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RESEARCH ARTICLE (ORIGINAL)

Developing Care Flowcharts to Guide Primary Antenatal Care in Southern Brazil: Action Research in Interprofessional Education

Desenvolvimento de Fluxogramas de Cuidados de Saúde Pré-natal em Cuidados de Saúde Primários no Sul do Brasil: Pesquisa-Ação em Educação Interprofissional

Desarrollo de Diagramas de Flujo de Asistencia para Orientar la Atención Primaria Prenatal en el Sur de Brasil: Investigación-Acción en Educación Interprofesional

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Abstract
Background: Quality prenatal care requires collaborative practices and tools to guide the interprofessional care pathway.
Objective: To cocreate and validate flowcharts guiding antenatal care consultations in primary health settings through action research in interprofessional education.
Methodology: An action research study involving 65 primary health professionals was conducted in southern Brazil. They completed a 40-hour interprofessional antenatal education course, which included flowcharts of local practices. To reach consensus on shared regional flowcharts, two focus groups with 16 participants were held. Content validation was assessed by two groups of 10 and eight participants.
Results: Two flowcharts were developed to guide interprofessional antenatal care and determine the optimal course of care for pregnant women. Both were considered useful and relevant tools for promoting better practices and reinforcing the maternal and child health network. The tools had content validity of 95% and 99%.
Conclusions: Action research has shown potential for improving regional services, especially in smaller health units. However, further research is needed on how to sustainably incorporate these processes into practice.

Keywords: women's health; pregnant women; prenatal care; primary health care; workflow

Resumo
Enquadramento: A assistência pré-natal qualificada requer práticas colaborativas e ferramentas que orientem o percurso assistencial interprofissional.
Objetivo: Cocriar e validar fluxogramas para orientar consultas pré-natais na atenção primária, utilizando investigação-ação em educação interprofissional.
Metodologia: Estudo com 65 profissionais de saúde da atenção primária no Sul do Brasil. Realizou-se um curso interprofissional de 40 horas sobre cuidados pré-natais, abordando fluxogramas locais. O consenso sobre os fluxogramas regionais foi alcançado em dois grupos focais com 16 participantes. A validade de conteúdo foi avaliada por dois grupos de 10 e 8 participantes.
Resultados: Elaboraram-se dois fluxogramas para guiar as consultas interprofissionais e definir o percurso ideal da gestante. Ambos foram considerados ferramentas úteis e relevantes para promover melhores práticas e fortalecer a rede materno-infantil, com validade de conteúdo de 95% e 99%.
Conclusão: A investigação-ação demonstrou potencial para reforçar os serviços regionais, sobretudo em unidades menores. Novas investigações são necessárias para avaliar a incorporação sustentável desses processos na prática clínica.

Palavras-chave: saúde da mulher; gestantes; cuidado pré-natal; atenção primária à saúde; fluxo de trabalho

Resumen
Marco contextual: La atención prenatal de calidad requiere prácticas colaborativas y herramientas que orienten el itinerario asistencial interprofesional.
Objetivo: Crear conjuntamente y validar diagramas de flujo para orientar las consultas de atención prenatal en la atención primaria, utilizando la investigación-acción en la formación interprofesional.
Metodología: Estudio realizado con 65 profesionales sanitarios de atención primaria de una región del sur de Brasil. Se impartió un curso interprofesional de 40 horas sobre atención prenatal, que incluyó la presentación de diagramas de flujo de las prácticas locales. Se alcanzó el consenso sobre los diagramas de flujo regionales en dos grupos focales (n = 16). La validez de contenido fue evaluada por dos grupos de 10 y 8 participantes, respectivamente.
Resultados: Se elaboraron dos diagramas de flujo para orientar la asistencia prenatal interprofesional y definir el itinerario ideal de atención a la gestante. Ambos se consideraron herramientas relevantes para mejorar las prácticas y reforzar la Red de Atención Sanitaria Materno-Infantil, con una validez de contenido del 95 % y del 99 %.
Conclusión: La investigación-acción ha puesto de manifiesto el potencial para reforzar los servicios regionales, sobre todo en los centros de menor tamaño. Es necesario realizar nuevas investigaciones para evaluar la incorporación sostenible de estos procesos a la práctica clínica.

Palabras clave: salud de la mujer; mujeres embarazadas; atención prenatal; atención primaria de salud; flujo de trabajo

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Introduction

High-quality care for pregnant women is a priority strategy in primary health care in Brazil. Under the principles of the Brazilian Unified Health System (SUS), pregnant women have the constitutional right to universal, equitable, and comprehensive antenatal care (Tomasi et al., 2022). The SUS has increased investments in antenatal care coverage and strengthened regional maternal and child health care networks. Since 2011, these networks have been supported by the national strategic program "Stork Network". Although the number of antenatal consultations has increased significantly since the network program began, it remains below the number of consultations recommended (Souza et al., 2021).

Efforts in public health policies have made important contributions to reducing maternal and infant mortality rates. However, this decline has not been equal across all regions of Brazil, particularly in rural and disadvantaged communities (Leal et al., 2018; Prezotto et al., 2021). Primary health care plays a vital role in mitigating the inequities that characterize rural and remote territories in Brazil; however, existing rural health policies remain insufficient (Franco et al., 2021), underscoring the need for tools that guide antenatal care and foster the integration of regional practices through interprofessional education.

Background

Identifying and addressing systemic barriers in the health system is crucial to creating an inclusive antenatal care environment. The effective implementation of comprehensive, interprofessional approaches depends on the protagonism and shared responsibility of all health professionals involved in the care process (Queiroz et al., 2021). Interprofessional education fosters collaborative learning among health professionals to enhance dialogue and service quality, while action research engages participants in reflective cycles to co-produce practical solutions. This approach aligns with the perspective advanced by Paterson et al. (2007), who propose that combining interprofessional education with action research with health professionals may be a useful strategy. Systemic flowcharts serve as visual tools to map and optimize care processes, reducing errors and promoting efficiency. This conceptual framework underpins the study by integrating evidence-based practices with local expertise for improved antenatal care integration.

This study aims to co-create and validate a flowchart for regional primary antenatal health care through action research in interprofessional education. Systemic flowcharts can help optimize activities, reduce errors, and increase productivity.

Methodology

Design

An action research method with a constructivist and interpretivist approach (Koerich et al., 2020) was used to develop a proposal of best practices based on the demands identified and shared by health professionals. The Standards for Reporting Qualitative Research (SRQR) were followed for this process (O'Brien et al., 2014).

The research targeted health professionals working in municipal primary healthcare centers under the Regional Health Coordination (RHC) in the state of Rio Grande do Sul. This region encompasses [n>30] small- to medium-sized municipalities, with approximately 50% covered by the Family Health Strategy. These family health teams are composed of one primary care physician, one nurse, one to two nursing technicians, and five to six community health agents; one to more teams operate in a health center. Sixty-five primary health care professionals from any of the [n>30] municipalities covered by the RHC participated in the intervention, which consisted of a 40-hour online course in antenatal care. No registration fees were required to participate in this university-based course, but 70% attendance at course activities was required. The course was designed following several meetings between the research team and four representatives from the RHC. These meetings focused on the core challenges and strategic alignment of primary health care in the region.

The study included 16 participants from a pool of 65 professionals who completed the antenatal qualification course. They were aged between 28 and 48 years old and working exclusively in urban areas. Selection was based on the inclusion criterion of having completed the course and the exclusion criterion of not actively practicing antenatal care during the study period. All provided formal consent to participate in the research phases—specifically focus groups and flowchart development and validation—and were required to have at least 6 months of experience in antenatal care.

The first phases of the action research were determined during the completion of the antenatal care course, held from August to November 2022. The course focused on the history of childbirth and antenatal care; organization of maternal-child health services; quality indicators in antenatal health; multiprofessional and interdisciplinary antenatal care; legal framework; quality of antenatal care in the region; the importance of rapid HIV/AIDS and viral hepatitis testing in antenatal care; and antenatal care in the international context. The course units were developed by an interdisciplinary team and comprised lectures, discussion, and group work.

In the final step of the course, the health professionals were divided into working groups to develop flowcharts depicting antenatal care in their municipalities. In total, 13 local flowcharts were created. The participants presented and discussed their flowcharts with the other participants and the researchers. The presentations and discussions were documented via audio recordings and field notes.

This study used a mixed-methods approach to balance the flexibility of collaborative methodologies with scientific rigor. Key strategies included: Collaborative Participation (Engaging researchers and participants jointly in problem definition, flowchart development, and validation); Interactive Cycles of Action and Reflection (Implementing

continuous loops of planning, action, observation, and reflection); Data Triangulation (Combining focus groups, validation instruments, and official records to enhance the robustness of the findings); Researcher Reflexivity (Maintaining critical awareness of the researcher's role to ensure objectivity throughout the study); and Participatory Validation (Discussing preliminary results and conclusions with participants to reach a collective consensus; Schoonenboom, 2017). Thus, the study employed Bardin's (2016) content analysis method, categorized into three distinct phases: pre-analysis, material exploration, and treatment of results. While the core analysis was performed by a triad of researchers, 16 health professionals participated in the development and validation of the findings.

Co-creation of the flowcharts

Based on the (discussion of the) local flowcharts, an integrated version was developed for use in all [n>30] municipalities of the RHC by an interprofessional team (two researchers, two representatives of the RHC, and two bachelor students) in partnership with the health professionals who had participated in the course. Current scientific evidence and the Ministry of Health's regulations were considered in this process. The theoretical framework proposed by Silva and Silvino (2018) was use to structure the flowchart, as well as action research strategies for the active involvement and participation of the study participants. Researchers organized, streamlined, and coordinated the entire process. The focus groups were guided by several key questions: 'What do you understand by quality in antenatal care?'; 'How do you conduct antenatal care?'; and 'What could be improved in antenatal care?' The flowcharts were subsequently developed based on suggestions provided in response to the final question.

After developing the first integrated version of the flowchart, an online focus group was held with all professionals who had participated in the antenatal care training course. Among the 65 participants invited, 11 obstetric nurses, two primary care physicians, one dentist, and two nurse preceptors participated in the focus group. The meeting was held in March 2023 and lasted 90 minutes. During this meeting, the integrated flowchart was presented and discussed, and the accepted main results were recorded in writing.

The focus group participants suggested changes to the design, wording, and routes of the flowcharts, and discussed care-routine peculiarities that should be considered. Moreover, the participants decided that a second flowchart was needed to inform pregnant women about the optimal course of prenatal care. All the participants agreed with the suggestions. Accordingly, the research team subsequently developed a second flowchart.

As this was constructivist action research, no standardized scales or instruments were employed for data collection. Instead, data were generated through audio-recorded focus groups, field notes taken throughout the process, and an online structured questionnaire administered via Google Forms to support the preparation and validation of the flowcharts. The transcription process followed strict reliability standards, with manual review of all audio recordings to ensure the accuracy of the qualitative data.

Validation of the flowcharts

After the research team developed both flowcharts, a second focus group discussion and validation were held in April 2023 (audio recorded with field notes). All 16 health professionals who participated in the first focus group also participated in the second. The flowcharts were presented again and widely discussed. After the focus group, a Google Forms questionnaire for standardized validation was sent in the meeting chat. Content validity was used to validate the flowcharts. The researchers developed a questionnaire outlining practical and theoretical requirements for the flowcharts, drawing on prior discussions with health professionals. This instrument then underwent formal validation. Content validity was assessed using the Item-Level Content Validity Index (I-CVI), which determines the relevance of each item individually. The I-CVI represents the proportion of expert judges who rated an item as either 'quite relevant' or 'highly relevant'. An agreement of 80% or more was necessary to recommend the use of the flowcharts in the primary health care centers of the [>30] municipalities involved in the action research.

Among the 16 participants, ten completed the validation questionnaire for the use of flowchart 1 for "interprofessional primary antenatal care", and eight completed the questionnaire for the use of flowchart 2 for "pregnant women" (Table 1).

Table 1

Validation of flowcharts 1 and 2

Evaluation items	Content validity index	
	Flowchart 1 *N* = 10	Flowchart 2 *N* = 8
1. Is the structure and presentation of the flowchart layout clear and understandable?	1.00	0.88
2. Do the colors of the flowchart layout help the professional and the user understand the route?	1.00	1.00
3. Do the symbols that guide the flowchart's route help in understanding?	1.00	1.00
4. Is the flowchart easy to understand for any health care professional?[1]	1.00	-
5. Is the flowchart easy for health care users to understand?	0.90	1.00
6. Is the flowchart consistent with your professional work setting?	1.00	1.00
7. Does the flowchart comply with Ministry of Health regulations?	1.00	0.88
8. Is the content of the flowchart clear, coherent, and consistent?	1.00	0.88
9. Is the flowchart relevant to guiding your work process (and the autonomy of pregnant women and their relatives)[1]?	1.00	1.00
10. Does the flowchart have the potential to guide prenatal care in your municipality?	1.00	1.00
11. Is it important to display this material at the primary health care center, in the form of a banner, for users and professionals?	1.00	0.88
12. Is the flowchart for the route to be followed by pregnant women in antenatal care valid and adapted to your region of activity?[2]	1.00	-
TOTAL	0.99	0.95

Note. [1] Only asked for Flowchart 2; [2] Only asked for Flowchart 1.

Following the initial conception, graphic design professionals finalized the flowcharts. Under the researchers' supervision, the layout was refined until the the validation participants made their final adjustments.

During the whole action-research process, the recommendations of Resolution No. 466/2012 of the National Health Council (Ministério da Saúde & Conselho Nacional de Saúde, 2012) were followed. The project was approved by the Universidade Franciscana (UFN) Research Ethics Committee (n. 6.188.961 and CAAE: 54380521.2.0000.5306). After agreeing to participate in the study, all 49 participants signed an informed consent form.

Results

The findings below meet the study's objective of co-creating and validating interprofessional flowcharts for prenatal care in primary care settings. The results are structured and discussed based on two main phases of the action research: (a) the development and (b) the validation of the flowcharts.

Development of the flowcharts

Based on the local flowcharts developed by the professionals in the prenatal course, an integrated flowchart was designed to guide interprofessional primary prenatal care within the RHC's scope. After its presentation and discussion, the participants decided to create a second flowchart addressing pregnant women. This process of construction and refinement was guided by collective discussions, taking into account the participants' local needs, scientific evidence, and the Ministry of Health's regulations. Given that the professionals were from different areas of expertise and locations, their health needs also differed. Professionals who worked in rural health centers mentioned difficulties in reaching pregnant women. Those who worked in poor communities reported that pregnant women did not attend the expected number of prenatal consultations.

The collective and participatory development of the flowcharts enabled a path of professional qualification through exchanges of knowledge and practices grounded in what each municipality was already developing, tailored to its specific reality. The exchanges were highly effective and enabled new intervention strategies, especially for professionals working in rural areas and far from centers of reference.

Throughout the (de)construction of the "interprofessional prenatal care" flowchart (final version: Figure 1), the *value and role of each health professional* in maternal and child care were considered. In the focus group discussions, participants often emphasized the need for interprofessional work in health care.

The flowchart for pregnant women featured colors, images, and inspirational language, which could contribute to the *empowerment and autonomy* of these women in decision-making. To enhance relatability, attractiveness, and interactivity, the participating health professionals

proposed naming it "Cátia's Prenatal Care" (Figure 2). They highlighted that this flowchart should be displayed in the waiting rooms of primary care centers to attract pregnant women and their accompanying relatives and encourage them to share their fears, anxieties, and hopes with health professionals. Furthermore, health professionals should use the flowchart to encourage dialogue with pregnant women, for example, in regular group sessions with pregnant women and during in-home visits. According to health professionals, the flowchart should increase the number of consultations and pregnant women's active participation, particularly among women in poor communities.

Figure 1

Interprofessional prenatal care flowchart & Figure 2

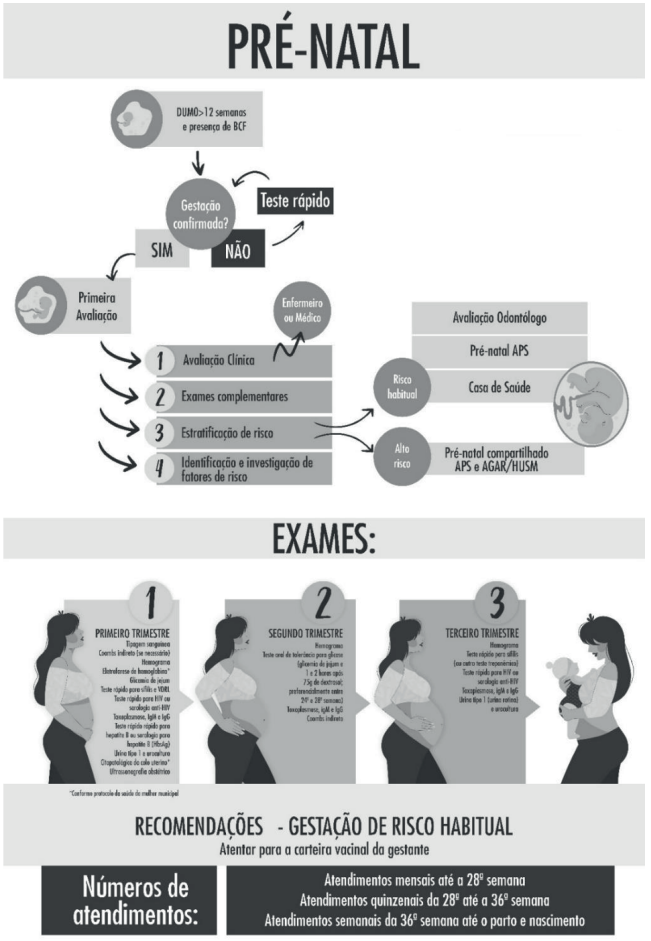
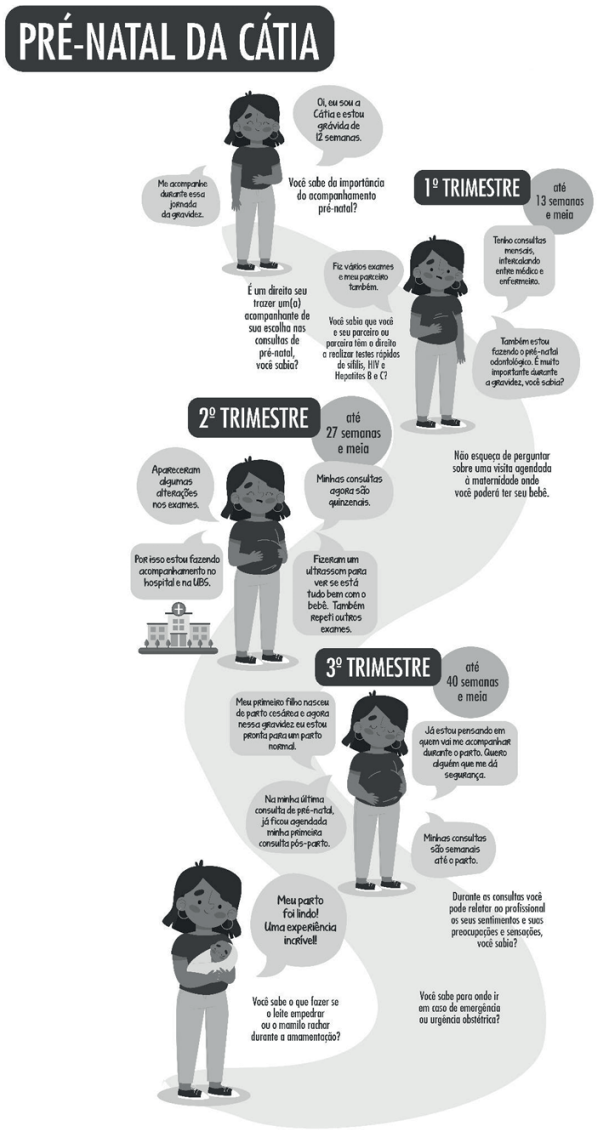


Figure 2

"Cátia's Prenatal Care" Flowchart



The development of both flowcharts constituted a dynamic, creative, and participatory interprofessional education path. Both were created from the intersection of three axes of knowledge: (1) regulations and recommendations from the Ministry of Health; (2) up-to-date scientific evidence on prenatal care and interprofessional education; and (3) local knowledge and practices shared by professionals from different municipalities during training, focus groups, and co-creation.

In this sense, flowcharts are not a technology created for people, but with people, resulting from a participatory, dialogical, and context-specific process, in which professionals—as representatives of community realities and daily practices—play an active role in defining the paths, content, and languages used.

At each meeting, all participants learned and shared their perceptions and the desire to improve their practice. They predicted benefits for smaller health centers after completing the learning process.

Validation of the flowcharts

In the last focus group, after the flowcharts were presented, participants extensively discussed their usability for regional primary health care centers. During the validation process, they suggested several adjustments, which were agreed within the group and implemented by the researchers. Regarding the flowchart guiding interprofessional antenatal care (Figure 1), participants requested greater clarity on the division and alternation of physician and nurse consultations. They specifically requested that the number and timing of consultations be highlighted in line with Ministry of Health recommendations and that the required vaccinations for pregnant women be clearly indicated, adhering strictly to regional protocols. For the "Cátia's Prenatal Care" flowchart (Figure 2), participants suggested clearler signaling of the number of gestational consultations per trimester and emphasized the critical relevance of the first-trimester dental appointment. Furthermore, they requested that the flowchart indicate

the need to schedule a visit to the reference maternity hospital for the birth and the need for a collaborative discussion between the primary healthcare physician, nurse, and patient regarding delivery type. Finally, participants advocated reinforcing the importance of selecting a support person for delivery and initiating breastfeeding immediately postpartum.

In conclusion, the group agreed with the flowcharts and did not suggest any further changes. The results of the standardized validation showed a total agreement of 99% (interprofessional prenatal care flowchart) and 95% (Cátia's Prenatal Care flowchart) (range 88% - 100%) (Table 1).

Discussion

National studies indicate that, despite the expansion of antenatal care coverage in Brazil, the number of consultations per pregnant woman remains below recommended levels and relevant social inequalities in access persist (Leal et al., 2018; Tomasi et al., 2022). These findings from the literature constitute the contextual framework for this study.

Within this context, this action research aimed to combine interprofessional education and collaborative practice to co-create and validate regional flowcharts that qualify antenatal care processes in primary health care from [n>30] municipalities in a region of southern Brazil. Coordinating and integrating different local practices and professional expertise through meetings to construct and validate flowcharts enabled reflection, (de)construction, alignment, learning and, above all, motivation to continue improving maternal and child health. The incorporation of expectant mothers' psychological and emotional experiences into the flowcharts further ensures a holistic approach to antenatal care, enhancing the comprehensiveness and effectiveness of the care provided (Mahaffey et al., 2022).

From this perspective, the flowcharts were not treated and designed as linear and unchangeable tools but rather as resources to be reviewed and continually updated based on critical analysis. A previous study confirmed that flowcharts are feasible for identifying strengths and weaknesses in health services, organizing the work process, and coordinating interprofessional actions (Tabile et al., 2015).

This study uniquely contributes to antenatal care optimization by using action research to co-create regional flowcharts. By involving 65 health professionals from over 30 predominantly small and rural municipalities in southern Brazil, the research addresses localized disparities in service delivery often overlooked in broader national studies (Tabile et al., 2015; Franco et al., 2021). Unlike urban-centric interventions, this approach integrates diverse local practices into standardized yet adaptable care pathways, fostering regional cohesion within the maternal and child health network.

Furthermore, the flowcharts align with international recommendations, such as the World Health Organization's 2016 guidelines for antenatal care, (Veiga et al., 2023) which advocate at least eight contacts to ensure a positive pregnancy experience, incorporating nutritional, preventive, and assessment interventions while emphasizing patient-centered and interprofessional collaboration. This aligns with the existing literature on antenatal care pathways, which demonstrates their efficacy in streamlining processes, reducing variations in practice, and improving outcomes through integrated perinatal models that foster decision-making and holistic care (e.g., as reviewed in integrated perinatal care studies and maternity pathway designs; Hermans et al., 2026). By broadening implications for interprofessional practice in primary care, especially maternal and child health nursing, the study underscores how such tools can empower nurses as key coordinators in multidisciplinary teams, facilitate shared decision-making with pregnant women, mitigate inequities in underserved areas, and ultimately contribute to sustainable advancements in care quality, aligning with Sustainable Development Goals (SDGs) for maternal health.

This study emphasizes the crucial roles of interprofessional education and teamwork in overcoming the challenges in antenatal care. This aligns with the findings of Reid et al. (2016), who also highlight that interprofessional collaboration can significantly enhance care quality and patient outcomes.

The rationale for this action research was to design flowcharts with practicing primary health care professionals in a way that valued and recognized their expert knowledge of local needs. To achieve the SDGs, especially those related to maternal and child health, at the local and global levels, all actors must regard themselves as protagonists of new knowledge and practices.

The study's experiences showed that action research is an effective methodology for promoting new interprofessional thinking and action in primary health care settings. However, a limitation of this study is that representative pregnant women did not participate in the project, nor did community health agents, who play an important role in assisting pregnant women in the community. Another limitation in the action research process was the low attendance rate among health professionals in the final meetings to validate the flowcharts.

Conclusion

We conclude that the study achieved its objective of co-creating and validating flowcharts for prenatal health consultations in primary care. The adoption of action research enabled a participatory and reflective process, while interprofessional education fostered alignment and collaboration among the different categories of the healthcare team. As a result, the validated tools have proven effective in guiding clinical practice in an integrated manner, improving the quality of prenatal care and strengthening teamwork in the context of primary care.

To ensure sustainable use and continuous improvement, the flowcharts have been implemented across the [n>30] communities of the studied region. Their impact in health

care practice should be evaluated, with the views of those involved, in this case, health professionals and pregnant women, being crucial.

The findings indicate that further research and action are needed to strengthen interprofessional collaboration and enhance the regional maternal and child health network's initiatives.

Author contributions

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Writing – review & editing: Backes, D. S., Caetano, A. C., Kruel, C. S., Hämel, K., Lomba, L., Oliveira, T.

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