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Implementing Multimorbidity Care Innovations in Three Nova Scotian Primary Care Clinics: A Qualitative Case Study

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Abstract

Background:

The increasing global prevalence of multimorbidity poses major challenges for primary healthcare systems because its treatment and prevention require coordinated, patient-centered, and interprofessional models of care. In Nova Scotia, Canada, one response has been the implementation of interprofessional team-based primary healthcare. This study evaluated the implementation of multimorbidity care program components in three interprofessional primary healthcare teams. The aim was to describe programs and identify enablers, barriers, and lessons learned to guide future implementation of similar programs in primary healthcare settings.

Methods:

A qualitative case study design was used, involving in-depth semi-structured interviews and focus groups with 12 team members across two rural and one urban primary healthcare practices in Nova Scotia, Canada. Data were analyzed using the Consolidated Framework for Implementation Research (CFIR) to explore contextual and organizational factors influencing implementation. Thematic analysis identified common enablers, barriers, and recommendations across the CFIR framework's domains: Innovation, Outer and Inner Settings, Characteristics of Individuals, and Implementation Processes.

Results:

Implementation was supported by several enablers, including strong leadership engagement, interprofessional collaboration, and effective use of Information Technology systems that enhanced workflow and communication. Providers reported that team-based care improved job satisfaction and enabled patients to receive more coordinated, accessible care. Community partnerships and blended models of virtual and in-person care also facilitated implementation. However, programs faced multiple barriers, including staffing shortages, limited funding for key roles, high costs and complexity of Electronic Medical Records (EMR), and patient discomfort with virtual care. Additional challenges included limited training, competing provider priorities, and difficulties coordinating across multiple sites. Participants recommended expanding training on EMR systems, increasing funding for navigator roles and infrastructure, streamlining technology, and fostering leadership and team engagement.

Conclusions:

The implementation of multimorbidity care programs in primary healthcare settings is influenced by both systemic and contextual factors. While interprofessional teamwork, leadership support, and community partnerships are essential enablers, sustainable funding, structured training, and user-friendly technology are critical for program scalability and success. These findings offer actionable guidance for policymakers, healthcare leaders, and researchers seeking to strengthen integrated multimorbidity care, enhance provider satisfaction, and improve patient outcomes in primary healthcare.

Background

Multimorbidity (MM), defined as the presence of two or more co-occurring chronic or long-term conditions, (1, 2) affects one in four adults (3–5) and creates complex health and social challenges, particularly among older adults. In Nova Scotia, the burden of MM is amplified by an aging population and high rates of chronic disease.(6)

Traditional clinician-centered approaches to MM management may increase patients' knowledge of lifestyle changes to improve their health outcomes, but they often fail to promote sustained behavioral change.(7) Patient-centered approaches, by contrast, strengthen collaboration between patients and healthcare providers, encouraging behavioral change,(8) self-management,(9) and improved self-reported health.(10) Evidence shows that the complex needs of individuals with MM are best addressed by interprofessional teams (9, 11) within a patient-centered health home model.(12–17)

Primary healthcare for MM is frequently guided by Wagner's Chronic Care Model,(18) which emphasizes self-management support, decision support, teamwork, information systems, and community partnerships.(19, 20) In Canada, the Patient-Centred Innovations for Persons with Multimorbidity (PACE in MM) program has contributed substantial evidence on team-based primary healthcare for MM, particularly in Ontario and Quebec.(18–20)

Over the past decade, Nova Scotia has expanded interprofessional family practice teams that increasingly deliver care through a Health Home model.(21–23) These teams provide coordinated, equitable, and comprehensive services across health system and community settings.(24) Despite the growing evidence supporting patient-centered Health Home models,(25–27) little is known about how MM programming is implemented in primary healthcare practices, especially those serving smaller or rural populations with fewer resources.(28)

As efforts to expand Health Home models continue, understanding how teams implement and adapt MM programming is essential. This study identifies, describes, and compares the implementation and care delivery innovations of Multimorbidity Program Components (MMPCs) offered in primary healthcare settings across Nova Scotia. MMPCs are defined as structured approaches used by primary healthcare teams to address the needs of patients with MM.

Methods

Aim, Design, and Setting

This study aimed to identify, describe, and compare the implementation and care delivery innovations of MMPCs in primary healthcare settings across Nova Scotia. A case study evaluation(29) was used to understand MMPC implementation within collaborative family practice teams. The Consolidated Framework for Implementation Research (CFIR) (30) guided analysis of factors influencing implementation.

Conceptual Framework

CFIR domains—Innovation Characteristics, Outer Setting, Inner Setting, Characteristics of Individuals, and Implementation Process—were applied. Innovation Characteristics examine attributes such as quality, complexity, design, and cost.(31) Outer Setting includes factors beyond organizational control, Inner Setting captures organizational constructs, including culture, leadership, and resources, and Characteristics of Individuals reflect participants' roles. Implementation Process refers to activities and strategies used to implement the MMPC.

Ethics Approval

Ethics approval

was obtained from the Nova Scotia Health Research Ethics Board (File No. 1024492). Informed consent was obtained from all study participants.

Site Selection

Sites were selected in consultation with Nova Scotia Health leadership. Eligible sites were primary healthcare settings offering team-based MMPCs. Three teams were identified based on composition, availability and interest: MMPC-A and MMPC-B in Western Zone (predominantly rural) and MMPC-C in Central Zone (predominantly urban).(32)

Participants and Data Collection

Purposive sampling identified healthcare providers and administrators/managers from the three MMPC teams. Semi-structured interviews were conducted virtually via Microsoft Teams between May and July 2021, facilitated by two researchers with one scribe per session. Participants included administrators, managers, physicians, nurse practitioners, nurses, and dietitians. In total, MMPC-A had 7 participants, MMPC-B had 4 participants, and MMPC-C had 1 participant, totaling 12 across the three MMPCs. A semi-structured interview guide informed by CFIR was developed, with questions focused on MMPC implementation. An additional pdf file includes the full interview guide (see Additional File 1). Interviews were transcribed verbatim and reviewed for accuracy and anonymization.

Data Analysis

Transcripts were analyzed using inductive and deductive qualitative content analysis (14, 33–35) to describe and compare MMPCs. A deductive coding framework based on the 2022 CFIR framework and addendums was applied. Two team members independently coded transcripts, and themes were generated both inductively and deductively. Patterns and relationships across constructs were examined. Coding and thematic analysis were supported using NVivo 64 software (QSR International, Melbourne,

Australia), which facilitated organization, retrieval, and comparison of coded text. Regular team meetings ensured rigor and trustworthiness, and final themes were mapped to CFIR domains to provide a comprehensive understanding of implementation factors.

Results

Description of the MMPCs

The MMPCs aimed to provide patients with MM an integrated, patient-centered approach to care that moved beyond disease-specific management toward holistic wellness. Each clinic shared this vision but adapted it to its local context.

MMPC-A operates across two rural primary healthcare sites in Nova Scotia's Western Zone and historically evolved from a diabetes-focused chronic disease management program. The team functions as a shared interdisciplinary service that provides coordinated support to patients with MM across a wide geographic catchment area. Access occurs primarily through provider referral, with some capacity for self-referral. The model includes outreach to nearby communities and incorporates group-based education and wellness activities when resources allow.

MMPC-B is located in a rural primary healthcare setting in the Western Zone and is structured around a focused model of care for patients with Chronic Obstructive Pulmonary Disease (COPD). The team consists of a manager, nurse practitioner, family practice nurses, and a project lead. The program emphasizes proactive chronic disease management and integrates respiratory-focused care within a broader family practice environment. Referrals come from within the primary healthcare team and allied providers in the surrounding area.

MMPC-C is situated within an urban primary healthcare clinic in Nova Scotia's Central Zone and serves a diverse patient population with complex MM needs. The practice operates within a longstanding academic and team-based care structure, supported by a physician-led interdisciplinary team. The clinic integrates digital tools, population health methods, and collaborative workflows to support MM care in a high-volume urban context with mixed in-person and virtual access.

Together, the three MMPCs shared a commitment to coordinated, patient-centered care while differing in scope, setting, and technological integration—ranging from rural, relationship-based models (A and B) to data-driven, digitally enhanced care in an urban environment (C).

CFIR Domains

Innovation Characteristics

Across the three MMPCs, the design of the MM innovations reflected a shared commitment to holistic, team-based care, while differing in focus, scope, and technological sophistication. Each model was structured to support coordinated, person-centered care, offering alternatives to traditional "single-

condition," episodic approaches. At MMPC-A, the innovation built on a long-standing chronic disease program and expanded into broader MM management across two rural clinic sites. Providers emphasized the flexibility and comprehensiveness of the approach, noting its capacity to meet patients where they are and address multiple issues within a single, integrated plan:

"They are usually referred by their healthcare practitioner, or sometimes it's a self-referral... we almost act as a case management team offering different services… looking at the holistic person and all of the options available to them." — MMPC-A Participant

MMPC-B's innovation centered on a COPD-specific prevention and management model designed to shift care from reactivity to proactive, continuous support. Participants described the model as structured, disciplined, and intentionally preventative. As one participant said:

"We've got a really good preventative care plan versus the 'stop the fires' kind of reactionary model." — MMPC-B Participant

MMPC-C represented the most technologically advanced innovation, integrating EMR customization, patient engagement tools, GIS-based population analysis, and blended in-person, virtual, and asynchronous care. The innovation offered notable value for both providers and patients by enabling information sharing and active patient involvement. As one provider explained:

"Patients love it [uploading information on EMR]. Once they get accustomed to doing that... it's so wonderful. Like there's these patients that I'm seeing like every two or three weeks. Before the visit, they've already uploaded their information on a spreadsheet. And I go, wow, it's got everything I need... So that patient engagement and realization of why I'm so worried about their health, I really feel like it's being shared." — MMPC-C Participant

Across clinics, innovations emphasizing shared decision-making, empowerment, and proactive management were perceived as clear improvements over conventional care models. However, the complexity of these innovations varied considerably by site; MMPC-A and B focused on interpersonal, relationship-based innovations, whereas MMPC-C introduced more complex digital components that required new skills and workflow adjustments.

Inner Setting

The organizational climate, communication structures, and available resources shaped implementation in each MMPC. While all teams demonstrated strong commitment to delivering integrated care, their internal environments influenced how effectively innovations were adopted and sustained. MMPC-A benefitted from structured team meetings and frequent opportunities to realign roles and expectations. Participants described these sessions as important mechanisms for building shared understanding and fostering collaboration:

"There's been some regular opportunities to come together as a team… and I think that has been an enabler to really help people work together and collaborate." — MMPC-A Participant

The EMR also supported coordination within the Inner Setting by enabling real-time communication, which was particularly helpful across MMPC-A's two rural sites:

"I find using the EMR helps with the communication piece. So because the providers are all on Med Access, when we're in with a patient, if an issue comes up, we can sometimes message the provider at that moment, and they'll get back to us as soon as they can – sometimes during the visit when the patient is still with us." — MMPC-A Participant

At MMPC-B, the Inner Setting was shaped by a small, cohesive team that relied on shared responsibility and consistent communication to support preventative care. MMPC-C, by contrast, formalized its workflows through digital templates and tasking processes, enabling clear delegation and timely follow-up across staff roles.

Despite these strengths, clinics identified Inner Setting barriers, including staff shortages, competing demands, and in MMPC-A, logistical difficulties coordinating across two geographically separate rural locations. Limited time and capacity for training or reflection further constrained the depth of implementation at all sites.

Outer Setting

External pressures, resources, and relationships played important roles in shaping the MMPCs' implementation. Across settings, community partnerships, patient needs, funding structures, and policy environments influenced adoption and sustainability.

MMPC-A benefited from partnerships with community organizations such as the YMCA, which expanded patients' access to wellness and physical activity programming in supportive environments. These collaborations helped extend care beyond the clinic and strengthened the program's reach within rural communities. MMPC-B operated in alignment with provincial priorities aimed at improving chronic disease outcomes, which indirectly supported its COPD-focused design. MMPC-C's development was influenced by broader provincial and academic leadership promoting patient-centered, team-based care models:

"Dr. X… was kind of taking the model from Dal Family Medicine and describing it provincially… it gave me an incentive to try it." — MMPC-C Participant

Funding constraints emerged as a consistent barrier, particularly in rural clinics attempting to broaden or sustain MM services. MMPC-A noted challenges securing support for a dedicated navigator role needed to coordinate care:

"It's not been a typical path… because there's been no money." — MMPC-A Participant

The Outer Setting also shaped patient engagement. In rural contexts, some patients resisted virtual modalities due to comfort levels, access limitations, or preference for in-person interactions. Additionally,

COVID-19 disrupted planned programming and shifted staff capacity toward immediate service demands, delaying implementation activities in MMPC-A.

Characteristics of Individuals

Individual-level factors—including provider motivation, knowledge, beliefs, and autonomy—were crucial determinants of implementation success across the MMPCs.

MMPC-A participants described the challenge of adopting a new way of thinking about care delivery. The shift required reframing the model not as a discrete "program" but as a holistic approach embedded in everyday practice:

"It's understanding that we're not creating a new program, we're not creating a new service, it's a way of looking and understanding our approach to our work. So I'd say that's been a challenge… making that shift to try to really understand working with the resources that we already have." — MMPC-A Participant

In MMPC-B, staff demonstrated strong intrinsic motivation and autonomy, taking ownership of learning and patient management:

"I more or less update it myself, educated myself, and then when I got the referrals and then I went through the patient's chart, made sure I had all the information on the patient, give the patient a call, let them know what was happening and that they would see me the next visit, set up the appointment and then they would come in…" — MMPC-B Participant

MMPC-C providers demonstrated high confidence in adopting population-level tools and incorporating equity considerations into routine practice:

"With the GIS integration and starting to look at scope, I'm now adding another layer of complexity or visibility to start to look at diversity, dependency and social determinants of health." — MMPC-C Participant

Across sites, barriers included variable digital literacy, workload burden, and competing priorities that limited time for training and innovation adoption.

Implementation Process

Implementation processes varied but shared core elements across the MMPCs, including team meetings, workflow refinement, communication strategies, and patient-centered triage approaches.

MMPC-A relied on structured team dialogue to support sense-making and coordination. MMPC-B incorporated predictable follow-up routines and consistent patient communication as part of their everyday practice. MMPC-C used digital tasking templates to formalize processes and ensure efficient follow-up:

"Then as soon as that visit is done, in that very same window I have it set up so that there's a template. You know, book patient. And it'll be a 1, 2, 3 [follow-up tasks]… I will send that task to [front staff]. I will

then go in and create the requisition… and [front staff] just uploads it… and then [the patient] prints it off from their end." — MMPC-C Participant

MMPC-C also described how blended care processes were triaged to match patient needs:

"We use telephone or video or asynchronous care or direct care based on what they [patients] need. And we work so well together that [the front staff] has an idea of what are some of the things that I would absolutely need to see versus what I want to hear from." — MMPC-C Participant

Across clinics, Implementation Process barriers included limited time for structured training, reliance on individual initiative rather than standardized onboarding, and substantial disruptions from COVID-19, which halted group-based programming and affected workflow stability.

Cross-Case Analysis Using the CFIR

The findings were further mapped into the CFIR framework to provide a comprehensive analysis of implementation factors within each domain (Table 1). The table categorizes enablers and barriers across the CFIR domains of Innovation Characteristics, Outer Setting, Inner Setting, Characteristics of Individuals, and Implementation Process. Each domain captures key dynamics that shape the implementation and sustainability of MM programs, offering actionable insights into areas of strength and opportunities for improvement. These findings provide a structured overview of how contextual and programmatic factors interact to influence the outcomes of MM interventions.

Table 1
Factors influencing the success of three MMPCs, organized by CFIR domain

Innovation Characteristics
Enablers • Evidence supporting MMPC effectiveness (e.g., MMPC-A's integrated care model derived from successful clinics). • Customizable IT tools like EMRs and GIS mapping software enhancing care delivery and decision-making (e.g., MMPC-C). • Relative advantage of integrated, patient-centered approaches over traditional care models (e.g., MMPC-A and MMPC-B). **Barriers** • High costs of IT systems, such as customizable EMRs, reducing accessibility for smaller practices. • Complexity of IT tools, requiring advanced training that staff often lack. • Limited trialability for some innovations, such as asynchronous care, reducing physician adoption.
Outer Setting
Enablers • Partnerships with community organizations (e.g., MMPC-A's collaboration with the YMCA to expand wellness initiatives). • Patient-centered innovations, like blended care models, addressing accessibility challenges (e.g., MMPC-C's use of virtual care). • Alignment with policy-level goals, such as reducing emergency department reliance. **Barriers** • Insufficient funding for critical roles like navigator positions and IT infrastructure. • Patient resistance to virtual care, with some perceiving it as less personal or comprehensive. • Lack of policy incentives or reimbursement for innovations like asynchronous care.
Inner Setting
Enablers • Strong leadership engagement in some MMPCs, enabling proactive problem-solving • Effective collaboration and communication within teams, supported by integrated IT systems. • Informal work infrastructure fostering teamwork and coordination. **Barriers** • Staffing shortages, especially in rural clinics, limiting program capacity. • Challenges in collaboration between multiple clinic sites, reducing program cohesion.

Innovation Characteristics
Characteristics of Individuals
Enablers • High staff motivation demonstrated through self-directed learning and proactive patient care. • Physician autonomy in decision making, fostering innovation and iterative improvements. • Commitment to improving patient care, as seen in staff efforts to update knowledge and workflows. **Barriers** • Competing priorities and burnout among staff, reducing capacity to focus on implementation. • Lack of specialized training for staff, especially in EMR customization and IT integration.
Implementation Process
Enablers • Collaborative care models enhancing patient experience and provider satisfaction. • Regular team meetings fostering reflective practices and problem solving. • Iterative feedback loops between front staff and physicians improving care delivery. **Barriers** · Lack of structured training programs for front staff and physicians to optimize workflows and IT tools. · Disruptions from critical incidents, such as COVID-19, delaying program progress. · Limited engagement in reflective evaluation, reducing opportunities for iterative improvement.

Overall, the table illustrates the multifaceted nature of implementing MMPCs, where successes are driven by innovative care models, effective leadership, and motivated staff, while challenges stem from systemic resource limitations, external crises, and the complexity of adopting new technologies. Addressing these barriers through targeted interventions, such as increasing funding, enhancing training, and fostering stronger community partnerships, will be important to optimizing the scalability and sustainability of MMPCs. These findings emphasize the interdependence of CFIR domains and highlight the need for a holistic approach.

Discussion

This case study evaluation of MMPCs in Nova Scotia highlights a range of factors influencing their implementation, including key enablers such as robust leadership engagement, effective use of innovative technologies, and patient-centered care models. Program components benefited from strong evidence-based practices, collaborative team dynamics, and integration of customizable IT tools like EMRs and GIS. However, significant barriers were also identified, including inadequate funding, staffing shortages,

complexity in IT systems, and some patient resistance to virtual care. These findings underscore the importance of addressing organizational readiness, fostering partnerships, and enhancing patient engagement to optimize the delivery of MM care. This discussion situates these results within the broader healthcare literature, synthesizes recommendations, and examines implications for policy and practice.

Alignment with the Wider Literature

This evaluation highlights themes that are consistent with broader research on integrated care models and implementation science, providing valuable contextual insights. The influence of Innovation Characteristics, particularly the adaptability and perceived relative advantage of MMPCs, emphasizes that interventions with clear, demonstrable benefits and flexibility are more readily adopted in diverse healthcare settings. Our findings echo these observations, particularly in the implementation of technologies like GIS mapping and customized EMRs, which resonate with literature highlighting technology's transformative role in healthcare delivery.(36, 37)

Challenges associated with the Outer Setting, such as patient resistance to virtual care and reimbursement barriers, are also widely recognized. Previous studies have noted that external policy factors, including financial incentives and patient buy-in, are pivotal for the success of healthcare innovations.(38, 39) The resistance to virtual modalities identified in this evaluation reflects findings from studies that emphasize the importance of targeted patient education and gradual integration of digital tools to build trust.(40)

Internal organizational challenges tied to the Inner Setting, such as staffing shortages and leadership engagement, are well-documented barriers to effective implementation. For example, Gifford et al.(41) highlight that organizational readiness, including sufficient human resources and committed leadership, is a determinant of successful program outcomes. Our findings build on this literature by highlighting the nuanced interplay between leadership involvement and team dynamics in achieving implementation goals.(41)

Furthermore, the evaluation’s emphasis on patient-centered care aligns with the global shift toward integrated care models that prioritize collaboration and empowerment. Bodenheimer and Sinsky(38) emphasize the importance of interdisciplinary teamwork, proactive care management, and patient involvement in achieving high-quality outcomes. Program components like MMPC-A and MMPC-C exemplify these principles, reinforcing the need for a robust, patient-focused approach to multimorbidity management.

Opportunities to Advance Programs

The evaluation illuminates the creative energy and commitment of interprofessional teams to develop MMPCs to address MM in their primary healthcare practices and identifies several actionable strategies for optimizing MMPCs, and eventually MM programs, grounded in evidence and implementation science principles.

Addressing Funding Constraints

Consistent with findings by Nolte and Pitchforth,(42) securing financial resources for roles such as navigators and expanded nursing staff is critical for MMPC and eventual program sustainability. The lack of reimbursement mechanisms for innovations like asynchronous care represent a significant hurdle. Policymakers should prioritize funding and create reimbursement frameworks that incentivize innovation and support the scalability of MMPCs to fully developed programs. In Nova Scotia, the recent introduction of a Health Home model of primary healthcare delivery includes remuneration plans that reflect the model of care.(43)

Overcoming Technological Barriers

The literature identifies training and user-centric design as pivotal for the successful adoption of health IT.(44) Our findings similarly emphasize the need for modular, targeted training sessions on EMR customization and GIS tools. Simplifying interfaces and co-designing templates with end-users can enhance adoption and satisfaction.

Strengthening Leadership and Team Engagement

The importance of leadership in fostering a culture of change is a recurring theme in healthcare implementation studies.(45) Structured leadership development programs focused on change management and reflective practices can improve team cohesion and readiness for innovation. Regular interprofessional team meetings can facilitate collaborative problem-solving and workflow optimization.

Expanding Patient Engagement Strategies

Addressing patient resistance requires innovative strategies to build trust in virtual care. Educational campaigns, as suggested by Shaw et al.,(40) should focus on the benefits of virtual modalities while providing practical guidance for patients. A blended care model that integrates in-person, virtual, and asynchronous care can cater to diverse patient preferences and enhance overall satisfaction.(40)

Fostering Community Partnerships

Strengthening community collaborations aligns with findings by Alderwick et al.,(46) who highlight the role of local partnerships in addressing social determinants of health. Establishing regional task forces and engaging stakeholders such as non-profits, local governments, and community organizations can create a more cohesive support system for patients living with MM.

Implications and Suggestions

The evaluation of MMPCs in Nova Scotia offers critical insights into their current strengths, challenges, and potential for improvement. These findings hold significant implications for policy, practice, and research. By addressing identified barriers and leveraging enabling factors, stakeholders can work toward scalable and sustainable MMPCs, and eventually MM programs that meet the diverse needs of patients while strengthening healthcare systems.

Implications for Policy

Policymakers play a pivotal role in ensuring the long-term success and scalability of MMPC and eventual MM programs. The findings underscore the urgent need for systemic changes in reimbursement models, funding allocation, and community collaboration. Currently, the lack of reimbursement for innovative care delivery methods, such as asynchronous care, acts as a disincentive for clinicians to adopt these approaches despite their proven capacity to enhance care efficiency. Funders should prioritize the creation of reimbursement frameworks that reward innovation while reducing the financial burden on providers.

Additionally, addressing workforce shortages by funding key roles like navigators and expanding nursing staff is essential for ensuring that MMPCs, and eventually MM programs, are effective. Navigators are critical for maintaining care continuity and guiding patients through the complexities of chronic disease management. Without adequate staffing, even the most well-designed MMPCs or programs may struggle to meet their goals.

The integration of community partnerships offers another pathway to success. Collaborating with non-profits, local organizations, and regional task forces can help address the social determinants of health, which significantly impact patients with MM. Policymakers should foster and fund these collaborations, recognizing their value in creating holistic care models that extend beyond the clinic.

Implications for Practice

Healthcare providers and clinic administrators should prioritize capacity building, interprofessional collaboration, and patient engagement to optimize the delivery of MM care. One key area of focus is the effective use of technology. In the current study, MMPC-C demonstrated the transformative potential of customized EMRs and GIS mapping tools. However, many clinics lack the training and expertise needed to maximize these tools. Structured training programs for both clinicians and front-line staff are vital to improving workflow efficiency and enhancing patient outcomes. Peer-to-peer learning, software vendor partnerships, and real-world demonstrations of EMR capabilities can bridge this knowledge gap.

Patient engagement must also be a cornerstone of clinical practice and MMPC development. Educational campaigns that emphasize the benefits of virtual care and blended models can address patient resistance and build trust. Materials should be accessible and tailored to different literacy levels, ensuring that all patients feel confident navigating digital tools. Programs should also consider proactive measures, such as asynchronous communication channels, to maintain consistent patient-provider interactions.

Interdisciplinary teamwork is another critical enabler. Regular team meetings and shared decision-making processes allow providers to align care plans and leverage each team member’s expertise. Clinics should prioritize fostering a collaborative culture where roles are clearly defined, and communication flows seamlessly.

Front-line staff play an increasingly important role in care delivery and clinic operations. By empowering these team members to take on expanded responsibilities, such as patient follow-ups and mental health

support, clinics can reduce the workload on physicians and other most responsible providers and improve patient satisfaction. Training programs in areas like mental health first aid and advanced use of EMRs will further enhance their contributions.

Implications for Research

The evaluation highlights several avenues for future research to refine and expand MMPCs and eventually care programs. Long-term studies are needed to evaluate the sustained impacts of these MMPCs and programs on patient health outcomes, healthcare utilization, and cost-effectiveness. Comparing the performance of MM programs in rural versus urban settings would provide valuable insights into context-specific challenges and strategies.

Research into the scalability of innovative technologies, such as customized EMRs and GIS tools, is equally important. By quantifying the return on investment and identifying factors that promote successful adoption, researchers can inform policy and funding decisions. Additionally, investigating the impact of blended care models on patient satisfaction and provider workflow will help refine these approaches to meet diverse needs.

Finally, the role of leadership and organizational culture in driving and supporting MMPC innovation and successful implementation warrants further exploration. Understanding how leadership engagement, team dynamics, and readiness for change influence outcomes will guide the development of targeted training programs and implementation strategies.

Limitations

Participation in all interviews was voluntary, thus the findings are susceptible to self-selection bias, where individuals with strong opinions or experiences are more likely to participate, leading to an overrepresentation of certain perspectives. Furthermore, the sample size was small with only three MMPCs being evaluated, thus limiting the comprehensiveness and generalizability of the findings.

Conclusions

This study demonstrates that implementing MMPCs in primary healthcare requires attention to both contextual and system-level factors. Across three Nova Scotian clinics, strong leadership, interprofessional teamwork, and adaptable digital tools enabled coordinated, patient-centered care, while staffing shortages, limited funding, and technological complexity constrained progress. Although each site adapted its model to local needs, common priorities emerged: strengthening training and digital literacy, improving infrastructure, and securing sustainable resources for key roles. These findings offer practical guidance for policymakers and health system leaders seeking to scale integrated MM care and enhance provider experience and patient outcomes in primary healthcare settings.

Abbreviations

Multi-Morbidity (MM)

Multimorbidity Program Components (MMPCs)

Electronic Medical Records (EMR)

Consolidated Framework for Implementation Research (CFIR)

Geographic Information Systems (GIS)

Information Technology (IT)

Chronic Obstructive Pulmonary Disease (COPD)

Coronavirus Disease of 2019 (COVID-19)

Declarations

Ethics approval and consent to participate

This study was approved by the Nova Scotia Health Research Ethics Board (Policy Number RS-RE-001; File No. 1024492). The study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all study participants.

Availability of data and materials

The data analyzed during this study consisted of qualitative interview transcripts and are not publicly available due to confidentiality and ethical restrictions associated with the informed consent process. De-identified data may be available from the corresponding author on reasonable request, subject to approval by the Research Ethics Board and study participants.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

ME was the principal investigator. RMM and ME conducted provider interviews, and MAE, SM and ME analyzed these interviews. MAE, SM, and ME were principal contributors in writing the initial manuscript and RMM and TS provided critical review and revisions. All authors read and approved the final manuscript.

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