## Developing digital health interventions for falls prevention

*An innovative user-centered design approach*

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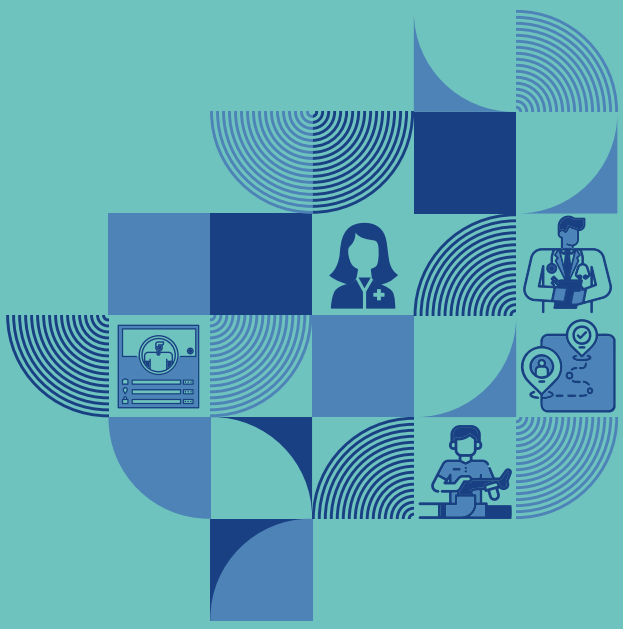
# Chapter 3

## Multidisciplinary care pathways for falls prevention in older adults: Visualizing the needs of primary care-based health care professionals



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# Abstract

**Purpose**

Multidisciplinary care pathways for falls prevention, which include falls risk stratification, multifactorial falls risk assessment, and management of multidomain interventions, can reduce falls in older adults. However, efficient multidisciplinary falls prevention care is challenging due to issues such as poor communication and role allocation. This study aimed to identify and visualize the multidisciplinary care needs of primary care-based health care professionals (HCPs) for falls prevention in the Netherlands using the novel co-design approach of journey mapping.

**Methods**

Online focus groups and interviews (N = 45) were conducted with physical therapists (n = 15), district nurses (n = 9), occupational therapists (n = 7), pharmacists (n = 6), nurse practitioners (n = 5), podiatrists (n = 2) and one general practitioner. HCPs were asked about their interactions, experiences, needs, and barriers with regards to multidisciplinary falls prevention care in a primary care context. Insights were used to visualize a journey map depicting the desired future state of multidisciplinary care pathways for falls prevention.

**Results**

Journey mapping identified the following needs for effective multidisciplinary falls prevention care: a dedicated case manager after risk stratification, preparatory patient information before the assessment, small multidisciplinary care team for the assessment, patient involvement during intervention management, good communication between HCPs and a reduction in workload for HCPs.

**Conclusion**

The inclusion of a case manager program for older adults and access to resources to facilitate good communication between HCPs are important to optimize the configuration of multidisciplinary care pathways for falls prevention in actual practice.

## Introduction

Falls and related injuries contribute significantly to morbidity and mortality in older adults (65+; James et al., 2020). Falls are usually a result of several, modifiable risk factors, such as reduced mobility, vision, and use of medications, which makes their management and prevention complex (Jehu et al., 2021). With the global population aging, the prevalence of falls in older adults is expected to increase as the incidence rate of multimorbidity, polypharmacy, and frailty among this age group increases (Montero-Odasso et al., 2022). This makes falls in older adults a significant global health problem, and effective falls prevention interventions are vital to ensure improved health outcomes for older adults in the Netherlands and reduce the burden on the Dutch health care system (VeiligheidNL, 2023).



Geriatric multidisciplinary care involves the collaboration between HCPs from multiple disciplines on a single case. This approach is recommended for health problems that are multifactorial in nature, such as falls, to effectively address the complex care needs associated with such conditions (Geriatrics Interdisciplinary Advisory Group, 2006; Wall et al., 2022). Research trials have shown that multidisciplinary care pathways for falls prevention are more effective in reducing the rate of falls compared to single-care or care as usual (Gillespie et al., 2012; Hopewell et al., 2018; Vieira et al., 2016). Multidisciplinary care pathways for falls prevention include a falls risk stratification to identify high falls risk, a multifactorial falls risk assessment to detect individual risk factors, and the management of multidomain interventions to target detected falls risk factors (Montero-Odasso et al., 2022; Randell et al., 2021). Despite its effectiveness in research trials, efficient multidisciplinary care for falls prevention in older adults in practice remains challenging. HCPs are uncertain about the distribution of roles and responsibilities that constitute multidisciplinary falls prevention care (Gemmeke et al., 2022).

Furthermore, HCPs have been shown to experience poor communication and coordination within multidisciplinary falls prevention care (Gemmeke et al., 2022; Van Rhyn & Barwick, 2019), suggesting that such falls prevention interventions have yet to be optimized for primary care-based HCPs in practice.

Research suggests that involving users in the development of interventions could enhance adoption and implementation in practice through improved intervention design (Dopp et al., 2019; Langley et al., 2018). Journey mapping is a novel co-design approach that relies on the direct involvement of users. This method translates various components of the user journey into a visual map that can be used to inform the development and implementation of interventions (Benz et al., 2024; Davies et al., 2023). Journey mapping has been useful in the context of falls prevention by informing the integration of a falls risk management computerized clinical decision support system in primary care. Specifically, this previous study used journey mapping to provide a significant understanding into general practitioners (GPs) and nurse practitioners falls risk management experience, and the desired future state of the system (Shear et al., 2023). However, the study did not explore the needs of other primary care-based HCPs commonly involved in falls risk and factors management, such as occupational therapists and district nurses. Addressing this gap is essential for effectively assisting policy makers in developing falls prevention interventions that are acceptable to all end users (i.e., primary care-based HCPs). For this reason, the aim of this study is to identify the multidisciplinary falls prevention care needs of primary care-based HCPs by constructing a visual journey map that outlines the desired future state of multidisciplinary care pathways for falls prevention (i.e., for falls risk stratification, multifactorial falls risk assessment, and management of multidomain interventions) using a Dutch primary care context.



## Methods

### Procedure

A total of eight online focus groups and five online interviews (N = 45) were conducted between February 2022 and January 2023 using Zoom. Where necessary, interviews were offered as an alternative to focus groups to accommodate to the schedules of HCPs. HCPs were recruited with assistance from a total of 13 representatives from nine different HCP

organizations who were asked to distribute a call for participants (see online appendix for the full list of organizations).

Each organization is in direct contact with different primary care-based HCPs in all 12 provinces of the Netherlands. This call for participants included information about the study and a sign-up sheet. HCPs were eligible to participate and contacted for informed consent if they were currently (1) working in Dutch primary care; and (2) regularly engage in falls prevention care with older adults. The study was assessed by the Medical Ethics Research Committee of the Amsterdam University Medical Center (Amsterdam UMC, location University of Amsterdam; W21_179 # 21.194) who declared that the Medical Research Involving Human Subjects Act did not apply to this study. Written or verbal informed consent was obtained from all participants prior to data collection.



## The Fall Analysis

This study was conducted in the Dutch primary care setting. Based on Dutch guideline recommendations, multidisciplinary care pathways for falls prevention (i.e., for risk stratification, assessment, intervention management) can be carried out in primary care by HCPs with experience in falls prevention, such as by GPs, nurse practitioners, physical therapists or occupational therapists, using the Fall Analysis (Federatie Medisch Specialisten, 2024). Developed by the Dutch National Expert Center on Injury Prevention (in Dutch: VeiligheidNL), the Fall Analysis (in Dutch: 'Valanalyse') is a validated-instrument that guides HCPs in identifying older adults at high risk of falling followed by the assessment of 13 (modifiable) risk factors for falls in these older adults (i.e., history of falls, mobility, medication, dizziness/vestibular, vision, hearing, cognition, urinary incontinence, fear of falling, activities of daily living, environmental factors, footwear and foot problems, nutritional status and vitamin D intake). Risk factors are assessed using a set of evidence-based questionnaires and functional assessments, such as the Short Physical Performance Battery or Short Nutritional Assessment Questionnaire 65+ for assessing mobility and nutritional status, respectively. Based on the multifactorial falls risk assessment, interventions are selected, which are intended to reduce falls risk by targeting identified risk factors (VeiligheidNL, n.d.).

## Focus group and interview sessions

Focus groups were held with physical therapists only (n = 2 focus groups), pharmacists only (n = 1), district nurses only (n = 1), nurse practitioners only (n = 2), and a mix of different HCPs (n = 2), and were carried out by two moderators (SG and LW, SG and ST). The interviews were held with occupational therapists (n = 4) and a GP, and were carried out by one interviewer (SG or ST). To prepare participants, slides and instructions for using Zoom were developed and shared with participants via email. The preparatory slides provided an overview of the Fall Analysis and the topics to be discussed during the focus groups/interviews. A semi-structured focus group/interview guide was developed following an iterative process whereby the session topics were based on previous research examining the needs of Fall Analysis users (Groos, Linn, et al., 2024).



The focus group and interviews started with a short introduction on the topics to be discussed. HCPs were asked about their multidisciplinary falls prevention care needs for the Fall Analysis. The topics focused on understanding HCPs interactions, experiences, needs, and barriers for each pathway component (i.e., for falls risk stratification, multifactorial falls risk assessment, and management of multidomain interventions; see online appendix for guide). For this, participants were shown a journey map for the Fall Analysis from start (i.e., falls risk stratification) to finish (i.e., management of multidomain interventions), as displayed in Fig. S1 in the online appendix. Participants were asked to think about how they would like to conduct the Fall Analysis (e.g., where, how, and who should stratify for falls risk?). Participants in the focus group sessions were divided into separate, online groups using virtual breakout rooms in which they could discuss the questions. Afterwards, one member from each group shared the groups desired future state of the Fall Analysis with the remainder of focus group participants. Subsequently, a discussion unfolded and the journey map was updated based on the discussion. Participants in the interviews engaged in co-design with the interviewer.

## Data Analysis

All focus group and interview sessions were recorded and transcribed verbatim by two of the moderators (SG, ST). All transcripts were analyzed in MAXQDA 2022 (Verbi Software, n.d.). Each transcript was coded by one of the two moderators (SG, ST) using a general inductive approach (Thomas, 2006). The coding was discussed in regular meetings (between SG and ST), and disagreements were resolved through discussion. Coding first began with a thematic analysis to examine detailed needs within the raw data using a main category (e.g., assessment location), and where necessary, sub-category coding scheme (e.g., home). The results from the thematic analysis helped to identify specific needs for each pathway component (i.e., for falls risk stratification, multifactorial falls risk assessment and management of multidomain interventions), and the similarities and differences between HCPs within these pathway components. These insights were used to develop four preliminary journey maps illustrating the desired future state of multidisciplinary care pathways for falls prevention for different HCPs (e.g., nurse practitioners versus physical therapists). The preliminary journey maps were subsequently combined into one journey map, and further clarification was added from the co-design sessions. After several rounds of iterations, a condensed journey map was developed depicting the desired future state of multidisciplinary care pathways for falls prevention that are in line with the multidisciplinary falls prevention care needs of primary care-based HCPs in the Netherlands.



## Results

The final sample included 45 HCPs. The majority of participants were physical therapists (33%, n = 15) followed by district nurses (20%, n = 9), occupational therapists (16%, n = 7), pharmacists (13%, n = 6), nurse practitioners (11%, n = 5), podiatrists (4%, n = 2), and a GP (2%, n = 1). The results are discussed below using illustrative quotes that have been translated into English where applicable.

## Journey map

Figure 1 illustrates the journey map portraying the desired future state of multidisciplinary care pathways for falls prevention that are in accordance with the needs of HCPs. A more detailed version of Fig. 1 can be found in the online appendix as Fig. S2. Table S1 in the online appendix displays the multidisciplinary falls prevention care needs of nurse practitioners, physical therapists, occupational therapists, podiatrists, pharmacists, district nurses, and the GP linked to each pathway component (i.e., falls risk stratification, multifactorial falls risk assessment, management of multidomain interventions).

### *Falls risk stratification: Case manager*

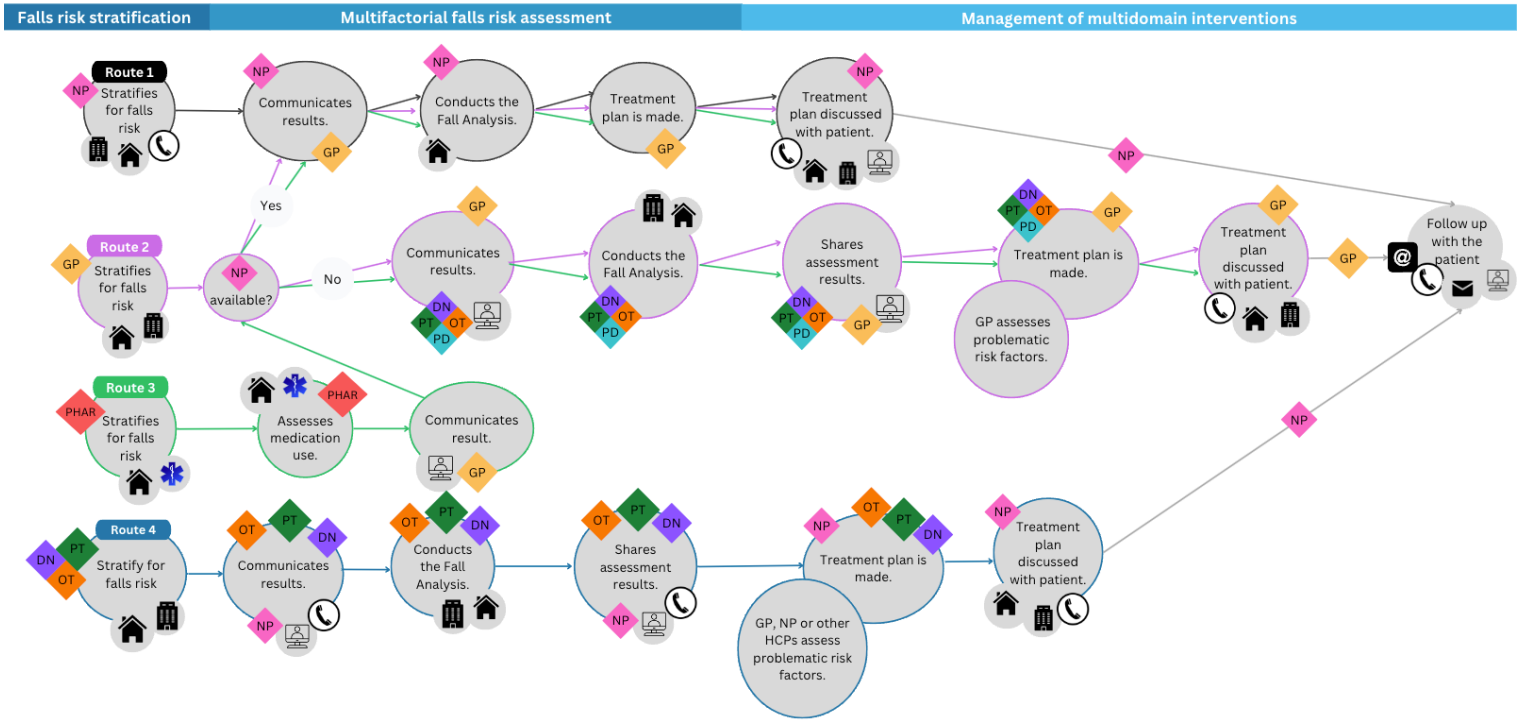


HCPs discussed having a role in falls risk stratification to identify high risk of falling in older adults (see routes 1-4). Pharmacists mentioned how they can stratify for falls risk when older adults pick-up their medications (see route 3). In turn, occupational therapists described how the social domain (e.g., informal caregivers, neighbors) sometimes initiated contact with them to conduct falls risk stratification in community-dwelling older adults (see route 4):

*"And in any case, we have organized it in such a way that if, for example, an informal caregiver or a neighbour or the municipality is concerned about a particular client, they can simply contact us if the client also gives permission for the process to continue. […] So it's not just that only HCPs can do it, because I think that actually, if you think of those three questions [in the falls risk stratification] and answer them, a lot of people can do it."*

Consensus was reached on the important role that GPs and nurse practitioners play in falls risk stratification in older adults, assigning the role of subsequent case manager to the nurse practitioner. This was in line with nurse practitioners who saw themselves as having the role of case manager for the patient, and had a preference for falls risk stratification via telephone due to efficiency (see route 1). The GP also viewed GP practices as a *"very good entry point for when an increased risk of falling is suspected"* as they *"know what"* falls prevention-related care *"[has] already been done"* by looking into the patient's file to *"prevent things from being done twice."*

*Fig 1. Journey map portraying the desired future state of multidisciplinary care pathways for falls prevention in primary care.*




Note. Developed using Canva graphic design platform. Abbreviations: GP = general practitioner, NP = nurse practitioner, PHAR = pharmacist, DN = district nurse, PT = physical therapist, OT = occupational therapist, PD = podiatrist.

### *Multifactorial falls risk assessment: Preparatory information and team size*

HCPs discussed the usefulness of receiving preparatory patient information prior to the multifactorial falls risk assessment. Important preparatory information included *"entire medication list"* [physical therapist], *"medical history"* [occupational therapist], and/or previous administration of a cognition test. There was a preference for receiving preparatory information from the GP, which was also perceived as feasible by the GP as they can *"make a referral letter"* with *"the patient's medical history included."* However, an up-to-date list of medications should be requested *"from the pharmacy, not the GP"* [GP]. Additionally, HCPs mentioned the importance of a small multidisciplinary care team, consisting of two to three HCPs from different disciplines to reduce the burden on the patient. They also discussed how the assessment of certain risk factors should be carried out at the patient's home, such as activities of daily living, resulting in one to two appointments per patient. Nurse practitioners preferred close collaboration with GPs and vice versa (see routes 1-2). According to the GP, nurse practitioners are *"the most logical and best person[s]"* for conducting a multifactorial falls risk assessment as *"they have access to the medical records"* and *"they work closely with the GP."* However, in the event that the GP practice did not have access to a nurse practitioner, then collaboration should be sought with occupational therapists, physical therapists, district nurses, and/or podiatrists (see route 2). Occupational therapists, physical therapists, district nurses, and pharmacists perceived GPs, nurse practitioners and/or other HCPs (e.g., dieticians) as preferred collaborators for the assessment of risk factors that lie outside of their expertise, such as cognition, medication, dizziness/vestibular, mobility, nutritional status and vitamin D intake (see routes 3-4). Specifically, the involvement of *"another professional or several colleagues"* would allow them to *"make decisions"* which would be *"helpful"* as they *"don't have the expertise in everything"* [district nurse]. One pharmacist also explains:

*"Basically, we [pharmacists] are the medication experts, and that is, of course, our profession. The physical therapist, on the other hand, can train muscles or work on people's walking techniques, and an occupational therapist can assess a home where there are too many rugs lying around.*

*So everyone should continue doing their thing; you just need to ensure that you collaborate with each other. […] You know, so you want that whole process around it to have a shared goal, so to speak. That's where I see additional value: In doing falls prevention but each with their own specialization."*

### *Management of multidomain interventions: GP and patient involvement*

All HCPs mentioned that the involvement of a GP is standard for the management of multidomain interventions. For example, physical therapists, pharmacists, and nurse practitioners stated that they share the final report of the multifactorial falls risk assessment and recommendations for interventions tailored to detected risk factors with the GP. HCPs also discussed the importance of *"work[ing] together with the patient"* when *"decid[ing] which factors to address and when"* [GP]. According to the GP, follow-up should occur in six weeks post assessment by the nurse practitioner (i.e., the case manager of the patient). However, if an older patient needs one or more referrals to a specialist, this should always be made in accordance with the GP:

*"Well, if the nurse practitioner thinks that a referral to a physical therapist is necessary, they will arrange that themselves. If they think there might be something for the hospital, then the patient comes to see me first in the consultation; I'll listen to their heart or do a neurological examination, and then we look at what is already known. We discuss whether it makes sense to do a referral, and if so, whether it should be to a geriatrician, neurologist, or cardiologist—or maybe even to internal medicine?"*

### *Similarities and differences: Beliefs, communication, and workload*

Similarities and differences in HCP needs were observed when discussing the desired future state of multidisciplinary care pathways for falls prevention. Physical therapists and nurse practitioners emphasized how motivating HCPs to conduct annual falls risk stratification in a standardized manner is difficult, as such assessments are not considered standard practice. Moreover, there was also a belief among physical therapists that not every HCP has the qualifications to conduct a multifactorial falls risk assessment

in older adults. According to many HCPs, good communication between HCPs is lacking in practice.

Pharmacists discussed that they and other HCPs are not informed when *"someone has an increased risk of falling"* [pharmacist]. Similarly, district nurses indicated that sometimes they are not made aware by the GP of important changes to a patient's file, such as a change in medications. While good communication facilitates the referral process for some nurse practitioners, others are unable to keep short lines of communication, such as not being notified that *"the physical therapist is on vacation for three weeks"* [nurse practitioner]. There was a need among many HCPs to integrate existing communication mediums, such as an online communication or referral platform that enables accessible collaboration between HCPs, informal caregivers and the patient, in multidisciplinary care pathways for falls prevention.



A difference between HCPs was the amount of risk factors in the multifactorial falls risk assessment and workload. District nurses expressed how collaboration between HCPs could help reduce the administration time of such an assessment in older adults. Similarly, according to the GP, being part of multidisciplinary falls prevention care is more feasible than conducting a multifactorial falls risk assessment alone arguing that *"the chances of GPs doing [the assessment] themselves are not very high"* due to *"extra work"* [GP]. By contrast, physical therapists were uncertain about the extent to which GPs should be included in the multidisciplinary care pathways for falls prevention due to workload. Lastly, while nurse practitioners are open to the role of case manager, they also emphasized that *"there's already plenty of work"* and feared that additional responsibilities, such as being part of multidisciplinary falls prevention care implies *"that even more work will come our way"* [nurse practitioner].

## Discussion

In this study, we sought to uncover primary care-based HCPs needs for multidisciplinary falls prevention care. Subsequently, these needs were used to develop a visual journey map outlining the desired future state

of multidisciplinary care pathways for falls prevention by HCPs (i.e., for falls risk stratification, multifactorial falls risk assessment, management of multidomain interventions). We found that a case manager program after after risk stratification, preparatory patient information before the assessment, small multidisciplinary care team for the assessment, patient involvement during intervention management, good communication between HCPs, and a reduction in workload are essential for sustainable multidisciplinary care pathways for falls prevention. Research trials show that multidisciplinary care pathways for falls prevention for older adults are an effective falls prevention strategy, but their configuration in actual practice is suboptimal (Chang et al., 2004; Gemmeke et al., 2022; Gillespie et al., 2003, 2012; Grant et al., 2015; Hopewell et al., 2020; Van Rhyn & Barwick, 2019; Vieira et al., 2016). By using journey mapping, we were able to explore the optimum configuration of multidisciplinary care pathways for falls prevention for different HCPs, providing valuable insight for policy makers seeking to improve these pathways in primary care. In this study, the need of a case manager for high risk older adult fallers and increased patient involvement were found to be important components for improving multidisciplinary falls prevention care for all participating HCPs. Previous research has shown that a case management program can reduce falls in older adults through increased patient involvement (Sossai et al., 2024). Moreover, research has highlighted the facilitating role of patient involvement on adherence to multidomain falls prevention interventions in older adults (Tai et al., 2020). Therefore, policy makers should consider implementing a case manager program into multidisciplinary care pathways for falls prevention to facilitate patient involvement and intervention adherence in older adults. Based on the findings from this study, the role of case manager could be fulfilled by nurse practitioners.

Additionally, while we found that almost all participating HCPs saw a primary role for themselves in falls risk stratification in older adults, this was not the case for the multifactorial falls risk assessment in older adults. HCPs in this study preferred collaborating on the assessment with a small multidisciplinary care team (such as a GP with a physical therapist) or distributing the entire assessment to other HCPs due to reasons related to efficiency. Specifically, some HCPs believed that belonging to a

multidisciplinary falls prevention care team could help decrease the workload due to the distribution of the assessment of falls risk factors, while others voiced that involvement in such a team could result in additional responsibilities and, consequently, increase workload. This finding showcases how, on one hand, collaboration can facilitate multifactorial falls risk assessment in older adults and, on the other hand, act as an inhibiting factor. HCPs mentioned how the efficiency of multifactorial falls risk assessment collaboration between HCPs could be improved through the receival of preparatory information from the GP about the older patient (e.g., medical history) prior to the assessment. Moreover, evidence suggests that inadequate collaboration in falls prevention can result due to poor communication between HCPs (Gemmeke et al., 2022; Grant et al., 2015; Mackenzie et al., 2013; Van Rhyn & Barwick, 2019; Vandervelde et al., 2024). Corroborating previous findings, in this study poor communication between HCPs often resulted in (1) unawareness of high falls risk patients or changes to treatment plans; (2) not knowing who is responsible for the assessment of which falls risk factor(s); and (3) an inefficient referral process for the treatment of detected falls risk factors. Thus, policy makers seeking to improve collaboration in multidisciplinary falls prevention care pathways should consider providing HCPs with the necessary resources to enable good communication between HCPs. For example, workshops or connecting multidisciplinary care pathways to existing communication platforms, as mentioned by HCPs in this study, have been shown to facilitate the implementation of falls prevention interventions (Liddle et al., 2018; Vandervelde et al., 2024).



A strength of this study is the use of an innovative method to explore the optimum configuration of multidisciplinary care pathways for falls prevention in older adults for different HCPs. As a result, we were able to identify requirements for making these pathways sustainable in primary care. However, given that this study focused on multidisciplinary care pathways for falls prevention in primary care, we did not examine the multidisciplinary falls prevention care needs of secondary care-based HCPs (e.g., geriatricians). Additionally, despite occupational therapists emphasizing the important role that informal caregivers play in falls risk screening, a further limitation of this study is that we did not examine the

multidisciplinary care pathways for falls prevention in the social domain (i.e., neighbors, municipalities, informal caregivers). Future research should examine and visualize the requirements for sustainable pathways in the secondary care and social domain through journey mapping to improve the implementation of falls prevention interventions further.

Another strength of this study is the inclusion of different primary care-based HCPs. This allowed us to effectively capture the diverse needs of HCPs for multidisciplinary care pathways for falls prevention. However, the following limitations should be noted with regards to the sample of this study. First, among the primary care-based HCPs who participated in this study, only one was a practicing GP. Despite HCPs in this study highlighting the influential role of nurse practitioners as case managers, which is reflective of falls prevention in Dutch GP practices whereby certain tasks are distributed to nurse practitioners, the lack of participating GPs presents limitations to the generalizability of the findings. While the influential role of GPs for falls risk and factors management is well established across the literature, future research should explore the multidisciplinary falls prevention care needs of GPs (Mackenzie et al., 2020). Second, despite nationwide sampling, information about the total number of HCPs who received the call for participants is unknown due to the privacy regulations of organizations. Therefore, selection bias cannot be ruled out, which presents limitations to the generalizability of the within-group findings. Specifically, HCPs who chose to participate in this study may be more motivated in falls prevention initiatives compared to those who did not participate. While motivation is recognized as a facilitator for the implementation of multidisciplinary care pathways for falls prevention, future research should examine and visualize the needs of less motivated HCPs to enhance the implementation of falls prevention interventions further (Vandervelde et al., 2024).

## Conclusion

This study developed a visual journey map outlining the desired future state of multidisciplinary care pathways for falls prevention in older adults by primary care-based HCPs (i.e., for falls risk stratification, multifactorial falls risk assessment, management of multidomain interventions), providing important implications for policy makers seeking to develop sustainable pathways in practice. Implementing a case manager program into multidisciplinary care pathways for falls prevention and providing HCPs with access to resources to enable good communication between HCPs, such as through workshops or connections to existing communication platforms, are fruitful for improving collaboration between HCPs.



## Acknowledgments

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# Appendix

## Full list of organizations used for recruitment of HCPs

| Dutch names | English translations |
|---|---|
| VeiligheidNL | Dutch Consumer Safety Institute |
| Koninklijk Nederlands Genootschap voor Fysiotherapie (KNGF) | Royal Dutch Society for Physical Therapy |
| Landelijke Huisartsen Vereniging (LHV) | National General Practitioners Association |
| Ergotherapie Nederland | Occupational Therapy Netherlands |
| Nederlandse Vereniging voor Geriatrie Fysiotherapie (NVFG) | Dutch Association for Geriatric Physical Therapy |
| Verpleegkundigen en Verzorgenden Nederland (V&VN) | Nurses and Care Assistants Netherlands |
| Nederlandse Vereniging van Praktijkondersteuners en Praktijkverpleegkundigen (NVvPO) | Dutch Association of Nurse Practitioners and Practice Assistants |
| Koninklijke Nederlandse Maatschappij ter bevordering der Pharmacie (KNMP) | Royal Dutch Society for the Advancement of Pharmacy |
| Het Nederlands Huisartsen Genootschap (NHG) | The Dutch General Practitioners Association |
| Verpleegkundigen en Verzorgenden Nederland (V&VN) | Verpleegkundigen en Verzorgenden Nederland (V&VN) |

## Semi-structured focus group/interview guide

### *Introduction*

- Who are you? (name, profession, region)
- What is your experience with screening and assessing falls risk and factors in older adults in practice?
- Tell me about a positive or negative experience you have had while screening and assessing falls risk and factors in older adults?
- Tell me why you decided to participate in this focus group?

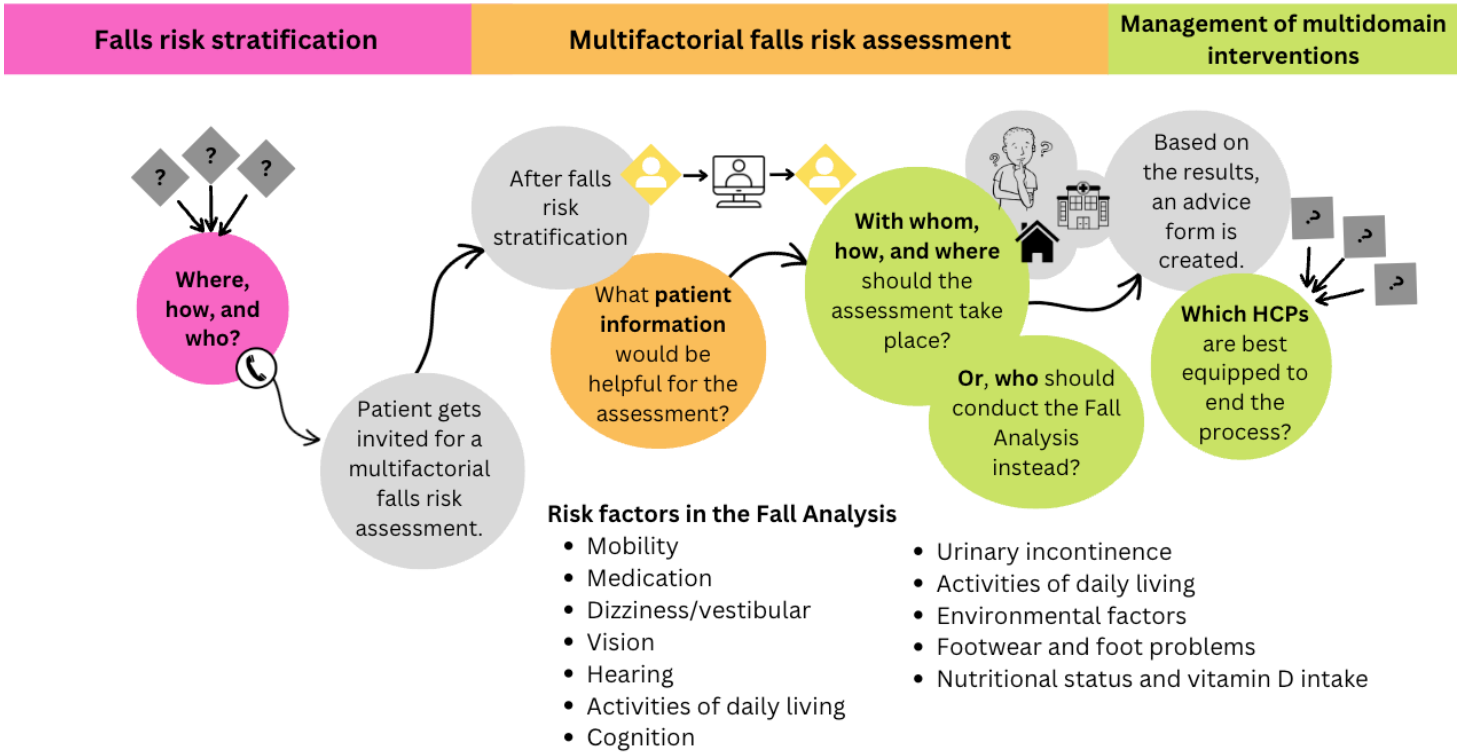


### *The Fall Analysis trajectory*

- Which health care professional group do you think is/are suitable for screening for falls risk in older adults?
    - Is it suitable to screen for falls risk via a telephone consultation? Why/why not? What are possible alternatives?
- Do you think that collecting and preparing relevant information about the patient related to the Fall Analysis would be helpful for you? Why/why not?
    - What preparatory information about the patient do you need to perform the Fall Analysis as optimally as possible? Consider the 13 risk factors that can be assessed using the Fall Analysis.
    - Through which means of communication would you like to receive/share preparatory information from/with other health care professionals?
- How would you like to conduct the Fall Analysis?
    - Should the Fall Analysis be performed in two appointments?
    - Where do the appointments take place, in the practice or at the client's home?
    - Which location(s) is/are most suitable for assessing certain risk factors?

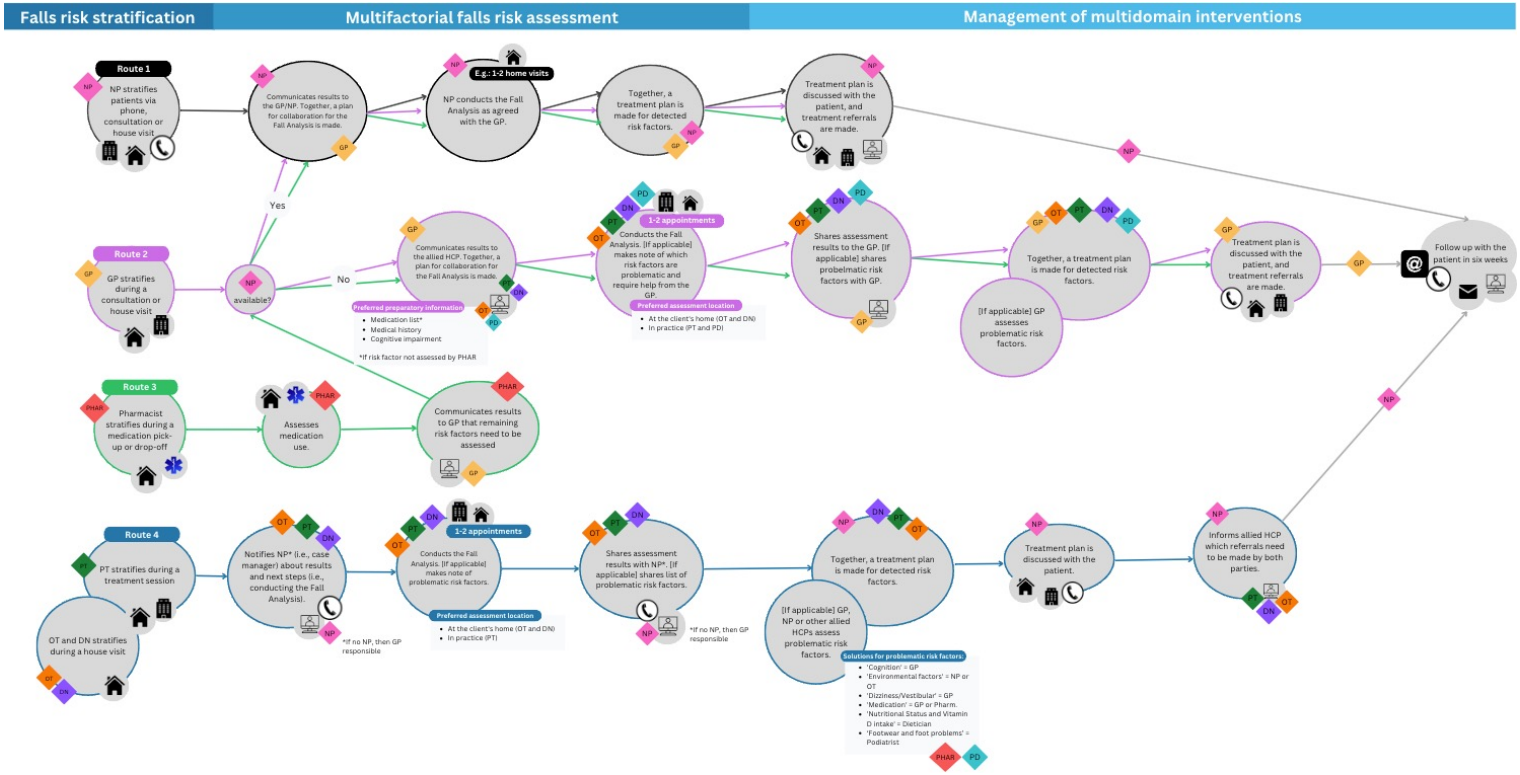
- Which health care professional group do you think is/are suitable for completing the Fall Analysis trajectory? Consider how the advice based on the results of the Fall Analysis should be communicated to the patient.
- To what extent does the Fall Analysis trajectory differ from your current trajectory for high falls risk?
- Which risk factors in the Fall Analysis are already part of the multifactorial falls risk assessment for older adults that you do in practice?
- Do you foresee problems with assessing certain risk factors in the Fall Analysis? For example, with the risk factors that you are less familiar with?
    - What are these problems? And, to which risk factor(s) does/do this apply?
    - What would help you to assess this/these risk factor(s)?

*Fig S1. Journey map used for focus group and interviews.*




Note. Developed using Canva graphic design platform.

*Fig S2. Detailed journey map portraying the desired future state of multidisciplinary care pathways for falls prevention in primary care.*




Note. Developed using Canva graphic design platform. Abbreviations: GP = general practitioner, NP = nurse practitioner, PHAR = pharmacist, DN = district nurse, PT = physical therapist, OT = occupational therapist, PD = podiatrist.

*Table S1. Multidisciplinary falls prevention care needs of HCPs.*

| Topic | HCP quote |
|---|---|
| Falls risk stratification | *"Additionally, when stratifying for falls risk, I think the big advantage of a pharmacy is of course that a lot, we have a lot of contact moments with the patients at risk. Whether that is a [medication] review or an extra evaluation or a first prescription or a second prescription, or manual sales, a lot of high-risk patients come to the pharmacy at least once a year. So, if you want to capture that entire group, a pharmacy would be a logical starting point. I think."*<br>– Pharmacist<br><br>*"I think, you actually want a HCP who is responsible for the entire Fall Analysis both for guidance and afterward. A great example within podiatry is diabetic foot care. […] The initial stratification is usually done by the nurse practitioner, and if they notice an increased risk of wounds, it is then referred to the podiatrist. At that point, the podiatrist becomes the case manager for the diabetic foot care of that patient. This means the patient comes to us, we conduct all possible tests to assess the risk of developing wounds, and then we can determine what care the patient needs to avoid wounds. […] It could work similarly here, not necessarily for podiatrists but for all other HCPs. You screen for falls risk, and if it's identified that someone may have an increased risk, then you have a specific HCP who becomes the case manager for the Fall Analysis and its guidance."*<br>– Podiatrist<br><br>*"[…] I think that the GP and the nurse practitioner need to be tackled the most. To create that awareness when patients actually come there for blood pressure or something, that the risk of falling is also discussed."*<br>– Physical therapist<br><br>*"But I do think that you are a HCP group that is primarily responsible for ensuring that everything with your patients is going well. At least, I think that is my job as a nurse practitioner to follow up [with my older patients]."*<br>– Nurse practitioner |

*"As a nurse practitioner for older adults, […] I call the older adults over 75. I just do that in alphabetical order and I then ask them the three questions."*

– Nurse practitioner

*"Yes, I do think that the GP practice is a very good entry point for when an increased risk of falling is suspected, also because we know what has already been done. When I see that a patient has fallen then I look into the file and I think: 'Oh, that [falls preventive care] was already completely mapped out by the nurse practitioner two years ago.' So you also want to prevent things from being done twice and most of the [patient's] history and such is known at the GP practice."*

- GP



Preparatory patient information

*"From the GP, I always receive the entire medication list, so I don't ask for it any further, if it is not available I ask the patient. And then I work it out further at home to see how many medications are involved. Is there polypharmacy and which falls risk medications are present? And, I indeed mention that in my conclusion. And, my advice then adds: 'Please monitor medication. Preferably once a year.'"*

– Physical therapist

*"[…] Of course you have to look at information, such as medication use and so on, incontinence. Yes, these are things that are often known to the GP."*

– Podiatrist

*"In principle we get this [patient information] through the GP. […] A history in that sense is of course important, whether there has been an operation or something. Or whether there have already been other medical issues. So I always think a medical history is very important."*

– Occupational therapist

*"And if, as a GP, you would need to make some kind of referral letter, that could work. You could make a referral letter just like when you refer someone to, I don't know, a specialist. You create a referral letter, and ideally, the GP would refer via [name of referral platform], which is a referral platform linked to our patient records. So I can just log into [name of referral platform] directly from a patient's file, and it's done automatically. Then I can also select which information should be included in the letter. That way, you immediately have the patient's medical history included."*

- GP

"Well, in any case, it's important to know the medical history. Are there any heart problems, neurological issues, mobility problems, and cognition? Additionally, there's the medication, but you should request that from the pharmacy, not the GP. That's also what we always did…; [name of nurse practitioner] would always request the medication from the pharmacy, because patients often have no idea what they are taking. And what's also important, but you might get that from your conversation during the Fall Analysis, is understanding how someone functions in daily life. Also, is their daily life limited by any falls risk? So, to what extent is someone frail or not."

- GP



Multifactorial falls risk assessment

*"We actually make a home visit quite quickly to see how, apart from mobility, what the home situation looks like and to see whether there are already safety rails, stair lifts, alarms available and whether there is a need for them in consultation with the patient."*

– Nurse practitioner

*"And that also makes it very easy and clear for us to map activities of daily living and environmental factors because you actually see the client at home in his own environment […]. So I think that it is a prerequisite that you do the Fall Analysis in the client's home situation."*

– Occupational therapist

Size of multidisciplinary care team

*"Yes, yes, I would say it would be better to have some overlap than to miss something and that means people don't have to go to 10 different HCPs just to get all those questions or the whole Fall Analysis completed."*

– Occupational therapist

*"[…] I would indeed not keep it with more than two or three people. But then I still think it is also very important to make some kind of plan with the patient and then look back. Okay, so what is most needed? What is compensated?"*

– Podiatrist



*"And if older patients indicate, "Oh yes, I would like to do something about that [my falls risk]," then I will discuss it with the GP, and that's where further analysis on various fronts [would begin]. […] People are categorized into high, low risk groups, etc. and then a whole process is set in motion."*

– Nurse practitioner

*"Yes, you know, in principle, I think the nurse practitioner is the most logical and best person for this. Because they have the insight, they have access to the medical records, they work closely with the GP, and they are right there in primary care."*

- GP

*"And then the alternative solutions are more due to a capacity problem... If the Netherlands considers this [multifactorial falls risk assessment] so important and the capacity for nurse practitioners is limited, then the financing should also be reviewed. Or perhaps some of the tasks that currently fall to the nurse practitioner should be shifted to district nurses, for example."*

- GP

*"I think cognition is the biggest problem, because I find it confrontational to assess. So that is a point: Should we assess it, when are you going to assess it? You need the Montreal Cognitive Assessment or the Mini Mental State Exam for that. But I always find that very difficult for myself. […]So if I have any doubts, I'll go to the GP."*

– Physical therapist

*"And I would rather go to a GP than to a pharmacist because the GP is much more able to see whether medication can be reduced or can be switched to a different type of medication."*

– District nurse



*"All I do about dizziness is ask about it. And if necessary, ask the nurse practitioner or the GP to check orthostatic hypotension."*

– Occupational therapist

*"Nutrition also goes to the dietician, for me."*

– Physical therapist

*"I almost never do those mobility tests. I find that very difficult. […]And I think it doesn't quite feel like I should do them, I would rather have a physical therapist do them."*

– Occupational therapist

*"For example, as a podiatrist, I can already address seven things. Then I can look, 'Oh, who can this person turn to for the last five things? Oh, wait, I have a good connection with that person,' so I see it more as not assigning specific tasks to each individual, but more like, 'Oh, this person can help with these five things with that other person.' I see it more as an 'and, and' story."*

– Podiatrist

*"I work a lot with nurse practitioners from the GP's office, and then they handle a portion of the assessment while I handle another portion."*

– Physical therapist

*"I think it will help me make decisions... so indeed, because I don't have the expertise in everything, I think this will be helpful. […]Yes, it [a multidisciplinary care approach] also allows me to involve a colleague right away, like saying, 'well, it's multidisciplinary,' so it also involves another professional or several colleagues."*

- District nurse

*"Yes, we are of course very much concerned with medication-related falls risk. But if you read the falls risk from VeiligheidNL then it, of course, has many other aspects, and for us this now means that it is picked up by the physical therapist or nurse practitioner."*

– Pharmacist



Management of multidomain interventions

*"Yes, I type it into my file. So, I include the falls risk factors there, type them into my file, and then copy and paste them into my email to the GP."*

– Physical therapist

*"And, of course, after your [medication] review, you always consult with the GP. So, in the end, I think the GP still has the lead because they can assess which issue we're addressing now, for example, falls risk, are we inviting people further, and what are we going to discuss with that person. These are the points that arise from the discussion between the pharmacist and the GP. So, on the one hand, I think maybe as a pharmacist, wanting to be involved throughout the entire project might be too much, but we also need to take this opportunity to showcase our role here and not let it pass us by."*

– Pharmacist

*"And then a whole process is set in motion, and one of the components is that the physical therapist is linked to it in the context of falls training, so to speak. That's one part, but polypharmacy is another part. So we have multiple components, but then it's actually out of my hands at that moment after I've discussed it with the GP."*

– Nurse practitioner

*"Yes, if you don't have contact with the other disciplines, then I think the GP should handle it, but you can discuss it with the patient beforehand, ensuring they are comfortable with it, that it will happen. Otherwise, you're just administering the Fall Analysis - 'okay, thank you, thank you... you'll hear from the GP' - I personally don't find that a pleasant way of working."*

– Physical therapist

*"What we used to do when we still had the multidisciplinary meeting was to hold the meeting, where each discipline would provide their recommendations. The nurse practitioner would then collect those recommendations, talk to the patient about what was discussed, and ask, 'What would you like to focus on, and what do you want to tackle first?' So, essentially prioritizing with the patient. Most of the time, things like sleeping pills and alcohol are low on the priority list, so we might say, 'Let's first focus on something like training with the physical therapist,' and then follow up with a call after six weeks, asking, 'So, how's it going? Is it getting better? Maybe now it's time to consider reducing the sleeping pills?' Something like that. So, you work together with the patient to decide which factors to address and when."*

- GP



Similarities and differences

Beliefs

*"What [name] is saying is that the implementation of behavior change takes a lot of time. It's about raising awareness among everyone about how important this [falls risk stratification] is and looking at what is needed to make this standard practice."*

- Physical therapist

*"Yeah, I always find it difficult when things get standardized or something because it's so individual where you are in that situation. I'm also a bit allergic to it when I have to fill out tests myself. Because you get this kind of vague idea of what you're supposed to do, and you think: 'Well, that's just completely useless to me."*

- Nurse practitioner

*"[…] What I'm a bit afraid of is that certain professionals, a physical therapist or occupational therapist or anyone else who is not very skilled with it, will conduct a multifactorial falls risk assessment in older adults. I think you have to have some experience with it."*

- Physical therapist

Communication between HCPs

*"I think a lot of problems also arise from the lack of data sharing in primary care. […] once you agree that someone has an increased risk of falling, it would of course be nice if every HCP knew that"*

- Pharmacist

*"…you might learn certain things because clients tell you…when you visit a client and you're not involved in their medication, there could easily be changes in their medication without you knowing. Because a GP doesn't always inform us, the client has to do that themselves. So there are definitely outcomes that we don't know about."*

- District nurse

*"Fortunately in our neighborhood, contact with the occupational therapist is very accessible, so that is just very nice. If in doubt, we can contact an occupational therapist very quickly within a few weeks or within two weeks."*

- Nurse practitioner

*"But also sure that the plans you set up or that have been set up are being followed. And if the physical therapist is on vacation for three weeks, that you know about it, so that something else can be arranged, or that you can communicate that back. … So a lot of things are left undone, and that's really unfortunate."*

- Nurse practitioner

*“I work for a GP and also a lot with [name of communication platform] and I think that this is a nice tool to use for someone who has fallen and where you then work on the problem with several professionals, so to speak. And, you also get good information, can share, and it is transparent for the patient and informal caregiver.”*

- District nurse

*“But it would be great if it’s a document that can be filled in by professionals, and also by multiple professionals from different disciplines. That way, you can make a request to the GP, like, ‘Okay, I need to complete this multifactorial falls risk assessment, could you fill in this and that information?’”*

- Occupational therapist

*“I definitely think it [reducing the administration time of the Fall Analysis] can help within a network. I work together with physical therapists, district nurses, and the elderly care network, and I think part of it falls under GP care—I work for the GPs—and then you can divide it up nicely. […] I think you can look closely at your network to see who can handle what. […] I think a multidisciplinary approach can really work well. Then we have everything...and as a check, we can see who can best address specific issues for that older adult at the moment.”*

- District nurse

Workload

*"I think the chances of GPs doing it themselves are not very high because it's definitely extra work. How long it takes also depends on the patient, as it often involves a broad range of issues. It's not just a matter of quickly ticking off questions; there's usually a whole story around it. But in principle, if someone has an increased falls risk, having the GP practice as the first point of contact is a good idea, I think."*

- GP

*"What gives me a bit of a strange feeling is the involvement of the GP because from practice we know that GPs are so incredibly overloaded. I really wonder if that [GPs as case managers] is the ideal option for the future."*

- Physical therapist

*"Yes, there's already plenty of work, so if you start encouraging more [multifactorial falls risk assessment for older adults], I always worry that even more work will come our way."*

- Nurse practitioner