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The development of BE-EMPOWERed: Belgian program Enhancing the uptake and Effectiveness of a Multifactorial falls Prevention intervention in Older communitydWElling peRsons

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Abstract

Background Falls among people aged 65 years and older represent a global health challenge, with substantial morbidity, mortality and economic costs. Despite strong evidence supporting the efficacy of multifactorial falls prevention interventions, their implementation in community settings remains inconsistent. There is a need to systematically develop and proactively tailor multifactorial falls prevention interventions and implementation strategies to the context. This study aims to describe the systematic development of the BE-EMPOWERed program, a comprehensive falls prevention initiative, and its corresponding implementation strategies to enhance the uptake and effectiveness of a multifactorial falls prevention interventions in community-dwelling older people.

Methods The BE-EMPOWERed program was developed using Intervention Mapping (IM) and Implementation Mapping guided by the Medical Research Council (MRC) framework. The development process involved co-production with key stakeholders, including older people, healthcare professionals, and local policymakers, ensuring the program's relevance and feasibility in real-world settings. The program components were pretested, refined, and evaluated through iterative cycles within primary care areas, incorporating continuous feedback from participants and implementation facilitators to address the complexities of the context and real-world implementation.

Results The BE-EMPOWERed program includes a group-based intervention for older people and workshops for healthcare professionals. A detailed implementation plan was created and implementation facilitators were trained to support the adoption of multifactorial falls prevention interventions across primary care areas in Flanders. Key implementation strategies for older people included tailored interventions, personal risk assessments, active learning, participation and opportunities for social comparison. For healthcare professionals, the strategies focused on

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raising awareness, guided practice and coalition-building. Additionally, active learning, guided practice, stakeholder engagement, community development and agenda setting were pivotal in training implementation facilitators and executing the implementation plan.

Conclusions The successful implementation of multifactorial falls prevention interventions in community settings requires addressing multiple contextual levels, from individual to organizational and policy-related factors. This study provides a comprehensive guide for the systematic development and implementation of complex interventions, offering practical insights for future initiatives aimed at improving community-based health outcomes, enhancing program sustainability, and facilitating the broader application of falls prevention interventions.

Keywords Community setting, Implementation, Falls prevention, Aged

Background

Falls in older people are a global issue, with approximately one third of the community-dwelling people aged 65 years and over experiencing at least one fall annually [1]. As the population ages, the incidence of falls and related injuries is on the rise [2]. A fall can result in an increased risk of morbidity, through physical, psychological, social and financial consequences, and death [3, 4].

Falls often stem from a complex interplay of risk factors, including poor balance, impaired gait and mobility, polypharmacy, reduced vision, and cognitive impairment [5, 6]. The World Guidelines for Falls Prevention and Management for older people recommend that high-risk community-dwelling older people undergo a multifactorial intervention, which includes both a multifactorial falls risk assessment and multidomain interventions [1]. Research indicates that multifactorial interventions can reduce falls rates by 23% compared to usual care or attention control (RaR 0.77, 95% CI: 0.67 to 0.87) [5, 7]. Effective interventions can include medication review, environmental adaptations and a physical exercise program – the latter being critical [7]. Despite available compelling evidence supporting these tailored multifactorial falls prevention interventions, their widespread implementation in clinical practice remains limited [8, 9].

Falls prevention is a dynamic and complex process, particularly multidomain interventions. Addressing one falls risk factor may inadvertently lead to unintended consequences, potentially undermining overall effectiveness. In addition, facilitators and barriers identified at different levels (micro, meso, and macro) interact with one another, further complicating implementation. These barriers include individual healthcare professionals' and patients' lack of knowledge, intention, and motivation; inadequate communication and referrals between healthcare professions; and unavailability of necessary resources [10]. Researchers around the world are calling on organizations and governments to take action [11]. However, the complexity of falls, coupled with overburdened health systems and resource constraints, impede the necessary system changes.

Research has shown that it is critical to consider potential determinants (i.e. barriers and facilitators) influencing the implementation of falls prevention in the community setting early. In addition, it is important to proactively tailor the intervention and implementation strategies to match the needs of the older people, healthcare professionals, organizations and policy makers [12, 13]. By addressing these determinants, it is possible to enhance uptake, optimize effectiveness, promote engagement, gain support from healthcare professionals and organizations, while aligning with policy goals, optimizing resource utilization, and ultimately ensuring long-term sustainability. A systematic review examining implementation strategies for multifactorial falls prevention interventions in community settings found that studies provided limited details on these strategies, with inconsistent labeling further complicating comparisons. While twelve studies referenced implementation theories, models, or frameworks, none explicitly described the use of a determinant framework or how strategies were designed to address specific implementation barriers [13]. Another systematic review on the use of theory in designing implementation strategies found that only 22.5% of included studies explicitly applied theoretical frameworks [14]. The absence of a strong theoretical foundation is often cited as a key factor contributing to the mixed results observed in implementation research and it can ultimately lead to wrong conclusions, research waste and poor patient outcomes [14].

Unlike previous research, this study examined the translation of a multifactorial falls prevention intervention into practice. The BE-EMPOWERed program, developed in Flanders, is a comprehensive falls prevention initiative shaped by Intervention Mapping (IM) [15]. The program's intervention core components builds on an existing evidence-based falls prevention intervention including tailored interventions such as medication review, environmental adaptations, and has a strong emphasis on structured physical exercise. The overall objective of this study is to describe the systematic development of the BE-EMPOWERed program and its matching implementation strategies, in collaboration with a

multidisciplinary stakeholder group, including representatives of older people, carers, healthcare professionals and the broader community.

Methods

IM and Implementation Mapping were used in line with the Medical Research Council (MRC) framework to develop and evaluate the BE-EMPOWERed program (Fig. 1) [15–18]. IM is an iterative process that guides the development, implementation and evaluation of a suitable program over six steps integrating theory, evidence and clinical practice [15]. Implementation Mapping expands on the fifth step of IM, focusing on the systematic development of implementation strategies by combining insights from implementation science and IM [17]. The MRC framework is a widely used guidance for the development and evaluation of complex interventions, such as a multifactorial falls prevention intervention [18].

Ethical approval was obtained and all participants provided written informed consent.

Defining the intervention and implementation strategy

In this study, the intervention is defined as a 'a clinical, behavioral, or biomedical innovation designed to improve recipient's (client/patient) health outcomes (e.g., prevent disease occurrence, reduce severity of disease, improve quality of life)' [19]. The BE-EMPOWERed program includes a multifactorial intervention consisting of a multifactorial falls risk assessment and multidomain interventions [1]. A multifactorial falls risk assessment is defined by the World Guidelines for Falls Prevention and Management for older people as 'a set of assessments performed across multiple domains to judge an individual's overall level of risk of falling, to identify the individual risk factors potentially modifiable and non-modifiable to *inform the choice of an intervention*' [1]. The multidomain interventions entail 'a combination of two or more intervention components across two or more domains (e.g. an exercise program and environmental modification) based on a multifactorial falls risk assessment and intended to prevent or minimize falls and related injuries' [1]. For instance, individual falls risk factors such as balance, gait and mobility, polypharmacy, home hazards, and vision are assessed. Based on the individual's falls risk profile, two or more interventions—such as an exercise program, medication review, or environmental modificationsmay be recommended.

Implementation strategies are defined as 'methods or techniques used to enhance the adoption, implementation, sustainment, and scale-up of an intervention' [20, 21]. Examples of these strategies include 'active learning,' 'consciousness raising,' 'participation,' 'increasing stakeholder influence,' and 'forming coalitions.' These implementation strategies are designed to engage older people, healthcare professionals in primary care, local policymakers, and key stakeholders within primary care settings.

Multidisciplinary stakeholder group

A multidisciplinary stakeholder group of 21 professionals (e.g. physiotherapists, geriatrician, pharmacist, occupational therapist, registered nurses, policy makers, representatives of older people, researchers) participated in five meetings between October 2020 and October 2023 to discuss and validate the outcomes of each step of IM. This group was selected through purposive sampling based on their knowledge about falls prevention and experience with community implementation projects. For reporting implementation strategies, we followed Proctor et al.'s (2013) recommendations and for the intervention, we adhered to the Template for Intervention Description and Replication (TIDieR) guidelines [21, 22]. The Standards for Reporting Implementation Studies (StaRI checklist) was used as reporting guideline for this article [23].

Setting

The development of the BE-EMPOWERed program (steps 1-4) took place in the community setting of Flanders (Belgium). The community is defined as 'home or places of residence that do not provide residential healthrelated care' [7]. The development process was in co-production with one primary care area (PCA 1) and a local stakeholder group with diverse expertise, meeting every three months. Flanders has a population of approximately 6.7 million, consists of five provinces and has 60 PCAs. A PCA is developed by the Flemish Government and forms a network of primary care providers in a geographically defined area; with the aim to exchange knowledge and information between primary care providers and to coordinate their activities [24, 25]. In the implementation planning and evaluation phase (steps 5-6), the BE-EMPOWERed program was expanded to three additionals PCA 2-4. Table 1 provides an overview of provinces, urban and municipal composition, total population, and the proportion of residents aged 65 and older in each participating PCA.

Step 1: needs assessment

To explore the problem, the context (population, setting and community) and to determine barriers and facilitators for the implementation of multifactorial falls prevention interventions in the community we conducted a systematic literature review and a qualitative study. The information out of both studies was used to develop the logic model of the problem. Full methodology and results of both studies are detailed elsewhere [10, 26].



Fig. 1 Overview steps intervention mapping [15]

РСА	Province	Cities and municipalities	Population (2022)	65+
1*	East Flanders	2 cities	73.421 (479/km ²)	15.577 (21,1%)
2	East Flanders	1 city, 4 municipalities	90.940 (398/km ²)	19.461 (21,4%)
3	Antwerp	7 municipalities	113.137 (1477/km ²)	25.116,41 (22,2%)
4	West Flanders	1 city	118.748 (850/km ²)	29.644 (24,2%)

 Table 1
 Demographics four primary care areas

*PCA that co-produced the BE-EMPOWERed program

PCA = primary care area

The systematic review aimed to explore the determinants influencing the implementation of multifactorial falls prevention interventions in community-dwelling older people. A literature search was conducted on December 3, 2021, and updated on April 3, 2023, across five databases: PubMed, EMBASE, Cochrane Central, Web of Science, and CINAHL. Two reviewers independently selected studies, with a third resolving disagreements. Methodological quality was assessed using the Mixed Methods Appraisal Tool (MMAT), and data were categorized using 'The Integrated Checklist of Determinants of practice' (TICD checklist) [10, 27].

The qualitative study explored contextual determinants influencing the implementation of a multifactorial falls prevention intervention in Flanders. Semi-structured interviews and focus groups were conducted with key persons (n = 6), older people (n = 7), healthcare professionals (n = 16), and local policymakers (n = 6). Participants were selected through purposive and theoretical sampling. The TICD checklist guided the interview development, and data were analyzed using the Qualitative Analysis Guide of Leuven (QUAGOL) [26, 28, 29].

Step 2: program outcomes and objectives

The results of the systematic review and qualitative study (step 1: needs assessment) were used to define expected outcomes for the program, behavior and environment. In addition, performance objectives and determinants for behavioral and environmental outcomes were defined based on the needs assessment. This information was used to develop the logic model of change. This model specifies who and what needs to change to properly manage falls prevention in community-dwelling older people. Hereafter, several matrices of change were made. These matrices map influenceable determinants against performance objective and describe specifically the envisioned change at individual, interpersonal, organizational and community level. They represent the immediate goals of the BE-EMPOWERed program. The program design (step 3) needs to address these change objectives [15].

Step 3: program design

In the third step of IM the components, scope, sequence, theory- and evidence based methods and practical applications of the program were defined [15]. First, to get an

insight into the strategies used to implement multifactorial falls prevention interventions in the community, we performed another systematic literature review [13]. The search, selection process and the methodological quality assessment are similar to the systematic review on determinants (step 1). The implementation strategies of the included studies were described following the Taxonomy of Behavioral Change Methods of Kok et al. (2016) [30]. Full methodology and results are reported elsewhere [13].

Next, suitable theory- and evidence based methods and practical applications were selected from the Taxonomy of Behavioral Change Methods of Kok et al. (2016) [30]. Based on the relevance, potential effectiveness and feasibility a final selection of methods and applications was made by the research group and discussed with the stakeholder group and the local stakeholder group of one PCA.

Step 4: program production

In Step 4 of IM, the research team collaborated with experts in falls prevention and implementation science to develop and refine the BE-EMPOWERed program. It was tested and adapted within a PCA through stakeholder engagement. Older people and healthcare professionals evaluated components via surveys, assessing content, clarity, pace, and materials on a five-point Likert scale, with space for feedback. Trained group leaders (i.e. occupational therapist and social worker) and a falls prevention expert provided input through a fidelity checklist and discussions. Findings were reviewed by the stakeholder and research groups, leading to program adjustments and additional materials.

Step 5: program implementation plan

A detailed implementation plan for the BE-EMPOW-ERed program was developed in step 5 of IM, drawing on frameworks like the MRC framework and the Plan, Do, Check, Act (PDCA) cycle [18, 31]. Data from the needs assessment (step 1) informed potential program implementers. The plan also builds on insights from developing, pretesting, and adapting the program in one PCA.

During the evaluation phase, the program will be tested in three additional PCAs with support from three implementation facilitators, selected via purposive sampling. Coordinators of the PCAs identified candidates based on interest in falls prevention, knowledge of primary care, attitudes toward aging, and leadership skills. After interviews, one occupational therapist and two physiotherapists were chosen and trained for three days. These implementation facilitators will guide and support the PCAs throughout the different steps of the implementation plan, with the ultimate goal to implement a sustainable falls prevention program within their area.

Step 6: evaluation plan

To implement and evaluate the BE-EMPOWERed program on implementation outcomes, processes and effectiveness a mixed methods study with a convergent parallel design is ongoing in four PCAs. The qualitative component, comprising focus group interviews and observations, will evaluate the implementation outcomes and processes. In parallel the quantitative component, a before-and-after study, incorporating surveys and tests conducted at multiple time points, will assess the program's effectiveness. Results will be reported separately. The study is registered at ClinicalTrials.gov (NCT06105437).

Results

Step 1: needs assessment

Figure 2a logic model of the problem, illustrates the results of this needs assessment [10, 32]. The findings showed that 24 to 40% of community-dwelling older people fall, of which 21 to 45% are recurrent fallers [33, 34]. Despite the high incidence of falls, healthcare professionals frequently do not perform a multifactorial falls prevention interventions. Furthermore, a fall can have a significant impact on the quality of life (OOL) of the older person. In the qualitative study, we found that falls prevention is not always a priority or a common goal for either older people or healthcare professionals [26]. It emphasized the need to involve consumers (older people, carers) and other stakeholders in the decisionmaking process. The study also identified the need to enhance beliefs, awareness, knowledge, skills and motivation towards falling and a multifactorial falls prevention intervention among older people and healthcare professionals. Healthcare professionals identified barriers to work proactively on preventing falls, such as high workload, competing priorities, time-consuming nature of the intervention and the financial constraints. Additionally, there is an urgent need to improve communication, collaboration and coordination across different healthcare professions and levels of the context [26].

Determinants

 Patient factors: Needs, beliefs and knowledge, preferences, motivation, behaviour

Determinants

- Guideline factors: Strength of the recommendation, clarity, cultural appropriateness, accessibility of the recommendation, source of the recommendation, consistency of the recommendation with other guidelines, feasibility of the intervention, accessibility of the intervention, compatibility of the behaviour, effort of the behaviour, trialability of the behaviour
- Individual health professional factors: Knowledge, awareness and familiarity with recommendation, knowledge about own practice, skills needed to adhere, agreement with the recommendation, attitudes towards guidelines in general, expected outcomes, intention and motivation, self-efficacy, learning style, emotions, nature of behaviour, capacity to plan change, self-monitoring and feedback
- Family and informal caregiver factors: Beliefs and knowledge
- Professional interactions: Communication and influence, team processes and referral processes
- Incentives and resources: Availability of necessary resources, (non)financial incentives and disincentives, information system, quality assurance and patient safety systems, continuing education system, assistance for clinicians
 Capacity for organizational change: Mandate.
- Capacity for organizational change: Mandate, authority, accountability, capable leadership, relative strength of supporters and opponents, regulations, rules, policies, priority of necessary change, monitoring and feedback
 Social, political and legal factors: Economic constraints
- Social, political and legal factors: Economic constraints on the health budget, legislation, payer or funder policies, influential people

Behavior of the older person

- Resistance from the older person
- Older person:
 does not seek help
 - does not report a fall
 does not comply to the
 - interventions/recommendations • is not involved in the decision-making process
 - and care coordination

Environment

Healthcare professionals: Do not screen for fall risk, do not assess the different fall risk factors (multifactorial assessment), do not plan and discuss suitable interventions (tailored to one's risk profile), do not follow-up, do no refer to other healthcare professionals, do not communicate clearly with other healthcare professionals and older persons, do not coordinate care for falls prevention

Interpersonal: Resistance from informal caregivers and family, informal caregivers/family do not report a fall

 Organization: Management does not see falls prevention as a priority, management does not develop a clear policy or vision on falls prevention, no resources to work on falls prevention, variety in how primary care areas and organizations operate, fragmented care with limited communication between care organizations

Community/society: No (non)financial incentives to work on falls prevention, falls prevention is not a priority of (local) policy makers, no uniform data sharing, no uniform quality indicator and registration of falls, new policy developments and roles in primary care areas Problem 24-40% of communitydwelling older persons fall, of which 21-45% fall recurrently

Problem

Healthcare professionals do not perform the multifactorial falls prevention intervention (screening, assess, plan intervention and follow-up) in the community setting

QOL

- Physical: Tissue damage, bruises, head trauma, fractures, mortality...
- Psychosocial: Concerns of falling, activity avoidance, less social interactions, loss of self confidence, loss of autonomy...

Fig. 2 Logic model of the problem adapted from Bartholomew et al. [15]

The systematic review classified barriers (n = 40) and facilitators (n = 35) within the TICD checklist [10]. The most frequently reported influencing determinant was availability of necessary resources. Other commonly reported determinants were knowledge, intention/ beliefs and motivation at the level of the older person and healthcare professionals, compatibility of the falls prevention intervention into current practice, effective communication, team and referral processes and financial incentives and disincentives. The complete results of the systematic review is reported elsewhere [10].

Step 2: program outcomes and objectives

Building on the insights from the systematic review and qualitative study in step 1 (i.e., needs assessment), expected aims for the program, behavioral and environmental outcomes and performance objectives were defined.

The first step was to develop the logic model of change (Fig. 3). The main health objective is to prevent community-dwelling people over the age of 65 from falling, by performing a multifactorial falls prevention intervention. The logic model consists of four behavioral outcomes at the level of the older person and 18 environmental outcomes at the level of the healthcare professional, informal caregiver/family, organization, community and society. The main behavioral outcomes focus on creating Page 7 of 19

awareness of the problem of falling, encouraging participation, involvement and adherence to the falls prevention interventions. The environmental outcomes revolve on raising awareness of the problem of falling, sharing knowledge and skills to perform a multifactorial falls prevention approach, promoting communication and collaboration among healthcare professionals, making falls prevention a priority and developing a clear vision or policy for falls prevention. For each behavioral and environmental outcome, several performance objectives were defined. Finally, a matrix of change objectives was developed for each behavioral and environmental outcome. The performance objectives were mapped against determinants and specific change objectives were defined. The matrices serve as the blueprint for behavioral and environmental changes. An example of a matrix can be found in Table 2.

Step 3: program design

In the third step of IM, the program's components, scope, sequence, theory- and evidence based implementation strategies and practical applications of the BE-EMPOW-ERed program were defined based on the findings of Step 1 and 2 of IM [15].

The following key insights from the two systematic reviews and qualitative study were considered in designing the BE-EMPOWERed program [10, 13, 26]:



Fig. 3 Logic model of change adapted from Bartholomew et al. [15]

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Table 2 Matrix or change objectives (contribut) **Behavioral outcomes:** (1) Older person seeks help, (2) Older person reports falls, (3) Older person is involved in the decision-making process for falls prevention, (4) Older person complies with interventions/recommendations

-					
	Needs	Beliefs & knowledge	Preferences	Motivation	Behavior
Acknowl- edges the problem of falling and importance of falls prevention	• The older person acknowledges the need to talk about the problem of falling and to receive information and (professional) help to prevent falls.	 The older person knows/believes that falling is a problem among older people. The older person knows/believes the consequences of a fall. The older person knows/believes that he/she can prevent falls. 	• The older person values the problem of fall- ing and the importance to prevent falls.	 The older person is motivated to know more about the problem and consequences of falling. The older person is motivated to know more about falls prevention. The older person is motivated to seek help and report falls. 	• The older person seeks help and reports falls.
Addresses the feelings of shame, pride and fear	 The older person has the need to talk about their feelings of shame, pride and fear to seek help and report falls. The older person ac- knowledges the need to talk about their feel- ings of shame, pride and fear to discuss suit- able falls prevention interventions. 	 The older person knows/believes that he/ she can talk about their feelings related to falling with healthcare professionals or family. The older person knows/believes that fall- ing is a problem among older people. The older person knows the consequences of a fall. The older person knows and believes that he/she can prevent falls. 	 The older person values the importance to talk about their feelings of shame, pride and fear related to falling with healthcare profes- sionals or family. 	• The older person is motivated to talk about their feelings of shame, pride and fear related to falling with professional healthcare providers or family.	• The older person talks about his/her feelings related to fall- ing with healthcare profession- als or family.
Builds rela- tionship of trust	•The older person has the need to build a relationship of trust with healthcare profes- sionals or family.	 The older person knows/believes that he/ she can trust healthcare professionals or family. The older person knows/believes that he/ she can talk about falling and falls preven- tion with healthcare professionals or family. 	• The older person values the importance to talk about the problem of falling and falls prevention with healthcare professionals or family. • The older person values a relationship of trust with healthcare professionals or family.	 The older person is motivated to talk about the problem of falling and falls prevention with health- care professionals or family. 	 The older person trusts health- care professionals or family to talk about the problem of falling and falls prevention. The older person trusts health- care professionals or family to report his/her fall incidents.
Active involvement of the older person	•The older person ac- knowledges the need to participate in the decision-making pro- cess of falls prevention.	 The older person knows/believes that his/ her involvement in the decision-making process for falls prevention is important. The older person knows/believes that it is important that he/she complies with the intervention/recommendations. The older person knows how he/ she can comply with the intervention/ recommendations. The older person knows barriers and facilitators to comply with the intervention/ recommendation. 	 The older person talks about his/her values/preferences regarding falls prevention interventions/recommendations. The older people values the importance of active participation in the decision-making process. The older person values the importance tance to comply with the interventions/recommendations. 	 The older person is motivated to talk about the problem of falling and falls prevention with health- care professionals or family. The older person is motivated to be involved/to participate in the decision-making process. The older person is motivated to comply with the interventions/ recommendations/ The older person is motivated to discuss barriers and facilitators to comply with the intervention/ recommendation. 	 The older person participates in the decision making process. The older person discusses barriers and facilitators to comply with the intervention/ recommendation. The older person complies with the interventions/ recommendations.

Table 2 (cc	intinued)				
	Needs	Beliefs & knowledge	Preferences	Motivation	Behavior
ntegration n life goals of the older oerson	• The older person has the need to match falls prevention interven- tions to his/her life goals.	 The older person knows his/her own life goals. The older person knows why it is important to match falls prevention interventions to his/hers life goals. The older person believes in the value of matching the falls prevention interventions to his/hers life goals. 	 The older person talks about his/her life goals. The older person talks about his/hers val- ues/preferences regarding falls prevention interventions/recommendations. 	 The older person is motivated to talk about his/her life goals. The older person is motivated to comply with the interventions/ recommendations/ The older person is motivated to discuss barriers and facilitators to comply with the intervention/ recommendation. 	•The older person talks about his/her life goals. •The older person complies with the interventions/ recommendations.
Fake the socio- economic, ohysical, social and ssychosocial actors into	• The older person has the need to talk about his/her socio-econom- ic, physical, social and psychosocial factors in relation to falls preven- tion interventions.	 The older person knows his/her socio- economic, physical, social and psychosocial factors that could influence the decision- making process for falls prevention. 	 The older person talks about his/her val- ues/preferences regarding falls prevention interventions/recommendations. 	 The older person is motivated to talk about his/her socio-economic, physical, social and psychosocial factors in relation to falls preven- tion interventions. 	• The older people discusses with a healthcare professional his/her socio-economic, physi- cal, social and psychosocial factors in relation to falls prevention interventions.

- Empowerment of older people: Encouraging active participation and self-management in falls prevention is essential for long-term sustainability.
- Knowledge and motivation: Raising awareness, enhancing beliefs, and building skills among both healthcare professionals and older people is key.
- Collaboration and coalition-building: Engaging stakeholders throughout both development and implementation phases strengthens long-term sustainability.

Table 3 gives an overview of the selected implementation strategies and related behavior change theories at the level of the older person and healthcare professional. These strategies and theories were translated into program components, consisting of a group program for older people and workshops for healthcare professionals.

1. Group program

The group program draws inspiration from the Australian multifactorial falls prevention program 'Stepping On,' [35] and aligns with strategies identified in the first two steps of IM: tailoring (i.e. matching the intervention to characteristics of the participant), personalizing risk (i.e. providing information about falls risks and intervention), active learning (i.e. encouraging learning from goal-driven and activity-based experience), participation (i.e. assuring high level engagement of the participants' group in decision making, prioritizing and change activities) and mobilizing social support (i.e. prompting communication about behavior change in order to provide instrumental and emotional social support) [30].

Stepping On is a multifaceted program aiming to empower older people to take control and incorporates falls prevention interventions into their everyday lives using a small-group learning environment [35, 36]. Stepping On has shown positive outcomes, i.e., increasing levels of independence, enabling a proactive approach to health [37] and a 30% reduction in falls in a randomized controlled trial [35].

However, based on the results of the first two steps of IM, Stepping On was adapted and translated to the community setting of Flanders. Recognizing the importance of motivation, the BE-EMPOWERed program introduces a session exploring personal life goals matching interventions with the intrinsic motivation of the older person to enhance engagement. To address the need for routine, the program encourages participants to search for new existing group programs during the final session to continue exercising and an additional booster session was added. Additionally, the qualitative study showed

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Table 3 Overview implementation strateg	

Target group	Determinant	Implementa- tion strategy	Theory	Definition (Kok et al., 2016)	Component
Derson	Needs Beliefs & knowledge Preferences Motivation Behavior	 Participation Belief selection Consciousness raising Active learning Tailoring Tailoring Tailoring Personalize risk Guided practice Goal setting Planning cop- ing responses Providing opportuni- ties for social comparison 	 Participation: Diffusion of Innovations Theory Belief selection: Theory of Planned behavior Consciousness raising: Health Belief Model, Trans-Theoretical Model Active learning: Social Cognitive Theory Tailoring: Trans-Theoretical Model Individualization: Trans-Theoretical Model Personalize risk: Precaution-Adoption- Process Model Guided practice: Social Cognitive Theory Goal setting: Goal-setting Theory, Theo- ries of Self-Regulation Planning coping responses: Attribution Theory and Relapses Prevention Theory, Theories of Self-Regulation Providing opportunities for social com- parison: Social Comparison Theory 	 Participation: Assuring high level engagement of the participants' group in problem solving, decision making, and change activities; with highest level being control by the participants' group Belief selection: Using messages designed to strengthen positive beliefs, weaken negative beliefs and introduce new beliefs Consciousness raising: Providing information, feedback, or confrontation about causes, consequences, and alternatives for a problem Active learning: Encouraging learning from goal-driven and activity-based experience Tailoring: Matching the intervention or components to previously measured characteristics of the participant Individualization: Providing opportunities for learners to have personal questions answered or instructions paced according to their individual progress Personalize risk: Providing Information about personal cost or risks of action or inaction with respect to target behavior Goal setting: Prompting Information about personal cost or risks of action or inaction with respect to target behavior Goal setting: Prompting planning what the person will do, including a definition of goal-directed behaviors: Providing participants to list barriers and ways to overcome these Planning coping responses: Prompting participants to list barriers and ways to overcome these 	Group pro- gram for older people (7 weeks) + boost- er sessions
Professional	 Knowledge, awareness and familiarity with recommenda- tion Knowledge about own practice Skills needed to adhere Skills needed to adhere Skills needed outcomes Nature of motivation Nature of behavior Team Processes Referral Processes 	 Belief selection Active learning Consciousness raising Guided practice Use of lay health workers; peer education Forming coalitions 	 Belief selection: Theory of Planned behavior Active learning: Social Cognitive Theory Consciousness raising: Health Belief Model, Trans-Theoretical Model Guided practice: Social Cognitive Theory Use of lay health workers; peer education: Theories of Social Networks and Social Support Forming coalitions: Models of Community Organization 	 Belief selection: Using messages designed to strengthen positive beliefs, weaken negative beliefs and introduce new beliefs Active learning: Encouraging learning from goal-driven and activity-based experience Consciousness raising: Providing information, feedback, or confrontation about causes, consequences, and alternatives for a problem Guided practice: Prompting individuals to rehearse and repeat the behavior various times, discuss the experience, and provide feedback Use of lay health workers, peer education: Mobilizing members of the target population to serve as boundary spanners, credible sources of information, and role models which they cooperate in joint action to reach a goal in their own self-interests 	2 Workshops

that to successfully implement a multifactorial falls prevention intervention it needs to be integrated in existing initiatives and systems. Thus, the content of the group sessions was linked to existing initiatives (e.g. Flemish Otago Exercise program, local exercise programs, pharmacy projects) and materials developed by the Center of Expertise for Falls and Fracture Prevention Flanders were incorporated (e.g. checklists for vision, concerns about falling, the use of mobility aids and appropriate footwear). The group program is designed for communitydwelling older people aged 65 and older who can walk independently outdoors with or without a walking aid, speak and understand Dutch, and meet at least one of the following falls-related criteria: a falls-related injury in the past year, two or more falls in the past year, self-reported gait or balance problems, or concerns about falling.

Figure 4 gives an overview of the implementation strategies, intervention and structure of the group program for older people.

2. Workshops

To address the needs identified in step 1 and 2 of IM, two workshops for healthcare professionals were developed to increase knowledge, skills and collaboration. The workshops focus on the multifactorial intervention (i.e. screening, multifactorial falls risk assessment, multidomain interventions and follow-up), reimbursement of healthcare costs, referrals to other healthcare professionals and motivational interviewing to empower the older people. Networking and building relationships among healthcare professionals is an essential part of the workshops. The workshops are facilitated by a trained expert in falls prevention and motivational interviewing. The main implementation strategies at the level of the healthcare professionals are: consciousness raising (i.e. providing information, feedback, or confrontation about causes, consequences, and alternatives for a problem), guided practice (i.e. prompting individuals to rehearse and repeat the behavior various times, discuss the experience, and provide feedback) and forming coalitions (i.e. forming an alliance among individuals or organizations, during which they cooperate in joint action to reach a goal in their own self-interests) [30]. Healthcare professionals can attend the workshops if they work in the PCA where the workshops are organized and if they can understand and speak the Dutch Language. Figure 5 entails an overview of the implementation strategies, content and structure of the workshops for healthcare professionals.

Step 4: program production

In step four of IM, the BE-EMPOWERed program components were produced, pretested and adapted within one PCA. The process involved the active engagement and collaboration of stakeholders within their systems, fostering co-production of knowledge.

In total, the group program was pilot tested twice and both workshops once. The demographics of the older people (n = 26) attending the group program and healthcare professionals attending the workshops (n = 11) can be found in Tables 4 and 5. Oral feedback was collected from two group leaders and falls prevention expert. Written feedback was collected from 24 older people (group program) and nine healthcare professionals for the first workshop and five for the second workshop. Overall, the majority of participants were "satisfied" or "very satisfied" with the content, clarity, location, pace, interaction and

Implementation strategies	Participants (action target)	Group program	Methods (action)	Impact
 Participation: Diffusion of Innovations Theory Belief selection: Theory of Planned behavior Consciousness raising: Health Belief Model, Trans-Theoretical Model Active learning: Social Cognitive Theory Tailoring: Trans-Theoretical Model Individualization: Trans-Theoretical Model Personalize risk: Precaution- Adoption-Process Model Guided practices Facial Cognitive 	 Community-dwelling 65 years and over No cognitive problems Independant with or without walking aid Understanding and speaking of the Dutch language Experienced one or more of the following events in the past year? One or more falls Mobility or balance problems Concerned about falling 	 Dose: 7 weeks (2 hours a week) + 2 booster sessions (after 3 months) Face to face group program 12 to 14 participants Key principals: Adult learning principles Decision-making process Self-efficacy Reflective motivation Problem solving Social support 	 Group leader facilitates interaction Group process for problem solving, support, reflection and feedback Positive optimism Story telling and using prompts Guest speakers S exercises from Flemish Otago 	 Assess your own fall risk Dealing with balance problems Ownership and empowerment Awareness of environmental safety Self-monitoring of actions Perform exercises for muscle strength, mobility and balance Home adjustments Talk to healthcare
Theory • Goal setting: Goal-setting Theory.	Where and by whom?	Multifactorial falls prevention Intervention: sessions	Challenges are	Outcome
 Theories of Self-Regulation Planning coping responses: Attribution Theory and Relapses Prevention Theory, Theories of Self- Regulation Providing opportunities for social comparison: Social Comparison Theory 	Location: • Local service center • Community health center • Social center Who provided (actor)? • Trained group leader • Guest speakers	 Introduction and life goals Balance, muscle strength and mobility Environmental safety and mobility aids Shoes, public places and transportation Vision and confidence Vitamin D, calcium and medication How further? 	 Experiencing and practicing Home work 	 Reduction of falls Increase self-confidence, ownership and self- efficacy with regard to fall prevention Maintain connection with community and healthcare professionals

Fig. 4 Group program for older people adapted from Clemson et al. [38]

Implementation strategy	Participants (action	Workshops	Methods	Impact	Outcome
 Belief selection: Theory of Planned behavior Active learning: Social Cognitive Theory Consciousness raising: Health Belief Model, Trans-Theoretical Model Guided practice: Social Cognitive Theory Use of lay health workers; peer education: Theories of Social Networks and Social Support Forming coalitions: Models of Community Organization 	 Healthcare professionals Working in the primary care area Understanding and speaking of the Dutch language By whom? (actor) Healthcare professional and trained falls prevention expert 	 Dose: 2 workshops (lunch or evening), 2.5 hours each Content workshop 1: Multifactorial intervention (screening, multifactorial falls risk assessment, multidomain interventions, follow-up) Reimbursement of healthcare costs Referrals to other healthcare professionals Content Workshop 2: Motivational interviewing to empower the older people 	 Raising awareness Networking Active learning Group work Experiencing and practicing Discuss cases Receiving feedback 	 Perform fall risk screening Assess different fall risk factors (multifactorial assessment) Organize a multidisciplinary consultation Plan suitable interventions, tailored to one's risk profile and needs Plan follow-up Coordinate care Report actions and decisions Motivate older people 	 Reduction of falls Increase self- confidence, ownership and self-efficacy regarding fall prevention Maintain connection with community and healthcare professionals

Fig. 5 Workshops for healthcare professionals

Tab	le	4	Demograp	hics old	der peop	le group	program

	Older people
	n=26
Age	86 (66, 90)
Gender	
Female	20 (77%)
Male	6 (23%)
Marital status	
Single	4 (15)
Legal partners	0
Married	7 (27%)
Widow	14 (54%)
Missing	1 (4%)
Highest degree	
Secondary degree	8 (31%)
Associate degree	0
Bachelor	9 (35%)
Bachelor after bachelor	0
Master	0
Master after master	1 (4%)
PhD	1 (4%)
Other	7 (27%)
Fall in last 12 months	13 (50%)
Concerns about falling	21 (81%)
Mobility or balance problems	17 (65%)
Use of a walking aid	12 (46%)
Home care: nurse	3 (12%)
Home care: HCP	0
Home care: cleaning	5 (19%)
Home care: family help	4 (15%)
Home care: other	2 (7%)

materials (see Tables 6 and 7). Based on the feedback, small adaptations to the timetables of the group program and the workshops were made and more time was allocated to networking and questions of participants of the workshops. The group leaders found the developed materials and handbook useful, clear and complete. They shared some extra tips to recruit older people and to find

Table 5	Demographics	healthcare	professionals	attending	the
worksho	ps				

	Health-
	care pro-
	fessionals
	n = 11
Gender	
Female	10 (91%)
Male	1 (9%)
Age (years)	37 (24,59)
Highest degree	
Bachelor	9 (82%)
Bachelor after bachelor	1 (9%)
Master	1 (9%)
Currently employed	11 (100%)
Profession	
Registered nurse	2 (18%)
Physiotherapist	1 (9%)
Occupational therapist	5 (46%)
Social worker	3 (27%)
Other	
Years in current job	12 (1,27)
Years of experience	15,5 (1,37)
Followed additional training on falls prevention	2 (18%)

 Table 6
 Percentage of older people who scored 'satisfied' or 'very satisfied' regarding the group program

, , , , , , , , , , , , , , , , , , , ,	11 5
Item	Group program (n = 24) Satisfied/very satisfied (%)
Content of the sessions	96
Clarity	96
Location	96
Pace	92
Interaction	92
Materials	96
Guest speakers	96
General	96

Table 7	Percentage of he	althcare pro	ofessionals who	scored
satisfied	or very satisfied re	egarding the	e workshops	

Item	Workshop 1 (n=9) Satisfied/very satisfied (%)	Workshop 2 (n=5) Satisfied/very satisfied (%)
Content of the workshops	100	100
Clarity	100	100
Location	100	100
Pace	100	100
Interaction	89	100
Materials	100	100
Networking	67	80
General	100	100

suitable guest speakers. The falls prevention expert was also positive about the developed material for the workshops. To increase participation, the expert suggested to organize the workshops for healthcare professionals at a different time point in the day. Furthermore, no major changes were necessary.

Step 5: program implementation plan

In step five of IM, a detailed implementation plan was developed for the tailored deployment of the components of the BE-EMPOWERed program.

The following key insights from the two systematic reviews and qualitative study were considered in designing the implementation plan [10, 13, 26]:

- Multilevel approach: Implementation strategies must address multiple determinants at different levels and facilitate interactions between them.
- Stakeholder involvement: The prioritization of determinants and selection of implementation strategies should be a collaborative effort, ensuring alignment with stakeholder needs and perspectives.
- Collaboration and coalition-building: Engaging stakeholders throughout both the development and implementation phases enhances long-term sustainability.
- Contextual tailoring: Implementation strategies should be adapted to fit the specific needs and characteristics of the local context.

1. Implementation plan

Informed by the findings of the qualitative study, PCAs and local authorities were seen as key stakeholders in the implementation of multifactorial falls prevention interventions in the community [26]. The implementation plan was developed collaboratively with one PCA, and incorporates key implementation strategies from the systematic review, including technical assistance, use of lay health workers, peer education, increasing stakeholder influence, forming coalitions and community development [13]. The implementation plan allows tailored implementation of the BE-EMPOWERed program in the different PCAs. Figure 6 gives a brief description of the six steps and the content of the implementation plan. Table 8 provides an overview of the implementation



- Enable support from the president of the primary care area and local policy makers
- · Appoint a falls prevention coordinator
- Compose a falls prevention local stakeholder group
- Involve stakeholders

Step 2: Map baseline situation

Gain insight into the existing activities, protocols and initiatives regarding falls prevention

Step 3: Define objectives and priorities

- Develop a vision
- · Develop aims and prioritize them
- Communicate vision and aims

Step 4: Plan implementation

Develop an action plan for the group program and the workshops

Step 5: Implementation

Step 6: Evaluate, adjust and work towards sustainability



Fig. 6 Steps and content implementation plan

le 8	Overview implementatic	on strategies and re	elated behavior change theories for	the primary care area and implementation facilitator	
ш.	Determinant	Implementation	Theory	Definition (Kok et al., 2016)	Component
		suareyy			
>	• Mandate	Increasing stake-	 Increasing stakeholder influence: دامه ماطعة Thanky 	Increasing stakeholder influence: Increase stakeholder power, legitimacy, and urgency, After by forming coolitings and using community development and social action to	• Implemen- tation plan:
		נוסומבו וווומבוורב		טונפוז של זטוווווווט כטמוווטוז מווט עצוויוט כטווווזטוווט שפיפוטאווופוז מוט צטכומו מכנוטוו נט	
	 Capable leadership 	 Forming 	 Forming coalitions: Models of Com- 	change an organization's policies	Step 1–6
	 Relative strength of sup- 	coalitions	munity Organization	 Forming coalitions: Forming an alliance among individuals or organizations, during 	• Imple-
	porters and opponents	 Participatory 	 Participatory problem solving: Mod- 	which they cooperate in joint action to reach a goal in their own self-interests	mentation
	 Regulations, rules, policies 	problem solving	els of Community Organization	 Participatory problem solving: Diagnosing the problem, generating potential solutions, 	facilitator
	 Priority of necessary 	 Technical 	 Technical assistance: Models of 	developing priorities, making an action plan, and obtaining feedback after implement-	
	change	assistance	Community Organization	ing the plan	
	 Availability of necessary 	 Community 	 Community assessment: Models of 	 Technical assistance: Providing technical means to achieve desired behavior 	
	resources	assessment	Community Organization	 Community assessment: Assessing a community's assets and needs, with feedback of 	
	 Monitoring and feedback 	 Community 	 Community development: Models 	results to the community	
		development	of Community Organization	 Community development: A form of community organization, based on consensus, in 	
		 Agenda setting 	 Agenda setting: Multiple Streams 	which power is shared equally and members engage together in participatory problem	
			Theory, Advocacy Coalition Theory,	solving	
			Theories of Power-	 Agenda setting: Process of moving an issue to the political agenda for action; may make use of broad policy advocacy coalitions and media advocacy 	
	 Knowledge, aware- 	 Belief selection 	 Belief selection: Theory of Planned 	Belief selection: Using messages designed to strengthen positive beliefs, weaken nega-	• Training
	ness and familiarity with	 Active learning 	behavior	tive beliefs and introduce new beliefs	implementa-
	recommendation	 Guided practice 	 Active learning: Social Cognitive 	 Active learning: Encouraging learning from goal-driven and activity-based experience 	tion facilita-
	 Skills needed to adhere 		Theory	• Guided practice: Prompting individuals to rehearse and repeat the behavior various	tors (3 days)
	 Intention and motivation 		 Guided practice: Social Cognitive 	times, discuss the experience, and provide feedback	• Training
	 Self-efficacy 		Theory		group lead-
					ers (2 days)
					 Peer coach-
					ing sessions
					 Telephone
					coaching

strategies and related behavior change theories underlying the implementation plan. The primary implementation strategies include: 'Increasing stakeholder influence' (i.e. increase stakeholder power, legitimacy, and urgency, often by forming coalitions and using community development and social action to change an organization's policies), 'community development' (i.e. a form of community organization, based on consensus, in which power is shared equally and members engage together in participatory problem solving) and 'agenda setting' (i.e. process of moving an issue to the political agenda for action; may make use of broad policy advocacy coalitions and media advocacy) [30].

2. Implementation facilitator

Implementation facilitators play a pivotal role in guiding the three additional PCAs through the implementation process, providing crucial support in executing the various steps of the plan. Each PCA is allocated an implementation facilitator for 252 h spread over two years, with these hours funded by the Flemish Government. The facilitators are responsible for supporting the PCA in navigating the steps of the implementation plan, organizing the group program for older people and conducting workshops for healthcare professionals. The main implementation strategies and related behavior change theories applied during the training and followup of the implementation facilitators are: active learning (i.e. encouraging learning from goal-driven and activitybased experience) and guided practice (i.e. prompting individuals to rehearse and repeat the behavior various times, discuss the experience, and provide feedback) (Table 8) [30].

Step 6: evaluation plan

In step 6 of IM, an evaluation plan was developed for the ongoing assessment of the BE-EMPOWERed program in four PCAs (one PCA that collaborated in the development phase and three additional PCAs with implementation facilitators). The implementation outcomes to assess were chosen based on the program objectives and outcomes defined in step 2 of IM.

This mixed methods study focuses on collecting data related to various implementation outcomes and process: reach (i.e., the absolute number, proportion, and representativeness of individuals who are willing to participate in the group program and workshops), fidelity (i.e., the degree to which the group program and workshops are implemented as it was prescribed in the original protocol), feasibility (i.e., the extent to which the BE-EMPOW-ERed program can be successfully used or carried out within a PCA), acceptability (i.e., the perception among implementation stakeholders that the group program and workshops are agreeable, palatable or satisfactory), sustainability (i.e., the extent to which BE-EMPOWERed is maintained or institutionalized within a service setting's ongoing, stable operations) and cost of implementation (i.e., the cost of an implementation effort).

The researchers will gather information on and experiences with the implementation process of the BE-EMPOWERed program from the perspective of the older people, healthcare professionals, implementation facilitators, the local stakeholder group of the PCAs and local policy makers. Furthermore, change in behavior of healthcare professionals (i.e. perform falls risk screening, assessment, plan interventions,...) is being assessed by means of surveys.

In addition, the effectiveness of the multifactorial falls prevention intervention will be evaluated based on several factors: changes behavior of the older people, concerns about falling of the older people, balance, walking speed and muscle strength, fallers. A variety of methods are used to collect data such as self-reported implementation costs, fidelity checklists, participant lists, observation, meeting minutes, surveys, tests and focus group interviews.

Table 9 gives an overview of the outcomes and measurements of this mixed methods study. The study protocol is registered at ClinicalTrials.gov (NCT06105437) on 27 October 2023. The results of this mixed methods evaluation will be reported elsewhere.

Discussion

The systematically developed BE-EMPOWERed program includes a group program for older people and workshops for healthcare professionals, supported by an implementation plan facilitated by trained implementation facilitators. The program is anchored in the IM methodology, incorporating context, evidence and theory for enhanced effectiveness [15, 18]. Previous studies on falls prevention did not clearly describe how the intervention and implementation plan were developed; making it hard to replicate, to build on research findings and to gain insight into the underlying mechanisms of actions for behavior change [13, 39].

Recent studies, such as the Norwegian FALLPREVENT project, have explored the feasibility and development of falls prevention programs [40, 41]. Their co-created strategy consists of an implementation package with four components: [1] empowering leaders to facilitate implementation, [2] compose multidisciplinary implementation teams, [3] dual competence improvement (both falls prevention and implementation) and [4] implementation support. A strength of FALLPREVENT is the local tailoring of the implementation strategies to city districts by involving stakeholders in a co-creation approach [40, 41]. While the implementation strategies and components of FALLPREVENT are comparable to our implementation

Table 9 Overview outcomes and measurement mixed met	hods study		
Outcome	Measurement	Time point	Data collection
Implementation outcomes Reach (older people and healthcare professionals)	Participant list group program Participant list workshops	After every session	Group leader
-	-	After every workshop	and Falls
			expert
Fidelity group (group leader and falls prevention expert)	Fidelity checklist and observation of group program and workshops	After every session	Group leader
		Observation of one session	Researcher
Implementation cost	Self-report of costs group program, workshops	For 2 years	Group leader Primary care
			area
Experiences (older people, healthcare professionals, group leaders, stakeholders, local policy makers, implementation facilitator)	Focus group Meeting minutes of the falls prevention local stakeholder group of the primary care area, peer coaching sessions,	Evaluation phase	Researcher
Feasibility (older people, healthcare professionals, group leaders, stakeholders, local policy makers, implementation facilitator)	Focus group Meeting minutes of the falls prevention local stakeholder group of the primary care area, peer coaching sessions	Evaluation phase	Researcher
Acceptability (older people, healthcare professionals, group leaders, stakeholders, local policy makers, implementation facilitator)	Focus group Meeting minutes of the falls prevention local stakeholder group of the primary care area, peer coaching sessions	Evaluation phase	Researcher
Behavior healthcare professional	Questionnaire	Baseline and after 3 months	Researcher
Clinical outcomes			
Behavior older person	Falls Behavioral (FaB) Scale for the Older Person Incidental and planned activity questionnaire (IPEQ) for older people	Baseline and after 6 months	Researcher
Concerns about falling	Falls Efficacy Scale International (16 items)	Baseline and after 6 months	Researcher
Fallers	Questionnaire	Baseline and after 1 year	Researcher
Balance, walking speed and muscle strength	Short Physical Performance Battery (SPPB)	Baseline, after 7 weeks and after 8 months	Group leader

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plan, our study also provides a detailed account of the development and tailoring of the multifactorial falls prevention intervention. Our contextual analysis (i.e. qualitative study) showed the complexity of implementing a multifactorial falls prevention intervention in the community setting in Flanders [32]. To address this complexity, we developed the intervention and suitable implementation strategies together with a stakeholder group and one PCA. We defined fixed key elements related to effectiveness of the intervention and the implementation plan. This was translated into the group program, workshops and a practical implementation plan that supports local tailoring by PCAs and implementation facilitators.

A key strength of our study is the methodological rigor and the innovative approach taken in developing the BE-EMPOWERed program. Unlike previous multifactorial falls prevention interventions, the BE-EMPOWERed program is built on the foundation of two systematic reviews and a contextual analysis (i.e. needs assessment) [10, 13, 26], guided by IM [15]. Recent developments in complexity science within implementation science highlight the importance of understanding dynamic interactions within a certain context to inform intervention development, the selection of implementation strategies and the interpretation of implementation and effectiveness outcomes [42, 43]. A critical gap in the field is the lack of explicit contextual analysis to inform intervention development and implementation strategies. Despite its proven importance, the review of Vandervelde et al. (2023) showed that no studies implementing a multifactorial falls prevention intervention in the community setting reported a contextual analysis as foundation for their intervention development and chosen implementation strategies [13]. The BE-EMPOWERed program addresses determinants at the level of the older person, healthcare professional and local policy makers. While many studies focus primarily on interventions and strategies at the level of the older person and/or healthcare professional, our program also emphasizes implementation strategies at environmental level (i.e. organization, community, and policy/society) [13]. To bridge 'the know-do gap,' we established a partnership between researchers and end-users [44], involving an iterative and interactive process of knowledge exchange. Evidence shows that participatory approaches may increase collaboration among practitioners, organizations and researchers in the community, thereby increasing the likelihood of successful implementation [44, 45]. By integrating these elements- contextual analysis, multi-level implementation strategies, and participatory knowledge exchange-**BE-EMPOWERed** represents a novel and comprehensive approach to falls prevention that sets it apart from existing programs.

Nevertheless, this study has some limitations. First, the development of the BE-EMPOWERed program was a time-intensive process, integrating IM, Implementation Mapping, and the MRC framework [15, 17, 18]. The prioritization of determinants was informed by a qualitative study conducted during COVID-19, which may have introduced bias, potentially influencing the development of implementation theories and practical applications [26]. Furthermore, the program was designed and pre-tested within a single PCA, which could limit its generalizability to other areas in Flanders due to differences in demographics, policies, and priorities. Next, the lack of interventions for family and informal caregivers is a notable gap. The rapid review of Sultana et al. (2023) states, that informal caregivers can have an important role in preventing falls among cognitive impaired older people [46]. The results of the mixed methods study (Step 6 of IM) will inform us whether additional components need to be developed for informal caregivers and family. In addition, the needs assessment highlighted the urgent need to have a multidisciplinary care plan for healthcare professionals, to address the complexity of falling. While the BE-EMPOWERed program includes two workshops aimed at increasing knowledge, awareness, skills and familiarity with the falls prevention intervention, motivation, self-efficacy and team- and referral processes, it may be beneficial to develop an integrated pathway for healthcare professionals. Other programs such as STEADI and iSOLVE have developed an integrated pathway to screen for people at risk of falling and to engage a primary care approach to prevent falls [47, 48]. In the mixed methods evaluation study, it will also be necessary to assess the implementation cost and the added value of implementation facilitators. These results can inform the sustainability and potential scale-up of the BE-EMPOWERed program. It is possible that there will be no additional funding from the government to appoint an implementation facilitator, in the future. The possibility of limited future funding for implementation facilitators could significantly impact the success of the implementation project [49]. Although we used implementation facilitators to support three PCAs, coaching and close follow-up (e.g. peer debriefing, monthly telephone calls) by the researchers is still needed. A similar finding is mentioned in the feasibility study of FALLPREVENT [40]. Lastly, the group program mainly focuses on an at-risk population that is still active and healthy. The results of the mixed methods study will inform us if an additional component needs to be developed for the more frail target population.

Conclusion

This study emphasizes the challenges in implementing multifactorial falls prevention interventions, citing determinants like lack of knowledge, poor motivation, and inadequate resources and support. A collaborative and participatory approach involving stakeholders throughout the development and implementation phases is essential to drive sustainable change [41, 42, 50]. This approach fosters knowledge exchange and increases collaboration among practitioners, organizations, and researchers. By acknowledging the dynamic nature of context and its interaction with interventions, the study highlights the significance of understanding and continually assessing the context to inform intervention development and implementation strategies. Our study provides a detailed account of the development and implementation planning for the BE-EMPOWERed program, offering insights for falls prevention researchers, healthcare professionals, and policymakers. The transparent documentation of the development of the intervention and implementation strategies aims to enhance the uptake, effectiveness, and sustainability of multifactorial falls prevention interventions in the community setting. The ongoing mixed methods study will further contribute to the understanding of the program's implementation process and outcomes.

Abbreviations

IM	Intervention Mapping
MRC	Medical Research Council
PCA	Primary Care Area
PDCA cycle	Plan, Do, Check, Act cycle
StaRI checklist	Standards for Reporting Implementation Studies
TIDieR	Template for Intervention Description and Replication

Supplementary Information

The online version contains supplementary material available at https://doi.or g/10.1186/s12877-025-05879-9.

Supplementary Material 1

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Author contributions

SAV, EV, BDdC, KM: Study design. SAV, EV, BDdC, GB, KD, LC, MS, KM: Development and production of BE-EMPOWERed. SAV, KD: Drafting the manuscript. EV, BDdC, JF, KM: Supervision. All authors read and approved the final manuscript.

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Data availability

All data generated or analyzed during this study are included in this published article.

Declarations

Ethics approval and consent to participate

Research have been performed in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Social and Societal Ethics Committee of Leuven University Hospitals, on 26 January 2023 [G-2022-5783-R3(AMD)]. All participants provided written informed consent. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication

Competing interests

No personal data were included in this manuscript.

The authors declare no competing interests.

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