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Co-designing a logic model for community-based diabetic foot screening in primary care: A participatory study

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Abstract

Background.

Diabetic foot complications, including ulcers and amputations, lead to reduced quality of life and premature death, and up to 85% of amputations could be prevented through optimal prevention. In Canada, preventive foot care remains fragmented and difficult to access, and to our knowledge, no recognized screening program currently exists in Quebec primary care. This study aimed to co-design a logic model specifying the inputs, activities, outputs, and expected outcomes of an equitable community-based diabetic foot screening program in primary care.

Methods.

Using a participatory co-design approach following GUIDED reporting guidelines, we developed the logic model in two steps: 1) a rapid review synthesizing implementation determinants and strategies from 44 diabetic foot screening programs across 16 countries, and 2) a stepwise co-design process structured around seven meetings of an interdisciplinary steering committee (N = 23) comprising patient partners, clinicians, managers, community representatives, trainees, and researchers at a University Family Medicine Group (U-FMG) in Trois-Rivières, Quebec, Canada. The process was guided by the Knowledge-to-Action framework, the Consolidated Framework for Implementation Research, and Quebec's Ministry of Health and Social Services proximity services reference framework, and was evaluated through an anonymous mid-course survey and a final reflexive workshop.

Results.

The final logic model articulates the program theory for early detection of diabetic foot complications, specifying required resources, standardized screening and follow-up activities, corresponding outputs, and time-phased expected outcomes, with equity embedded across most of the components. The mid-course evaluation was positive (mean item scores 4.0 to 4.6 out of 5.0), and participants highlighted inclusive participation and the recognition of different voices.

Conclusions.

The model provides an evidence-informed roadmap for implementing and evaluating equitable diabetic foot screening at the U-FMG and is intended to be transferable, with deliberate adaptation, to similar primary care settings.

1. Background

Diabetic foot complications, including ulcers and amputations, lead to reduced quality of life and premature death (1). They represent a substantial human, financial, and material burden for patients, their family, and the healthcare system (2). These complications disproportionately affect individuals living in rural areas, socioeconomically disadvantaged settings, or from marginalized and vulnerable groups (3–5). In Canada, preventive foot care remains fragmented and difficult to access, exacerbating health inequities (6). Yet, evidence demonstrates that up to 75% of ulcers and 85% of amputations could be prevented through optimal interdisciplinary prevention, including structured education, preventive screening in primary care, and integrated care pathways (1).

The International Working Group on the Diabetic Foot (IWGDF) provides the clinical foundation for diabetic foot prevention (7). Its 2023 guideline recommends annual screening for people at very low risk, including assessment of neuropathy and peripheral artery disease (7). At higher risk, assessment extends to previous ulceration or amputation, deformity, and other risk factors (7). Indeed, recommended reassessment intervals are every 6–12 months for IWGDF risk 1, while it is every 3–6 months for risk 2, and every 1–3 months for risk 3 (8). Prevention also includes foot self-care education, treatment of pre-ulcerative lesions, and suitable footwear (8).

Canadian guidance is broadly aligned with these recommendations. Diabetes Canada recommends at least annual foot examinations and more frequent assessment at higher risk (9). It also recommends foot-care education, appropriate footwear, and timely referral when complications are identified (9). Wounds Canada further emphasizes validated risk-screening tools, interprofessional care, and regular foot-health education (10). Complementing these recommendations, the Registered Nurses' Association of Ontario reports that specialized wound-care teams are associated with a 39%–56% reduction in amputation rates and 24 fewer recurrences per 100 patients (11). Similar reductions in major amputations have been reported in systematic reviews of multidisciplinary diabetic foot care (12, 13). In primary care, implementation remains challenging because of limited resources and fragmented referral pathways (14). This calls for local adaptation and knowledge-holder engagement (15) .

Gaps between research and practice underscore the need for locally adapted implementation (16). Logic models can help organize this work (16). They link program resources and activities to expected outcomes (17–19). They also support planning, evaluation, and communication (19, 20). Moreover, they can make contextual assumptions explicit (19, 21). In implementation science, defined as the "rigorous study of methods that allow for a systematic uptake of research findings and other evidence-based practices" (22), logic models have been frequently used (23, 24). The goal is to specify the determinants, strategies, mechanisms, and outcomes of complex health interventions, providing a structured approach to understanding how and why programs achieve their intended effects (25).

Furthermore, logic models can expose program assumptions and guide evaluation questions as their causal pathways help assess whether a program works as intended (26). The process of developing a logic model can itself foster communication, build consensus on program objectives, and strengthen knowledge holder buy-in (23). When programs are co-developed, logic models can support shared

understanding of roles and goals (27). To our knowledge, no formal diabetic foot screening program has been developed in primary care in Quebec, despite persistent gaps in preventive foot care access and the need for structured, context-adapted approaches.

2. Objective

This study aimed to co-design a logic model specifying the inputs, activities, outputs, and expected outcomes of an equitable foot screening program for people with diabetes in primary care, in partnership with an interdisciplinary steering committee including patient partners and community representatives. The model was developed within a University Family Medicine Group (U-FMG) and designed for transferability to comparable primary care settings.

3. Methods

3.1 Study design

We conducted a participatory co-design study to develop the program logic model. We followed the Guidance for Reporting Intervention Development Studies in Health Research (GUIDED) reporting guideline as the primary framework because it supports transparent reporting of intervention development and the underlying programme theory (28). Patient and public involvement is described in Appendix 2 using the GRIPP2 short-form checklist (29).

Ethics review and consent procedures are detailed in the “Ethics approval and consent to participate” section, including the application of the Tri-Council Policy Statement (TCPS 2) (30). Participants are acknowledged in project dissemination materials. Only patient partners received financial compensation for their participation in accordance with the compensation policy of the *Unité de soutien SSA Québec* (Québec Learning Health System Support Unit) (31).

3.2 Setting

The study took place at the U-FMG in Trois-Rivières (Québec, Canada), within the CIUSSS MCQ. This U-FMG is a public primary care teaching clinic where family medicine residents train within an interprofessional team (32). It serves more than 15,000 registered patients, including over 1,000 people living with diabetes. Since its creation in 2005, it has played a key role in training and retaining family physicians in the region and, in partnership with the *Université du Québec à Trois-Rivières (UQTR*), currently also trains primary care nurse practitioners. Additionally, the U-FMG is distinguished by strong interprofessional collaboration. Its clinical team brings together family physicians, medical residents, primary care nurse practitioners, registered and auxiliary nurses, social workers, a psychologist, psychoeducator, physiotherapist and pharmacists. The project also benefits from the support of an affiliated podiatrist through a research and clinical collaboration agreement. In addition, an administrative and management team is actively involved in implementing the community-based service,

including appointment coordination, patient flow management and the integration of screening tools into clinical workflows.

3.3 Overall approach and conceptual frameworks

This study followed a two-step process in which a rapid evidence synthesis of implementation determinants and strategies (Step 1) informed the participatory co-design of the logic model with knowledge holders (Step 2) (Fig. 1). This project is grounded in the Knowledge-to-Action (KTA) framework (33), which guides the translation of knowledge into action in healthcare contexts. The KTA framework comprises two interrelated components: a knowledge creation funnel (from knowledge inquiry to synthesis to tools and products) and a cyclical action component (15). The action cycle includes identifying a practice problem and know-do gap, adapting knowledge to the local context, assessing barriers and facilitators, selecting and tailoring implementation strategies, monitoring knowledge use, evaluating outcomes, and sustaining knowledge use over time (15). The project also mobilizes the Consolidated Framework for Implementation Research (CFIR) (34) to structure the analysis of barriers and facilitators to program implementation. CFIR is a determinant framework that organizes factors influencing implementation into five domains: intervention characteristics, outer setting, inner setting, characteristics of individuals, and the implementation process (34). Finally, this project also draws on Quebec's Ministry of Health and Social Services proximity services reference framework (35). This framework delineates proximity services by specifying principles of accessibility, continuity, integration, and equity, and by defining knowledge holder roles and governance oriented toward population needs (35). These frameworks supported both evidence synthesis and the progressive construction of a context-sensitive logic model.

Step 1: Rapid review

A rapid review was conducted to identify and synthesize implementation determinants and strategies for diabetic foot screening programs. Grounded in CFIR, we mapped barriers and facilitators and used the Expert Recommendations for Implementing Change (ERIC) taxonomy to classify implementation strategies (34, 36). Detailed methods are reported in the protocol (37) and results are detailed in the published study (38). These synthesized determinants and strategies provided the evidence base for the initial prototype developed at the outset of the co-design (Step 2), which knowledge holders then refined and adapted to the local context.

Step 2: Stepwise logic model co-design

A participatory approach (39) involving an interdisciplinary steering committee was used to ensure the model's contextual relevance and applicability. Building on the literature synthesis, the logic model was co-designed through a stepwise methodology (24) structured around 7 meetings, each targeting specific model components. This sequential approach enabled systematic development of each logic model element, from inputs through to long-term outcomes. Before each session, participants received preparatory materials, including the agenda, objectives, planned activities, and documents to review.

After each session, the research team circulated a structured summary capturing key decisions, unresolved points, and next steps to support member validation and continuity across sessions. Between meetings, targeted research, synthesis, and drafting were undertaken to refine the model components and prepare materials for committee discussion. This iterative participatory process supported the model's coherence, the plausibility of linkages across components, and its alignment with local realities and implementation constraints.

3.4 Participants and recruitment

Our interdisciplinary steering committee (N = 23) was composed of knowledge holders (N = 9) and researchers (N = 14). Knowledge holders included clinicians and staff from the U-FMG, managers and decision-makers from the CIUSSS MCQ, patient partners, and representatives from community resources involved in diabetes support and service navigation. The research team members on the committee comprised clinician-researchers and other investigators, as well as trainees in the family medicine residency program and observers including a research assistant and a graduate student supporting the team. Full details on the committee composition are provided in Appendix 1. The steering committee was constituted for this project through convenience and purposive recruitment in collaboration with the clinical team. Additionally, individuals who expressed interest were contacted by email. Participation was voluntary, with informed consent and the option to withdraw at any time.

Patient partners and community representatives contributed to the co-design process by helping identify local needs, interpret barriers and facilitators, and refine the logic model components across meetings.

3.5 Logic Model Development Process

The development of the logic model was guided by the WK Kellogg Foundation Logic Model Development Guide (19) and adapted to the local primary care context. Appendix 3 details the 5-step development process.

Step 1: Clarify the situation and context. The starting point was the specific problem or need the program seeks to address and the conditions in which it operates. We reviewed relevant literature and knowledge holder inputs to understand the problem, target population, existing services, and contextual factors shaping the program's implementation.

Step 2: Define intended outcomes and evaluation focus. Guided by Kellogg's emphasis on results, we specified expected changes as a sequence of short-term (1–3 years) and long-term (4–6 years) outcomes, followed by anticipated impact (7–10 years). Outcomes were defined as measurable changes in participant knowledge, skills, behaviors, or functioning that are plausibly attributable to the program within these time horizons, whereas impact reflects broader system- or population-level changes expected to emerge over a longer timeframe.

Step 3: Identify core logic model components. We defined inputs (resources and capacities mobilized), activities (planned work), outputs (direct products of activities), and expected outcomes (short- and

long-term changes) and ensured coherence across components and with the stated objective.

Step 4: Construct the visual logic model. We then organized these components into a visual diagram showing the underlying “if-then” relationships described by Kellogg (10). Where relevant, we documented key assumptions and external factors that could influence how activities lead to outcomes.

Step 5: Review and refine the model with knowledge holders. A draft logic model was presented to the steering committee for review and was circulated for written feedback, which was incorporated into a revised version. The final model was then re-presented for confirmation and validated in the final meeting. Validation at Meeting 7 involved the full steering committee.

3.6 Data Collection

Seven 90-minute steering committee meetings were conducted in a hybrid format, either in person at the U-FMG or via Zoom (Zoom Communications, USA), between December 2024 and April 2026. After the fourth meeting, a brief anonymous cross-sectional mid-course evaluation was administered online through Qualtrics (qualtrics^{XM}, USA). It was placed at the midpoint to enable real-time recalibration of the remaining co-design process, consistent with formative evaluation in implementation research (40). The mid-course evaluation was administered to 14 committee members: all 10 knowledge users, including both patient partners, and four family medicine residents who participated in the co-design process. The other investigators and the doctoral student (first author) were not invited because they were involved in designing, coordinating, or overseeing the process being evaluated. The two observers were not committee members and were not invited. The survey was administered between May 19 and August 20, 2025. Two reminder emails were sent during the response period. The questionnaire included 12 items: six Likert-scale questions and six open-ended questions. The domains assessed were satisfaction with participation, clarity and understanding of the project and meetings, communication and collaboration, perceived contribution and consideration of participant input, and suggestions for improving the process. Moreover, the final meeting included a 20-minute reflexive workshop combining an anonymous Mentimeter (Mentimeter, Sweden) activity and three open-ended discussion questions on participants’ experience, perceived project priorities, what worked well, what could be improved, and learning carried forward from the process. The English-language mid-course evaluation questionnaire is provided in Appendix 4, and the final reflexive workshop questions are provided separately in Appendix 5. The 12-item questionnaire was developed specifically for this study and had not previously been published. It was not pretested or psychometrically validated. Its domains were consistent with those commonly evaluated in co-design and patient and public engagement processes, including satisfaction, clarity of purpose and roles, communication and collaboration, perceived influence, and opportunities for improvement (41). Data sources included facilitator notes, meeting recordings when applicable, written contributions submitted during and between sessions, responses to the mid-course evaluation, and notes from the final reflexive workshop.

3.7 Data Analysis

Meeting materials, facilitator notes, and written contributions were compiled and subjected to an inductive analytic synthesis focused on model-building. The analytic mapping between meeting content and logic model components is summarized in Table 1. Contextual factors and local resources were identified early, but the full logic model was developed iteratively as the intervention scope and intended results became clearer. Because meeting discussions did not follow the final logic model order (inputs → activities → outputs → outcomes), we first articulated the intended outcomes and impact, then back-mapped the outputs, activities, and inputs to ensure coherent and plausible linkages. Draft versions were reviewed with the steering committee, and feedback was incorporated into subsequent refinements until the final version was validated.

Table 1
Stepwise Logic Model Development: Steering Committee Meeting Schedule and Component Mapping

Meeting	Objectives	Activities	Inter-meeting Work	Logic Model Components
1	Present project objectives, introduce committee members, and explore the current context.	Introductions, discussion of expectations, identification of barriers, facilitators, and local resources related to diabetic foot screening.	Synthesize meeting notes, organize barriers, facilitators, and resources and prepare an initial prototype informed by literature and local input.	− Objective − Outcomes − Inputs (local resources identified) − Contextual factors (barriers/facilitators)
2	Present and discuss the proposed prototype based on best practice standards.	Presentation of prototype components, discussion of fit with U-FMG realities, barriers, resources, care pathways, education, and data collection needs.	Compile feedback on the proposed prototype and prepare continued discussion on feasibility, patient engagement, data collection, and implementation needs.	− Activities (prototype presented) − Inputs (resource needs) − Preliminary outputs
3	Continue discussion from Meeting 2 and refine the prototype according to local barriers and feasibility.	Discussion on reaching patients, assessing screening effectiveness, facilitating implementation, supporting maintenance, and considering patient literacy and education needs.	Consolidate priority issues and proposed adaptations; refine implementation assumptions and patient-facing components.	− Activities − Inputs (resource needs)
4	Present literature-informed solutions and contextualize them for the U-FMG	Review of evidence-based strategies across screening tools, roles and training, workflow integration, referral pathways, and patient engagement/education.	Administer anonymous mid-course evaluation questionnaire via Qualtrics and synthesize prioritized strategies and contextual adaptations.	− Activities (strategies prioritized and adapted) − Outputs
5	Review mid-course evaluation results and	Presentation of survey results; discussion of vulnerable populations, training needs,	Integrate mid-course feedback, refine implementation	− Inputs − Activities

Meeting	Objectives	Activities	Inter-meeting Work	Logic Model Components
	advance implementation planning.	educational resources, indicators, and feasibility of implementation.	plan, indicators, and resource needs.	− Indicators − Implementation conditions.
6	Present and discuss the implementation plan and draft logic model.	Presentation of the implementation plan, logic model definition/process, and draft components: inputs, activities, outputs, and expected outcomes.	Circulate draft logic model, collect written feedback and revise model structure and wording.	− Draft logic model − Expected outcomes (short/long-term) − “if-then” relationships
7	Validate the revised logic model, discuss pre-pilot findings, and reflect on the co-design process.	Final review of the logic model; discussion of pre-pilot findings, implementation next steps, and 20-minute reflexive workshop.	Synthesize final comments and finalize logic model and accompanying appendices.	− Final validation of the logic model − Implementation readiness − Reflexive learning.

Quantitative responses to the mid-course evaluation were analyzed descriptively using means, standard deviations, and ranges for each Likert-scale item. Open-ended responses from the mid-course evaluation were summarized thematically to identify perceived strengths, limitations, and suggested improvements to the co-design process. Finally, notes from reflexive workshop were also summarized thematically, focusing on participants’ overall experience, perceived project priorities, elements that worked well, areas for improvement, and learning carried forward from the process.

4. Results

4.1 Final Logic Model

The final logic model is presented in Fig. 2. The program’s overarching objective is to strengthen early detection of diabetic foot complications through a structured primary care screening program that builds team capacity, engages patients, and improves access to integrated, accessible, and equitable care pathways.

Compared with the initial evidence-informed prototype, the co-design discussions led to several adaptations. The committee selected a hybrid delivery model that combines dedicated screening clinics with opportunistic screening during routine visits; added a patient roadmap and clearer education to support understanding and self-management; and strengthened targeted equity-oriented outreach to reach patients facing socioeconomic and access barriers. Participants also emphasized proximity-based service delivery, an eligible-patient list, registry data for follow-up and quality improvement, and formalized linkages among screening, community resources, and referral services. These adaptations

reflected patient partners, clinical, community, and managerial perspectives on feasibility, acceptability, access, and continuity of care.

Inputs. Required inputs were organized across six domains: 1) staffing and clinical expertise including physicians, nurse practitioners, nurses, residents, affiliated podiatrist, community partners, 2) clinical tools such as monofilaments and standardized exam kits, and clinical space, 3) digital infrastructure and data systems including patient electronic records, operational registries, and patient lists, 4) training and quality improvement resources, 5) patient and public education and communication resources such as personalized roadmaps for patients and digital-literacy support and 6) partnerships with community organizations and referral networks. These inputs support a set of interrelated activities that implement a hybrid delivery model, combining dedicated screening clinics with opportunistic screening during routine visits.

Activities. Activities center on standardizing diabetic foot risk assessment (42) and documentation within the primary care workflow, alongside risk-based follow-up, monitoring, and continuous improvement through a local registry and routine indicator review. The program also embeds interprofessional capacity building through communication, training, role clarification, onboarding, reminders, and reusable learning assets, while strengthening patient engagement through a patient roadmap, self-management support, and targeted outreach aimed at reducing barriers for vulnerable subgroups. Finally, care coordination is reinforced through formalized referral pathways linking community services and specialized care. Both detailed input specifications and activities including operational workflows are provided in Appendix 6.

Outputs. Direct outputs reflect implementation of these program functions: dedicated screening clinics established and maintained, an eligible patients list created and regularly updated, standardized assessment and documentation tools embedded within the medical record and a registry operationalized with defined indicators and a routine performance review cycle. Additional outputs include clinician training delivered and training assets produced for reuse, deployment of a patient roadmap with targeted reminder mechanisms and self-management advice, and implementation of formalized interprofessional referral pathways and coordination routines to maximize existing resources.

Outcomes and impact. Expected outcomes were articulated across time horizons aligned with the program's scope and reasonable sphere of influence. In the short term (1–3 years), the program is expected to increase coverage of documented, standardized annual foot screening among eligible patients followed at the U-FMG, strengthen clinicians' knowledge and skills in alignment with national and international best practice recommendations for diabetic foot screening, improve the appropriateness of risk-based referrals to podiatry and specialized services, shorten the time from risk identification to foot-care assessment, reduce loss to follow-up among patients identified as moderate or high risk, and strengthen patients' self-management capacity and engagement in their health and care. Over the longer term (4–6 years), the program is expected to contribute to a lower incidence of new diabetic foot ulcers within the U-FMG population, fewer hospitalizations and emergency department

visits attributable to diabetic foot complications, fewer preventable amputations among patients followed at the U-FMG, maintenance of a local, accessible, and sustainable screening offer year over year, reduced inequities in screening uptake and follow-up completion across vulnerable subgroups. Within a 7–10 year horizon, the anticipated impact is a stronger and more equitable primary care system for preventing diabetic foot complications, reflected in better conditions for care, improved care delivery, and more reliable care pathways that reduce avoidable morbidity in people with diabetes.

As for contextual factors synthesized from steering committee discussions, barriers were primarily workflow- and access-related, including limited time during routine appointments, difficulties reaching patients for follow-up, constrained clinical nursing capacity for diabetes follow-up, inconsistent access to screening tools or clinical equipment, and limited access to podiatry and other professionals due to cost and service availability. Knowledge holders also described gaps in patient information and understanding, particularly around diagnosis. In contrast, proposed facilitators emphasized program structuring and coordination, including paired nurse–clinician encounters, sequencing post-diagnosis education through dedicated nursing visits, and strengthening patient engagement through clear education supported by a roadmap specifying recommended screenings and frequency. Knowledge holders also highlighted the value of local referral and support resources (e.g., the UQTR podiatry clinic, *Diabète Mauricie, Ma santé à vie, Centre d'organisation mauricien de services et d'éducation populaire (COMSEP)* and *CIUSSS* online educational capsules) to improve affordability, access, follow-up, and cross-provider communication, alongside continued professional development to sustain best practices.

4.2 Mid-course evaluation of the co-design process

Ten of the 14 committee members invited to complete the mid-course evaluation responded (71%). Quantitative scores were positive across all six items, with mean scores ranging from 4.0 to 4.6 on a five-point Likert scale. Communication among committee members received the highest mean score, while perceived impact of individual contributions received the lowest, although it remained positive overall. Quantitative results are presented in Table 2.

Table 2
Mid-course evaluation of the co-design process

Item	Mean	SD	Min–Max
Satisfaction with participation in the co-design process	4.40	0.66	3–5
Clear understanding of the overall project objective	4.40	0.49	4–5
Clear understanding of each meeting's objectives	4.20	0.60	3–5
Clear understanding of role within the committee	4.20	0.87	3–5
Effective communication among committee members	4.60	0.49	4–5
Perceived real impact of contributions on program development	4.00	0.77	3–5

Open-ended responses provided additional context. The most frequently reported source of satisfaction was the inclusion and recognition of different voices within the committee. Participants also valued the preparatory documents and visual supports, the co-design process itself, and the opportunity to mobilize community partners. In terms of sources of dissatisfaction, few were reported, with several respondents indicating no specific concern. Points raised occasionally included initial challenges with the hybrid format, longer “monologues” that could limit ideation, and a perceived sense of limited contribution in some roles. Additionally, participants described three ways in which their contributions were recognized: 1) integration of ideas into meeting summaries and implementation planning, 2) explicit invitations for quieter members to contribute, and 3) reliance on field expertise to clarify appointment workflows and local care pathways.

4.3 Final reflexive workshop and transition toward implementation

In the anonymous Mentimeter activity, participants described their experience in the committee using terms such as “enriching/interesting,” “interprofessional/“interdisciplinary”, “constructive/“contributive” and “pleasant”. When asked to identify the most important priority for the project, most participants emphasized improving early screening. Other priorities included sustainability, access to care, and standardization. Participants’ hopes for the next phase centered on durability, implementation, success, prevention of amputations, and patient benefit.

Moreover, the open discussion highlighted several strengths of the process, including live interaction among knowledge holders, diversity within the committee, and the richness of interprofessional perspectives. Participants also identified areas for improvement. One patient partner emphasized the effort required to adapt medical language for patient partners, and participants noted that long intervals between some meetings required additional time for recontextualization. These intervals reflected the conduct of related project activities in parallel, scheduling constraints within the clinical setting, and the principal investigator’s maternity leave, among others. In that sense, sending preparatory materials earlier was suggested as a practical adjustment. The hybrid format was generally appreciated for improving accessibility, particularly for participants outside Trois-Rivières, although participants noted that it offered a weaker group dynamic than in-person meetings.

In response to the final reflective question, participants emphasized learning that extended beyond the immediate project. One participant highlighted the importance of collaboration between researchers, clinicians, and patient partners, while another framed the project as a leadership experience in implementation science. These reflections reinforced the value of the co-design process as both a program development strategy and a learning process for those involved.

5. Discussion

To our knowledge, this is the first logic model co-designed for a community-based diabetic foot prevention service integrating screening, patient education, and coordinated access to foot care in

primary care in Québec. Its operational contribution is a hybrid pathway combining dedicated screening clinics and opportunistic assessment, with standardized documentation, a registry for follow-up, patient-facing education, and coordinated referrals. It was developed with an interdisciplinary steering committee of patient partners, clinicians, managers, community representatives and researchers. These components are designed for integration into routine U-FMG workflows, although feasibility remains to be tested. The co-design process also shows how international evidence can be adapted (38) to a local context, responding to two gaps identified in our earlier rapid review (38). First, equity was acknowledged more often than it was measured, and no included program stratified its outcomes by sociodemographic subgroup. Second, implementation science frameworks were seldom applied, since only one of the 44 programs reviewed used the CFIR (38). By using CFIR and making equity explicit, the model responds to both gaps at the design stage.

These components broadly align with those reported in the diabetic foot screening literature. Integration of screening into routine workflows, risk stratification, interdisciplinary delivery, patient education, documentation templates within the electronic medical record, referral pathways, and audit and feedback were all recurrent in the programs we reviewed, as was the 60-second screening tool we adopted (Inlow) (38). The main distinction lies in when and with whom the model was developed. Most reviewed programs were led by clinicians and refined through quality improvement cycles once already in place, with patients involved mainly as recipients of education (38). Here, the model was developed before the program was implemented, with patient and community representatives participating as designers. Equity is also explicit in the model. Indeed, tailored communication and barrier reduction are activities; reduced inequities are an intended long-term outcome, and a more equitable primary care system is the anticipated impact.

Furthermore, local financial and access barriers reinforce the equity rationale. In Quebec, podiatric care is not among the services covered by the public health plan and is paid largely out of pocket or through private insurance (43). Therefore, access to it depends in part on ability to pay. However, preventing diabetic foot complications requires timely access to an interprofessional continuum of foot care, not podiatry alone. A Quebec retrospective cohort reported higher ulcer-healing rates and shorter healing times after podiatric care was integrated into a multidisciplinary public wound-care clinic (44). Consistent with the importance of the broader care team, an Ontario ecological study found that home- or community-based nursing care was negatively correlated with diabetes-related amputation rates (45). These findings support a primary care model that mobilizes nurses providing foot care, family physicians, podiatrists, other specialists, and community services. Hence, by integrating screening, education, risk stratification, early management, follow-up, care navigation, and coordinated referral within the U-FMG, the proposed service aims to strengthen primary care capacity and provide a more accessible entry point to foot care, while reducing financial barriers to early detection. This locally accessible, interprofessional approach complements specialized services for people at highest risk and aligns with evidence associating structured diabetic foot care with fewer lower-extremity amputations (46).

Furthermore, the way the model was developed merits comparison with the literature on co-design and a participatory logic model. The sequence we followed was a familiar one. We built the model first from the evidence and then through iterative consultation. Abimbola et al. (2019) proceeded similarly, developing a telehealth logic model from a literature review and refining it through in-person consultations that started from the program's ultimate aims (23). Moreover, our process evaluation lends empirical support to the argument that the development of a logic model is valuable in itself, beyond the model it produces (23). In our mid-course evaluation, communication among committee members received the highest score, and participants most often cited the inclusion and recognition of different voices as a source of satisfaction. These findings suggest that the co-design process itself built the shared understanding and sense of ownership that some authors identify as what embeds a program within its organization and prepares its implementation (23). Nonetheless, our process differed from comparable work in the breadth of participation it maintained. For instance, the telehealth logic model reported by Abimbola et al. (2019) was developed with knowledge holders internal to the implementing organization, namely staff, clinicians and executives, without patients or community members. Similarly, in a recent co-design of a primary care intervention for diabetes in Mendoza, Argentina, patients contributed to the workshops but were absent from the final refinement sessions, which involved only professionals and decision-makers (47). By contrast, in our process, patient partners and community representatives remained involved continuously until the final validation of the model. This sustained involvement aligns with Canadian patient-oriented research approaches, in which patients contribute as partners throughout the research process rather than solely as participants (48). It also corresponds to higher levels of collaboration and partnership described in patient-oriented diabetic foot care (49).

That said, one caveat should be kept in view. Logic models have been criticized as too static to capture the complexity of implementation as it unfolds, whereas developing them in a staged or iterative manner allows change to occur and to be documented (50). Therefore, they are best treated not as fixed representations but as tools to be revisited as evidence and context evolve (50). Accordingly, we present ours as a starting point, to be revised as implementation proceeds. The next phase will also include the development of a complementary implementation logic model (51). Whereas the current program logic model specifies the intervention and its hypothesized pathways to outcomes, the implementation logic model will specify how the service will be deployed by linking contextual determinants, implementation strategies, mechanisms of action with responsible actors, and implementation outcomes. It will be refined during the pilot as implementation experience accumulates (51).

Strengths and limitations

Key strengths of this study were the integration of international evidence with sustained interdisciplinary input, the continuous involvement of patient partners and community representatives through final validation, and the explicit use of implementation science and equity frameworks. Furthermore, the rapid review, iterative meeting summaries, mid-course evaluation, and final reflexive workshop provided repeated opportunities to challenge assumptions and refine the model before implementation.

However, several limitations should also be considered. First, patient-partner representation was limited to two men and included no women or members of racialized or Indigenous communities, leaving some gendered, cultural, and access-related perspectives potentially underrepresented. That said, male representation was directly relevant because diabetic foot ulcers are more prevalent among men than women (52). The patient-partner group also included socioeconomic and educational perspectives relevant to the program's equity goals. Community representatives further contributed knowledge of the populations they serve, although this does not replace direct lived-experience representation from absent groups. Both patient partners were established partners already involved in projects conducted by the research team. This supported informed and sustained participation but may have limited input from people without prior experience in patient-oriented research. A pilot will therefore examine whether the program is acceptable to and reaches patients facing socioeconomic and access barriers. Second, the co-design process required seven meetings over more than a year, together with substantial preparation and synthesis work. This may constrain its replication in settings with fewer research resources. However, the extended process enabled iterative refinement and consensus-building, while the resulting model and documentation provide a structured starting point that may reduce the development burden in other settings.

Third, the study was conducted at a single U-FMG, and the model has not yet been implemented. Its assumptions, effectiveness, and transferability therefore remain to be tested. Nonetheless, future adaptation and scale-up were considered during development by specifying core program functions, making contextual assumptions explicit, linking activities to outcomes, and documenting inputs, activities, outputs, indicators, and implementation requirements. These features provide a basis for adaptation to comparable primary care settings (50), although local tailoring and empirical evaluation will remain necessary.

The next stage will pilot and evaluate the program. The pilot will assess time and staffing requirements, workflow integration, acceptability, data capture and follow-up, linkages among screening, education, community resources, and referral services, equitable reach among patients facing access barriers, and prospects for sustainability.

6. Conclusions

This study produced, to our knowledge, the first logic model co-designed for a community-based diabetic foot screening program in primary care in Quebec. It links the resources and activities of a screening program to expected outcomes, with equity considered across the pathway. Beyond the model, the process evaluation suggests that co-design fostered communication, shared understanding, and ownership among knowledge holders, creating favourable conditions for implementation. The model should be treated as a baseline to be revisited as evidence and context evolve; its assumptions and expected outcomes remain to be tested empirically. Next steps are to pilot the program and evaluate its implementation and outcomes. With deliberate adaptation, this evidence-informed, knowledge

holder-driven approach could be transferred to similar primary care settings in Canada and beyond to support more equitable prevention of diabetic foot complications.

Declarations

Ethics approval and consent to participate

In October 2024, the Research Ethics Board of the Centre intégré universitaire de santé et de services sociaux de la Mauricie-et-du-Centre-du-Québec (CIUSSS MCQ) determined that the co-construction phase reported in this manuscript constituted a continuous quality improvement initiative and was exempt from research ethics review, consistent with Article 2.5 of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2, 2022) (30). The Board specified that separate ethics approval would be required for clinical implementation of the program. Approval for this subsequent phase was obtained from Santé Québec (project 2027 – 970, 1081, Proxi-PIEDS). All participants provided verbal informed consent to participate. In accordance with arrangements established with the site's continuous quality improvement officer, who was also a steering committee member, participating staff members additionally provided written consent for audio recording of meetings to support preparation of the meeting minutes. Participation was voluntary, and participants could withdraw at any time. The mid-course survey was anonymous. All project activities were conducted in accordance with relevant institutional guidelines and regulations and the ethical principles of the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

MF and VB contributed to the study conceptualization and methodology. MF coordinated and conducted all stages of the project, including data collection and analysis, and drafted the original manuscript. MF, VB and MBF co-facilitated the co-design workshops, and participated in the workshops. VB and MBF co-supervised the project.LP contributed throughout the co-design process as a patient partner. MB, YC, MAD, MEP, and AC critically reviewed and revised the manuscript. All authors read and approved the final manuscript.

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Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Figures



CFIR: Consolidated Framework for Implementation Research
ERIC: Expert Recommendations for Implementing Change

Figure 1

Methodological approach to develop the logic model

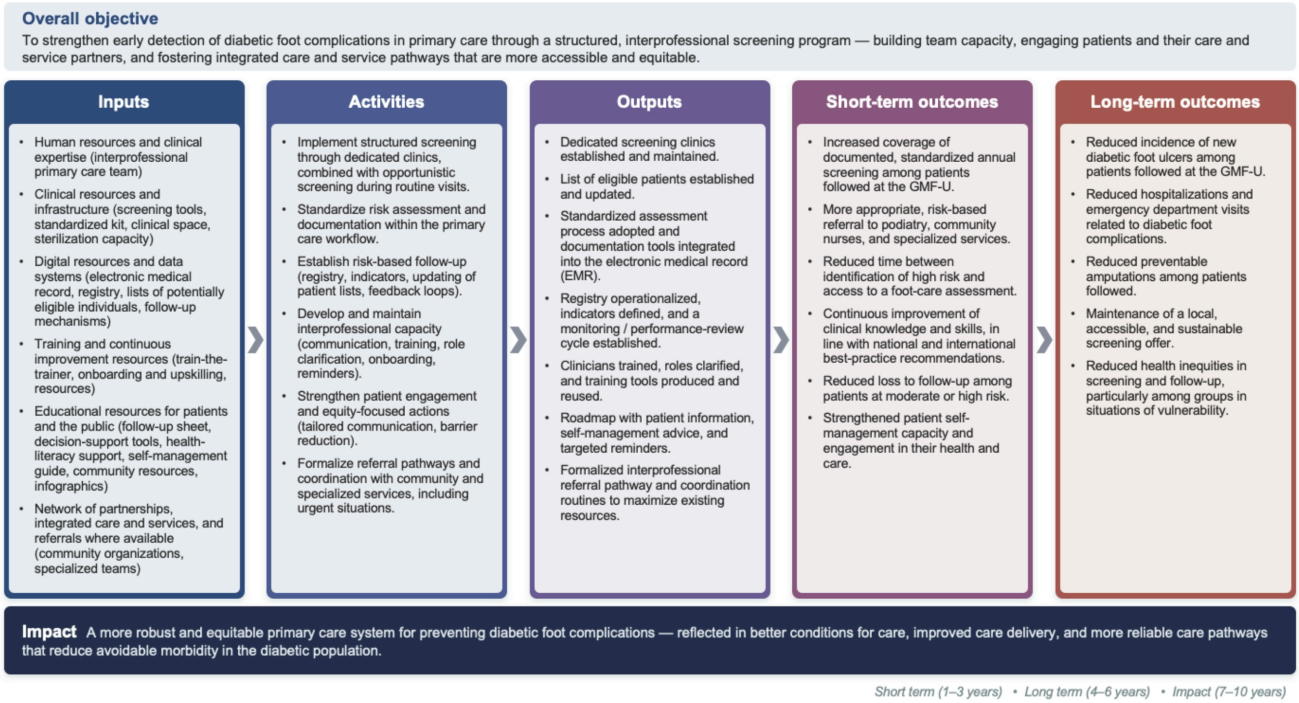


Figure 2

Logic model for early detection of diabetic foot complications at the University Family Medicine Group in Trois-Rivières

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