



Establishing a community pharmacy-based fall prevention service – An implementation study

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ABSTRACT

Background: Community pharmacists are in the position to contribute to fall prevention, but this is not yet common practice.

Objective: The aim of this study was to evaluate the implementation of a community pharmacy-based fall prevention service.

Methods: A fall prevention service, consisting of a fall risk screening and assessment including a medication review, was implemented in pharmacies during three months. A preparative online training was provided to the pharmacy team to enhance adoption of the service. Included patients were aged ≥ 70 years, using ≥ 5 drugs of which ≥ 1 fall risk-increasing drug. The implementation process was quantitatively assessed by registering medication adaptations, recommendations, and referrals. Changes in patient scores on the Short Fall Efficacy Scale-International (FES-I) and a fall prevention knowledge test were documented at one month follow-up. Implementation was qualitatively evaluated by conducting semi-structured interviews with pharmacists before and after the project, based on the consolidated framework of implementation research.

Results: The service was implemented in nine pharmacies and 91 consultations were performed. Medication was adapted of 32 patients. Patients' short FES-I scores were significantly higher at follow-up ($p = 0.047$) and patients' knowledge test scores did not differ ($p = 0.86$). Pharmacists experienced the following barriers: lack of time, absence of staff, and limited multidisciplinary collaboration. Facilitators were training, motivated staff, patient engagement, and project scheduling.

Conclusion: The service resulted in a substantial number of medication adaptations and lifestyle recommendations, but many barriers were identified that hamper the sustained implementation of the service.

1. Introduction

Pharmacy practice research is an evolving field of science, investigating the provision of pharmaceutical care.^{1,2} Fall prevention is an example of an important health topic that is gaining pharmacists' interest.^{3,4} Currently, falling among older people is an escalating problem, due to increased life expectancy, aging of the population, people living longer at home, and the serious consequences of falls.⁵ The structural

implementation of pharmaceutical care services, including fall prevention care, in routine practice is warranted in order to improve patient outcomes.^{1,2}

Effective multiple component fall prevention interventions target common modifiable fall risk factors, including impaired mobility, medication use, and home environmental hazards.⁶ Despite the fact that multiple component fall prevention interventions have shown to be effective, implementation of these interventions in daily clinical practice

Abbreviations: short FES-I, Short Fall Efficacy Scale-International; FRID, fall risk-increasing drug; GP, general practitioner; CFIR, consolidated framework of implementation research; UPPER, Utrecht Pharmacy Practice Network for Education and Research; StaRI, Standards for Reporting Implementation Research; sd, standard deviation.

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is difficult, as circumstances in clinical practice differ from those in research settings with respect to e.g. timing, funding and target population.^{7–9} It is thus essential to gain more insight into the implementation process, including its barriers and facilitators.⁹

Nowadays, the provision of fall prevention care is not common in daily practice of community pharmacies in the Netherlands. Previously, pharmacists indicated that, despite their current limited contribution, they are motivated to contribute to fall prevention.¹⁰ Pharmacists could contribute to fall prevention by recognizing and modifying the use of fall risk-increasing drugs (FRIDs), identifying patients at risk of falls, and improving their collaboration with regard to fall prevention with general practitioners (GPs), home care nurses, and physiotherapists e.g., by referring patients.^{6,11–13} Deprescribing of FRIDs, preferably alongside interventions targeting other fall risk factors, is an effective component of the multifactorial falls evaluation in older patients.¹⁴

Even though pharmacists believe their involvement in fall prevention is relevant, their current contributions seem limited.^{10,15} Pharmacists should therefore be supported to successfully implement fall prevention services in their daily practice, in order to advance sustained implementation. Pharmacy technicians are experienced in instructing patients on their medication use. They are also trained to explore and provide counselling on medication-related problems. In the Netherlands, pharmacy technicians are the first point of contact for patients.^{16,17} Pharmacy technicians could hence contribute to the provision of fall prevention in community pharmacies. However, pharmacy staff's experiences, including their barriers and facilitators, regarding the provision of such services are currently unknown.

Based on previous findings,^{6,13,18} a new community pharmacy fall prevention service was developed by the research team. The aim of the current study was to assess the implementation process, including the potential benefit on patient outcomes, of the service and to describe the barriers and facilitators for the implementation of a community pharmacy fall prevention service.

2. Methods

2.1. Study design and setting

An implementation study was conducted in 10 Dutch community pharmacies. The implementation of the community pharmacy-based fall prevention service was assessed both quantitatively and qualitatively.

The implementation process and the potential benefit on patient outcomes were quantitatively assessed by registering durations of the provided service, medication adaptations, recommendations, and referrals to other health care providers. Furthermore, changes in patient scores on the Short Fall Efficacy Scale-International (FES-I) and a fall prevention knowledge test were documented at one month follow-up. Implementation was qualitatively evaluated by conductance of semi-structured interviews with pharmacists before and after the project, based on the consolidated framework of implementation research (CFIR).

The planned duration to evaluate the implementation in each pharmacy was a period of three months. The pharmacists received training, toolkit material, and support of the research team to provide fall prevention. Pharmacies participated sequentially, therefore the data were collected between September 2020 and September 2021.

2.2. Fall prevention service

The fall prevention service consisted of 1) a fall risk screening and 2) a fall consultation to assess modifiable fall risk factors with accompanying interventions conducted by the pharmacy technician and 3) a quick medication check and 4) a comprehensive medication review if needed by the pharmacist (Fig. 1).

2.3. Training and toolkit material

As an implementation strategy, used to enhance the adoption of the service, the pharmacy staff was provided a preparative online training and toolkit material:

- an e-learning about FRIDs and the different steps of the service;
- a quick fall risk screening instrument (Fig. 2);
- a fall consultation guide (a manual to assess fall risk, refer patients to other healthcare providers, and provide them personalized recommendations; supplementary Information: Table 1);
- a patient information leaflet.

Furthermore, they received an explanatory instruction and support from the research team during the evaluation period of three months. The research team encouraged participating pharmacists to perform at least 10 fall consultations.

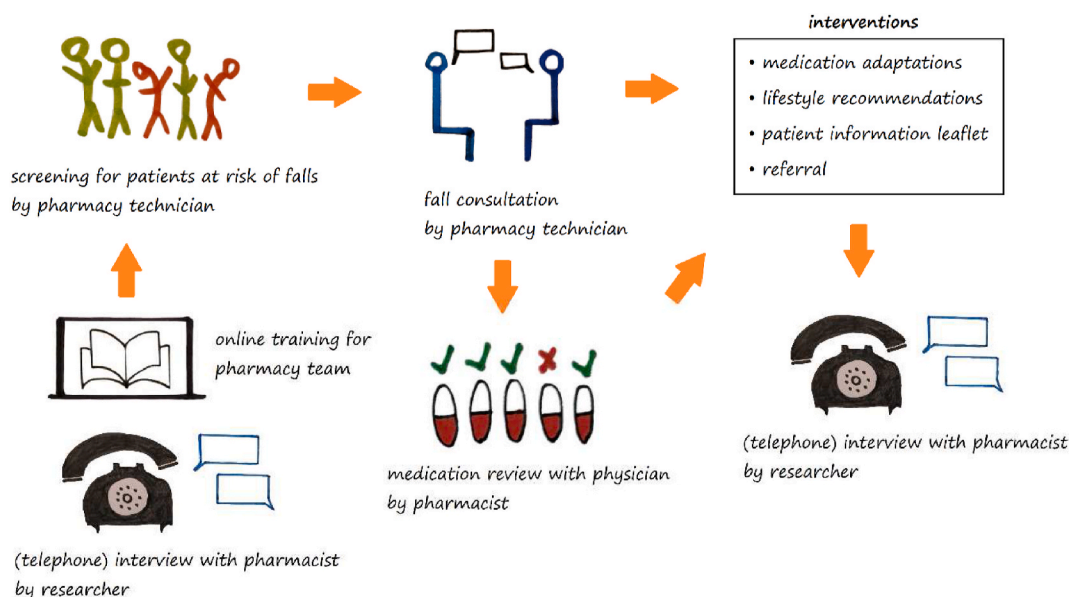


Fig. 1. Overview of the steps of the implementation research, including the steps of the fall prevention service.

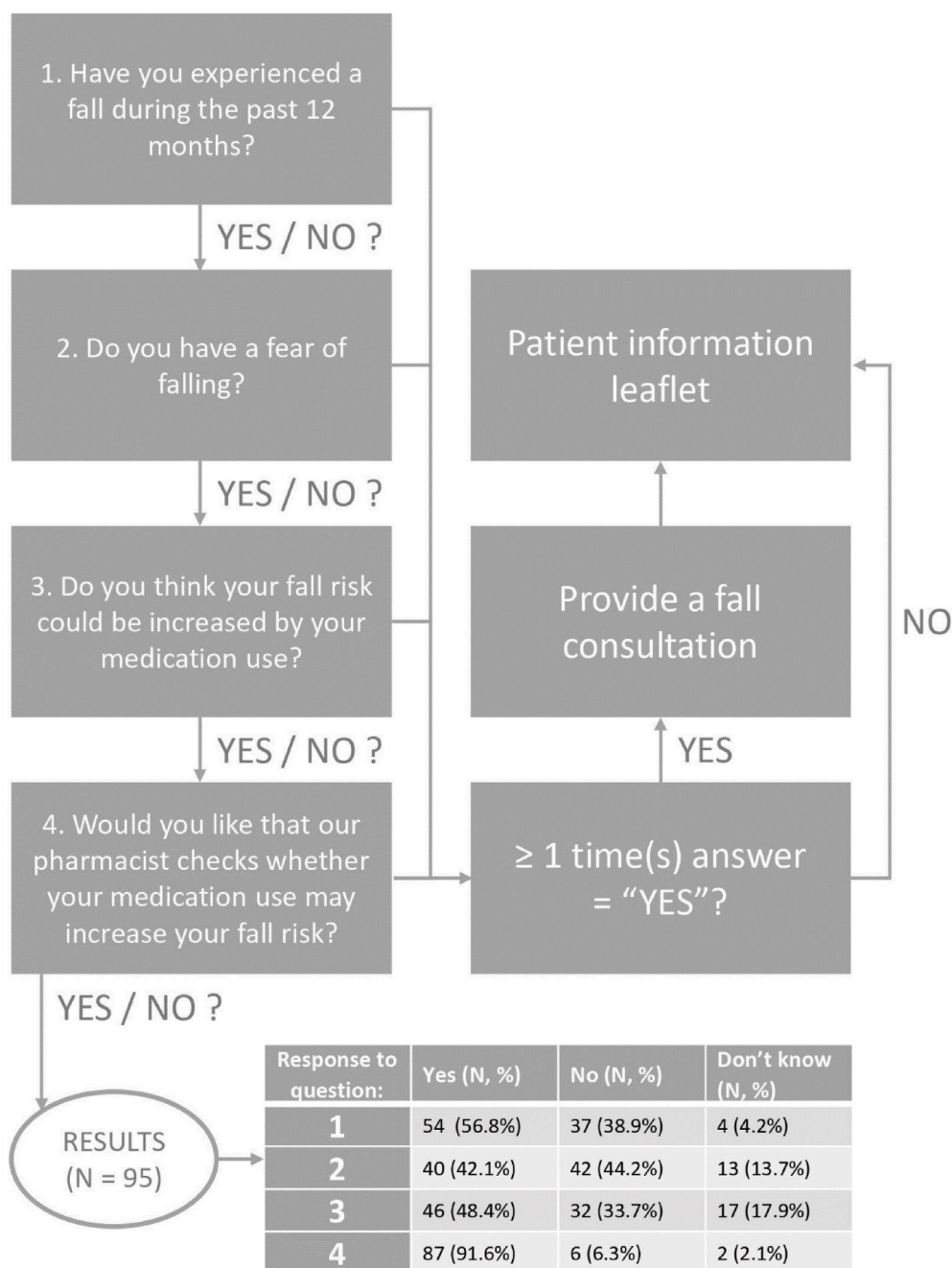


Fig. 2. Quick screening conducted by the pharmacy technician. The table shows the number (and percentages) of given responses of the 95 participants to the questions of the quick screening.

The quick screening was developed based on (1) a validated fall risk screening instrument, which includes two screening questions^{23,24} and (2) the minimal intervention strategy for smoking cessation.²⁵ The minimal intervention strategy recommends to ask patients about their motivation to quit smoking. Patients who indicate to have low motivation are subsequently not included for smoking cessation programs.

Pharmacists and pharmacy technicians completed the e-learning about FRIDs and the different steps of the fall prevention service prior to implementation. In the e-learning attention was paid to improving collaboration in fall prevention and for what risk factors patients may be referred to other health care providers. The training was based on Dutch fall prevention guidelines and current evidence concerning identification and deprescribing of FRIDs.^{18–22} Pharmacists completed an extended version of the e-learning for pharmacy technicians to ensure

they were sufficiently trained regarding the decision-making of deprescribing of FRIDs. For support with deprescribing, pharmacists were referred to evidence-based resources (e.g. the European consensus FRIDs list and deprescribing tool STOPPFall).¹⁸

2.4. Recruitment

2.4.1. Participating pharmacists

Pharmacists affiliated with the Utrecht Pharmacy Practice Network for Education and Research (UPPER) were informed about the study by an online newsletter and could sign-up accordingly.²⁶ Participating pharmacists and pharmacy technicians received an invitation letter and all of them gave oral informed consent before start of the study. Pharmacists were asked to share their background characteristics, including

age, gender, and years of work experience.

2.4.2. Patient inclusion criteria

Patients meeting the following criteria were eligible for the intervention: aged ≥ 70 years, using ≥ 5 drugs simultaneously of which ≥ 1 classified as FRID.^{19–21} Pharmacists extracted patients from the pharmacy information system based on polypharmacy and age, and thereafter manually selected patients using ≥ 1 FRID. Patients were informed about the study by the pharmacy technician by information letter and/or telephone. Upon receiving signed informed consent, a quick fall risk screening was conducted by the pharmacy technician with patients in order to decide whether they were eligible for fall consultations. Patients were excluded if they answered “no” to all questions of the fall risk screening.

2.4.3. Ethics and confidentiality

The study protocol was approved by the Institutional Review Board of the Division of Pharmacoepidemiology and Clinical Pharmacology, Utrecht University (reference number UPF2007). All participating patients gave written consent and all participating pharmacists gave oral consent. The Standards for Reporting Implementation Research (StaRI) were followed and uploaded (Supplementary information: Table 3).

2.5. Data collection

Data collection focused on two aspects of the implementation: 1) quantitative assessment of the process of the implementation and 2) qualitative evaluation of pharmacy staff perspective on implementation.

2.5.1. Quantitative assessment of the implementation process

Medication verification was performed at start of the fall prevention service. All responses to quick screening questions were noted by the pharmacy technician, as well as all recommendations from fall consultations. Pharmacists registered their suggestions for drug changes and the actual changes after agreement by the GP and patient. The durations of the fall consultations were noted.

To examine the effect of the service on patient outcomes, patients' fear of falling and patients' fall prevention knowledge were measured at baseline and follow-up. Fear of falling was originally defined as a fear of standing or walking, due to concerns about that these activities might lead to a fall. Nowadays, the definition of fear of falling also includes avoidance of activities or reduced self-efficacy due to a fear of falling.²⁷ As fear of falling, thus, can lead to reduced activity, it subsequently may increase the fall risk. In literature, the validated Short Fall Efficacy Scale-International (FES-I) is often applied to quickly assess fear of falling.²⁸ After the quick screening eligible patients completed the (FES-I and a short knowledge test about fall prevention. The FES-I consists of seven questions assessing fear of falling on a scale of 1–4. The sum score ranges from 7 to 28; scores 7–8 suggest low fear of falling, scores 9–13 moderate fear of falling, and scores 14–28 high fear of falling. The knowledge test consisted of 12 multiple choice questions and the percentage of correct answers was calculated. These 12 multiple choice questions were derived from a fall prevention game developed by a Dutch organisation that aims to prevent accidents and improve safety nationwide. The research team applied this game in a previous study.²⁹ The knowledge test included 5 questions about the relation between medication use and falls, 2 questions about calcium/vitamin D intake, 1 question about relevance of exercise, 1 question about frequency of falls, 1 question about fear of falling, 1 question about vision, and 1 question about footwear. The FES-I and knowledge test were also administered at one-month follow-up.

2.5.2. Qualitative evaluation of pharmacy staff perspective

Pharmacists were interviewed before and after approximately three-months, except for one pharmacist who was involved as a researcher in this project (MG). In principle, interviews were performed with

pharmacists only, but the researchers accepted double interviews when pharmacists asked team members to join the interviews. During these interviews, pharmacists' perception on the implementation of fall consultations in their practice was investigated. The semi-structured interview guide was based on the five domains of the CFIR (Fig. 3; Supplementary Information: Table 2).³⁰

The CFIR was applied to guide interview data collection for evaluation of the implementation process.³⁰ This is a widely used framework in implementation research used to investigate barriers and facilitators explaining implementation outcomes.^{31,32} The CFIR is an implementation theory to detect determinants explaining the results of implementation at multiple levels, categorized in five domains: intervention characteristics, outer setting, inner setting, characteristics of the individuals involved, and the process of implementation.

2.6. Data analysis

Descriptive statistics were used for pharmacists' and patients' background characteristics. The implementation of the fall prevention service was described by calculating the mean durations of the consultations and the number of medication adaptations, recommendations, and referrals to other health care providers. Two-tailed paired t-tests were conducted to investigate the significance of intervention effects on patients' scores on knowledge and FES-I. A significance level of < 0.05 was considered statistically significant.

The audio-recordings of the interviews were transcribed verbatim and imported in NVivo version 12 software. Names of participants were removed from the transcript. The interviews were analysed by a post-graduate student researcher (MG) with experience in qualitative research. The interviews were deductively coded by MG by use of a topic list based on CFIR. An experienced postgraduate researcher (EK) carefully checked and reviewed the coding process of all interviews. This entailed that the correct identification of topics and the consistency of the coding process were reviewed. Additionally, EK made suggestions to enhance interpretability. Inconsistencies were resolved through discussion with a third researcher (MB).

3. Results

3.1. Quantitative assessment of the implementation process

From 10 pharmacies that agreed on participating nine pharmacies completed their participation in the research (Fig. 4). The mean participation duration of the project was 3.9 months per pharmacy (sd = 1.4). The number of fall consultations per pharmacy ranged from 2 to 32 (median = 6 [Q1 – Q3 = 4–9]). The median duration of the fall consultation was 38 min (Q1 – Q3 = 30–45 min).

In total, 771 patients were invited and 95 of them agreed on the quick screening. Of these patients, 56.8% reported at least one fall in the past year and 42.1% reported a fear of falling (Fig. 2). Nearly half of the participants (48.4%) thought their medication use could influence their risk of falling and the majority (91.6%) appreciated a medication review by the pharmacist. After the quick screening, four patients were excluded, since they answered “no” to all questions of the fall risk screening and were therefore ineligible for receiving a fall consultation.

A total of 91 patients received a fall consultation and 87 of them also underwent the follow-up. All patients received a quick medication check by the pharmacist, and for 41 patients a medication review with a physician was conducted. More men (52.7%) than women participated, and the median age of the participants was 78 years (Q1 – Q3 = 74–85.5 years).

In total, 157 lifestyle recommendations were given to the 91 patients. Of these, patients were most often recommended on home safety (N = 39; 42.9%), footwear (N = 38; 41.8%), and exercise (N = 39; 39.6%). Twenty-three patients (25.3%) were referred to another health care provider e.g. for a full multifactorial fall risk assessment in

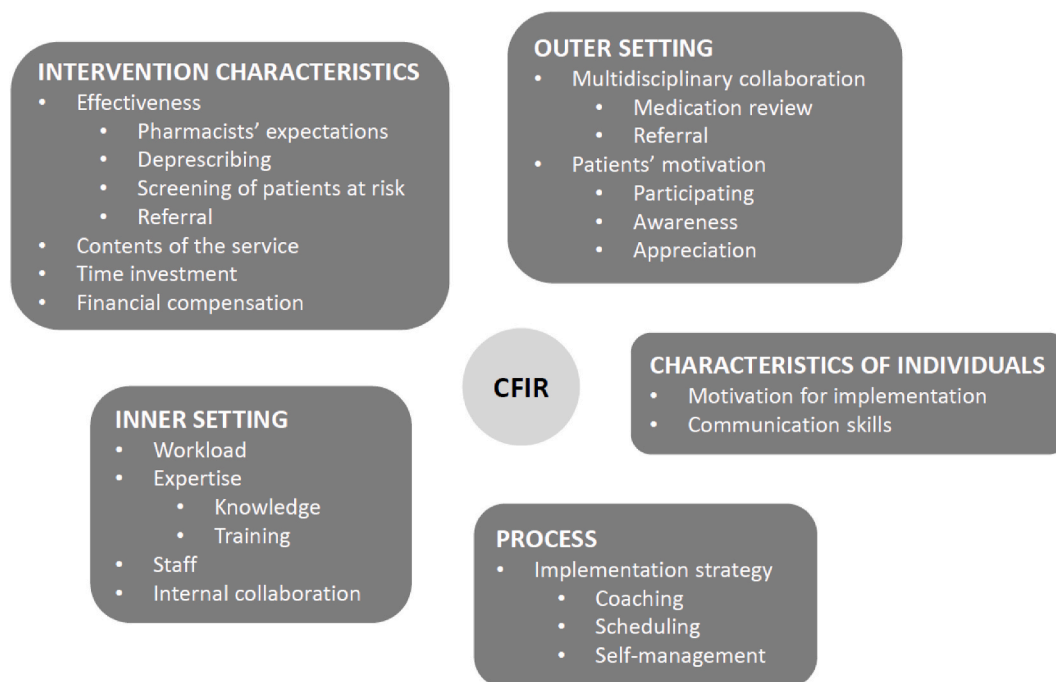


Fig. 3. Overview of the addressed topics in the interviews in relation to the five domains of the consolidated framework for implementation research (CFIR). Abbreviation: Consolidated framework for implementation research, CFIR.

accordance with the Dutch fall prevention guideline.²² Pharmacists proposed medication adaptations for 41 patients (74 medication adaptations). The physician judged the proposed medication adaptations and agreed on adapting medication of 32 patients (44 medication adaptations) (Table 1).

Patients had a significant higher FES-I score at follow-up than baseline ($p = 0.047$), indicating that their fear of falling was increased at one month follow-up. The mean score on the knowledge test at baseline and follow-up did not differ significantly ($p = 0.86$). Therefore, it appeared patients did not improve their fall prevention knowledge.

3.2. Qualitative evaluation of pharmacy staff perspective

Nine pharmacists were interviewed at the start of implementation, and eight of them were also interviewed after the implementation. One participating pharmacist was not interviewed since she was also involved as a researcher in this project (MG). In one interview the pharmacy technician also joined the interviews with the pharmacist, and in another interview a pharmacist-in-training was present. Interviewed pharmacists were on average 44.4 years old (standard deviation [sd] = 12.0). Pharmacists' years of work experience ranged from 2.5 years to 38 years. Four pharmacists were male and five were female.

Perspectives of pharmacists are summarized along the CFIR domains under the headings below and in Table 2.

3.2.1. Intervention characteristics

Before implementation, participating pharmacists were generally positive about fall prevention because they were aware of increased fall risk in older patients and the potential contribution of FRIDs to this increased risk. Many pharmacists were, however, uncertain about whether the intervention could have significant positive impact, due to the multicausality of falls. Furthermore, pharmacists expected that routinely performing fall consultations would influence the workload. They however mentioned that fall consultations could be combined with medication reviews as these were already standard of care.

At follow-up, pharmacists remained positive, however, they doubted effectiveness of their interventions in reduction of falls. Regardless of its

effectiveness on falls, some pharmacists indicated that it was difficult to deprescribe FRIDs, because physicians did not agree with suggestions for deprescribing, or because patients were reluctant to discontinue medication. On the other hand, one pharmacist indicated that she had lots of experience with deprescribing in collaboration with physicians, and another pharmacist indicated that deprescribing is a relatively simple intervention to reduce fall risk.

To facilitate further implementation, most pharmacists would appreciate an abbreviated version of the fall consultation, preferably integrating the fall consultation into regular medication reviews. One pharmacist did not implement the fall prevention service, because his opinion was that the content of the fall consultation was too broad. He thought pharmacists should only focus on reducing use of FRIDs. Correspondingly, another pharmacist reported that he felt his expertise of other risk factors than medication use was not sufficient to adequately advise patients.

Most other pharmacists believed the content of the fall consultation was in line with the expertise of pharmacy technicians and that it was a suitable task for them. One pharmacist indicated that since deprescribing results in less prescriptions, it is financially unattractive. Therefore, financial compensation for broad implementation of such services is needed.

Pharmacists thought that by participating in the fall prevention service, patients got more aware of their own fall risk and the risks of their medication use.

3.2.2. Outer setting

3.2.2.1. Multidisciplinary collaboration. Pharmacists recognized the importance of a multidisciplinary approach in fall prevention both before and after implementation. The GP was the most important collaboration partner for them. A few had, prior to the project, informed the GP about the project, and one had even informed the physiotherapist. Afterwards, some pharmacists mentioned they regretted that they had not collaborated more with other health care providers including home care nurses, practice nurses, or physiotherapists. One pharmacist mentioned that she was proud she managed to strengthen her

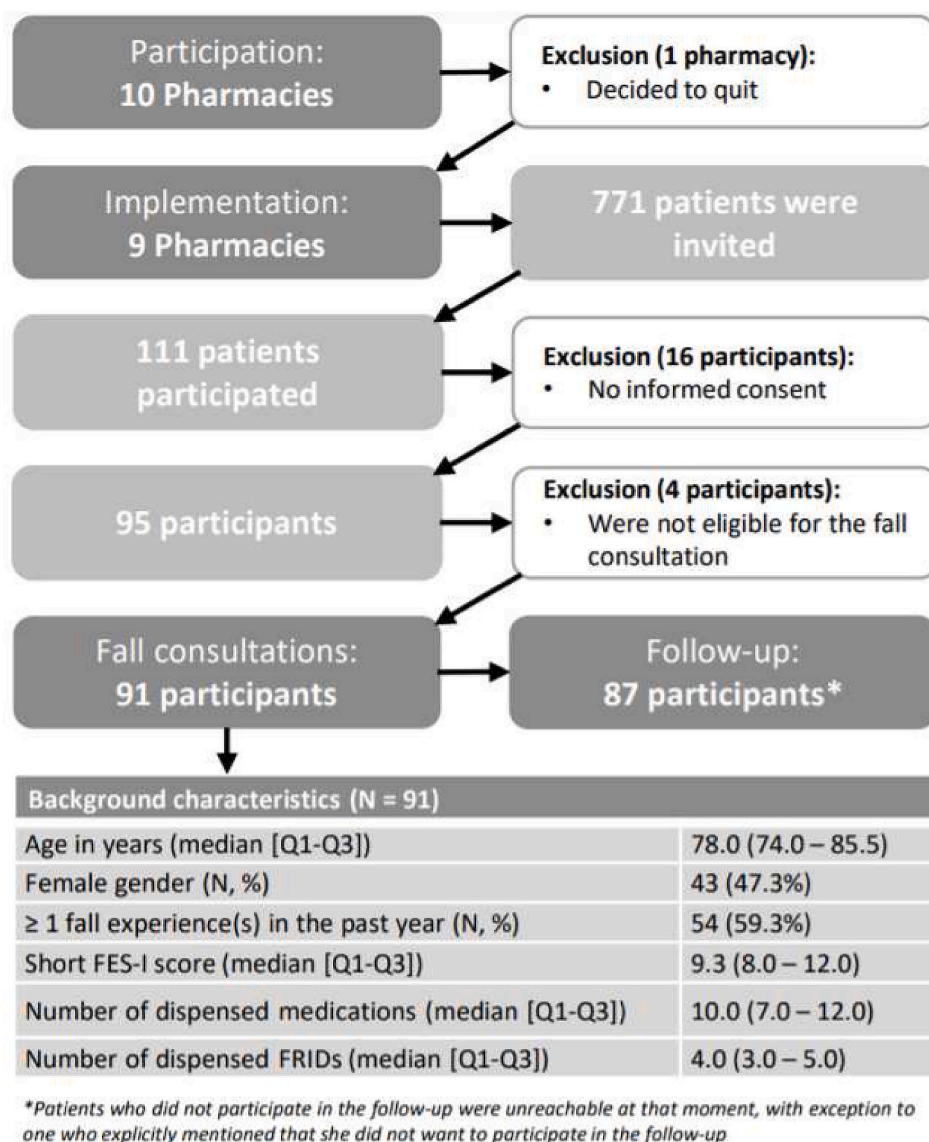


Fig. 4. Flowchart and background characteristics of patients included in the fall consultations. Abbreviations: first quartile, Q1; third quartile, Q3; number, N; fall risk-increasing drug, FRID.

relationships with physiotherapists.

All pharmacists indicated that they had good relationships with the GPs in their neighbourhood. However, they mentioned that GPs or other health care providers seldom spontaneously requested a medication review to reduce fall risk. Pharmacists reported to be very dependent on prescribers regarding deprescribing.

3.2.2.2. Patients' motivation. Before implementation, most pharmacists expected that patients would react positive on the invitation to participate in the study. At follow-up, pharmacists particularly experienced that patients appreciated the attention that was given to them. They also thought that patients were generally open to receiving recommendations of pharmacy technicians regarding fall prevention. Pharmacists reported that patients especially appreciated that their medication was reviewed.

On the other hand, some pharmacists expressed that the response to the invitation letters was low, and therefore had doubts about reaching the target group. Some pharmacists expected that patients might

underestimate their own fall risk and patients thus believe fall prevention services are unnecessary for them. Pharmacists thought most patients are unaware about the risk of medication use on falling.

Pharmacists thought that the provision of the fall prevention service contributes to the awareness of patients regarding risks of medication use on falling. However, it was mentioned by pharmacists that it was difficult to explain to patients that their medication use might increase their fall risk. Furthermore, pharmacists thought that patients believe medication safety is guaranteed by the fact that their physician 'knows what's best for them'.

3.2.3. Inner setting

Most pharmacists indicated that they previously only paid attention to fall prevention in an unstructured way during regular medication reviews. For example, they did not regularly ask patients about fall history nor informed them about fall risk-increasing drugs. One pharmacist who was involved in a fall prevention project organized in the health care centre, indicated that she already paid attention to

Table 1
Quantitative implementation outcomes.

Fall prevention intervention		
Recommendations	Provided recommendations	Number (%)
	Home safety	39 (42.9%)
	Footwear	38 (41.8%)
	Exercise	36 (39.6%)
	Vision/hearing	26 (28.6%)
	Incontinence	10 (11.0%)
	Nutrition	8 (8.8%)
Referrals	Reason	Number (%)
	Fall analysis [§]	18 (19.8%)
	Other reason	10 (11.0%)
Prescription adaptation	Number of patients	Number (%)
	Proposed for prescription adaptation to GP	41 (45.1%)
	Prescription adaptation accepted by GP	32 (35.2%)
	Sum of adaptations	Number
	Proposed prescription adaptations (Total)	74
	Accepted prescription adaptations (Total)	44
	Accepted prescription adaptations (CNS)	8
	Accepted prescription adaptations (CVS)	14
	Accepted prescription adaptations (Calcium/Vitamin D)	13
	Accepted prescription adaptations (Other)	9
Effectiveness		
Short FES-I (N = 85) [†]	Time	Mean (sd)
	Baseline	10.8 (4.4)
	Follow-up	11.6 (4.0)
	Paired t-test	Value
	P-value	0.047*
Knowledge test (N = 47) [‡]	Time	Mean (sd)
	Score at baseline (%)	66.3 (15.5)
	Score at follow-up (%)	66.8 (15.2)
	Paired t-test	Value
	P-value	0.86

Abbreviation: Short Falls Efficacy Scale – International, Short FES-I ; standard deviation, sd.

*Significant at level $p < 0.05$ † Results on the FES-I and knowledge test at follow-up were missing of two patients, due to loss and because one follow-up was performed with the wife of the patient instead of the patient himself ‡Data of knowledge tests were missing for 39 patients, since one pharmacy was not instructed to perform the knowledge tests and other pharmacies lacked to perform or save patients’ knowledge tests of 17 patients §Referral for the official fall risk assessment of the Dutch fall prevention guideline.²²

increasing patients’ awareness on risks of fall-related drug effects. She mentioned that in her pharmacy stickers are pasted on some drug boxes, including benzodiazepines and opioids, that specifically warn patients for the adverse effects related to falls.

3.2.3.1. Workload. In advance of the project, some pharmacists were very confident about being able to implement the project successfully, whilst others were less secure. Eventually, in most pharmacies less fall consultations were performed than initially planned.

Most pharmacists indicated that the implementation of the fall prevention service takes time which is often lacking. Pharmacists reported that occasionally it was not possible to spend time on the service, for example in times of staff absence. In these circumstances pharmacist gave priority to the primary processes.

Pharmacists had different opinions on whether the service could be

implemented in routine pharmacy practice. For example, one pharmacist did not even start with the project. He reported that for pharmacy practice an easier implementable service was needed. Most pharmacists seemed to somehow agree with this, as they believed that fall prevention should be provided in practice by integrating it in medication reviews. One pharmacist indicated that for sustained implementation she needed extra staff.

3.2.3.2. Knowledge and training. Most pharmacists thought they have sufficient knowledge to perform medication reviews aimed at reducing fall risk. Yet, they valued the e-learning. In particular, pharmacists valued the e-learning for pharmacy technicians, since they indicated importance of training of pharmacy technicians on conducting fall consultations. Apart from knowledge about fall prevention or FRIDs, pharmacists believed pharmacy technicians need sufficient communication skills to perform fall consultations well. They therefore specifically indicated the importance of training in interviewing techniques.

3.2.4. Characteristics of individuals

Pharmacists and pharmacy technicians were motivated to implement the fall prevention service, particularly prior to their participation in the implementation project. Pharmacists mentioned they are positioning themselves increasingly as health care provider. Providing a fall prevention service fits in this picture.

Pharmacists included all patients who responded to the invitation letters, but most did not put an extra effort to include more patients. Unfortunately, most pharmacies were thus not able to reach their goal of performing 10 fall consultations, with exception to two pharmacies. In one of these two pharmacies a pharmacy technician was very motivated to implement the fall prevention service and she even managed to perform 32 fall consultations.

In most pharmacies, pharmacy technicians performed the fall consultations. Pharmacists selected technicians who showed interest in this new service, were emphatic, had good communication skills, or had sufficient knowledge of fall prevention.

Pharmacists stated that technicians were motivated to perform fall consultations when they felt that these led to meaningful interventions. One pharmacist therefore gave feedback on the results of the medication reviews to the pharmacy technicians. However, still some pharmacy employees questioned the effectiveness of fall consultations, which decreased their motivation. One pharmacist tried to keep pharmacy technicians motivated by explaining that increased awareness of patients regarding their fall risk and medication use is also an important result.

3.2.5. Process

Prior to the start of the project pharmacists informed their team. Pharmacists applied diverse strategies to facilitate the implementation of the fall prevention service. First, pharmacy technicians were scheduled to perform fall consultations on a weekly basis. Second, some pharmacists coached technicians, by performing the first fall consultation together. Third, some pharmacists made one pharmacy technician fully responsible for fall consultations. Fourth, some pharmacists combined fall consultations with regular medication reviews.

Many pharmacists thought that improved collaboration with other health care providers could aid them to contribute to fall prevention e.g., for the selection of patients and for referral. Therefore, some pharmacists contacted physiotherapists. Some pharmacists needed more decision support for the identification of patients at risk of medication-related falls. For example, a contra-indication “fall risk” in patient records of the pharmacy information system could trigger alerts in case of the prescription of FRIDs in patients at risk of falls.

Table 2
Pharmacists' perspectives on the implementation of the fall prevention service before and after the project.

CFIR domain	Time	Pharmacists' perspectives	Topic	Barrier/ Facilitator
Intervention characteristics	Before the project	"I think it happened one month ago when someone physically fell in the pharmacy. [...] I warned the general practitioner because I saw he used medicines that may cause falls." 36-year-old pharmacist, Pharmacy 10	Effectiveness: expectations	Facilitator
		"The drug is only part of the story. As pharmacists we overestimate the contribution of drug use to falls. [...] However, every bit helps, and, in any case, it supports awareness." 59-year-old pharmacist, Pharmacy 7	Effectiveness: expectations	Barrier
	After the project	"At least I think that fall risks of a few patients are captured by the GP now. The question is if a follow-up action takes place that prevents a fall incident." 47-year-old pharmacist, Pharmacy 1	Effectiveness: screening of patients	Facilitator
		"We modified some medications, especially beta-blockers. I called with many people who feel dizzy regularly, and I think that when it is easy to halve the dose, then they might be helped with that." Pharmacy technician, Pharmacy 3	Effectiveness: deprescribing	Facilitator
		"There are many drugs that could increase fall risk, but they are used for reasons. If someone is using a selective serotonin reuptake inhibitor, you could switch to another selective serotonin reuptake inhibitor, but this has a similar negative impact. And you don't want to switch just like that. Sleeping pills are hard to discuss in any case. [...] And also, when patients are dizzy, it is often unclear where it comes from. For example, someone is using many antihypertensives indeed, but blood pressure is high, then they cannot be deprescribed." 31-year-old pharmacist, Pharmacy 9	Effectiveness: deprescribing	Barrier
		"With regard to the fall consultation manual, sometimes you think, I don't have experience with this, for example in the field of psychotherapy or shoes. [...] Thus, should this really be a task for pharmacists? And then, how is it financed?" 36-year-old pharmacist, Pharmacy 10	Contents of the service	Barrier
Outer setting	Before the project	"We approached the physiotherapist that we wanted to start with this project. Meanwhile, we also informed the GP." 36-year-old pharmacist, Pharmacy 10	Multidisciplinary collaboration	Facilitator
		"For me, it is very difficult to convince those physicians that medication withdrawal is better for those patients [older than 75 years, cognitively impaired and a recent fall]." 28-year-old pharmacist, Pharmacy 4	Multidisciplinary collaboration	Barrier
		"Yes, I expect patients are positive. It is free and it is attention. Vitamin A from Attention, that is awesome. I think the target groups likes every conversation, especially when it is about themselves." 64-year-old pharmacist, Pharmacy 3	Patient's motivation: participating	Facilitator
		"The patients who need it the most, you can often reach them, but they just do not want it. Sometimes they just do not get it." 41-year-old pharmacist, Pharmacy 5	Patient's motivation: participating	Barrier
		"They think it comes with age and it is normal, or they disagree with that they fall. Because they fell because of their dog, or because of a stone, or something else." 36-year-old pharmacist, Pharmacy 10	Patient's motivation: awareness	Barrier
	After the project	"We were searching for a good geriatric physiotherapist in the district, because previously there was one, who is now retired. But this did not get off the ground well." 41-year-old pharmacist, Pharmacy 5	Multidisciplinary collaboration	Barrier
		"We started to align our actions more with other health care providers. By this, these other health care providers are increasingly realizing that medication use could negatively affect patients' fall risk. And we know that we can also refer patients to the physiotherapists here." 31-year-old pharmacist, Pharmacy 9	Multidisciplinary collaboration	Facilitator
		"There was one specialist who said, well, she is under my close medical supervision, and I cannot change her medications based on what you tell me, that it is in increasing her risk a little bit." 24-year-old pharmacist in training, Pharmacy 5	Multidisciplinary collaboration	Barrier
		"I expected that more people would participate. Apparently, patients are not appealed to this subject. It is never about them. I also notice this when I am conducting medication reviews and ask about falls." 46-year-old pharmacist, Pharmacy 8	Patient's motivation: participating	Barrier
		"People think: 'the doctor is prescribing this, so it must be good.' There is very little knowledge among patients about risks of medications and people often don't think that is important." 28-year-old pharmacist, Pharmacy 4	Patient's motivation: awareness	Barrier
Inner setting	Before the project	"Sometimes I thought: 'damn, we couldn't adjust anything for this sir or madam ... [...]. And then you told this to these people, and they replied: 'that's totally fine, how nice to hear you've checked this'." Pharmacy technician, Pharmacy 3	Patient's motivation: appreciation	Facilitator
		"The pharmacy I am working is a very small pharmacy. There are only two assistants in the workplace. [...] This means we experience quiet moments, but also have high peak moments. We have little cushion." 36-year-old pharmacist, Pharmacy 10	Workload	Barrier
		"It is hard to implement this when you are understaffed. It needs to fit in the schedule. [...] When you thus called me a month ago and I knew we were temporary weakly staffed, I thought: 'aaaah', so I said: 'call me back in a month'." 48-year-old pharmacist, Pharmacy 6	Staff	Barrier
		"I already broadly had the knowledge explained in the e-learning. However, the unawareness or denial of patients at fall risk, that was an eye-opener. There were a few things of which I thought: I did not know that." 36-year-old pharmacist, Pharmacy 10	Expertise	Facilitator

(continued on next page)

Table 2 (continued)

CFIR domain	Time	Pharmacists' perspectives	Topic	Barrier/ Facilitator
48-year-old pharmacist, Pharmacy 6 Characteristics of individuals	After the project	“The pharmacy technicians should be educated, and I think, once is not enough. I think it could be even more extensive. [...] The technicians have lot of experience with conversations at the counter, but this is a different kind of conversation.” 31-year-old pharmacist, Pharmacy 9	Expertise	Barrier
		Barrier	“It was a busy period anyway. When we signed it was a calmer period because of COVID-19, but at the moment we wanted to start with the project it became extremely busy. Then it is difficult to implement the project in addition to the regular work activities.” 31-year-old pharmacist, Pharmacy 9	Workload
		“I think it is a specific skill to perform such conversations well, to ask questions in respond to cues. [...] I think someone needs to be very trained for this. I doubt whether the e-learning is sufficient to prepare them properly in order to perform fall consultations eventually.” 28-year-old pharmacist, Pharmacy 4	Expertise	Barrier
		“We have a lot of experience with deprescribing and medication withdrawal. We have been doing this for years.” 46-year-old pharmacist, Pharmacy 8	Expertise	Facilitator
		“It is easier to implement this when you are already doing a lot of comparable things in your pharmacy on the field of patient care. Because you need to motivate your pharmacy technicians and when they have never done anything regarding consultations, it is difficult.” 46-year-old pharmacist, Pharmacy 8	Internal collaboration	Barrier
	Before the project	“I often asked the pharmacy technician: ‘how is it going?’, ‘did you have another conversation?’ and the pharmacy technician always passed on the results. As a pharmacist you need to keep an eye on the project.”	Internal collaboration	Facilitator
		“You need to have the right feeling for older persons. We have some pharmacy technicians who think the elderly are amazing, and even talk to them in our dialect.” 64-year-old Pharmacist, Pharmacy 3	Communication skills	Facilitator
		“This pharmacy technician also participates in the fall prevention project of the health center. It was a logical decision to ask her again. When we asked her back then to participate in the project, we also chose her because of her competences regarding communication.” 48-year-old pharmacist, Pharmacy 6	Communication skills	Facilitator
		“I noticed that at a certain moment the pharmacy technicians thought: ‘again a patient I cannot really mean something for...’ Of course, they also hoped to find that patient who falls daily and there is a very strong relationship with medication.” 28-year-old pharmacist, Pharmacy 4	Motivation to implement the project	Barrier
		“Our pharmacy technician is very driven and she aimed to perform fifty fall consultations [...]. She all did this with a lot of energy. And she often chose me to have a seat: ‘can we discuss four patients, and could you also discuss them with the general practitioner?’” 64-year-old pharmacist, Pharmacy 3	Motivation to implement the project	Facilitator
Process	Before the project	“We definitely showed that a pharmacy technician is able to perform such consultations very well.” 46-year-old pharmacist, Pharmacy 8	Communication skills	Facilitator
		“I am planning to monitor how the fall consultations will be performed, by doing the first conversation together, in order to startup well and they feel comfortable to perform the fall consultations.” 28-year-old pharmacist, Pharmacy 4	Implementation strategy: coaching	Facilitator
	After the project	“Prior to the implementation of fall consultations, you should think about the time schedule carefully. It works quite well to schedule half a day per week for fall consultations, and beforehand you are able to estimate which time periods are most convenient.” 28-year-old pharmacist, Pharmacy 4	Implementation strategy: scheduling	Facilitator
		“When we had a response I told the pharmacy technician, you should make time for this, so check the week schedule. And then she asked a colleague to take over some of her tasks for a moment, because she needed to perform a fall consultation.” 46-year-old pharmacist, Pharmacy 8	Implementation strategy: self-management	Facilitator

4. Discussion

The aim of this study was to evaluate the implementation of fall prevention services in community pharmacies. Nine community pharmacies completed the implementation project for a fall prevention service. On average, 10 fall consultations were performed per participating pharmacy. The fall prevention service led to adaptation of medication in approximately one-third of the patients and a quarter was referred. Pharmacy technicians felt capable to assess fall risk, provide lifestyle recommendations, and refer patients, on basis of a fall consultation

manual. Pharmacists were positive about the pharmacist-led fall prevention service, but they experienced several barriers during implementation, including lack of time, absence of staff, and limited multidisciplinary collaboration.

Previously, multiple component fall risk interventions including a medication review have shown to be effective to reduce falls.¹⁴ The effectiveness of deprescribing FRIDs as standalone intervention to reduce fall risk is questionable.³³ Of all intervention components, the most effective component of multiple fall prevention interventions is exercise and a basic fall risk assessment including medication review

comes second.¹⁴ The fall consultation guide was designed to address all common modifiable fall risk factors. However, a minority of the patients was recommended to exercise more or was referred. Pharmacists in our study reported that their focus was primarily on identifying and modifying the use of FRIDs. The fall prevention service might hence have fallen short of recommending patients sufficiently on other risk factors.

Previously, patient education has shown to be effective to reduce falls.^{14,34} However, patients' fall prevention knowledge did not significantly increase in our study, even though they were educated extensively. Fall prevention education might not easily be accepted by older people.³⁵ Patients' uptake of fall prevention education might increase when pharmacy employees are trained to frame the information positively, as being part of healthy ageing.³⁵ Pharmacists in our study also indicated pharmacy technicians might need more training in interviewing techniques. On the other hand, it is well-known that consolidation of memory declines during aging,³⁶ and fear of falling has also been associated with memory decline.³⁷ Therefore, the time of follow-up might have influenced older people's performance on recall, because the information might not have been consolidated and forgotten at the time of follow-up.

Patients' fear of falling was increased at one month after the fall prevention service. As fear of falling has often been associated with falls, the hypothesis was that patients' fear of falling would decrease by participating.^{38,39} However, regardless of high levels of fear of falling being associated with falls, sufficient awareness of one's own fall risk seems beneficial for acting on fall prevention.^{38,40–42} Furthermore, patients who are aware of their fall risk behaviours but who do not adopt recommendations, have a higher fear of falling than patients who are not aware of their fall risk behaviours.⁴² In our study, patients most often had a low or moderate fear of falling at start and pharmacists indicated that the service seemed to increase patients' awareness their risk of falling. Therefore, the small increase in fear of falling presumably indicates participants became more aware of their fall risk and this could eventually motivate them to act on fall prevention. This assumption should be monitored in practice, because persisting fear of falling should be a reason for therapy e.g., exercise or cognitive behavioural therapy.^{43,44} At last, since patients may develop fear of falling after experiencing a fall, patients' increased fear of falling could also be due to potential fall experiences between the received fall consultation and the follow-up.

In the literature, patients' underestimation of fall risk is an extensively described phenomena.^{45–47} Although the uptake of 95/771 in our study seems a good uptake, pharmacists in our study emphasized the low response to the invitation letters. They reported that they thought many patients underestimate their own fall risk. On the contrary, pharmacists were generally positive about patients' motivation to follow recommendations. Patients could, however, give socially desirable answers during fall consultations.⁴⁸

Important motivators for the pharmacy team to implement the service were (1) pharmacy employees believed that the service could be effective and (2) pharmacy employees noticed that the service was appreciated by patients. Eventually, many pharmacists reported that they believed that fall prevention should be included in regular medication reviews instead of providing fall consultations. The design of the service may therefore not correspond to pharmacists' beliefs about providing fall prevention, limiting their motivation to implement the service.⁴⁹

The major barrier for the implementation of the fall prevention service was a by pharmacists perceived high workload and subsequent lack of time. Similar barriers to provide pharmaceutical care services have been reported previously.^{10,50,51} Pharmacists in our study reported that for successful implementation the project needs to be carefully planned and scheduled into daily routine. In a previous study it has been indicated that community pharmacists who have more time for the provision of pharmaceutical care services, generally spend less time on pharmacy management.⁵² Pharmacists' prioritization to pharmacy

management and logistics should be reduced, so that pharmacists have time for pharmaceutical care services, including fall prevention.⁵³

Corresponding to findings of a previous study,⁴ pharmacists valued the provision of training material in order to implement the fall prevention service. Most pharmacists thought that the e-learning provided sufficient material to prepare pharmacists and pharmacy technicians to implement the fall prevention service. However, pharmacy technicians might need more training in communication to ensure that patients' needs and concerns are adequately discussed during fall consultations. This was indicated by pharmacists in our study and relates to previous findings suggesting that pharmacy technicians rarely discuss patients' needs and concerns at the counter even though they are instructed to do so.¹⁷

Prior to implementation most pharmacists indicated that they planned to expand their multidisciplinary collaboration in order to implement the service effectively. Despite of few attempts of pharmacists, most eventually indicated that they only collaborated with the GP for the performance of the medication reviews. However, to ensure adequate treatment of all risk factors, interprofessional collaboration in fall prevention is strongly recommended.^{8,54–56} To enhance adoption of fall prevention services in community pharmacies, multidisciplinary fall prevention services, involving community pharmacies should be developed, implemented and evaluated.

4.1. Strengths and limitations

The application of CFIR supported the in-depth assessment of the variety of reasons explaining the success rate of intervention implementation. The CFIR is widely acknowledged as a suitable framework to explore barriers and facilitators for implementation. Another strength of this study was that pharmacists were interviewed both before and after the study. The consistency of their perceptions and the fulfillment of their expectations was hence evaluated. A limitation of the study was that the service was implemented in only nine pharmacies and evaluation was completed in only eight pharmacies. Pharmacists participated voluntarily in the implementation study and were thus motivated and interested to provide fall prevention services. Findings may therefore not be generalizable to other settings e.g., when pharmacy teams are less interested in providing such services. Another limitation of the study was that evaluation primarily was performed with pharmacists. Pharmacy technicians were asked to complete a digital evaluation form. Because only three technicians filled out this form, it was decided that these data were not used.

4.2. Implications

The need for a pharmacy-led fall prevention service is reflected by the high number of medication adaptations that are performed during implementation. Yet, pharmacists pronounced their desire for less time-consuming fall prevention interventions to contribute to fall prevention. Currently, pharmacists perceive a lack of time to implement complex fall prevention services. Related to this, pharmacy teams should be facilitated to increase the efficiency of the primary logistic process in the pharmacy, in order to have time for the provision of pharmaceutical care services, such as fall prevention. Because pharmacy employees struggle with referring patients adequately to health care providers after identification of patients at risk of falls, the multidisciplinary collaboration between pharmacists and other health care providers should be stimulated e.g., by enhancing two-way referral. Also, interprofessional education could facilitate the communication among primary care providers.^{57,58} At last, training and resources should be provided to all pharmacists in order to implement fall prevention services in pharmacies.

5. Conclusion

Pharmacists believe that the provision of the fall prevention service in pharmacies is useful. The service led to adaptation of medication in approximately one-third of the patients and approximately a quarter was referred to another health care provider. Pharmacists feel that pharmacy technicians can perform the consultations adequately in case they are trained well. During the implementation process, pharmacists experienced the following barriers: lack of time, absence of staff, and limited multidisciplinary collaboration. Sustained implementation in pharmacy practice might require a less time-consuming intervention predominantly based on enhanced multidisciplinary collaboration.

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Data statement

Author elects to not share data due to privacy/ethical restrictions.

Author statement

Marle Gemmeke: Conceptualization, Investigation, Data Curation, Writing – Original Draft. Ellen Koster: Conceptualization, Supervision, Writing – Review & Editing. Nathalie van der Velde: Writing – Review & Editing. Katja Taxis: Conceptualization, Supervision, Writing – Review & Editing. Marcel Bouvy: Conceptualization, Supervision, Writing – Review & Editing.

Declaration of interest

There were no conflicts of interest.

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Appendix A. Supplementary data

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