br>• The Explanation and Elaboration document provides specific examples of well-written SQUIRE items, and an in-depth explanation of each item.<br>• Please cite SQUIRE when it is used to write a manuscript. | **As you review the manuscript, place a checkmark in this column for each SQUIRE item that is appropriately addressed in the manuscript. Remember that not every item is necessary in every manuscript.** |
| **Title and Abstract** | | |
| **1. Title** | Indicate that the manuscript concerns an initiative to improve healthcare (broadly defined to include the quality, safety, effectiveness, patient-centeredness, timeliness, cost, efficiency, and equity of healthcare) | p.1 |
| **2. Abstract** | a. Provide adequate information to aid in searching and indexing<br>b. Summarize all key information from various sections of the text using the abstract format of the intended publication or a structured summary such as: background, local problem, methods, interventions, results, conclusions | pp.2-3 |

| | | |
|---|---|---|
| **Introduction** | *Why did you start?* | |
| **3. Problem Description** | Nature and significance of the local problem | p.5-6 |
| **4. Available knowledge** | Summary of what is currently known about the problem, including relevant previous studies | p.5-6 |
| **5. Rationale** | Informal or formal frameworks, models, concepts, and/or theories used to explain the problem, any reasons or assumptions that were used to develop the intervention(s), and reasons why the intervention(s) was expected to work | p.8 |
| **6. Specific aims** | Purpose of the project and of this report | p.7 |
| **Methods** | *What did you do?* | |
| **7. Context** | Contextual elements considered important at the outset of introducing the intervention(s) | p.7 |
| **8. Intervention(s)** | a. Description of the intervention(s) in sufficient detail that others could reproduce it<br>b. Specifics of the team involved in the work | a) p.7<br>b) p.7 |
| **9. Study of the Intervention(s)** | a. Approach chosen for assessing the impact of the intervention(s)<br>b. Approach used to establish whether the observed outcomes were due to the intervention(s) | a) p. 9 |
| **10. Measures** | a. Measures chosen for studying processes and outcomes of the intervention(s), including rationale for choosing them, their operational definitions, and their validity and reliability<br>b. Description of the approach to the ongoing assessment of contextual elements that contributed to the success, failure, efficiency, and cost<br>c. Methods employed for assessing completeness and accuracy of data | pp.10-13 (quantitative)<br>pp. 13-15 (qualitative) |
| **11. Analysis** | a. Qualitative and quantitative methods used to draw inferences from the data<br>b. Methods for understanding variation within the data, including the effects of time as a variable | pp. 10-13 (quantitative)<br>p.16 (qualitative) |
| **12. Ethical Considerations** | Ethical aspects of implementing and studying the intervention(s) and how they were addressed, including, but not limited to, formal ethics review and potential conflict(s) of interest | p.17 |

| Results | *What did you find?* | |
|---|---|---|
| **13. Results** | a. Initial steps of the intervention(s) and their evolution over time (*e.g.*, time-line diagram, flow chart, or table), including modifications made to the intervention during the project<br>b. Details of the process measures and outcome<br>c. Contextual elements that interacted with the intervention(s)<br>d. Observed associations between outcomes, interventions, and relevant contextual elements<br>e. Unintended consequences such as unexpected benefits, problems, failures, or costs associated with the intervention(s).<br>f. Details about missing data | Not appropriate; protocol article |
| **Discussion** | *What does it mean?* | |
| **14. Summary** | a. Key findings, including relevance to the rationale and specific aims<br>b. Particular strengths of the project | a) N/A<br>b) p.4 and pp.18-19 |
| **15. Interpretation** | a. Nature of the association between the intervention(s) and the outcomes<br>b. Comparison of results with findings from other publications<br>c. Impact of the project on people and systems<br>d. Reasons for any differences between observed and anticipated outcomes, including the influence of context<br>e. Costs and strategic trade-offs, including opportunity costs | N/A (protocol article) |
| **16. Limitations** | a. Limits to the generalizability of the work<br>b. Factors that might have limited internal validity such as confounding, bias, or imprecision in the design, methods, measurement, or analysis<br>c. Efforts made to minimize and adjust for limitations | pp.19-20 |
| **17. Conclusions** | a. Usefulness of the work<br>b. Sustainability<br>c. Potential for spread to other contexts<br>d. Implications for practice and for further study in the field<br>e. Suggested next steps | pp.17-20 |
| **Other information** | | |
| **18. Funding** | Sources of funding that supported this work. Role, if any, of the funding organization in the design, implementation, interpretation, and reporting | p.20 |

Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. BMJ Quality & Safety. 2016;25(12):986-92. doi:10.1136/bmjqs-2015-004411

# Standards for Reporting Implementation Studies: the StaRI checklist for completion

The StaRI standard should be referenced as: Pinnock H, Barwick M, Carpenter C, Eldridge S, Grandes G, Griffiths CJ, Rycroft-Malone J, Meissner P, Murray E, Patel A, Sheikh A, Taylor SJC for the StaRI Group. Standards for Reporting Implementation Studies (StaRI) statement. *BMJ* 2017;356:i6795

The detailed Explanation and Elaboration document, which provides the rationale and exemplar text for all these items is: Pinnock H, Barwick M, Carpenter C, Eldridge S, Grandes G, Griffiths C, Rycroft-Malone J, Meissner P, Murray E, Patel A, Sheikh A, Taylor S, for the StaRI group. Standards for Reporting Implementation Studies (StaRI). Explanation and Elaboration document. *BMJ Open* 2017 2017;7:e013318

Notes: A key concept of the StaRI standards is the dual strands of describing, on the one hand, the implementation strategy and on the other, the clinical, healthcare, or public health intervention that is being implemented. These strands are represented as two columns in the checklist.

| | |
|---|---|
| The primary focus of implementation science is the implementation strategy (column 1) and the expectation is that this will always be completed. | The evidence about the impact of the intervention on the targeted population should always be considered (column 2) and either health outcomes reported or robust evidence cited to support a known beneficial effect of the intervention on the health of individuals or populations. |

The StaRI standardsrefers to the broad range of study designs employed in implementation science. Authors should refer to other reporting standards for advice on reporting specific methodological features. Conversely, whilst all items are worthy of consideration, not all items will be applicable to, or feasible within every study.

| Checklist item | | Reported on page # | Implementation Strategy | Reported on page # | Intervention |
|---|---|---|---|---|---|
| | | | "Implementation strategy" refers to how the intervention was implemented | | "Intervention" refers to the healthcare or public health intervention that is being implemented. |
| **Title and abstract** | | | | | |
| Title | **1** | p1 | Identification as an implementation study, and description of the methodology in the title and/or keywords | | |
| Abstract | **2** | pp 2-3 | Identification as an implementation study, including a description of the implementation strategy to be tested, the evidence-based intervention being implemented, and defining the key implementation and health outcomes. | | |
| **Introduction** | | | | | |
| Introduction | **3** | pp 5-7 | Description of the problem, challenge or deficiency in healthcare or public health that the intervention being implemented aims to address. | | |
| Rationale | **4** | p9 | The scientific background and rationale for the implementation strategy (including any underpinning theory/framework/model, how it is expected to achieve its effects and any pilot work). | | The scientific background and rationale for the intervention being implemented (including evidence about its effectiveness and how it is expected to achieve its effects). |

| | | | | | |
|---|---|---|---|---|---|
| Aims and objectives | **5** | pp7-8 | The aims of the study, differentiating between implementation objectives and any intervention objectives. | | |
| **Methods: description** | | | | | |
| Design | **6** | P9 | The design and key features of the evaluation, (cross referencing to any appropriate methodology reporting standards) and any changes to study protocol, with reasons | | |
| Context | **7** | pp 5-8 | The context in which the intervention was implemented. (Consider social, economic, policy, healthcare, organisational barriers and facilitators that might influence implementation elsewhere). | | |
| Targeted 'sites' | **8** | pp8 | The characteristics of the targeted 'site(s)' (e.g locations/personnel/resources etc.) for implementation and any eligibility criteria. | | The population targeted by the intervention and any eligibility criteria. |
| Description | **9** | pp8-9 | A description of the implementation strategy | | A description of the intervention |
| Sub-groups | **10** | N/A | Any sub-groups recruited for additional research tasks, and/or nested studies are described | | |
| **Methods: evaluation** | | | | | |
| Outcomes | **11** | pp11-14 + pp15-18 | Defined pre-specified primary and other outcome(s) of the implementation strategy, and how they were assessed. Document any pre-determined targets | | Defined pre-specified primary and other outcome(s) of the intervention (if assessed), and how they were assessed. Document any pre-determined targets |
| Process evaluation | **12** | P11 | Process evaluation objectives and outcomes related to the mechanism by which the strategy is expected to work | | |
| Economic evaluation | **13** | pp11-14 | Methods for resource use, costs, economic outcomes and analysis for the implementation strategy | | Methods for resource use, costs, economic outcomes and analysis for the intervention |
| Sample size | **14** | p12 + p14 + pp15-16 | Rationale for sample sizes (including sample size calculations, budgetary constraints, practical considerations, data saturation, as appropriate) | | |
| Analysis | **15** | pp11-13 +p18 | Methods of analysis (with reasons for that choice) | | |
| Sub-group analyses | **16** | N/A | Any a priori sub-group analyses (e.g. between different sites in a multicentre study, different clinical or demographic populations), and sub-groups recruited to specific nested research tasks | | |

| | | | | | |
|---|---|---|---|---|---|
| **Results** | | | | | |
| Characteristics | **17** | N/A | Proportion recruited and characteristics of the recipient population for the implementation strategy | | Proportion recruited and characteristics (if appropriate) of the recipient population for the intervention |
| Outcomes | **18** | N/A | Primary and other outcome(s) of the implementation strategy | | Primary and other outcome(s) of the Intervention (if assessed) |
| Process outcomes | **19** | N/A | Process data related to the implementation strategy mapped to the mechanism by which the strategy is expected to work | | |
| Economic evaluation | **20** | N/A | Resource use, costs, economic outcomes and analysis for the implementation strategy | | Resource use, costs, economic outcomes and analysis for the intervention |
| Sub-group analyses | **21** | N/A | Representativeness and outcomes of subgroups including those recruited to specific research tasks | | |
| Fidelity/ adaptation | **22** | N/A | Fidelity to implementation strategy as planned and adaptation to suit context and preferences | | Fidelity to delivering the core components of intervention (where measured) |
| Contextual changes | **23** | N/A | Contextual changes (if any) which may have affected outcomes | | |
| Harms | **24** | N/A | All important harms or unintended effects in each group | | |
| **Discussion** | | | | | |
| Structured discussion | **25** | p4 + pp20-22 | Summary of findings, strengths and limitations, comparisons with other studies, conclusions and implications | | |
| Implications | **26** | pp21-22 | Discussion of policy, practice and/or research implications of the implementation strategy (specifically including scalability) | | Discussion of policy, practice and/or research implications of the intervention (specifically including sustainability) |
| **General** | | | | | |
| Statements | **27** | p19 + pp22-23 | Include statement(s) on regulatory approvals (including, as appropriate, ethical approval, confidential use of routine data, governance approval), trial/study registration (availability of protocol), funding and conflicts of interest | | |