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GENERAL INTRODUCTION
In 2007, the Dutch College of General Practitioners (DCGP) published a statement on future care for older people in general practice. In 2008 the Dutch government released the National Programme of Elderly Care (NPEC). Both the DCGP and the NPEC recognised an increasing population of older people with complex problems, for whom health care is poorly coordinated. Both the DCGP and the NPEC introduced proactive integrated care as an answer to poorly coordinated care.

The work presented in this thesis is set within this context of integrated care for older people with complex problems.

This thesis is based on two main research questions:

1) How can older people with complex problems, that might benefit from integrated care, be identified?

2) How effective is proactive integrated care for older people with complex problems in general practice?

Information on what is already known about these two questions is discussed below.

**PROACTIVE IDENTIFICATION OF OLDER PEOPLE WITH COMPLEX PROBLEMS**

Most older people have multiple (health) problems. For example, about 20-30% of the population aged 70 years and over has a disability. Additionally, the incidence and prevalence of chronic disease is much higher among the elderly: most older people have at least one chronic disease (69% of people aged ≥75 years) and at least 40% of older people aged 75 years and over suffer from multimorbidity (i.e. two or more chronic diseases). Also, apart from chronic diseases, (minor) ailments, such as memory complaints, restricted mobility, falls, vision and hearing problems and incontinence, increase with age. These ailments tend to have a considerable impact on the daily life of older people. In addition, because of a decreasing number of friends and family, various social problems (such as loneliness) can arise. This implies that most older people will probably have multiples of these functional, somatic, mental and/or social problems, which often interact (Figure 1). These multiple interacting problems in older people are covered by the term complex problems.

To provide integrated care, and to test the hypothesis that older people with complex problems might benefit from integrated care, general practitioners (GPs) need to be able to identify this group of older people.

This identification should preferably be proactive in order to prevent adverse outcomes. Proactive means tending to initiate something rather than reacting when certain events have occurred. In the context of identification of complex problems, proactive
implies: identification of older people at risk for adverse outcomes rather than reacting to an adverse outcome. With this proactive identification, adverse outcomes might be postponed or even prevented.

Functional decline is an adverse outcome that needs to be proactively identified, because functional decline is an important and certainly undesired adverse outcome for most older people. This is because functional decline leads to disability and, most likely, dependency upon others. Of all older groups of people, older people with complex problems are considered to be at highest risk for functional decline. Therefore, this group of older people needs to be proactively identified.

We tested five measures to proactively identify older people with complex problems, for their feasibility within general practice. These measures included a profile of laboratory

Figure 1. Conceptual model of complex problems in older people.
measurements, handgrip- and quadriceps muscle strength, Fried's frailty phenotype criteria\(^{11}\), the clinical intuition of the GP, and the ISCOPE screening questionnaire. These measures are briefly discussed below.

Laboratory parameters are used by GPs to regularly monitor older persons. Many of these parameters, including C-reactive protein (CRP) level\(^5\), high homocysteine level\(^6\), low high-density lipoprotein-cholesterol (HDL-C)\(^7\), low albumin level\(^8\), low alanine transaminase level\(^9\), low hemoglobin level\(^{10, 11}\), and poor kidney function (low creatinin clearance)\(^{12}\), are individually associated with adverse outcomes. An index that combines these parameters into one profile could be a good measure to identify problems in the somatic domain general practice. Since the somatic domain is one of the domains that determine complex problems (Figure 1), and all these domains interact mutually, somatic problems identified by a laboratory profile might also be an effective measure to identify complex problems.

Sarcopenia is the degenerative loss of skeletal muscle associated with aging\(^{13}\). Sarcopenia is thought to play a major role in functional decline\(^{14, 15}\). Handgrip strength is often used as a measure for sarcopenia and is associated with several adverse health outcomes\(^{16-21}\), although upper limb muscle strength (measured by quadriceps strength) might be a better reflection of sarcopenia\(^{13}\). Measurement of muscle strength is not often used in primary care, but is relatively easy to obtain. Both reduced handgrip- and upper limb muscle strength could be a good measure to identify problems in the somatic domain of complex problems. Therefore the measurement of muscle strength could be feasible to identify complex problems in general practice.

The Fried's frailty phenotype is an internationally recognized and validated measure\(^{11}\). This measure aims to identify frailty in older people. Frailty is a term used to describe a biologic syndrome of decreased reserve and resistance to stressors in older people, resulting from cumulative declines across multiple physiologic systems which increase the risk of adverse outcomes\(^{22}\). The Fried frailty phenotype criteria define frailty as meeting three or more of the following criteria: 1) unintentional weight loss, 2) self-reported exhaustion, 3) slow walking speed, 4) weak grip strength, and 5) low physical activity level\(^{22}\). The Fried frailty phenotype criteria have been widely used in research\(^{22}\) but are rarely applied in general practice\(^{22}\). It is currently unknown whether the Fried frailty phenotype criteria can be used as a measure to identify complex problems in general practice. However, since frailty is a concept which describes the interrelation of multiple health domains in older people, the Fried frailty criteria are potentially suitable for the identification of complex problems.

Most healthcare providers have a clear clinical intuition about the vulnerability of older people. It is expected that the intuition of clinicians will improve when there is a long-term doctor-patient relationship. Since most GPs have a long-term relationship
with their patients and are used to relying on a ‘gut feeling’ in their diagnostic process\textsuperscript{24}. The GP’s clinical intuition could be an appropriate measure to identify vulnerability in older people\textsuperscript{25, 26}. However, it is unknown whether this intuition about vulnerability can be used as an effective measure to identify complex problems.

In addition to these measures which were already available, as a part of this thesis we developed a new measure to identify complex problems in general practice, i.e. a questionnaire with questions covering the four domains of health (functional, somatic, mental and social), known as the ISCOPE screening questionnaire. Based on this questionnaire, older people are considered to have complex problems when they indicate to have problems on three or four of the four domains. Items were partly derived from

\begin{figure}[h]
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\includegraphics[width=\textwidth]{conceptual_model}
\caption{Conceptual model of complex problems in older people, the measures to identify complex problems examined in this thesis are placed in the domains that they aim to measure.}
\end{figure}
existing identification measures, including the Groningen Frailty Indicator (GFI)\textsuperscript{27} and the Identification of Seniors At Risk (ISAR) tool\textsuperscript{28}.

The five above-described measures can be classified according to the domains of complex problems that they relate to (Figure 2). As only somatic (laboratory) parameters are included in the laboratory profile, it is assumed that they measure primarily somatic problems. Muscle strength is also a somatic parameter and is therefore also assumed to measure somatic problems. In contrast, Fried’s frailty phenotype measures somatic problems (unintentional weight loss, self-reported exhaustion and low physical activity level, weak grip strength) as well as functional problems (slow walking speed). The GP’s intuition is assumed to relate to all these domains, as a holistic vision on their patients is thought to be characteristic for GPs. Finally, the ISCOPE screening questionnaire aims to identify problems in each health domain.

**PROACTIVE INTEGRATED CARE FOR OLDER PEOPLE WITH COMPLEX PROBLEMS IN GENERAL PRACTICE**

For several reasons, primary care for older persons with complex problems is often not optimal. Firstly, GPs, multiple medical specialists and (informal) caregivers are usually involved with these older persons; unfortunately they each tend to deal with individual problems separately, and none of these professionals has an overview of all the problems of these older persons. This may lead to fragmented care. Secondly, because disease-specific guidelines do not always apply to older people with complex problems\textsuperscript{4}, the care processes for this group are often not routine or standard.

It has been suggested that to more optimally address these complex problems, GPs, medical specialists and (informal) caregivers should collaborate – this is known as integrated care. The DCGP issued a statement (which was based on expert opinions), recommending integrated care for older people in general practice, in particular for older people with complex problems\textsuperscript{1}. In fact, some evidence is available for the effectiveness of integrated care for older people with complex problems\textsuperscript{28-30}. In line with this, most GPs are interested to implement integrated care in their practices.

However, no programs are currently available in the Netherlands for integrated primary care. Therefore, we selected a method that is commonly used by elderly care and rehabilitation physicians in the Netherlands. The reason for this is that, within rehabilitation and nursing home medicine, the therapeutic focus is on function rather than on disease. In other words: therapeutic goals are mainly to restore and maintain functional status. For older people with complex problems, this functionally-oriented care is preferred to the traditional disease-oriented approach, because a diagnosis of a
disease is unlikely to fully depict the severity and nature of the accompanying functional consequences.

Specifically, to support this approach, the GP/physician (who has overall responsibility) in close collaboration with the other healthcare workers (e.g. physiotherapist, psychologist, etc.) formulates a so-called care plan which combines problems on all health domains (functional, somatic, mental and social). This care plan consists of two steps. The first is an inventory of the existing health problems using five categories or problem areas: somatic, activities of daily living, social, psychological and communicative problems (SASPC). The wishes and expectations of the older person about the goals to achieve are explored in a dialogue between the participant and the informal caregivers. The second step is to design the care plan itself, taking the priorities and goals of the older person and informal caregivers as a starting point. Such integrated care plans made by GPs for older people with complex problems could be used to implement integrated care in general practice.
GENERAL AIMS AND OUTLINE OF THIS THESIS

The aims of this thesis were:
1. To test five measures on their feasibility to proactively identify older people with complex problems in general practice
2. To investigate the (cost-) effectiveness of a proactive integrated care plan for older persons with complex problems in general practice.

The Integrated Systematic Care for Older PEople (ISCOPE) study was designed and conducted to explore whether a proactive approach to complex problems in older people (consisting of proactive identification of older people with complex problems as well as an integrated care plan for older people with complex problems) is applicable for GPs in the Netherlands. Additionally, the ISCOPE study was used to investigate measures to identify older persons with complex problems in general practice. To investigate longitudinal identification measures for complex problems we also used the Leiden 85-plus Study, a prospective cohort of 85-year-olds living in Leiden, the Netherlands.

Chapter 2 describes a multistate model to predict disability transitions in the oldest old in the general population.
Chapter 3 examines the predictive value of a profile of routine blood measurements in the Leiden 85-plus Study.
Chapter 4 examines the consequences of the interaction of functional, somatic, mental and social problems in older persons.
Chapter 5 reports on the development, feasibility, internal consistency, construct validity, test-retest reliability and content validity of the ISCOPE screening questionnaire.
Chapter 6 compares the yield of three measures of complex problems in a cross-sectional sample of participants of ISCOPE. The comparison involved the Fried frailty phenotype criteria, clinical intuition of the GP, and the ISCOPE screening questionnaire.
Chapter 7 compares handgrip and quadriceps strength in their association with adverse health outcomes in older people in general practice.
Chapter 8 presents the results of the ISCOPE randomized trial, which investigates the effects and costs of a proactive approach in older people with complex problems by general practitioners in the Netherlands.
Chapter 9 is a general discussion of the main results of this thesis. This chapter also focuses on implications for further research on this topic.
Chapter 10 and Chapter 11 provide a summary of the results of this thesis, in English and Dutch, respectively.

The results of this thesis will contribute to evidence-based care for older people in general practice.
REFERENCES