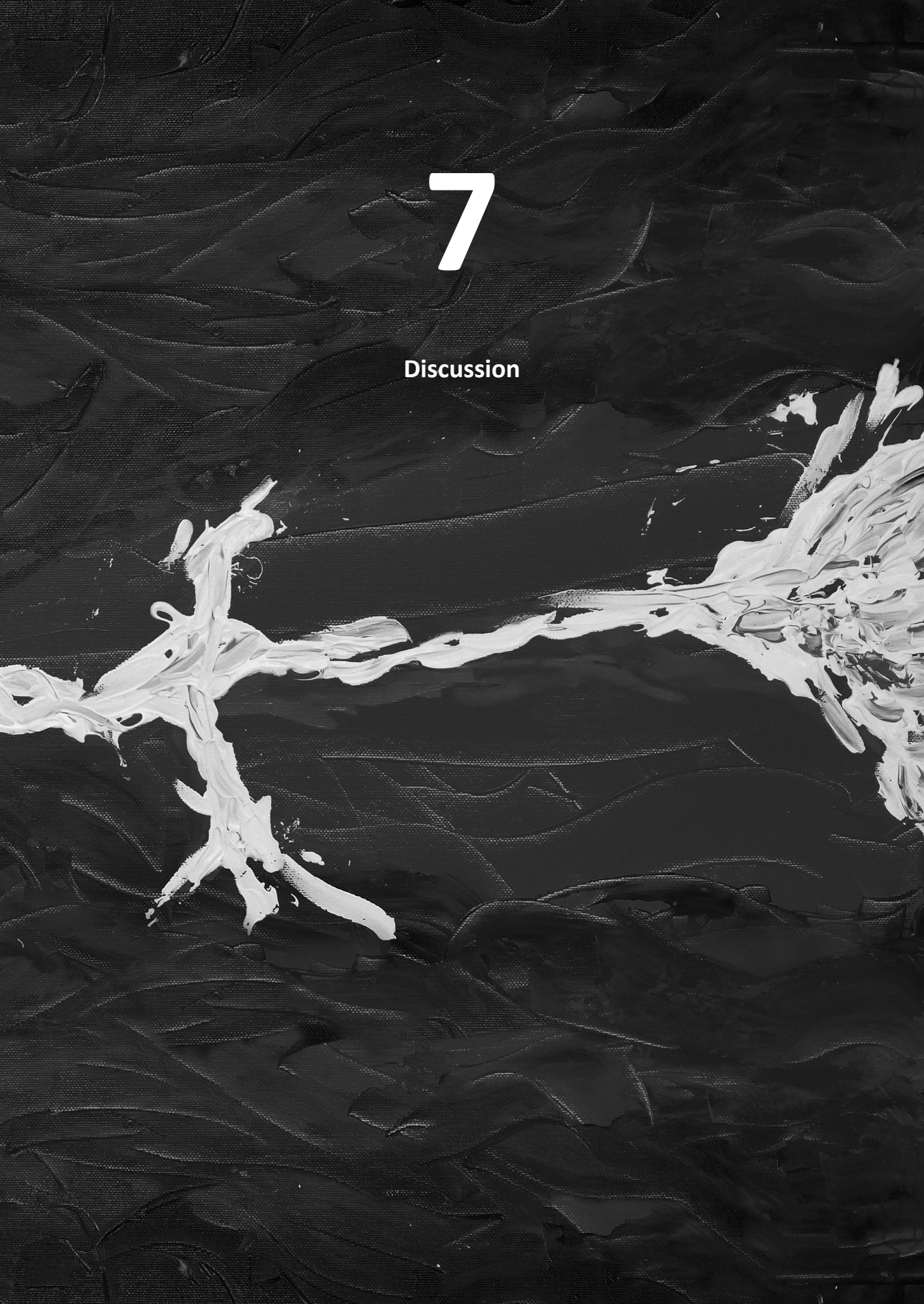
7

Discussion



The aim of this thesis is to study fear of falling (FoF) in vulnerable older people with a hip fracture who rehabilitate in a skilled nursing facility (SNF). More knowledge is needed to develop interventions to reduce FoF and to improve outcomes of the rehabilitation process. Therefore, six main research questions were formulated - these are addressed first. Then, issues related to the methods and concepts used in this thesis are discussed. Finally, some implications for clinical practice and future research are considered.

7.1 MAIN FINDINGS

1. What is the prevalence of FoF in older patients with a hip fracture?

To determine the prevalence of FoF after hip fracture the literature was analysed by means of a systematic review (Chapter 2) and a cross-sectional study was carried out among 10 SNF in the Netherlands (Chapter 4). The review revealed that different instruments are used to measure FoF, thereby making comparisons difficult. Also, no evidence-based cut-off points are available to distinguish between a high and low level of FoF. A study by Muche et al.[1] indicated that 50% (68/135) of the patients aged ≥ 65 years who were admitted to a hospital after hip fracture had a high level of FoF. In a study by Ingemarsson et al.,[2] in which FoF was measured 25 days after surgery in patients aged ≥ 65 years admitted to a geriatric hospital, 65% had some kind of FoF. In our cross-sectional study (Chapter 4) we found that 37% were not at all concerned about falling, while 36% were somewhat concerned, 23% were fairly concerned and 4% were very much concerned about falling. More recent studies among older patients after a hip fracture also report high percentages of FoF, e.g. 58% in a study by Jellesmark et al.[3]

These high prevalence rates are comparable to rates in older persons who reside for long-term care in nursing homes, in which prevalence rates of FoF range from 40% to 75% with a mean prevalence of 63%.[4] FoF was also common among community-dwelling older people with a wide range of prevalence rates (21%-85%), depending on the instruments used and the characteristics of the study population.[5,6]

When focusing on the severity of FoF by using instruments such as the FES, a substantial level of FoF was found among older patients after a hip fracture. In the study by Ingemarsson et al. the mean score was 5.6 (SD ± 2.8) on a scale from 0-10 (0=no confidence at all, 10=full confidence not to fall).[2] In our cross-sectional study (Chapter 4) the mean score on the FES-I was 32.2 (range 16-64). Both studies indicate that, after a hip fracture, patients generally have a substantial level of FoF. Therefore, FoF may constitute a serious problem during rehabilitation and requires further research and actions.

2. Which factors are related with FoF?

If FoF is indeed an important problem in rehabilitation after a hip fracture, it is essential to select those patients who are at most risk for high levels of FoF. To identify such patients, factors correlated with FoF have to be identified. Therefore, our literature study (Chapter 2) and cross-sectional study (Chapter 5) present the most important correlates of FoF after hip fracture. The literature review revealed a relationship with two pre-morbid factors, i.e. a strong correlation with pre-fracture activity and a weaker but significant relationship with history of falls. FoF was also correlated with physical function, balance, mobility, exercise, falls after fracture, institutionalisation and even mortality (Chapter 2). In our cross-sectional study, the univariate regression analysis identified six factors related to FoF i.e. walking ability before fracture, number of complications, activities of daily living (ADL) before fracture, anxiety, ADL after fracture, and self-efficacy.

These results are comparable with recent studies in community-dwelling older people. In a cross-sectional study among 540 community-dwelling older people, female gender, limitations in ADL, and one or more falls in the previous six months correlated independently with severe FoF.[7] Univariate correlates in this study were old age, female gender, limitations in ADL, impaired vision, poor perceived health, chronic morbidity, falls, low general self-efficacy, low mastery, loneliness, feelings of anxiety, and symptoms of depression. In another study among community-dwelling older adults, female gender, physical function, the use of a walking aid, history of falls and poor self-related health were associated with FoF-related constructs.[8]

Studies in long-term care facilities showed that age, gender and poor self-rated health status were also correlated with FoF.[4] Other factors were psychological states, such as depression and anxiety. In our study, FoF was not related with depression but only with anxiety.

In the multivariate regression analysis (Chapter 5) only three factors were independently related with FoF, i.e. impaired walking ability before fracture, impaired ADL after fracture, and increased anxiety were associated with a higher level of FoF. Therefore, health professionals should be aware that older patients who have a history of problems with walking, or who have an anxious character, have a high risk for FoF. This risk is even higher if the Barthel Index (expressing basic ADL such as going to the toilet and (un)dressing) remains low during rehabilitation.

3. What is the course of FoF after a hip fracture?

No longitudinal studies are available to provide information on the course of FoF after a hip fracture (Chapter 2). However, our cross-sectional study shows that the percentage of patients with FoF is highest in phase 2 (29-56 days after fracture) of the rehabilitation process (Chapter 4). In phases 1 (≤ 28 days after fracture), 2 and 3 (≥57 days after fracture) the FES-I was 30.6, 35.6 and 29.4, respectively (P=0.025, Kruskal-Wallis test). Thus, FoF was

highest in the group that had rehabilitated for 4-8 weeks. Initially, patients may not realise the consequences of the fracture because the first exercises are usually done under close supervision and in a step-by-step manner. However, after a few weeks patients have to walk more independently and may then realise the consequences of their fracture for future functioning; this may result in an increase in FoF. In a later phase of rehabilitation, after further training, FoF may decrease again. However, since our study had a cross-sectional design, we have to be cautious about drawing any firm conclusions from these results.
Analysis of the longitudinal study (Chapter 6) revealed that up to 85.4% of the patients with a trauma, including hip fractures, had FoF 4 weeks after discharge (Chapter 6). Therefore, FoF is rather persistent in older patients rehabilitating in a SNF after a hip fracture.

4. Is the FES-I a suitable instrument to measure FoF after hip fractures?
The literature review in Chapter 2 shows that different instruments are used to measure FoF in patients after a hip fracture. Firstly, some instruments measure FoF directly; these are mostly one-item instruments with a single question, such as "How much fear of falling do you have?". Secondly, instruments focusing on balance and fall-related self-efficacy are used, such as the Falls-Efficacy Scales, of which several modifications have been developed. Other scales, such as the Activity-specific Balance Confidence (ABC) scale, are used but are less sensitive to change than the FES.[9] Furthermore, the FES is more suitable for use in vulnerable older persons than the ABC scale, which includes several more complex activities.[10]
Nowadays, the FES-I, which has been developed and validated in different countries by the Prevention of Falls Network Europe (ProFaNE) network, is regarded as the most suitable instrument for community-dwelling older people.[11] To assess whether the FES-I is also a suitable instrument to measure FoF after a hip fracture, the measurement properties of the FES-I were assessed in two groups of patients with a hip fracture (Chapter 3). The FES-I was unidimensional in patients with a hip fracture. The internal consistency was high (Cronbach's alpha was 0.94), although the construct validity was not optimal since only 4 of the 11 hypotheses could be accepted. The intra-class correlation coefficient was 0.72, which is considered fair.
Although Chapter 3 demonstrates that the FES-I can also be used to measure FoF in patients after a hip fracture, the construct validity requires further consideration. For older patients with hip fractures the FES-I may not capture all aspects of FoF. The FES-I seems more closely related to functional performance than to psychological concepts. It is likely that the FES-I is predominantly a rational self-assessment of an individual regarding whether he/she is capable of performing an activity without falling, and only to a lesser extent measures emotional aspects of FoF (such as embarrassment and fear for the consequences of a fall). Therefore, some researchers have recommended (as we did in our cross-sectional study) to use two instruments for FoF, e.g. a one-item instrument *and* the FES-I.[12]

Although in other studies the FES-I was administered through self-reporting,[13] in our cross-sectional study the FES-I was carried out through face-to-face interviews. This is supported by more recent research. For example, in a study in older persons with and without cognitive impairment, Hauer et al.[14] found that in vulnerable older persons, especially with cognitive impairment, an interview-based method is advisable. In an additional study we also found that the FES-I may have elements which are sometimes misinterpreted, indicating that a face-to-face interview in older and vulnerable people is the best option.[15] Items can be better explained, particularly when they concern an activity which currently cannot be performed by an older person.

Until now, only a few studies have suggested cut-off points for the FES-I (range 16-64). Jellesmark et al. reported that a score of 22-64 indicates a high degree of FoF, resulting in 58% of their participants having a high level of FoF.[3] In a study by Delbaere et al. a score of 22 and over and of 20 and over, were used as cut-off points for low and high perceived fall risk, respectively, for persons with a low and high physiological fall risk.[16] In a validation study of the FES-I, in which cut-points were defined as the best trade-off between sensitivity and specificity, a score of 23 and over was regarded as a high concern of falling.[17]

In Chapter 5, which identifies factors that explain differences in patients with high and low levels of FoF, the median was the cut-off point. A FES-I score of 33 and over was regarded as a high level of FoF. It is likely that in our study group, including many vulnerable older people, the level of FoF is substantially higher. Therefore, the group of older persons with a low level of FoF also included persons that had a level of FoF which could be considered as a high level of FoF according to other standards. This may even have led to an underestimation of the outcomes. The most suitable cut-off points for the FES-I in these patients is still debated and requires further research. This may be important for the selection of patients who require a specific intervention, particularly when FoF leads to avoidance of activities.

In conclusion, we recommend to use the FES-I, using a face-to-face interview, and to measure FoF after hip fractures. The FES-I could also be useful for monitoring FoF during the rehabilitation period, particularly when interventions are implemented to reduce FoF.

5. Which interventions reduce FoF after hip fracture?

Unfortunately only four intervention studies aiming to reduce FoF after hip fracture could be found in our literature search (Chapter 2). Moreover, none of these studies included very vulnerable older patients.

In a home-based rehabilitation programme, Crotty et al.[18] found that the mean FES at 4 months was significantly better compared to usual treatment. Hauer et al.[19] started a 12-week programme of ambulatory training after hip surgery. Measurements were carried out at 3-4 weeks after admission to hospital, at the end of the training period, and again 3 months later; although there was a clear improvement related to FoF, it was not significant.

A community exercise programme, in which patients with a hip fracture were assessed after a 4-month intervention period, was evaluated by Jones et al.[20] The FES improved in the intervention group, but not significantly. Ziden et al.[21] studied a home rehabilitation programme focusing on balance confidence and ADL. The intervention group showed significantly higher confidence in performing daily activities as measured by the FES. When comparing changes one month after discharge with baseline data, the intervention group showed a larger increase in balance confidence on stairs and instrumental ADL.
Although some of these studies demonstrate that FoF can be modified, the results have to be interpreted with care. The studies only included relatively healthy patients, the sample sizes of the studies were small, and the follow-up period was generally rather short. Also, most programmes had FoF as a secondary outcome with (generally) the reduction of falls being the primary outcome. A recent Cochrane review on exercises for reducing FoF in community-dwelling older people concluded that these exercises probably reduced FoF to a limited extent immediately after the intervention, without increasing the risk for falling.[22]
A recent literature review on interventions aimed at multi-factorial falls prevention and FoF rightfully concludes that, to reduce falls, FoF must be addressed in these interventions in addition to the physiological parameters.[23]
Interestingly, the regression analyses in Chapter 5 resulted in a final model consisting of three factors i.e. walking ability before fracture, activities of daily living after fracture, and anxiety. Since the latter two factors are modifiable, they also constitute aspects that interventions should focus on in order to reduce FoF.

6. What is the prevalence and what are the consequences of FoF in other patient groups who rehabilitate in a SNF?

FoF in patients rehabilitating in a SNF is not only restricted to patients with a hip fracture (Chapter 6). In patients who rehabilitate in a SNF of a nursing home the percentage of patients with FoF was 51.6%, 77.8%, 69.5% and 56.5% for patients with stroke, an elective orthopaedic procedure, trauma or other underlying disease, respectively. In patients that could also be followed-up after discharge 78.3% 77.8%, 85.4% and 83.3% of the patients with a stroke, an elective orthopaedic operation, a trauma of another disease, respectively, had FoF. Therefore, also in other groups not admitted due to a fall causing a severe trauma (e.g. a hip fracture), FoF is highly prevalent. This may indicate that FoF is more strongly associated with other characteristics of older persons rehabilitating in a SNF than the underlying condition itself. Also, a serious fall is apparently not necessary for the presence of a high level of FoF. Factors such as impaired functional capacity, restricted mobility and enhanced anxiety may be even more important. After discharge from hospital, FoF was relatively persistent in all patient groups and, among patients with a stroke, was even higher than directly after admission in a SNF. This indicates that FoF also has to be addressed after discharge, particularly since it reduces instrumental ADL after discharge (Chapter 6).

7.2 REFLECTIONS ON METHODS AND CONCEPTS

During the research described in this thesis, it became apparent that several methodological and conceptual issues need to be addressed.

Limited number of studies

Chapter 2 shows that the number of studies on FoF after hip fractures is relatively small. Only 15 studies were found that provided some information on the prevalence and impact of FoF in persons with a hip fracture. Recently, although more studies have been published which highlight the importance of FoF, they do not change the main conclusions of our literature review.[24-28]

An additional problem was comparing studies that had different designs, were carried out in different settings, used different instruments to measure FoF and, generally, also had different endpoints. Therefore, conclusions drawn from comparisons of these studies should be interpreted with some caution.

Selection bias

A strength of this thesis is the specific focus on vulnerable older patients. In the cross-sectional study in Chapters 3, 4 and 5 the inclusion criteria were purposefully kept broad to include vulnerable older persons. The average number of co-morbidities was 3.5: also, of all participants,19% had short-term memory impairment, 6% had long-term memory impairment and 27% had visual impairments, indicating that the participants were less healthy than in most other studies. Nevertheless, 13 patients had to be excluded from our cross-sectional study because they were not able to respond to questions due to severe cognitive problems. In our literature review (Chapter 2) no studies were found that specifically focused on these vulnerable older patients.

Since we studied vulnerable older patients rehabilitating in SNF in nursing homes, the included participants were necessarily carefully selected. Therefore, caution is required about generalising the results of our study to other patient groups. Nevertheless, in the Netherlands this group is substantial (estimated to be ≥ ⅓ of all patients with a hip fracture) and most likely represents the group of patients with the worst outcomes.

Selection of variables

In Chapters 3, 4 and 5 the type of information collected and the measurement instruments used are common in clinical practice. Therefore, based on the results of the regression analyses, it is relatively easy in clinical practice to collect data on variables closely related to FoF, such as anxiety, and scores on ADL (Barthel Index) and walking ability (Functional Ambulation Categories (FAC)). Subsequently, it may be relatively easy to identify persons that are particularly prone to have FoF.

In the cross-sectional study (Chapter 5) we asked relatively simple questions for cognitive status derived from the Cognitive Performance Scale from the Minimal Data Set of the nursing home resident assessment instrument.[29] An advantage of these questions, is that these data are easy to collect. However, other instruments, such as the Mini-Mental State Examination (MMSE), although more time-consuming, may be more suitable to provide information on the extent of cognitive impairment in older persons. For more understanding on the relation between cognition and FoF, studies are required that use instruments providing more detailed information on the cognitive status of older persons.

Cross-sectional study: strengths and weaknesses

A strength of our cross-sectional study was that it provided a reasonable representation of SNFs, since 10 different SNFs were included. The rehabilitation programmes of these SNFs were comparable in terms of intensity, disciplines involved and duration. Also, the targeted (and realised) number of 100 participants was sufficient for statistical analysis. Although a cross-sectional study is particularly suited to explore a topic and to generate hypotheses, it has some limitations. For example, since data are collected at only one moment in time, no causal relations can be proven. In Chapter 3, for instance, we could assess the course of FoF during rehabilitation by relating it to the time period after the fracture. However, a more accurate analysis can only be made in a longitudinal study in which FoF is measured in one individual at different points in time.

The concept of FoF

The literature lacks one clear definition and conceptualisation of FoF.[12] Initially, FoF was regarded as the 'post-fall syndrome', i.e. excessive FoF after a fall.[30,31] Although FoF is indeed related to earlier falls, FoF is also reported by many older people who did not fall at all, suggesting a multi-factorial aetiology that includes other psychological factors, such as anxiety and depression.[5,31]

FoF has often been discussed in terms of conceptual and methodological aspects, e.g. whether the 'self-efficacy' definition used for FoF by Tinetti et al. relates to a functional or psychological status, or to both.[32] Fall-related self-efficacy has been used as a proxy for FoF, even though the two are increasingly regarded as different concepts. Fall-related self-efficacy focuses on a person's confidence in his/her ability to avoid falling while undertaking ADL. FoF can be regarded as a broader concept which includes physiological, behavioural and cognitive elements. FoF itself influences activity avoidance, functional performance, and falls indirectly through falls efficacy.[32]

When assessing the FES-I we found that our initial hypotheses, in which we thought that the FES was more closely related to psychological status than to motor assessments, were not correct (Chapter 3). The FES-I, assessing concerns about falling when performing certain

activities, appears to be more closely related to physical performance. This is in line with Hadjistavropoulos et al. who indicated that fall-related self-efficacy is related to FoF, but probably with less intensity and emotion.[32]
Also in more recent publications, e.g. by Denkinger et al.,[8] different FoF-related constructs are distinguished, i.e. i) fear of falling, ii) fall-related self-efficacy/balance, and iii) FoF-related activity restriction. These authors argue that FoF is often used as an umbrella term that should be divided into distinct psychological concerns such as the specific fall-related fear, fall-related self-efficacy, balance confidence, and other constructs.

Perceived versus physiological risk to fall

In this thesis we used the definition of Tinetti et al. to describe FoF: "…*a lasting concern about falling that leads to an individual avoiding activities that he/she remains capable of performing*".[33] In this definition FoF is regarded as an obstacle for persons to carry out certain activities. However, FoF is also a mechanism for persons to prevent them from undertaking high-risk activities for falling, particularly if they indeed have a high objective risk to fall. In a study by Delbaere et al. among community-dwelling older people, the researchers emphasise that many older persons may underestimate or overestimate their risk of falling, and that measures for both physiological and perceived fall risks should be used to assess fall risk and to prevent future falls.[16] In their study, a distinction is made between perceived and physiological risks of falling. While the physiological risk is based on a physiological profile assessment, i.e. tests for vision, proprioception, muscle strength, reaction time and postural sway, the perceived fall risk is assessed with the FES-I. Also, 31% of the participants had disparity between their physiological and perceived fall risk. Based on these tests four groups are distinguished: "anxious" (high perceived, low physiological), "vigorous" (low perceived, low physiological), "stoic" (low perceived, high physiological) and "aware"(high perceived, high physiological). Interestingly, the stoics had a significantly lower number of falls than the awares, indicating that a high perceived fall risk among older persons with a high physiological fall risk is not protective at all. According to the authors, possible explanations for this may be the active lifestyle of the stoics, the higher use of psychotropic drugs among the awares, and the fact that the stoics had experienced less falls resulting in less perceived fall risk.
Although it would be interesting to carry out a similar analysis among older persons after a hip fracture, it also demonstrates that (in general) FoF can be seen as an obstacle for older patients, whether or not such perceived fall risk is in line with more objectively measured fall risk. Therefore, it is essential not only to carry out more objective tests for physiological tests in fall analysis, but also to include tests for perceived fall risks, such as the FES-I, because higher levels of perceived fall risk result in future falls.

In this thesis FoF was also regarded as an obstacle in rehabilitation and not as a preventive mechanism. In most studies on FoF after hip fracture, this perspective is taken. Although based on clinical experience such a perspective may be logical, it would be useful to distinguish between physiological and perceived fall risk in future studies. Our own data can, to some extent, be analysed based on this perspective, e.g. by using 'objective' tests such as the Performance Oriented Mobility Assessment (POMA) as a proxy for physiological risks of falling.

7.3 IMPLICATIONS OF THIS THESIS

Implications for clinical practice

During the last decades, geriatric rehabilitation has evolved as an important discipline in elderly health care, both for clinical practice and research.[34] More research data are available, various instruments have been validated, and an increasing number of researchers are interested in rehabilitation in older persons.[35] Multidisciplinary rehabilitation and comprehensive geriatric hip fracture units have proven to result in better functional outcomes and reduction of poor outcomes, such as mortality or admission to a nursing home.[36-38] This thesis has revealed that, after hip fracture, the majority of patients has FoF and that FoF can be measured with the FES-I. The thesis also identified several factors that correlate with FoF. The most important consequences of these findings for clinical practice are summarized below.

Assess FoF in all patients rehabilitating in a SNF

FoF has been identified as a most important and potentially modifiable threat to autonomy in older individuals.[8] The number of studies on FoF is increasing annually and FoF is also regarded as an important negative aspect related to participation and quality of life in nursing homes.[4] Furthermore, FoF predicts delayed recovery in geriatric rehabilitation.[39] Therefore, FoF warrants more attention: this applies not only to community-dwelling older persons, but also to persons in nursing homes whether they be residents or patients who are rehabilitating.

This thesis demonstrates that FoF is not only common after hip fracture, but also in other patient groups rehabilitating in SNF. So far, FoF has rarely been routinely assessed during geriatric rehabilitation. To elucidate the role of FoF in the outcomes of rehabilitation, FoF needs to be assessed during rehabilitation and be included in protocols and guidelines for rehabilitation.

Measure FoF throughout the rehabilitation process and address FoF after discharge

When assessing FoF over time, this thesis (Chapter 3) found differences between patients related to the time after operation. In the Back Home study (Chapter 6), in some patient groups FoF increased even after discharge. Although data from a longitudinal study are necessary to determine the precise course of FoF after a fracture or other event, it is advisable to assess FoF at different points in time. Suitable moments may be shortly after start of rehabilitation, during rehabilitation, and after discharge home. Assessment at these moments enables health professional to identify older persons with a high level of FoF and to engage them in interventions to reduce FoF.

Chapter 6 also reveals that FoF is rather persistent over time. Therefore, rehabilitation should not stop after discharge from a SNF, especially because current guidelines recommend early discharge home.[40,41] Patients should be followed up at home and interventions addressing FoF need to be continued after discharge. Physiotherapists should be trained in geriatrics and be aware of the psychological factors involved in rehabilitation. Often, a broader geriatric assessment by the elderly care physician and a multidisciplinary approach with the involvement of a psychologist may be required.

Include FoF in fall analysis for all older people

Falls are regarded as a geriatric syndrome because the prevalence is high in older persons living in the community and in nursing homes, and falls have severe negative consequences. Nowadays, analysis of falls is regarded as an essential element in health care for older people and an important element in rehabilitation after hip fractures.[40] In the analysis of falls, FoF also needs to be assessed in order to prevent future falls. In the Netherlands, an assessment of FoF through the short FES-I has recently been added to the fall protocol.[42] The main challenge is to implement this protocol in a timely way and in all relevant settings, both at home and in nursing homes. For patients who reside in a nursing home, this assessment should be carried out at least at admission and after a fall. The focus of such an assessment should not be on identifying persons at risk (since almost all patients in a nursing home are at risk), but at interventions to reduce the risk to fall. For older persons admitted to a SNF a fall analysis should also be carried out, at least for all those who experienced a recent fall, such as patients with a hip fracture.

Use the FES-I to measure FoF

Chapter 3 of this thesis demonstrates that the FES-I is suitable to be used for hip fractures. Since it has been shown that the measurement properties of the short FES-I are comparable to those of the FES-I, this instrument may also be used.[43]

Chapter 3 indicates that the FES-I is closely related to motor performance and balance, e.g. measured with the POMA. Therefore, it can be argued that the POMA may also reflect some

aspects of FoF or falls efficacy. Nevertheless, it is important to measure FoF separately, since special interventions focusing on the cognitive aspects of FoF may be necessary to reduce FoF. This may improve both measures for FoF (such as the FES-I), as well as functional tests (such as the POMA), which should be routinely measured after hip fracture.

Implications for research

In geriatric rehabilitation many challenges remain for further research.[44,45] The American Geriatric Society has formulated a research agenda for geriatric rehabilitation based on three cross-cutting needs.[35] One of them is the disablement process itself in older persons, and another is the identification of the most important factors which influence the rehabilitation process. Hip fractures and falls were identified as two of the eight conditions requiring more research in older persons. This thesis, by dealing with falls, hip fractures and FoF during the rehabilitation process, aims to offer additional knowledge to address the research agenda. Since research is a learning process, several lessons can be drawn from our study, while new issues and challenges emerged when answering the research questions. These are summarized below.

- Because the study on FoF after hip fractures had a cross-sectional design, caution is required about drawing firm conclusions on the course of FoF and causal relations between demographic, functional and psychological factors. Longitudinal studies are needed to provide more knowledge on the exact course of FoF, by measuring FoF at different points in time. Such studies are also useful in establishing the temporary and causal relations between different factors and FoF. Chapter 5, and a study by Denkinger et al.,[8] report the most important parameters that can be used for such a longitudinal study on FoF after hip fracture.

- Although some longitudinal studies, also on hip fractures, are available, none have included FoF over a longer time period, particularly not after hospital discharge. Also, in the study in Chapter 6, we could only assess FoF during admission or shortly after discharge. Since FoF seems rather persistent, it is important to assess FoF over a longer time period, e.g. one year after the actual hip fracture, and to assess its impact on participation and quality of life. This requires a longitudinal study in which the patients are followed on the longer term after discharge.

- This thesis focused on vulnerable older people rehabilitating in SNF and shows that FoF is widespread among all patients groups. FoF may be more strongly related to different aspects of vulnerability than to the underlying disease itself. Therefore, more research is required to unravel the relations between vulnerability and FoF. This applies to patients rehabilitating in SNFs, as well as to older community-dwelling persons.

- Particularly the literature review (Chapter 2) showed a strong selection bias. In most studies, older persons with high levels of co-morbidity or cognitive problems were excluded. Although including such participants will cause some methodological challenges, the increasing numbers of vulnerable older persons demand more evidence-based knowledge for these groups, also in relation to intervention studies. It is possible that these older people may benefit most from interventions targeting, for instance, FoF.

- Although the concept of FoF is still being debated and different FoF-related constructs exist, the measurement properties of the FES-I were suitable to measure FoF in patients after hip fracture. The FES-I may not measure all aspects of FoF, but it is the most frequently used instrument for FoF-related constructs. For reasons of comparability it is advisable to use (at least) this instrument in studies in FoF. In order to encompass the broader concept of FoF another instrument, such as the one-item instrument, can be added. Also, tests for physical performance, such as the POMA, which are commonly used in clinical practice and are related to the FES-I, should be included in future research. Using these tests may also provide information to measure objective fall risk (physiological risk to fall) more adequately.

- The intention of our cross-sectional study was to focus on vulnerable older people and to include as many of them as possible. However, for their participation, these individuals need to be able to answer questions, to complete interviews, and to perform various tests. As a result we could not include all patients with a hip fracture, particularly those with severe cognitive problems which are often associated with poorer prognosis.[46] Although such patients may suffer from FoF, they are often not able to complete a FES-I, even in a face-to-face interview. Therefore, instruments for FoF need to be developed and validated for these patients; observational instruments might prove to be useful for this.

- This thesis provides new knowledge on FoF in patients with hip fracture to develop interventions to reduce FoF resulting in better outcomes of rehabilitation. During the last decades, several interventions (particularly targeted at community-dwelling elderly) have been developed and evaluated to reduce FoF.[47,48] Using the knowledge from this thesis and these interventions, studies should be designed and implemented for vulnerable older patients in geriatric rehabilitation. Until now, no intervention programmes to reduce FoF associated avoidance of activities have been carried out in SNFs, while in community-living older adults such programmes

have proven to be effective. [47,48] An example is the multi-component intervention 'A Matter of Balance'.[49] This programme focuses on i) restructuring misconceptions about falls and controlling the risk of falls, ii) setting realistic goals for increasing activity, iii) changing the home environment to reduce risk of falls, and iv) promoting physical exercise to increase strength and balance. The principles of this programme can be translated into intramural settings for patients with hip fracture. Such a behavioural multi-component intervention, in which both physiotherapist and psychologist should be involved, will enhance self-efficacy and daily functioning and should be evaluated in terms of effectiveness and costs. Recently, based on our research, a randomised controlled trial was formulated using these principles; this study will be carried by the department of Public Health and Primary Health Care of the Leiden University Medical Centre and the Department of Health Services Research of the Maastricht School of Public Health and Primary Care.

Finally; what actually happened to Mrs. V. who underwent rehabilitation in our SNF?

Mrs. V. did not make much progress in the first weeks of rehabilitation. Although motivated, on several occasions she was reluctant to train with the physiotherapist. She pointed out that she was very much afraid of falling, risking a new hip fracture and severe embarrassment when falling in the training hall. She scored 38 on the FES-I, indicating a high level of FoF. The FES-I also indicated that she not only had a high level of FoF for activities outside (such as walking on uneven surfaces) but also for activities in the home, such as taking a bath or shower.

In order to reinforce the rehabilitation process and to achieve the goal to function independently at home, her FoF had to be decreased. Although no special intervention programme for FoF existed at that time, the physiotherapist spent extra hours with her, encouraging her and emphasising the progress she had made. Together with the occupational therapist she visited her house and discussed which adaptations should be made to reduce to her risk of falling at home.

On October 21st, 2014, Mrs V. was discharged home. She walked independently with a walker. Even though she still experienced some FoF, she indicated that she felt more self-confident when walking. At home she received home care for a few weeks and continued physiotherapy for six more weeks. She was able to carry out most activities of daily living and managed to do her shopping by herself.

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