Chapter 1

General introduction
Yeah what is it that you feel when you’re dizzy? A bit light-headed, unwell. How can I describe it? You can’t describe it, it’s your own feeling. You start walking very carefully and hold on to everything around you obviously. And wait until it subsides.

Female patient, 78 years old
Suffering daily from dizziness since several months

Last week I saw the general practitioner by chance, so I said ‘the dizziness isn’t gone yet, what should I do?’ She said ‘I’m afraid there is just nothing that can be done’.

Female patient, 84 years old
Suffering weekly from dizziness for over 10 years now
The central topic of this thesis is dizziness in older people. In this introduction I provide background information on the symptoms of dizziness and current treatment of dizziness. Furthermore, I introduce a new approach for treatment of dizziness in older people: a prognosis-oriented approach. I conclude the introduction with our research questions and an outline of this thesis.

**Definition, epidemiology and causes of dizziness in older people**

At first sight, dizziness seems pretty straightforward. However, dizziness represents a subjective symptom describing a wide range of sensations. In this thesis, dizziness is defined as one or more of the following sensations: instability or unsteadiness, a loss of balance, light-headedness, a giddy or rotational sensation, a tendency to fall, a sensation as if the environment is spinning, a feeling of becoming unwell, (a feeling of) nearly fainting, and/or a feeling of everything turning black. In 1972, Drachman and Hart proposed a classification into four subtypes: vertigo, presyncope, disequilibrium, and ‘other dizziness’ (table 1) [1]. Vertigo is a sensation that the body or the environment is moving (usually spinning). Presyncope is a feeling of light-headedness that is often described as a sensation of an impending faint. Disequilibrium is a sense of imbalance (postural instability) that is primarily felt in the lower extremities, most prominent when standing or walking, and relieved by sitting or lying down. ‘Other dizziness’ describes feelings not covered by the aforementioned definitions which may include swimming or floating sensations, vague light-headedness or feelings of dissociation [2]. The subtypes categorise the different types of dizziness and might help the physician to get a grip on the cause of dizziness. Yet, as many older dizzy patients report more than one dizziness subtype or suffer from non-specific dizziness [3-6], categorising dizziness into one subtype is difficult and may therefore be less useful in this subgroup.

**Table 1. Overview of dizziness subtypes**

<table>
<thead>
<tr>
<th>Dizziness subtype</th>
<th>Sensation</th>
<th>Presenting complaint</th>
<th>Most common causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertigo</td>
<td>A sensation that the body or the environment is moving (usually spinning)</td>
<td>Vertigo</td>
<td>Otological or vestibular</td>
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<tr>
<td></td>
<td></td>
<td>Giddy</td>
<td></td>
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<tr>
<td>Presyncope</td>
<td>A feeling of light-headedness that is often described as a sensation of an impending faint</td>
<td>Light-headedness</td>
<td>Cardiovascular</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Faint feeling</td>
<td>Anxiety</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Becoming unwell</td>
<td>Vasovagal response</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Everything turning black</td>
<td>Adverse drug reaction</td>
</tr>
<tr>
<td>Disequilibrium</td>
<td>A sense of imbalance (postural instability) that is primarily felt in the lower extremities</td>
<td>Loss of equilibrium</td>
<td>Musculoskeletal Impaired vision</td>
</tr>
<tr>
<td></td>
<td>Most prominent when standing or walking and relieved by sitting or lying down</td>
<td>Unsteady on one’s leg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tendency to fall</td>
<td></td>
</tr>
<tr>
<td>Other dizziness / non-specific dizziness</td>
<td>A dizzy feeling not covered by the abovementioned definitions</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
Dizziness is reported by up to 45% in community-dwelling people aged 65 years and over, and the prevalence increases with age [5,7-14]. In older patients in primary care, the reported prevalence is 8% [15]. Given the difference in reported prevalence in community and primary care settings, it appears that many older people do not visit their general practitioner when they suffer from dizziness. This is remarkable since dizziness markedly impacts daily life [16-18]. Dros et al. reported that 60% of older dizzy people in primary care experience moderate or severe impact on daily living due to dizziness [17]. Dizziness in older people is associated with depression, frustration, decreased self-esteem, decreased self-rated health, less social activities, loneliness and isolation [16,18]. Especially chronic dizziness can lead to loss of confidence, irritability, fear of falling, fear of going out alone, and patients can then further restrict their physical and social activities to reduce the risk of symptom occurrence in uncomfortable situations [18]. Regarding general practitioner care for dizziness, Kruschinski et al. revealed that finding the cause of dizziness, curing dizziness or at least stabilising the symptoms, and preserving mobility were important priorities of older dizzy patients [19]. Furthermore, a study from Ollson Möller et al. found that difficulties in managing daily life is a big issue for older dizzy patients which needs extra attention in the management of dizziness [20]. Yet, it remains unclear why only few older patients visit their general practitioner when they suffer from dizziness. More insights in the wishes and needs of older patients concerning general practitioner care for dizziness may lay a basis for improved care.

Research question: what are older patients’ experiences of living with dizziness and what are their wishes and expectations regarding general practitioner care for dizziness?

Current treatment of dizziness in older people

Ideally, treatment of dizziness targets its cause. Yet, there is a broad etiologic spectrum for dizziness including peripheral vestibular conditions, cardiovascular conditions, neurological conditions, musculoskeletal conditions, psychiatric conditions, metabolic and endocrine conditions, and adverse drug effects [2,5,6]. Dizziness in older people is often a diagnostic challenge for physicians given the variety of sensations dizziness can refer to and because of the many potential underlying causes of dizziness. In 22%-39% of older patients general practitioners are unable to establish a final diagnosis of dizziness and in up to 18% of the dizzy patients general practitioners record two or more
General introduction

Final diagnoses [6,21]. Additionally, associations have been reported between dizziness and cardiovascular disease [5,10,13,22,23], mobility problems [11,24-26], polypharmacy [5,11,14,22-24], anxiety and depressive symptoms [5,10,11,13,22-25], visual and hearing impairment [5,10,11,23,25], and number of diseases [11,23]. The association between multiple characteristics and dizziness, together with the difficulty for physicians to establish a diagnosis for dizziness, has led to the suggestion that dizziness is often caused by multiple factors in older people [2,5,11,13,14,22-24]. Furthermore, in the past years research on dizziness in the aged has focused on dizziness as multifactorial geriatric syndrome [5,11,13,22,23]. A geriatric syndrome is defined as a specific symptom that is caused by multiple underlying factors, involving multiple organ systems that tend to contribute to the geriatric syndrome [27]. However, the term ‘geriatric syndrome’ is used to capture those clinical conditions in older persons that do not fit into discrete disease categories [27], whereas dizziness can also be caused by a discrete disease like benign paroxysmal positional vertigo or vestibular neuritis.

The current approach in treatment of dizziness is based on a ‘disease-model’, i.e. diagnosis-oriented: the doctor searches for the cause of dizziness and treatment follows once the underlying illness is diagnosed. The guideline ‘Dizziness’ of the Dutch College of General Practitioners advises to make a distinction in the various subtypes of dizziness (see table 1) because there are several common causes for every dizziness subtype [28]. Identifying the dizziness subtype will guide the general practitioner in the direction of the diagnosis and subsequent therapy of dizziness. If an accurate diagnosis of dizziness has been established, there is potential for effective treatment such as the Epley manoeuvre for benign paroxysmal positional vertigo (BPPV) [29,30], or vestibular rehabilitation for persisting vertigo after the Epley manoeuvre, or for chronic vertigo symptoms in patients who suffer from vestibular neuronitis or Ménière’s disease [31]. Yet, as mentioned before, many older dizzy patients report more than one dizziness subtype or suffer from non-specific dizziness [3-6], and in up to 40% of older dizzy patients the general practitioner is unable to establish a diagnosis [6,21]. Given the assumption that dizziness in older people often has a multifactorial origin, it is no surprise that establishing a specific diagnosis for dizziness is not possible in many older patients. With the current diagnosis-oriented approach, the general practitioner can find him- or herself at a loss when asked to treat dizziness of unknown cause. This is an unsatisfactory outcome for both the patient and the doctor. Yet, up until now it is unknown what kind of treatment Dutch general practitioners offer for older dizzy people. As a consequence,
it is unknown whether or where there is room for improvement of dizziness treatment in older people.

Research question: What is the usual care for dizziness in older patients in general practice?

Because of the assumption that dizziness in older people is often caused by multiple factors, many researchers have suggested multifactorial treatment for older dizzy people in the past years [2,5,11,13,14,22-24,26]. In addition, the recently revised guideline ‘Dizziness’ of the Dutch College of General Practitioners suggests multifactorial treatment for non-specific dizziness [28]. Yet, up till now there have been no trials with multifactorial treatment for dizziness in older patients. Consequently, it is unknown on which contributing factors multifactorial treatment should focus or which dizzy patients would benefit most from multifactorial treatment.

A prognosis-oriented approach for dizziness

![Diagram of diagnosis-oriented approach and combined diagnosis- and prognosis-oriented approach for dizziness]

* The circles represent an ongoing diagnostic process
As stated in the previous paragraph, the current diagnosis-oriented approach in treatment of dizziness is unsatisfactorily because physicians are unable to establish a diagnosis in a high number of older patients. Croft et al. have also stated that many illnesses cannot usefully be labelled from a disease-diagnosis perspective [32]. They argued that in such cases, a prognostic model can provide an alternative framework for clinical practice that extends beyond disease and diagnosis, and incorporates a wide range of information to predict future patient outcomes and to guide decisions to improve them [32]. Additionally, a prognosis-oriented approach could give the general practitioner guidance in the multifactorial management of dizziness in older people. Figure 1 above illustrates the difference between a diagnosis-oriented approach compared to a combined diagnosis- and prognosis-oriented approach. In the diagnosis-oriented approach treatment in most cases will not be started without a diagnosis. Furthermore, in this traditional model presence or absence of disease determines prognosis. Yet, patient prognosis is influenced by more than disease diagnosis and diagnosis-driven treatment, for example by biological, clinical, and social factors [32]. The prognosis-oriented approach aims to predict the patients’ future dizziness outcomes based on multiple factors, whereupon modifiable risk factors for an unfavourable dizziness outcome are targeted. By simultaneously focusing on diagnosis and prognosis, the general practitioner can concentrate on improving dizziness outcomes by targeting modifiable risk factors, even when a diagnosis is not established. A prognosis-oriented approach may have more advantages. First, it enables the general practitioner to identify patients at high risk of an unfavourable course of dizziness and most in need of intervention. Second, therapy can focus on modifiable risk factors for an unfavourable course of dizziness, i.e. the approach gives an indication to contributing factors of dizziness that should be targeted.

A prognosis-oriented approach should not go at the expense of a diagnostic evaluation. However, we suggest to simultaneously apply a diagnostic and a prognostic approach instead of the current approach where general practitioners are used to focus only on the prognosis after diagnosing the underlying cause of dizziness (see figure 1). Until now, no studies have investigated the effectiveness of a prognosis-oriented approach with a multifactorial risk factor guided intervention for dizziness.

Research question: Is a prognosis-oriented approach effective in reducing dizziness-related impairment in older patients in primary care, as compared to usual care?
RODEO study
To answer part of our research questions we started a combined cohort study and a cluster randomised controlled trial (RCT): the Reduction Of Dizziness in older pEOple (RODEO) study. In the RODEO study we investigated a prognosis-oriented approach for dizziness in older people. We used data of the cohort study for the construction of a prediction model to identify older patients at high risk of an unfavourable course of dizziness. Data of the RCT were used to investigate the effectiveness of a prognosis-oriented approach for dizziness in older people. In the RODEO study patients aged 65 years and over, who consulted their general practitioner for dizziness, were included. Patients were recruited from 45 primary care practices in the Netherlands between January 2015 and July 2016 and all patients were visited at their homes for baseline assessment.

The RODEO study builds on the work of the Dizziness in Elderly Patients (DIEP) study [6]. With data of the DIEP study, Dros et al. presented a prediction model to identify patients at high risk of an unfavourable course of dizziness [24]. Seven factors predicted an unfavourable course of dizziness: dizziness duration of six months or more, dizziness provoked by standing still, associated trouble with walking, polypharmacy, absence of diabetes mellitus, presence of anxiety or depression, and impaired functional mobility [24]. In prediction modelling research, it is important to evaluate the predictive performance of the model in an independent dataset because the performance of the model is generally lower in a new dataset than the performance in the original population [33]. Evaluation of the predictive performance in an independent dataset is therefore essential before routine clinical use of the model can take place [34]. Because Dros et al. did not externally validate their prediction model, we planned to perform external validation with data from the RODEO cohort study. However, external validation of Dros’ prediction model showed disappointing results (data not shown in this thesis). Therefore we decided to construct a new prediction model that we validated internally and externally.

Research question: How can we identify older patients at high risk of an unfavourable course of dizziness, i.e. what are predictors for an unfavourable course of dizziness in older people in primary care?

Three out of the seven identified risk factors of Dros’ prediction model are supposed to be modifiable: polypharmacy, presence of anxiety or depression, and impaired functional mobility [24]. All three risk factors have also been identified as being associated with dizziness in other studies [5,10,11,13,14,22-
Therefore, in our RCT that investigated the effectiveness of a prognosis-oriented approach, treatment focused on these three risk factors. All patients of the intervention group received usual care plus one, two, or three risk factor guided interventions. The offered interventions were: (1) Fall Risk Increasing Drug (FRID) medication adjustment in the case of ≥3 prescribed FRIDs; (2) stepped mental health care in case of anxiety disorder and/or depression; and (3) exercise therapy in case of impaired functional mobility. All the offered interventions have demonstrated to be effective in previous studies: (1) interventional studies demonstrated a reduction in falls and postural instability following FRID-withdrawal [35-37]; (2) stepped-care has been proven to be effective in reducing anxiety and/or depression in older patients in primary care [38,39]; (3) exercise therapy aiming to improve strength and balance in older people has a positive effect on mobility and reduces rate of falls and risk of falling [40-42]. We compared the multifactorial risk factor guided intervention to usual care to evaluate the effectiveness of the intervention on dizziness-related impairment.
Outline of this thesis
In line with the text boxes in the introduction, I aimed to answer the following research question:

1. What are older patients’ experiences of living with dizziness and what are their wishes and expectations regarding general practitioner care for dizziness?
2. What is the usual care for dizziness in older patients in general practice?
3. How can we identify older patients at high risk of an unfavourable course of dizziness, i.e. what are predictors for an unfavourable course of dizziness in older people in primary care?
4. Does a prognosis-oriented approach in older people with dizziness positively influence dizziness-related impairment, as compared to usual care?

Figure 2 gives an outline of this thesis. Chapter 2 provides a qualitative analysis of older patients’ experiences of living with dizziness and their wishes and expectations regarding general practitioner care for dizziness. Thirteen RODEO study participants, who did not receive any RODEO intervention, were interviewed to answer this question. Chapter 3 gives an overview of the usual care and management of FRIDs in older dizzy people in general practice. We used anonymised data from the database of the Academic Network of General Practice of VU University Medical Center (ANH-VUmc). The ANH-VUmc is a collaboration between VU University Medical Center and general practices located in Greater Amsterdam. Chapter 4 presents an education article on multifactorial treatment of dizziness in older people. In chapter 5 we discuss the importance of a prognosis-oriented approach in an opinion article. In chapter 6 a risk score for identification of patients at high risk of an unfavourable course of dizziness is constructed and validated. For the construction and internal validation of the risk score we used data from the RODEO study. For the external validation we used data from the DIEP study. In chapter 7 two prediction models for long-term (7 and 10 years) presence of dizziness were constructed and internally validated. Data from the Longitudinal Aging Study Amsterdam (LASA) were used for this chapter. In chapter 8 the study design of the RODEO study is presented, including both the cohort study and cluster randomised controlled trial. In chapter 9 we investigate the effectiveness of a prognosis-oriented approach with a multifactorial risk factor guided intervention, for dizziness in older people. Chapter 10 discusses the main findings of this thesis, outlines the implications for clinical practice, and offers recommendations for future research.
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