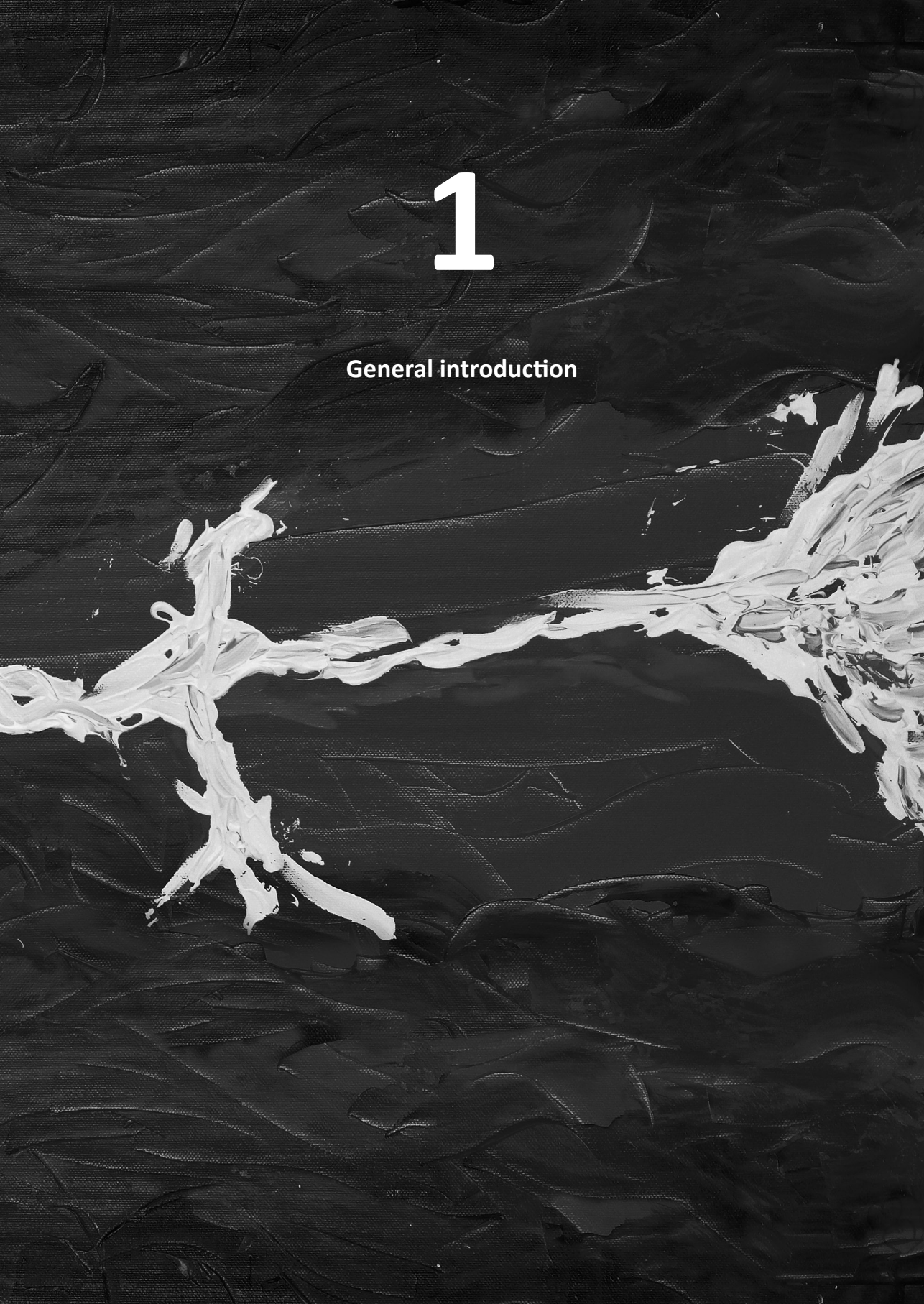

1

General introduction

On August 27, 2014 Mrs V. fractured her left hip. She was 88 years old, widowed and living independently in an apartment in Rotterdam (the Netherlands). Her husband had passed away two years earlier and her only daughter lived 150 miles further north.
Mrs. V. had a hip replacement (right side) in 2006; she also has arthritis in both knees, hypertension and was wearing hearing devices. During the last two years she had fallen on several occasions. Early 2014, when she fell again, she also complained of temporary difficulties in speaking. The family physician suspected a transient ischemic attack.
Soon after another fall, a hip fracture was diagnosed for which she was operated and received a hemi-arthroplasty. Due to a wound infection she was given antibiotics and for mild anemia she received ferrous fumarate.
On September 9th 2014 she could be transferred to a nearby skilled nursing facility within a nursing home for rehabilitation. Rehabilitation started with a geriatric assessment by the elderly care physician. Based on this assessment a rehabilitation plan was formulated. Mrs V.'s goal was to function again independently at home within 8 weeks. The plan focused on wound care, pain control, continuation of hypertensive treatment, stimulation to independently carry out activities of daily living, and improvement of gait and balance. In addition, a fall analysis was carried out including a medication review, screening for osteoporosis, and a home visit to ensure a safe environment after discharge home. Unfortunately Mrs. V. made little progress and was often reluctant to train with the physiotherapist. She complained that she was very concerned that she would fall again and her rehabilitation was hampered because of this severe fear of falling.

1.1. Introduction

In essence, this thesis is about Mrs. V and, in particular, about her fear of falling (FoF) which impaired her rehabilitation process after a hip fracture. Before presenting the specific aims and research questions in relation to FoF after hip fracture, some background information is given about falls, hip fractures, geriatric rehabilitation, FoF in general, and the instruments used to measure FoF.
This introduction also presents the study design and outline of the thesis.

1.2. Falls

Falls are a major health problem among older adults.[1] More than one third of community-dwelling people aged over 65 years fall at least once a year and the rates increase with age.[2] After a fall, about 20% of the persons seek medical attention from a general practitioner or visit an emergency department. About 5% of the falls result in a fracture and 2% in a hip fracture,[3] while 5-10% of falls cause other serious injuries, such as head injuries, bruises and contusions.[4] When a person has to be admitted to a hospital as a result of a fall, the most

common diagnoses are hip fracture (34%), fracture of the lower arm (10%), fracture of the ankle (7%), concussion (6%) and fracture of the upper arm (6%).[5] The impact of falls on a global scale is enormous and the WHO report 'Global Burden of Disease' indicates that fall-related injuries are the third leading cause of years lived with disability.[6] Therefore, falling is justifiably classified (along with other conditions such as delirium, functional impairment, frailty and urinary incontinence) as an important geriatric syndrome.[7]

1.3. Hip fractures: incidence, consequences and treatment

Falls, often the result of polypharmacy, cognitive impairments, chronic diseases and unsteady gait, are (together with osteoporosis) the most important risk factor for hip fractures.[8] In 2008, the incidence of hip fractures in the Netherlands was estimated at about 16,000[9] and is expected to rise by about 40% by 2025,[10] mainly because of the increasing number of older people. In the Netherlands, for instance, the number of people aged 65 years and over will double between 2007 and 2030 to about 4 million.[11] The worldwide number of hip fractures is more than 1.6 million annually,[12] and it is estimated that this number may increase to 4.5 million by 2050.[13] About three-quarters of all hip fractures occur in women, while persons aged 85 years and older are 10 times more likely to sustain hip fracture than those aged 65-69 years.[14] The average age of patients suffering a hip fracture is 79 years[15] and more than 85% is aged ≥ 65 years.[16] Compared with other European countries the incidence in the Netherlands is about average, with higher incidences in northern European countries than in southern European countries.[17]

Hip fractures have implications for both society and individuals, and both the short and long-term costs are high. Direct medical costs have been estimated at 14,000 euro per hip fracture[10] and the societal costs at 19,425 euro at two-year follow-up for femoral neck fractures.[18] For older persons a hip fracture is usually a life-breaking event and the negative consequences, such as an isolated life with more restricted activities and more limited ability to move, are both substantial and long-lasting.[19,20] Persons experience an increased relative risk for mortality following a hip fracture, at least double that of age-matched controls.[21] One year after a hip fracture the overall mortality is reported to be between 20-36%.[22-24] In addition, many patients are unable to regain their functional level.[23] Less than half of the patients reach their pre-fracture mobility within one year.[25] Particularly age, dementia and a lower level of activities of daily living (ADL) before fracture are risk factors for not returning to the pre-fracture place of residence.[26] As a result, older adults with a hip fracture are five times more likely to be institutionalised after one year than age-matched controls.[27]

When a hip fracture is suspected, most patients are assessed at the emergency department of a hospital. The vast majority of patients then undergo surgery. Only patients with a non-displaced or impacted femoral neck fracture, or terminal patients, may not be operated and can be treated conservatively.[28,29] Different surgical procedures are available, such as

plate and screw (sliding hip or intramedullary) fixation, and partial or total hip replacement, depending on factors such as the type and site of the fracture, and the overall condition of the patient.[13,30,31] Surgery should be carried out as soon as possible after the diagnosis is confirmed and the clinical condition of the patient is medically optimised.[13,32] This implies that disorders such as coagulopathies, electrolyte disturbances, and heart and respiratory failure should be addressed first. After surgery, the initial focus is on pain control, treatment of delirium if present, pressure ulcer prevention, nutrition, and wound care. Early mobilisation and unrestricted weight bearing may improve patient outcomes, thereby enhancing functional recovery and lowering mortality rates.[33]

1.4. Geriatric rehabilitation

In the Netherlands, after hospitalization, relatively healthy patients with a hip fracture are discharged home to rehabilitate ambulatory, and young persons with a hip fracture as part of a multi-trauma are discharged to specialised rehabilitation facilities. Older persons who already reside in a long-term care facility often return to their facility after surgery. Nevertheless, in 2007 about 40% of the older persons, previously living at their own home, rehabilitated after a hip fracture in a skilled nursing facility (SNF) of a nursing home, specialised in geriatric rehabilitation.[34] This percentage has probably increased over recent years.

Geriatric rehabilitation has been defined as "*…evaluative, diagnostic and therapeutic interventions whose purpose is to restore functional ability or enhance residual functional capability in older persons with disabling impairments*".[35] In the Netherlands, a working group of the Dutch Association of Elderly Care Physicians (Verenso) described geriatric rehabilitation as "*…integrated multidisciplinary care aimed at expected recovery of functioning and participation in vulnerable older people, after an acute disease or functional decline*".[36] This rehabilitation focuses on persons aged 65 years and over who often have a considerable number of co-morbidities and are more vulnerable for complications.[37-39] As a result, these older persons have a diminished exercise tolerance, are less trainable, and (often) are not capable to follow intensive rehabilitation programmes. Also, because they fit less well into a medical specialised rehabilitation facility, they are more suitable for a rehabilitation programme focusing on geriatric patients, as provided in nursing homes.

Nowadays, 25,000-30,000 patients are admitted to nursing homes for geriatric rehabilitation after discharge from a hospital.[34] The most important underlying conditions for geriatric rehabilitation are stroke (24%), elective orthopaedic operation (19%) and trauma (26%), particularly a hip fracture.[34] About 60% of these patients return home after rehabilitation.[34] After admission to a SNF, a multidisciplinary rehabilitation plan is made by the elderly care physician. This physician is specially trained in medical care of vulnerable older people and is part of the staff of a nursing home.[40] Patients generally follow a 4-16 weeks rehabilitation

programme, which includes treatment of pain and comorbidity, training in activities of daily living, and occupational and physical therapy. Also, a fall analysis and assessment of osteoporosis is generally included. When required, a social worker, psychologist or a dietician is consulted. Patients are discharged when they can function independently or with assistance of formal or informal care at home. Many patients continue physical therapy after discharge.

Since the aim of geriatric rehabilitation is to restore activities and to enhance participation, the WHO model of International Classification of Functioning, Disability and Health (ICF) is mostly used as a framework for defining goals and implementing interventions.[41] The model ensures a common structure and language for geriatric rehabilitation and emphasises the importance of activities and participation, in addition to health conditions and body functions (Figure 1).

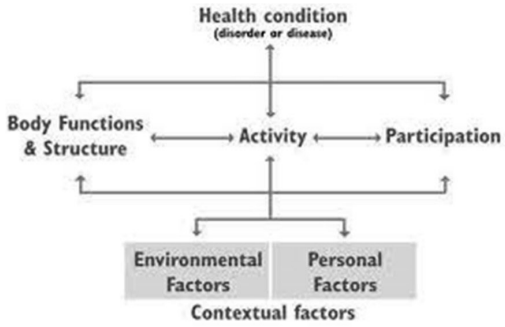

Figure 1 - International Classification of Functioning, Disability and Health (WHO)[41]

In older persons, the ultimate multidisciplinary rehabilitation goal is defined at the 'participation' level, i.e. functioning adequately at home after discharge and being able to continue the earlier lifestyle. This requires that an individual needs to be able to master certain activities, such as walking indoors/outdoors, getting in and out of bed, and going to the toilet. Goals for body function or structure may be set (such as strengthening of quadriceps muscles, adequate gait and aerobic endurance, and wound healing) to finally achieve the goals for activities and participation.

During the initial geriatric assessment not only the health condition but also all the contextual factors need to be considered. Health condition not only refers to the main reason for rehabilitation, e.g. a hip fracture, but also other relevant disorders which may influence the rehabilitation process and final outcomes.[42] This may include co-existing diseases such as pulmonary or cardiac disorders, as well as mental disorders such as a depression or dementia. Environmental factors encompass the social network of a patient, for instance the presence or absence of informal caregivers and the residence of an older

person, which may facilitate or hamper discharge home. Personal factors in older persons include important features of an individual, such as his/her character and motivation. Other psychological factors, such as FoF, may also influence rehabilitation outcomes.[43] FoF may even be more crucial than other factors such as pain or depression.[44]

1.5. Fear of Falling

FoF is common among patients with a hip fracture[45] and an important theme in recovery after hip fracture.[46] Feared consequences of falling are (in particular) functional independence and damage to identity caused by humiliation and shame.[47] FoF after a hip fracture contributes to avoidance of training activities and results in poorer quality of life.[48] FoF has been defined by Tinetti et al. as "*…a lasting concern about falling that leads to an individual avoiding activities that he/she remains capable of performing"*.[49] Others have defined FoF as "*…a loss of confidence in ability to maintain balance*",[50] and "*low perceived self-efficacy in carrying out certain activities without falling*".[51] Self-efficacy is defined as an individual's perception of capabilities within a particular domain of activities, and efficacy is the amount of self-confidence a person has in his/her ability to perform a specific activity.[52] Falls-related self-efficacy has often been used as a proxy for FoF, although it refers to a different concept.[53,54] Falls-related self-efficacy scales mostly assess 'concerns' about falling, a term related to FoF but probably with less intensity and emotion.[55] Fall-related self-efficacy focuses particularly on a person's confidence in his/her ability to avoid falling while undertaking activities of daily living.[53] The distinction between fall-related self-efficacy and FoF is also important when developing and evaluating fall-related psychological measurement instruments.[56]

1.6. Measurement of Fear of Falling

Various efforts to operationalise FoF have resulted in different measurement instruments.[56,57] The most direct and simple instrument is the question "Are you afraid of falling: yes or no?". This instrument has the advantage of being straightforward and its ease of generating prevalence estimates.[58] However, it does not reflect any variability in degrees of FoF and possibly reflects a more general state of anxiety. Therefore, measurement instruments have been developed that allow more gradations in response (e.g. 'not at all afraid', 'a bit afraid', 'quite a bit afraid', and 'very much afraid').[56 59] Tinetti et al. developed the Falls Efficacy Scale (FES) considering that FoF can best be measured through the construct of fall-related self-efficacy or, even better, the confidence somebody has **not** to fall during certain activities.[51] The original scale has 10 items, with questions such as "How confident are you that you can clean the house without falling?". The scale has been modified several times over the decades by adding and removing items.

The scoring and wording of the FES was further addressed in the development of the Falls Efficacy Scale-International (FES-I) (see Appendices 1-3).[57] This instrument was developed

by the Prevention of Falls Network Europe (ProFaNE), a European committee focusing on fall prevention and the psychology of falling.[60] The FES-I measures level of concern when carrying out both easy and more difficult physical and social activities without falling, on a 4-point Likert-type scale ranging from 1=not at all concerned to 4=very concerned.[55 61] The group tested and validated the FES-I using different samples in different countries.[60] Other instruments developed to measure FoF include the Activities-specific Balance Confidence Scale,[62] which is particularly directed to active older people, and the Survey of Activities and Fear of Falling in the Elderly (SAFFE), which also includes the negative consequences, such as restriction of activities and impaired quality of life.[63] However, the FES-I appears to be the most appropriate measurement tool to assess fear of falling.[57,61]
Although the Falls Efficacy Scales are used in patients after hip fractures, the measurement properties of the FES-I have not yet been tested in this specific patient group. Such evaluation is important, since patients with a hip fracture differ from those without a hip fracture because they have recently experienced a traumatic fall and their health status is worse, i.e. they are more vulnerable and have higher comorbidity.[22]

2. Aims and research questions

FoF is possibly one of the most important factors in patients after hip fracture, with a substantial impact on the final results of the rehabilitation process. Moreover, patients with hip fracture who rehabilitate in a SNF with high rates of comorbidity and complications, may have even worse outcomes as a result of FoF. Unfortunately, the role of FoF in the rehabilitation of these older persons has not yet been investigated.
The overall aim of the work in this thesis is to study FoF in vulnerable older people with hip fractures who rehabilitate in a SNF. To gain more insight into FoF in older patients with hip fracture, the following research questions are addressed:

1. What is the prevalence of FoF in older patients with a hip fracture rehabilitating in a SNF?
2. Which factors are related to FoF in older patients with a hip fracture?
3. What is the course of FoF after a hip fracture?
4. Is the FES-I a suitable instrument to measure FoF after a hip fracture?
5. Which interventions reduce FoF after hip fracture?
6. What is the prevalence and what are the consequences of FoF in other patient groups who rehabilitate in a SNF?

3. Outline of the thesis

Different study approaches were employed to examine the research questions of this thesis. Firstly, an extensive review of the literature was carried out in which the available knowledge based on earlier studies on FoF was assessed. The aim of this review was to systematically describe and analyse FoF in patients after a hip fracture, focusing on measurement instruments, prevalence, factors associated with FoF, and interventions that may reduce FoF (Chapter 2).

Secondly, a cross-sectional study was designed and carried out in 10 SNF in nursing homes, focusing on vulnerable older patients with a hip fracture, to explore FoF in older vulnerable persons. Data collection took place between September 2010 and March 2011. In every participating SNF, data were collected during a two-week period by two researchers, a psychologist and elderly care physician, and through questionnaires developed for the treating physicians and nurses. This cross-sectional study was also used to analyse the measurement properties of the FES-I. For the evaluation of inter-rater reliability, an additional group of older adults with a hip fracture rehabilitating in a SNF was assessed.

Chapter 3 describes the measurement properties of the FES-I, using two populations of older patients rehabilitating in a SNF. The structural validity, the internal consistency and the construct validity of the FES-I are investigated in the first study group of 100 patients. The inter-rater reliability is studied in a different study population of 22 patients.

Chapter 4 focuses on the prevalence of FoF after a hip fracture, the relation between FoF and other psychological factors, and the relation between FoF and time after fracture. This study uses the same study population of 100 participants recruited from 10 SNF in the Netherlands.

The study in Chapter 5 determines (by means of regression analysis) which factors are related to high and low levels of FoF after a hip fracture. The 100 participants of the cross-sectional study are divided into two groups based on their level of FoF. Both univariate and multivariate logistic regression analysis are used to reveal which factors help distinguish between older people with high and low levels of FoF.

Thirdly, data from a longitudinal study were used to study FoF, also after discharge, among different groups of older patients rehabilitating in a SNF, such as patients after a stroke or an elective orthopaedic procedure (Chapter 6). This study also evaluates the consequences of FoF for the Instrumental Activities of Daily Living (IADL).

Finally, Chapter 7 presents a general discussion on the main results and places them in a broader perspective. The methodological strengths and weaknesses of the studies are addressed and some implications for future clinical practice and research are discussed.

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