Integrated primary care for community-dwelling frail older persons

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General introduction

INTRODUCTION

Traditional primary care in the Netherlands is ill equipped to meet the complex (healthcare) needs of frail older persons who live independently at home. Integrated care is advocated to improve the quality of care and patient outcomes. However, the added value of integrated primary care for community-dwelling frail older persons remains inconclusive, and important underlying mechanisms that drive (a lack of) effectiveness are often ignored. This thesis reports on a theory-guided evaluation of an integrated primary care approach for community-dwelling frail older persons, called *Finding and Follow-up of Frail older persons* (FFF).

Care and support for frail older persons

The number and proportion of older people are increasing globally. In the Netherlands, approximately 1.4 million people are aged 75 years and older, and this number is expected to increase to 2 million by 2030 (CBS, 2020b). A growing number of older persons lives at home for longer (de Klerk, Verbeek-Oudijk, Plaisier, & den Draak, 2019; van Duin, Stoeldraijer, van Roon, & Harmsen, 2016), which older persons generally prefer (Doekhi, de Veer, Rademakers, Schellevis, & Francke, 2014; Sixsmith et al., 2014; Wiles, Leibing, Guberman, Reeve, & Allen, 2012). Currently, around 92 percent of persons aged 75 years and older in the Netherlands lives independently in the community (CBS, 2020a; de Klerk et al., 2019), and many of them are frail. Frailty, a predominant public health concern associated with populational aging (Ambagtsheer et al., 2019; Boeckxstaens & De Graaf, 2011; Cesari et al., 2016), is defined as a "dynamic state affecting an individual who experiences losses in one or more domains of human functioning (physical, psychological, social), which is caused by the influence of a range of variables and which increases the risk of adverse outcomes" (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010, p.342). Community-dwelling frail older persons have lower well-being levels than do non-frail persons (Andrew, Fisk, & Rockwood, 2012; Crocker et al., 2019). In the face of changes and losses in resources and opportunities at older ages, the realization and maintenance of well-being may be more difficult for frail older persons (Nieboer & Cramm, 2018; Steverink, 2014). The protection of well-being in aging populations with associated frailty is a core challenge in healthcare worldwide (Steptoe, Deaton, & Stone, 2015).

Due to populational aging and the reformation of (healthcare) policies, increasing numbers of frail older persons receive care and support from healthcare professionals in the primary care setting (de Klerk et al., 2019; Hoogendijk, 2016; Kroneman et al., 2016), with general practitioners (GPs) holding gatekeeping positions at the core of the system (Kroneman et al., 2016). In GP practices, practice nurses often collaborate in the provision of care to older persons (de Groot, de Veer, Versteeg, & Francke, 2018; Kroneman et al., 2016). Although the primary care setting is acknowledged to be suitable for the delivery of care and support to frail older persons (De Lepeleire, Iliffe, Mann, & Degryse, 2009; Lacas & Rockwood, 2012; Schers, Koopmans, & Olde

Rikkert, 2009), increased frailty has resulted in an increased complexity of (healthcare) needs and growing demand for services (de Groot et al., 2018). Compared with the general population of community-living older persons, frail older persons make a greater appeal on care and support provided by, for example, GPs and community nurses (de Booys et al., 2018). Although the Netherlands has a strongly developed primary care system (Kroneman et al., 2016), the quality of primary care for older persons with complex problems is increasingly difficult to maintain and insufficient attention is being paid to older persons' well-being (Schers et al., 2009). Most traditional healthcare systems were based on acute, episodic care models that are ill equipped to meet the long-term complex (healthcare) needs of this population (Amelung et al., 2017; Nolte & McKee, 2008). Such predominantly reactive systems focus less on prevention and early detection (de Booys et al., 2018; de Wit & Schuurmans, 2017), and generate considerable concern about the fragmentation of health services provided by diverse healthcare professionals (Boeckxstaens & De Graaf, 2011). The National Health Care Institute of the Netherlands has ascertained that frail community-dwelling older persons do not consistently receive appropriate care and support that is tailored to their needs and wishes, with shortcomings in areas such as communication and cooperation among healthcare professionals (de Booys et al., 2018). In addition, primary care professionals, such as GPs and practice nurses, are generally not trained to provide complex care to frail older persons, and thus may lack specific expertise (de Booys et al., 2018). Geriatric expertise is insufficiently integrated into primary care (Duque, Giaccardi, & van der Cammen, 2017; Schers et al., 2009). The fragmentation of health services, lack of effective coordination and discontinuities in care may result in the delivery of inadequate and inefficient care, which may in turn reduce the quality of primary care and well-being of community-dwelling frail older persons.

Expectations for integrated primary care

The situation described in the previous section points to the need for the reorientation of traditional healthcare systems, which are still primarily reactive, medically and disease oriented (de Booys et al., 2018), and ill equipped to meet frail older persons' complex needs (Boyd et al., 2005; Guthrie, Payne, Alderson, McMurdo, & Mercer, 2012; Hughes, McMurdo, & Guthrie, 2013; van Weel & Schellevis, 2006), to more proactive and integrated primary care models (Hopman et al., 2016). Integrated care is defined as "a well planned and well organized set of services and care processes, targeted at the multi-dimensional needs/problems of an individual client, or a category of people with similar needs/problems" (Nies & Berman, 2004, p.12). It is assumed to connect fragmented (healthcare) services resulting in the delivery of coherent, comprehensive, high-quality care to frail older persons living at home (Mann, Devine, & McDermott, 2019). Integrated care programs involve systemic changes in various interrelated areas (Wagner et al., 2005) and have multiple key elements (Hopman et al., 2016). First, integrated care approaches are proactive (involving, e.g., frailty screening) and effectively coordinated (among, e.g., healthcare professionals and sectors) to meet persons' health and social needs (Hopman et al., 2016; Wagner

et al., 2001). Second, integrated care is patient-centered; individuals' personal needs are addressed and they are actively involved in their own care and decision-making (Hopman et al., 2016). Such approaches may include, for example, comprehensive assessments of needs in multiple domains (e.g., social, psychological, and functional) and the development of individualized care plans. Third, integrated care approaches include the (simultaneous) provision of diverse interventions (Hopman et al., 2016) addressing, for example, the delivery system design (e.g., case managers appointment, medication reviews, and systematic follow-up), community resources (e.g., building partnerships with local community centers and service providers), and self-management support (Wagner et al., 2001). Frail older persons are expected to manage various interacting physical, psychological, and/or social problems that challenge the maintenance of their health and well-being (Goedendorp & Steverink, 2017). They may benefit from self-management interventions to enhance cognitive and behavioral abilities for resource management to maintain well-being and to avoid or cope with losses (Steverink, Lindenberg, & Slaets, 2005). Healthcare professionals can help frail older people optimize their ability to maintain well-being (WHO, 2017) by, for example, organizing resources to provide self-management strategies and collaborating with these individuals in assessing problems, setting goals, establishing action plans, and providing ongoing follow-up (Bodenheimer, Wagner, & Grumbach, 2002a, 2002b). Finally, integrated care initiatives are multidisciplinary with diverse (healthcare) professionals included (Hopman et al., 2016). Well-functioning multidisciplinary teams with also non-physician members (e.g., practice nurses and community nurses) are essential for the provision of this type of care and support (Wagner et al., 2001). Integrated care approaches also include consultation with primary care providers with specialist expertise (e.g., elderly care physicians) (Schers et al., 2009).

The provision of integrated primary care is assumed to enhance productive interactions between patients and (teams of) healthcare professionals that organize and coordinate care and support, thereby improving patient outcomes (Wagner et al., 2005). Productive patient-professional interactions comprise partnerships between patients and primary care teams (Coulter & Collins, 2011; Wagner et al., 2001) and are characterized by assessments (including of patients' perspectives), the provision of support (e.g., helping patients with goal-setting), the implementation of interventions to optimize treatment and well-being, and continuous planned follow-up (Wagner et al., 2001). Relationships based on shared goals, shared knowledge, and mutual respect, which reinforce and are reinforced by high quality (i.e., frequent, timely, accurate, and problem-solving) communication, are essential for the productivity of interactions (Batalden et al., 2015; Gittell, 2012; Gittell & Douglass, 2012). Such interactions require healthcare professionals to be prepared and proactive (i.e., possess the necessary expertise, patient information, and resources), and patients to be activated and prepared (i.e., possess skills, information, and confidence) (Wagner et al., 2001). Although well-designed integrated primary healthcare is assumed to be more effective in meeting the (complex) needs of patients through productive patient-professional interactions,

ultimately improving patient outcomes (Barr et al., 2003; Wagner et al., 2005), clear evidence remains largely lacking.

Current evidence for integrated primary care approaches

Integrated care approaches are assumed to offer the potential to enhance, among other aspects, the quality of care and cost-effectiveness of care, and the recipients' well-being (Coleman, Austin, Brach, & Wagner, 2009; Gress et al., 2009; Kodner & Kyriacou, 2000; Kodner & Spreeuwenberg, 2002; Mattke, Seid, & Ma, 2007). Due to the widespread interest in integrated care, many integrated primary care approaches targeting frail older persons have emerged over the years. However, evidence for their effectiveness and cost-effectiveness remains mixed (Blom et al., 2018; de Bruin et al., 2012; Eklund & Wilhelmson, 2009; Hopman et al., 2016; Looman, Huijsman, & Fabbricotti, 2018; Low, Yap, & Brodaty, 2011; Smith, Wallace, O'Dowd, & Fortin, 2016). In addition, evidence that such approaches improve the productivity of patient-professional interactions (Cramm & Nieboer, 2014), which is assumed to be important in enhancing patient outcomes (Bodenheimer et al., 2002b; Wagner, Austin, & Von Korff, 1996), is limited. A wide variety of outcome measures has been used for the evaluation of integrated care. In a recent systematic review, Looman and colleagues (2018) showed that most (cost-)effectiveness studies have considered (primary) outcomes related to, for example, (instrumental) activities of daily living, mortality, and physical functioning, most of which have not been affected by the interventions examined. A less frequently reported, but more promising, outcome in terms of effectiveness is the well-being of frail older persons (Looman et al., 2018). Integrated primary care is provided from a holistic perspective in which well-being is important (Schuurmans, 2004; Valentijn, Schepman, Opheij, & Bruijnzeels, 2013). To explore the full potential of integrated care for community-dwelling frail older persons, the focus of integrated care approaches (and their evaluation) should be shifted from (physical) functioning to well-being (Cramm & Nieboer, 2016; Looman et al., 2018). This situation emphasizes the importance of using appropriate outcome measures in economic evaluations of care programs targeting older people, with consideration of broader well-being aspects in addition to widely used health-related quality of life measures (Makai, Brouwer, Koopmanschap, Stolk, & Nieboer, 2014).

Given the mixed results regarding the effects of integrated primary care for older persons, our understanding of the mechanisms explaining (a lack of) effectiveness must be improved. Integrated care programs are considered to be complex (Tsiachristas & Rutten-van Mölken, 2017); they consist of various interrelated components, have multiple and diverse intended outcomes, and entail flexibility or tailoring to individuals or contexts, and their effects are impacted by the behaviors of the people delivering and receiving them (Craig et al., 2008). Complex programs are frequently evaluated in terms of patient outcomes, but the theoretical foundations of such approaches are often limited and underlying mechanisms remain largely unclear (Campbell et al., 2007; Goodwin, 2017). Based on previous research (Hartgerink et al., 2013; Lemmens, Nieboer,

van Schayck, Asin, & Huijsman, 2008), we assume that mechanisms explaining the effectiveness of integrated care include the cognitions and behaviors of healthcare professionals (e.g., situation awareness, and collaboration) and older persons (e.g., self-management abilities), which impact the productivity of patient-professional interactions and well-being. A new theoretical model is needed to facilitate the sound evaluation of complex integrated primary care approaches aiming to maintain the well-being of community-dwelling frail older persons, including the examination of underlying mechanisms and intended outcomes.

Research aims

The main objective of this thesis was to determine the added value of a proactive, integrated primary care approach for community-dwelling frail older persons. Its four aims were:

- To develop a theoretical model to facilitate theory-guided evaluation of integrated primary care approaches for community-dwelling frail older people;
- To identify the relationship between cognitive and behavioral (self-management) abilities of community-dwelling frail older persons and their well-being;
- To evaluate the quality of integrated primary care and usual care delivery, and its association with productive patient-professional interactions;
- To evaluate the integrated primary care approach regarding well-being and determine the (cost-)effectiveness of the approach, relative to the provision of usual primary care to community-dwelling frail older persons.

Finding and Follow-up of Frail older persons

For this thesis, the proactive, integrated care approach known as Finding and Follow-up of Frail older persons (in Dutch: Vroegsignalering Kwetsbare Ouderen en Opvolging) was evaluated. The ultimate objective of this approach is to maintain or improve community-dwelling frail older persons' well-being. It was implemented in GP practices in western North Brabant Province, the Netherlands, where 42.2 percent of community-dwelling older persons (age ≥ 75) is frail (Vestjens, Cramm, Birnie & Nieboer, 2016). The FFF approach advocates high-quality proactive and integrated care and support for community-dwelling frail older persons in the primary care setting. The approach has interrelated components in multiple areas of system redesign, including (i) proactive case finding, (ii) case management, (iii) medication review, (iv) self-management support, and (v) care provision by multidisciplinary teams led by GPs (including, e.g., practice nurses, physiotherapists, and elderly care physicians). Elderly care physicians are medical practitioners in the Dutch system who are specialized in primary care and geriatric medicine, which is essential in this context (Duque et al., 2017; Koopmans et al., 2010; Schers et al., 2009). They have, for example, specific competencies related to the support and treatment of community-dwelling (frail) older persons (Koopmans et al., 2010). The FFF approach thus allows for the development of geriatric expertise and consultation with professionals possessing such

expertise in the primary care setting, and fosters the involvement of other healthcare professionals specialized in geriatric medicine (e.g., geriatric nurses in the community).

The added value of the FFF approach in terms of improvements in the quality of care, cognitive and behavioral abilities of healthcare professionals and frail older persons (e.g., productive patient-professionals interactions), and (cost-)effectiveness with regard to well-being was evaluated using (elements of) a newly developed theoretical model.

Outline of the dissertation

The theoretical model used in this thesis is presented in Chapter 2. It is based on promising components of integrated primary care approaches (e.g., proactive case finding and case management), and incorporates the consideration of underlying cognitive and behavioral aspects for healthcare professionals and frail older persons, which are assumed to improve well-being. The theory-guided protocol used to evaluate the integrated primary care approach FFF is also described in Chapter 2. In Chapters 3 to 6, we report on the use of (elements of) the theoretical model in our evaluations and investigate the proposed relationships among concepts. The study presented in Chapter 3 addresses relationships of community-dwelling frail older persons' behavioral and cognitive self-management abilities and productive patient-professional interactions with their well-being. The research presented in Chapter 4 investigated healthcare professionals' perceived care quality and assessed the implementation of care interventions in GP practices implementing the FFF approach and those delivering usual primary care. An investigation of community-dwelling frail older persons' perspectives on the quality of primary care (usual and FFF), and their associations with the productivity of interactions with GPs and practice nurses, is presented in Chapter 5. The research presented in Chapter 6 examined the (cost-)effectiveness of the FFF approach relative to usual primary care in terms of community-dwelling frail older persons' well-being and health-related quality of life. An overall discussion of the main findings and reflection on methodological issues, followed by implications for policy and practice and recommendations for future research, are presented in Chapter 7.

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Chapter 2

Evaluating an integrated primary care approach to improve well-being among frail community-living older people: A theory-guided study protocol

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ABSTRACT

Background

A major challenge in primary healthcare is the substantial increase in the proportion of frail community-dwelling older persons with long-term conditions and multiple complex needs. Consequently, a fundamental transformation of current models of primary care by means of implementing proactive integrated care is necessary. Therefore, an understanding of the effects of integrated primary care approaches and underlying mechanisms is essential. This article presents the design of a theory-based evaluation of an integrated primary care approach to improve well-being among frail community-living older adults, which is called "*Finding and Follow-up of Frail older persons*" *(FFF)*.

First, we present a theoretical model to facilitate a sound theory-guided evaluation of integrated primary care approaches for frail community-dwelling older people. The model incorporates interrelated elements of integrated primary care approaches (e.g., proactive case finding and self-management support). Efforts to improve primary care should integrate these promising components to assure productive patient-professional interactions and to improve well-being. Moreover, cognitive and behavioral components of healthcare professionals and patients are assumed to be important. Second, we present the design of the study to evaluate the FFF approach which consists of the following key components: (1) proactive case finding, (2) case management, (3) medication review, (4) self-management support, and (5) working in multidisciplinary care teams.

Methods

The longitudinal evaluation study has a matched quasi-experimental design with one pretest and one posttest (12-month follow-up) and is conducted in the Netherlands between 2014 and 2017. Both quantitative and qualitative methods are used to evaluate effectiveness, processes, and cost-effectiveness. In total, 250 frail older persons (75 years and older) of 11 GP (general practitioner) practices that implemented the FFF approach are compared with 250 frail older patients of 4 GP practices providing care as usual. In addition, data are collected from healthcare professionals. Outcome measures are based on our theoretical model.

Discussion

The proposed evaluation study will reveal insight into the (cost)effectiveness and underlying mechanisms of the proactive integrated primary care approach FFF. A major strength of the study is the comprehensive evaluation based on a theoretical framework. The quasi-experimental design presents some challenges.

BACKGROUND

Population aging is challenging the delivery of primary care for older people. In the Netherlands, the number of people aged 65 years and older will increase from 3 million in 2015 (17.8% of the total population) to 4.7 million in 2060 (26% of the total population) (CBS, 2014). The condition of frailty is considered an increasingly problematic consequence of population aging (Clegg, Young, Iliffe, Olde Rikkert, & Rockwood, 2013). The main feature of frailty is the increased vulnerability to stressors resulting from impairments in several systems leading to decreased reserve capacity (Bortz, 1993; Fried et al., 2001; Lipsitz & Goldberger, 1992). The level of frailty can be placed on a continuum ranging from not frail to frail (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010). In addition, frailty appears to be a dynamic state in which people can become less or more frail over time (de Vries et al., 2011). Frail people have an increased risk of negative (health) outcomes, like institutionalization, disability, mortality, and the development or progression of (multiple) chronic conditions (Ensrud et al., 2008; Ensrud et al., 2009; Fried et al., 2001; Fried, Ferrucci, Darer, Williamson, & Anderson, 2004; Puts, Lips, & Deeg, 2005; Rockwood et al., 1999). Older people can simultaneously have multiple chronic conditions, be frail and disabled, which increases the complexity of their healthcare needs (Fried et al., 2004). Internationally, one important challenge to healthcare is the substantial increase in the proportion of frail older people with often multiple complex needs (Markle-Reid & Browne, 2003; Slaets, 2006) and an increased healthcare utilization (van Campen, Broese van Groenou, Deeg, & Iedema, 2013). Despite the substantial increase of frail older people with multiple complex needs, living independently in the community and avoiding or delaying institutional care is the avowed ambition of policy makers (van Campen et al., 2013). This has led to a decline in the proportion of older people in homes for the elderly and nursing homes (de Klerk, 2011). Furthermore, most older people these days prefer to remain living at home for as long as possible (van Dijk, Cramm, Lötters, & Nieboer, 2013; Wiles, Leibing, Guberman, Reeve, & Allen, 2012). The government increasingly expects frail older people to arrange their own care, e.g., informal care, and limits access to long-term care facilities. Consequently, care for older people is increasingly being delivered in the primary care setting by GP (general practitioner) practices (van Campen et al., 2013). In the Netherlands, the GP has a central and exceptional role in healthcare, since GPs function as primary care gatekeepers for secondary healthcare (Schäfer et al., 2010). The current primary care system is fragmented and reactive, and neither able to cope effectively with the increasing demands for healthcare, nor to improve well-being of frail community-dwelling older people (Bodenheimer, 2008; Schäfer et al., 2010; WHO, 2015a).

As a consequence, to meet the needs of frail older people and improve their well-being, primary healthcare systems are changing (van Campen et al., 2013) and many innovative integrated primary care approaches have emerged to provide optimal care (Grol, 2000). In essence, stable well-being is when frail older people have the psychological, social and physical resources they

need to meet a particular psychological, social and/or physical challenge (Dodge, Daly, Huyton, & Sanders, 2012). Healthcare systems need to be supportive of such challenges. Studies evaluating innovative primary care approaches, however, show inconsistent results with respect to effectiveness. Moreover, assessment of cost-effectiveness of primary care approaches is often ignored (Bouman, van Rossum, Nelemans, Kempen, & Knipschild, 2008; Eklund & Wilhelmson, 2009; Huss, Stuck, Rubenstein, Egger, & Clough-Gorr, 2008; Low, Yap, & Brodaty, 2011; Markle-Reid et al., 2006; Ouwens, Wollersheim, Hermens, Hulscher, & Grol, 2005; Smith, Wallace, O'Dowd, & Fortin, 2016; Stuck, Egger, Hammer, Minder, & Beck, 2002). Furthermore, a sound understanding of the effects of integrated primary care approaches and underlying mechanisms explaining effectiveness is lacking. This calls for a theory-based evaluation of such approaches.

The present study focuses on (1) the development of a theoretical model to facilitate the evaluation of integrated primary care approaches for frail older patients and to understand the underlying mechanisms explaining (lack of) effectiveness, and (2) the development of a theory-guided study protocol to evaluate a proactive integrated primary care approach to improve well-being of frail community-dwelling older people.

A theoretical model to facilitate the evaluation of integrated primary care approaches

Many interventions to improve healthcare entail complex changes in daily routines and organization of healthcare, and collaboration among healthcare professionals of different disciplines. Moreover, changes in the behaviors of patients are necessary. It is important to incorporate theoretical assumptions in the development and evaluation of innovative approaches to improve patient care because it provides insight into the underlying mechanisms of integrated primary care approaches and insight into the complexity of changing healthcare practices (Grol, Bosch, Hulscher, Eccles, & Wensing, 2007). Therefore, a theory-guided evaluation of an innovative integrated primary care approach is proposed (see Figure 1). In Figure 1 we show how proposed interrelated components of care delivery are presumed to influence cognitions and behaviors of frail older patients and healthcare professionals. These cognitions and behaviors are assumed to foster productive patient-professional interactions and ultimately to influence patients' well-being. We assume that improvements in well-being are associated with high-quality care delivery as well as cognitions and behaviors of older people and healthcare professionals. The proposed concepts and their interrelations are explained in detail hereafter.

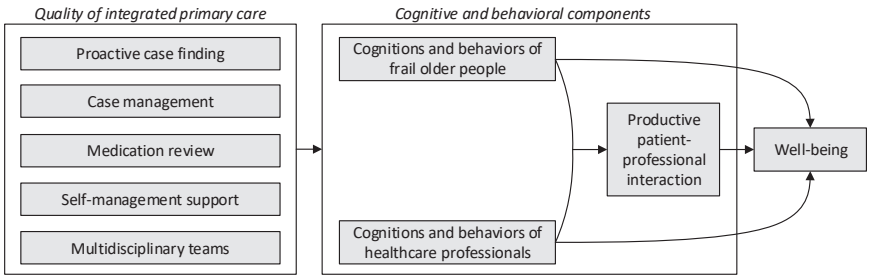

Figure 1 Theoretical model to facilitate a theory-based evaluation of integrated primary care approaches for frail community-dwelling older people

Quality of integrated primary care for frail community-dwelling older people

In order to effectively redesign primary healthcare for frail community-living older people, it is important to consider promising components of successful innovative primary care approaches aimed at supporting their needs to realize well-being. An overall state of well-being is determined by an older person's ability to achieve universal goals of social and physical well-being that are, in turn, achieved through five instrumental goals (stimulation and comfort for physical well-being and status, behavioral confirmation, and affection for social well-being) (Nieboer, Lindenberg, Boomsma, & van Bruggen, 2005; Ormel, Lindenberg, Steverink, & Verbrugge, 1999; Ormel, Lindenberg, Steverink, & Von Korff, 1997). Integrated care in the primary care setting is expected to support these needs and therefore improves or protects well-being (Schäfer et al., 2010). Earlier research already showed that quality of care affected the well-being of community-dwelling COPD patients (Cramm, Jolani, van Buuren, & Nieboer, 2015). Integrated care is defined as 'a well planned and well organized set of services and care processes, targeted at the multi-dimensional needs/problems of an individual client, or a category of people with similar needs/problems' (Nies & Berman, 2004, p. 18). The World Health Organization, for example, stated that by introducing integrated care, health services will be more responsive to frail older people's needs (WHO, 2015b). A systematic review of Eklund and Wilhelmson (2009) indeed provided some evidence regarding the benefits of integrated care for frail community-dwelling older people. In general, these integrated care approaches consist of multiple interrelated components, such as proactive case finding, case management, medication review, self-management support, and working in multidisciplinary teams (Eklund & Wilhelmson, 2009; Low et al., 2011; Ouwens et al., 2005; Smith et al., 2016). Efforts to improve primary care for frail older people should integrate these promising interrelated components in order to assure that activated, informed older adults can productively interact with prepared, proactive healthcare professionals of primary care teams (Wagner, Austin, & Von Korff, 1996; Wagner et al., 2001). Still, we lack understanding of the underlying mechanisms that explain how integrated primary care delivery affects outcomes. Earlier research investigating mechanisms explaining the effectiveness of integrated care showed that cognitive and behavioral components of healthcare professionals

and older patients drive effectiveness in terms of productive patient-professional interactions and well-being (Cramm et al., 2013; Hartgerink et al., 2013; Hartgerink, Cramm, de Vos et al., 2014; Hartgerink, Cramm, Bakker, van Eijsden et al., 2014a, 2014b; Hartgerink, Cramm, Bakker, Mackenbach, & Nieboer, 2015).

Cognitive and behavioral components

Productive patient-professional interaction

Well-designed healthcare systems should be able to meet the needs and preferences of frail community-dwelling older people by means of fostering productive interactions between these older patients and their (team of) healthcare professionals (Barr et al., 2003; Wagner et al., 2005). These productive interactions are at the core of patient-centered care (Jayadevappa & Chhatre, 2011). They are considered important in achieving the best possible patient outcomes (Wagner et al., 1996; Wagner et al., 2001; Wagner et al., 2005), like well-being (Barr et al., 2003). Productive patient-professional interactions are characterized by reciprocal interrelations between professionals and patients and high levels of shared goals, communal knowledge, and mutual respect (Gittell, 2002, 2006; Gittell & Douglass, 2012). Such productive patient-professional interactions were indeed associated with enhanced well-being of patients (Cramm & Nieboer, 2015a).
Hereafter we conceptualize the proposed underlying cognitive and behavioral mechanisms explaining effectiveness of integrated primary care approaches. These cognitions and behaviors of healthcare professionals and older adults are presumed to have a direct association with patients' well-being. In addition, cognitions and behaviors are believed to foster productive patient-professional interactions which, in turn, impact well-being of frail older patients.

Cognitions and behaviors of frail older people

Individuals take an active role in realizing well-being and aim to enhance their life situation by optimizing the universal goals of physical and social well-being (Lindenberg, 1986, 1991; Lindenberg & Frey, 1993; Nieboer et al., 1998; Nieboer, Koolman, & Stolk, 2010). Frail older people often experience a decline in reserves and resources in multiple domains, e.g., health status, loss of mobility, cognitive functioning, and social activities. This implies that well-being of older people in particular is more likely to be negatively affected by decaying reserve-capacities that otherwise may compensate sufficiently for these losses in resources. Their cognitions and behaviors may foster (or hamper) productive patient-professional interactions and allow them to regulate their resources and cope with or avoid losses in order to protect their well-being (Steverink, Lindenberg, & Slaets, 2005). Moreover, the degree to which chronic conditions are controlled and outcomes are achieved depends partly on the effectiveness of frail older people's behavioral and cognitive self-management abilities. It is therefore considered essential to involve patients in their own care process (Bodenheimer, Lorig, Holman, & Grumbach, 2002). Empowered patients that are effective self-managers are better equipped to control chronic conditions and to posi-

tively influence outcomes (MacStravic, 1999; Ormel et al., 1997). Key cognitive and behavioral abilities for managing resources for well-being identified earlier are (i) taking initiatives, (ii) investing in resources for benefits in the longer-term, (iii) maintaining a variety in resources, (iv) warranting multifunctionality of resources, (v) self-efficaciously managing resources, and (vi) keeping a positive frame of mind (Schuurmans et al., 2005; Steverink et al., 2005). These identified key self-management abilities include relevant cognitions, i.e. self-efficacy beliefs and a positive frame of mind, which advance the ability to take action. These cognitive processes are essential for both coping with losses and (pro)actively managing resources. A positive frame of mind refers to the ability to maintain positive expectations for the future, even in adversity. Self-efficacy beliefs, i.e. the belief in one's own ability to successfully interact with the environment and pursue goals, are important for the performance of many behaviors (Steverink et al., 2005). For example, low self-efficacy can lead people to believe they lack the ability to effectively perform a certain behavior that brings desired outcomes, which in turn may result in not engaging in that behavior (Bandura, 1997). At later stages of life, self-efficacy beliefs may be declined by, for example, physical disabilities and experiences of loss (Steverink et al., 2005). These cognitions are relevant but not sufficient. Although a person may have a strong sense of efficacy, he or she needs to perform the particular behavior to achieve desired outcomes. Therefore, Steverink and colleagues (2005) underline the importance of active-motivational processes with respect to managing resources, i.e. taking initiative and investment behavior (Steverink et al., 2005). As a result of a decline in reserves and resources, there may be a loss of autonomy and an increase in dependency in old age (Baltes, 1995). It is suggested that taking the initiative regarding relevant resources in contrast to being passive or dependent is important to attain or maintain well-being. Moreover, investment behavior is assumed to be important in realizing or maintaining well-being as investing in key resources is considered relevant for stability in resources. In addition to cognitions and active-motivational processes, resource-combining processes are presumed relevant, which include realizing multifunctionality of resources and a variety in resources (Steverink et al., 2005). Important for realizing well-being are resources that meet various dimensions of well-being at the same time in a mutually reinforcing way, for example, activities serving both social and physical well-being (Lindenberg, 2001; Nieboer & Lindenberg, 2002). In addition, a variety in resources is assumed to be of importance and refers to having multiple resources to realize a particular aspect of well-being. Resource-combining processes can create buffers against a loss of well-being (Nieboer & Lindenberg, 2002). Thus, these key cognitive and behavioral abilities are considered most essential in managing losses adequately and managing resources effectively to realize, maintain or improve well-being (Steverink et al., 2005). In addition to this, strengthening cognitive and behavioral abilities among frail older people is expected to lead to more productive patient-professional interaction, which in turn is expected to improve the well-being of frail older people (Barr et al., 2003; Cramm & Nieboer, 2015a; Wagner et al., 2005). For productive patient-professional interaction to occur, patients need to be informed (equipped with adequate information in order to become proactive partners and effective decision makers

in the care process) and activated (understanding the significance of sharing information and the importance of their own role in the care process) (Cramm & Nieboer, 2015a).

Cognitions and behaviors of healthcare professionals

In addition to the behaviors and cognitions of frail older people, the behaviors and cognitions of healthcare professionals also drive effectiveness of integrated care approaches (Hartgerink et al., 2013; Hartgerink et al., 2014; Hartgerink et al., 2014a, 2014b). It is therefore crucial to gain insight into the cognitions and behaviors of individual healthcare professionals. According to Salas and colleagues (2004), individual professionals need to have the right knowledge (cognitions) and skills (behaviors) (Salas et al., 2004). Cognitive components reflect the mechanisms that change the way individual healthcare professionals think (Hartgerink et al., 2013). We focus on the concept of situation awareness as it is considered a central construct for decision making and performing actions in complex, dynamic systems like healthcare (Endsley, 2013). Situation awareness is defined by Endsley (1995) as a person's awareness of the elements in the environment (perception), understanding of the significance of those elements (comprehension), and ability to project future actions to allow timely decision making (projection); or simply "knowing what is going on". It comprises a person's state of knowledge about the environment (Endsley, 1995) and can be thought of as an internal mental model of the present environment of a healthcare professional. These mental models allow people to interact effectively with their environment (Endsley, 2001, 2013). Healthcare professionals need to synthesize all incoming data from, among others, information systems, communications (e.g., individualized care plan), patients, and fellow professionals. This results in an integrated representation of the current status of the patient. In the work process, healthcare professionals are involved in developing and updating situation awareness in a complex and changing work environment (Wright & Endsley, 2008). To allow professionals to effectively respond to the needs of the patients, professionals need to perceive the critical factors in the current situation of a patient (e.g., being aware of chronic conditions and levels of frailty), understand the meaning of those factors (e.g., integrate information on present chronic conditions and different treatment options) and project future actions (e.g., predict the response of a patient to a certain treatment) (Mosier & Fischer, 2010; Reader, Flin, Mearns, & Cuthbertson, 2011; Wright & Endsley, 2008). Quality of care and frail patients' outcomes are therefore dependent on the professionals' knowledge and understanding of the patient's current situation. In addition to situation awareness, cognitive diversity has also been identified as underlying mechanism explaining effectiveness of integrated care programs (Hartgerink et al., 2013). Cognitive diversity refers to differences in knowledge, beliefs, preferences, and perspectives among professionals (Miller, Burke, & Glick, 1998). The integration of this diversity in cognitions, which mirrors the knowledge and skills of various disciplines, is related to the development of new knowledge among each team member (Miller et al., 1998; Mitchell & Nicholas, 2006). Especially in the case of complex patient populations, such as frail community-dwelling older people, patients are expected to benefit from a wide range of skills

and different types of knowledge (Wagner, 2000). In addition to these cognitions, behaviors such as collaboration and coordination among healthcare professionals with different areas of expertise are also essential (Ouwens et al., 2005; Wagner et al., 1996; Wagner et al., 2001). Coordination can occur through a structure of relational and communicational links among multiple professionals in a work process which consists of interdependent tasks. It involves managing interdependency of tasks as well as interdependency of professionals that execute the tasks (Gittell, 2012). For coordination to be effective, the quality of communication (e.g., frequent communication) among individual professionals is important. The quality of communication depends on the quality of underlying relationships (e.g., mutual respect) among healthcare professionals. Inversely, the quality of relationships is dependent on the quality of communication. This is known as relational coordination (Gittell, 2006).

Above-mentioned cognitive and behavioral components among patients and professionals are assumed to be important in fostering productive patient-professional interactions and improving well-being of frail older patients. Based on the literature, we presume that patients' and professionals' behaviors and cognitions are the underlying mechanisms explaining effectiveness of integrated care. The use of integrated care components such as proactive case finding, case management, and medication review are, for example, known to be more effective among teams with high-quality interactions and collaboration among professionals of different disciplines (Cramm & Nieboer, 2012c). Diverse healthcare professionals must be strongly connected for integrated primary care approaches to provide effective care (Cramm & Nieboer, 2012b). In addition, self-management support is more effective among frail older patients with cognitions and behaviors that foster productive patient-professional interaction, allowing them to effectively regulate their resources and improve their well-being (Steverink et al., 2005). Therefore, patients' and professionals' behaviors and cognitions should be investigated when the effectiveness of integrated primary care approaches for frail community-dwelling older people is evaluated. This may help to increase our understanding of the (inconclusive) effects of integrated primary care approaches and underlying mechanisms explaining their (lack of) effectiveness.

A theory-guided study protocol to evaluate the integrated primary care approach "Finding and Follow-up of Frail older persons"

Description of the "Finding and Follow-up of Frail older persons" approach

The theory-guided study protocol is based on an integrated primary care approach called "Finding and Follow-up of Frail older persons" (FFF). The FFF approach combines promising components of integrated primary care, including proactive case finding, case management, medication review, self-management support, and working in multidisciplinary teams. The FFF approach is implemented in several GP practices in the western part of the Province of North Brabant in the Netherlands and aims to target frail community-living older people. The main objectives of

the FFF approach are: (1) establishment of a proactive integrated primary care system for frail community-dwelling older people (consisting of collaboration among professionals with different occupational backgrounds led by a GP), (2) avoidance of hospital and nursing home (re-) admissions, and (3) improvement of well-being and self-management abilities. The integrated primary care approach advocates a proactive primary care practice team in which the GP has the lead. The multidisciplinary setting enables the development of the role of the elderly care physician and geriatric nurse within the primary care setting. An elderly care physician is a primary care expert in geriatric medicine and is specialized in long-term care for frail older patients with complex needs (Koopmans, Lavrijsen, Hoek, Went, & Schols, 2010; Verenso, 2014). The Netherlands is a trendsetter with respect to training physicians for this specific group of patients in a primary care setting (Verenso, 2014). In more detail, the following key elements of proactive integrated primary care are incorporated in the FFF approach.

1. Proactive case finding

With the aging of the population, an increasing trend in frailty is to be expected. Case finding of frail independently living older adults becomes of major importance and it is suggested that all older people should be screened for frailty by healthcare providers (Morley et al., 2013). Especially the primary care setting is considered suitable for proactive case finding as it is stated that 80 percent of all frail community-living older people consulted their GP in the past three months (van Maurik-Brandon, ten Dam, & Dautzenberg, 2015). In order to find potentially frail older people in the community, the GP selects older people based on, for example, gut feeling, i.e. a 'sense of alarm'. These selected older patients are then visited at home by the geriatric nurse or practice nurse and screened for frailty by means of the Tilburg Frailty Indicator (TFI). The TFI is a 15-item questionnaire that assesses frailty in the physical, psychological, and social domain (Gobbens, van Assen, Luijkx, Wijnen-Sponselee, & Schols, 2010). This instrument was developed based on the definition of frailty as stated by Gobbens and colleagues (2010, p. 175), namely 'Frailty is a dynamic state affecting an individual who experiences losses in one or more domains of human functioning (physical, psychological, social), which is caused by the influence of a range of variables and which increases the risk of adverse outcomes.' Scores on the TFI range from 0 to 15 and older patients with a TFI score ≥ 5 are identified as frail (Gobbens et al., 2010). Moreover, the practice nurse or geriatric nurse will perform physical measures or additional interviews with the older person when necessary (e.g., Mini–Mental State Examination (MMSE) to assess cognitive functioning). Hence, it may happen that a person is not frail according to the TFI (score ≤ 4) but is considered frail based on examination of the nurse. We consider these additional interviews important as the TFI may not grasp all relevant aspects of frailty and hence it is recommended not to use the instrument in isolation (van Dijk, 2015).

2. Case management

Case management is expected to improve quality of primary care for frail community-dwelling older people as well as delay or avoid institutionalization. The case manager in the FFF approach is expected to support the provision of proactive integrated care through a collaborative process of assessment, planning, facilitation, care coordination, evaluation, and advocacy for options and services to meet frail older patients' needs (Case Management Society of America, 2009). The FFF approach uses home visits by case managers to achieve these goals. Furthermore, the case manager acts as a boundary spanner to ensure a well-functioning team of professionals supporting frail older patients.

3. Medication review

Older persons' medicines are systematically and critically examined in a medication review. An important aspect of multidisciplinary consultation is the assessment of prescribed and over-the-counter medications used by these older people. The most recent overview of medications used by the older person, and experiences with medications, are discussed with the person (and informal caregivers or relatives). Possible additional actions include: (i) visitation of the older person by the elderly care physician to provide additional information about medications, (ii) the GP's discussion of the person's case history with the pharmacist, and (iii) the establishment of agreement about medication use between the GP and second-line medical care.

4. Self-management support

The FFF approach aims to improve self-management abilities and well-being among frail patients by incorporating different types of self-management support interventions, like skill building, educational materials, personal coaching, and the use of an individualized care plan. Needs and problems are listed by means of the so called SFSPC-model of reporting on Somatic, Functional, Social, Psychological, and Communicative indications for each individual frail older person. Subsequently, the individualized care plan is established and recorded, including the problems and needs, the formulated goals, and the possible actions and interventions. Agreements are made regarding follow-up and patients' cases are evaluated at least once a year. Specific protocols for patient referral are established. For example, older persons are asked to identify preferred healthcare organizations and professionals (e.g., physiotherapists) in the fields of care and welfare. These preferred professionals are approached by the GP, elderly care physician or practice nurse. The professionals provide feedback information about patient care to the GP and/or elderly care physician.

5. Multidisciplinary teams

A strong team of professionals with different occupational backgrounds led by a GP is one of the core elements of the FFF approach in order to deliver high-quality care to frail elderly patients. Each case of an older person is discussed in multidisciplinary consultation. An inventory of

relevant healthcare professionals is made by the GP and/or case manager and these professionals are invited to attend the consultation. They involve professionals in the care and treatment of patients (e.g., elderly care physician, physiotherapist, and psychologist) as well as professionals in the field of welfare when necessary. In the FFF approach, the elderly care physician plays an important role in the care process for older persons. Next to being present at the multidisciplinary consultations, the GP can obtain advice from the team's elderly care physician on several complex health problems, e.g., depression and apathy, somatic or geriatric indications, and problem analysis in case of multimorbidity. The GP and the elderly care physician discuss whether one or several consultations are needed to assess each older person's relevant healthcare needs. When necessary, other health and social care professionals (e.g., palliative care nurse) are involved. Plans and actions that are discussed during the multidisciplinary consultations are then discussed with the patient, tailored to the patient's needs and wishes, and reported in the individualized care plan.

The interrelated key elements of the FFF approach are combined in a comprehensive approach to provide integrated primary care that can be tailored to the wishes and complex healthcare needs of frail community-living older people. The elements of the FFF approach are based on promising components of integrated care that were found in the literature (Eklund & Wilhelmson, 2009; Low et al., 2011; Ouwens et al., 2005; Smith et al., 2016). As was explained in the previous section, we presume that this multicomponent approach influences the cognitions and behaviors of older patients and healthcare professionals which ultimately are expected to affect the productivity of patient-professional interactions and older patients' well-being (See Figure 1 and section 'A theoretical model to facilitate the evaluation of integrated primary care approaches').

Methods

The second aim of our study is the development of a theory-guided study protocol to evaluate the innovative primary care approach FFF aimed at improving well-being among frail community-dwelling older people. We will explain the proposed methods to be used for our theory-guided evaluation of the FFF approach.

We aim to investigate (i) the potential effectiveness of the FFF approach in improving well-being among frail community-dwelling older people (*effect evaluation*), (ii) the implementation and context of the FFF approach in order to facilitate the interpretation of the results (*process evaluation*), and (iii) the cost-effectiveness of the FFF integrated primary care approach (*economic evaluation*).

Study design

The longitudinal evaluation study has a mixed methods design in which a combination of quantitative and qualitative research methods are employed in order to evaluate the effective-

ness, processes, and cost-effectiveness of the FFF approach. The evaluation study is performed between 2014 and 2017. The study has a matched quasi-experimental design with one pretest and one posttest measurement, i.e. the effects are measured before and after the intervention. Measurements are performed at baseline (T0) and 12 months thereafter (T1). Moreover, the study includes an intervention and a control group (i.e. intervention and control GP practices).

Ethics approval

The research proposal has been reviewed by the medical ethics committee of the Erasmus Medical Centre in Rotterdam, the Netherlands (study protocol number MEC-2014-444). The committee decided that the rules laid down in the Medical Research Involving Human Subjects Act did not apply.

Setting and GP practices

The study is performed in the western part of the Province of North Brabant in the Netherlands. This region contains a relatively high proportion of frail older persons compared with many other regions in the Netherlands (Dekker, Stavenuiter, & Tierolf, 2012). GP practices in the region were eligible to participate in the intervention group of the study if they were not involved in other research projects and had implemented the FFF approach recently. Control GP practices were eligible for participation if GPs were not engaged in or planning to start screening older adults on frailty. In addition, GP practices that already follow-up older persons in a systematic way were not eligible to participate as control GP practices. Control GP practices continue to provide usual primary care and patients are able to use all available (primary care) services as before. We approached 17 GP practices for participation in this study (12 intervention practices and 5 control practices). In total, 11 of 12 GP practices that recently implemented the FFF approach agreed to participate in the study and 4 of 5 control GP practices consented to participate. The reasons for non-participation (2 GP practices) were the workload and time constraints. GP practices receive a small financial compensation for the administrative burden associated with the evaluation study.

Participants and recruitment of frail older people for the FFF approach

The target population of the study consists of community-dwelling older persons aged 75 years and older registered at the 15 participating GP practices. With increasing age, the prevalence of frailty increases substantially (Fried et al., 2001; Rockwood et al., 2004; Rolfson, Majumdar, Tsuyuki, Tahir, & Rockwood, 2006). Therefore, we decided to include persons aged 75 years and older. A four-stepped approach is used to describe the study population in terms of frailty, select patients that are eligible to participate in the FFF approach, include eligible patients in the evaluation study and match patients of intervention GP practices to patients in the control group (one-to-one matching).

Step 1: Frailty is assessed among patients aged 75 years and older registered at the 15 participating GP practices. All older patients receive the validated TFI to screen for frailty (Gobbens et al., 2010). Next to the TFI questionnaire, we provide a letter on behalf of the GPs and researchers, an information leaflet about the study, and a postage free return envelope. After 2-3 weeks, reminders are send to non-responders by mail and/or older patients are reminded by means of a telephone call. Older patients with a TFI score ≥ 5 are identified as frail (Gobbens et al., 2010). The aim of this inventory is twofold, namely (i) to assess frailty in a community-dwelling population of older persons, and (ii) to arrive at frailty scores for the one-to-one matching procedure (Step 4) of patients that are selected and eligible to participate in the evaluation study.

Step 2: The TFI frailty scores of older patients are handed over to the participating GPs in order to provide insight into their older patient population.

Step 3: GPs of the intervention group make their own selection of eligible patients to be included in the FFF approach. This selection can be based on the frailty scores obtained by the administration of the self-report TFI questionnaire but can also be based on additional interviews and measures that are performed by the healthcare professional as part of the care provision. Although the TFI is a reliable and valid instrument for measuring frailty in community-living older adults (Gobbens et al., 2010; Metzelthin et al., 2010), the previously stated added value of other interviews and measures to assess frailty underlines the importance of not relying solely on the TFI as a measure to identify frail older patients (van Dijk, 2015). Consequently, patients that are not frail according to the TFI (score ≤ 4) but are considered frail based on other examinations performed by healthcare professionals may nevertheless be selected for the FFF approach.

Step 4: Eligibility of the frail older people selected in Step 3 is then assessed in terms of the inclusion and exclusion criteria by the researchers. For participation in the evaluation study we exclude (1) older people living in nursing homes or homes for the elderly, (2) persons having an estimated life expectancy of less than 3 months, and (3) people with an inadequate understanding of the Dutch language. A challenge in quasi-experimental designs is to reduce the risk of selection bias, i.e. preexisting differences in characteristics between the intervention group and control group due to the absence of random intervention assignment. This may result in a biased posttest measurement. In order to acquire unbiased estimates of the effects, the most important covariables should be balanced between intervention and control groups (Stuart & Rubin, 2008; Stuart, 2010). To increase comparability of the intervention and control groups, we use one-to-one matching: each individual participant in the intervention group is matched to one participant in the control group with the same values of the key covariables, namely sex (male or female), frailty score (score on the TFI), and educational level (high or low). This one-to-one matching is performed by the researchers.

In total, 500 frail older patients are included (250 patients in the intervention group and 250 patients in the control group). Next to frail older patients, we include healthcare professionals in our evaluation study. All healthcare professionals involved in the healthcare delivery for older patients are approached to participate in our study. Our aim is to guarantee the inclusion of healthcare professionals with various backgrounds and areas of expertise, e.g., GPs, elderly care physicians, physiotherapists, case managers, practice nurses, and social workers. Moreover, we recruit professionals involved in the management of integrated care delivery. Approximately 60 professionals in the intervention group and 60 professionals in the control group are included.

Healthcare delivery: Intervention group and control group

Frail older persons in the intervention group receive the proactive, integrated care approach FFF as was previously described in detail. Frail older people in the control group receive usual care services available for older people as arranged by their GP practice and local health and community organizations.

Data collection and informed consent for the evaluation study

Older persons in the intervention group and control group are interviewed at home at baseline (T0) and 12 months thereafter (T1). Interviewers are recruited in the western part of the Province of North Brabant in the Netherlands to assure a cultural fit with the older persons and all interviewers have a background in healthcare. Interviewers are trained to conduct the interviews and are blinded to the status of the older patients, i.e. patient of an intervention GP practice or control GP practice. Before contacting potential eligible older persons to participate in the study, the GP assesses whether reasonable grounds to suspect incapacity to either participate in the study or to give consent due to cognitive impairment exist (based on their medical records and latest encounters with the GP). In case of doubt the GP will contact the older person's informal caregiver (spouse or children) to discuss the patient's current (cognitive) state which will lead to the GP's final assessment. Those who are considered incapable by the GP will be excluded from the study. This procedure will be followed at both T0 and T1. Eligible older patients are then informed by telephone and during the home visit about the study (verbal explanation of the study purposes, procedures, confidentiality, and contact information). In addition, patients receive a leaflet with research information. It is explicitly stated to patients that their voluntary participation in the evaluation study does not affect healthcare delivery. Patients registered at intervention GP practices can participate in the FFF approach even though they are not willing to participate in the evaluation study. Patients that are willing to participate in the evaluation study are interviewed after they sign an informed consent form. The informed consent form states that the patient may discontinue participation in the study at any time without adverse consequences or loss of benefits. On average, the duration of an interview is 60-75 minutes. Outcome data and demographic data from healthcare professionals are also collected at baseline (T0) and 12 months thereafter (T1) (see section 'Outcome measures and measurement instruments').

Postal self-report questionnaires are used to collect data among the professionals involved in the healthcare delivery for frail independently living older patients. After 2-3 weeks, reminders are send to non-responders by mail and/or healthcare professionals are reminded by means of a telephone call.

Outcome measures and measurement instruments

To assess the effectiveness of the FFF integrated primary care approach in improving well-being of frail community-living older patients, we selected measurement instruments that are particularly relevant for measuring all the concepts incorporated in our proposed theoretical model. All outcomes are measured at baseline (T0) and 12 months thereafter (T1). Outcome measures for the economic evaluation are described in the section 'Economic evaluation'.

Primary outcome measure

Well-being

To measure individuals' realization of universal goals needed to enhance their well-being, the 15-item Social Production Function Instrument for the Level of well-being (SPF-IL) is used (Nieboer et al., 2005). Social Production Function (SPF) theory, as introduced by Lindenberg (Lindenberg, 1986, 1991; Lindenberg & Frey, 1993), asserts that five instrumental goals, i.e. comfort, stimulation, status, behavioral confirmation, and affection, are important for optimizing the universal goals of physical and social well-being (Ormel et al., 1999; Ormel et al., 1997). This instrument has been thoroughly validated by Nieboer and colleagues (2005) and is used frequently among (frail) older populations (e.g., Cramm et al., 2013; Cramm & Nieboer, 2015a).

Secondary outcome measures

Cognitive and behavioral components

Productive patient-professional interaction

To assess productive patient-professional interactions, we measure dimensions of communication and relationships among community-living frail older persons and their healthcare professionals using a validated relational coproduction instrument. Relational coproduction will be measured by means of 7 survey questions. Frequency, timeliness, accuracy, and problem-solving nature of communication as well as quality of the relationships are measured. The latter aspect focuses on mutual respect and the extent to which goals and knowledge are shared. Frail older patients are asked to assess the quality of their communication and relationships with the healthcare professionals involved in their care process (e.g., GPs, practice nurses, physiotherapists). Similarly, healthcare professionals assess the quality of the communication and relationships

with patients. Together these dimensions form the relational coproduction construct (Cramm & Nieboer, 2012c; Gittell, 2000; Gittell et al., 2000; Gittell, Godfrey, & Thistlethwaite, 2013).

Cognitions and behaviors of frail older people

Cognitive and behavioral self-management abilities are measured by means of the short version of the Self-Management Ability Scale (SMAS-S). The SMAS-S contains 18 items assessing six core cognitive and behavioral abilities of self-management, i.e. self-efficacy beliefs, a positive frame of mind, taking initiative, investment behavior, multifunctionality of resources, and variety in resources (Cramm, Strating, de Vreede, Steverink, & Nieboer, 2012; Schuurmans et al., 2005; Steverink et al., 2005). This instrument has also been thoroughly validated among older populations by Cramm and colleagues (2012).

Cognitions and behaviors of healthcare professionals

Dimensions of communication and relationships among healthcare professionals (i.e. relational coordination) are measured similarly to the assessment of relational coproduction in older people and their healthcare professionals. The 7 questions of the validated measure of relational coordination assess the dimensions of communication (frequency, timeliness, accuracy, and problem-solving nature of communication) and relationships (shared knowledge, shared goals, and mutual respect) among healthcare professionals (Gilmartin, Pogorzelska-Maziarz, Thompson, & Sousa, 2015). Professionals involved in healthcare delivery for frail older people (e.g., GPs) are asked to assess the quality of their communication and relationships with other professionals (e.g., elderly care physicians). As a result, we evaluate separately the connections of healthcare professionals with other types of professionals involved in the care process. Altogether these dimensions form the construct of relational coordination (Cramm & Nieboer, 2012c; Gittell, 2000; Gittell et al., 2000; Gittell et al., 2013). We followed earlier research that also used this instrument to assess cognitions and behaviors among professionals (Hartgerink et al., 2014; Hartgerink et al., 2014a).

Quality of integrated primary care for frail community-dwelling older people

Older patients' experiences with integrated primary care

Quality of integrated care is measured using the short version of the Patient Assessment of Chronic Illness Care (PACIC-S) (Cramm & Nieboer, 2012a; Glasgow et al., 2005). The 11-item PACIC-S measures the extent to which care is proactive, planned, and patient-centered as perceived by patients (Bodenheimer, Wagner, & Grumbach, 2002; Von Korff, Gruman, Schaefer, Curry, & Wagner, 1997; Wagner et al., 1996). In addition, the instrument incorporates key components related to self-management support, e.g., goal setting, problem-solving, and follow-up (Glasgow et al., 2002; Glasgow, Davis, Funnell, & Beck, 2003).

Healthcare professionals' perceptions of integrated primary care

Quality of integrated care as perceived by healthcare professionals is assessed by means of the 21-item short version of the Assessment of Chronic Illness Care (ACIC-S) (Cramm, Strating, Tsiachristas, & Nieboer, 2011). The instrument comprises six levels of system change that affect quality of healthcare delivery (Bonomi, Wagner, Glasgow, & Von Korff, 2002).

Covariables

Several variables will be measured to provide insight into the characteristics of the study population and to facilitate interpretation of the outcomes of the evaluation study. Socio-demographic data (e.g., age, sex, marital status, educational level, net household income, and living situation) are collected during the interviews with frail older patients. We assess several additional variables in order to attempt to account for potential case-mix differences that may be introduced due to the non-random allocation of older patients to the intervention and control groups. Multimorbidity, physical functioning, cognitive functioning, and social functioning are assessed. Morbidity is assessed by indicating morbidities experienced in the past 12 months from a predefined list of 17 conditions (e.g., diabetes, chronic obstructive pulmonary disease (COPD), osteoporosis, and cancer). Multimorbidity is defined as the presence of two or more conditions from this list (Lutomski et al., 2013). Physical functioning is assessed by means of a modified version of the Katz Activities of Daily Living index (Katz ADL index). Functional limitations are assessed for 8 activities in daily life, i.e. bathing, dressing, toileting, eating, continence, transfer, walking, shaving or to comb one's hair (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963; Weinberger et al., 1992). Additionally, cognitive functioning is assessed by means of the 12-item Mini-Mental State Examination (MMSE-12). The MMSE-12 focuses on cognitive aspects of mental functions and includes elements like orientation to time and place, recall of words, and complex commands, e.g., drawing a figure (Braekhus, Laake, & Engedal, 1992; Kempen, Brilman, & Ormel, 1995). Social functioning is assessed by means of the social component of the Dutch version of the 20-item Short Form Health Survey (SF-20) (Carver, Chapman, Thomas, Stadnyk, & Rockwood, 1999; Kempen, 1992; Stewart, Hays, & Ware, 1988). Next to the additional variables that are measured at the level of the older adults, we collect socio-demographic data of healthcare professionals (e.g., age, sex, educational level, occupation, and working hours).

Process evaluation

An integral part of the evaluation of the FFF approach to determine the quality of integrated care and to understand underlying mechanisms explaining effectiveness is the process evaluation. A process evaluation is useful because of the complexity of the integrated care approach, which comprises multiple elements and affects various outcomes (Craig et al., 2008). These elements may be mutually reinforcing and have a synergistic effect (Øvretveit & Gustafson, 2002). Also, GP practices differ with respect to important characteristics. Oakley and colleagues (2006) state that approaches may be implemented and received differently across sites. According to

Øvretveit and Gustafson (2002), effectiveness of integrated care approaches often depends on the degree of implementation. Assessment of the implementation and context is therefore essential and may help to gain insight in how processes work to produce effects. Thus, it is important to describe the multicomponent approach, its implementation and context, and discover the factors that are crucial for the implementation and outcomes (Øvretveit & Gustafson, 2002). Therefore, the aim of the process evaluation is to provide a thorough description of the FFF approach, assess the implementation and the context of this integrated care approach, and to provide factors and conditions that are critical for success. This also applies to the control practices. They will be studied in-depth and usual care delivery will be richly described. The process evaluation study identifies whether the FFF approach contributes to integrated care delivery in order to effectively support independently living older persons. We aim to enhance our understanding of the challenges faced by healthcare organizations and professionals and identify factors that facilitate or hinder the implementation of integrated care in a primary care setting. Therefore, in addition to the quantitative data described in the previous section, also qualitative data are gathered from actors at all levels, including frail older persons, healthcare professionals involved in the care process, and professionals involved in the management of healthcare delivery. A combination of quantitative and qualitative data will provide a richer understanding of the effects and processes of integrated primary care for frail older people.

Process indicators are registered continually during the follow-up period of 12 months. Descriptions of patient visits by practice nurses and geriatric nurses, medication reviews, assessment outcomes, and individualized care plans describing the provided self-management support are analyzed. Data are collected from data registries (e.g., information systems). We collect data on several process indicators that are specifically related to the FFF approach. Examples are the number of frail older patients that are discussed in multidisciplinary consultations, the number of older adults that have an individualized care plan, and the number of multidisciplinary consultations per year. Moreover, field notes are made at several multidisciplinary consultations executed by intervention GP practices and general meetings related to the FFF approach. Examples are educational meetings for geriatric nurses and practice nurses, steering committees, and working groups. Furthermore, semi-structured face-to-face interviews are conducted with a sample of healthcare professionals involved in the care process for frail independently living older patients. We aim to interview a diverse group of professionals, including practice nurses, elderly care physicians, and case managers. Hence a purposeful sampling procedure will be used, which can be used in qualitative research to collect data from the participants who are knowledgeable about the topic (Creswell & Plano Clark, 2011; Patton, 2002). Healthcare professionals are encouraged to describe and reflect on their experiences with healthcare delivery for frail older patients living in the community. In addition, several professionals involved in the management of healthcare delivery are interviewed. Examples are the project manager of the FFF approach and policy advisors of different healthcare organizations (e.g., homecare agencies). Also, semi-structured face-

to-face interviews are held with a sample of independently living frail older persons. The aim is to gather the reflections on experiences of patients with the FFF approach (intervention group) or care as usual (control group) from their own perspective. To create a diverse sample of older people, we aim to select participants with different characteristics. Besides these semi-structured interviews, face-to-face interviews based on a more structured interview template are held with GPs of all participating GP practices as well. As the GP has the lead in the implementation and execution of the FFF integrated care approach, we decided to interview GPs to assess exactly how care is being delivered in the different intervention GP practices. We also assess how care for community-dwelling older people is being delivered in the control GP practices (care as usual). We developed an interview template based on the Chronic Care Model (CCM) (Bodenheimer et al., 2002; Wagner et al., 1996; Wagner et al., 2001). The CCM highlights system changes in several areas (e.g., decision support and clinical information systems) to guide quality improvements (Bodenheimer et al., 2002; Wagner, 1998; Wagner et al., 2001). Important interventions related to care delivery are classified according to the areas of system change in the interview format. Examples of interventions are the systematic follow-up of patients and the use of clinical guidelines. Data about the implementation of these various interventions within each of the areas of system redesign are collected. Altogether an extensive description of (un)successfully implemented interventions is provided. Interviews are recorded with permission of the GPs and finalized data are send back for member checking and corrections.

Qualitative analyses

All interviews are audio-taped with permission of the patient or professional. After the transcription of the audio-taped interviews, latent content analysis is used (Graneheim & Lundman, 2004; Hsieh & Shannon, 2005) in which the focus is primarily on analyzing the underlying meaning of the content (Babbie, 2010; Berg, 2001). The Dutch texts derived from the interviews will be translated into English. All texts will be read several times by researchers with expertise in qualitative research to ensure a holistic understanding. We will extract, code, and categorize meaning units. Underlying meanings of categories will be expressed in themes (Graneheim & Lundman, 2004).

Integration of qualitative and quantitative data

An embedded mixed methods design is used where qualitative data is added to the quasi-experimental design. During the study both quantitative and qualitative data will be collected and analyzed. For example, qualitative data will be collected during the study to explore how participants experience the FFF approach. By using this embedded design the qualitative data augment the (cost)effectiveness study, which is a popular approach within implementation and dissemination research similar to the FFF approach (Palinkas et al., 2011; Wisdom & Creswell, 2013). We will also use an explanatory design in which qualitative data helps to understand quantitative results (Creswell & Plano Clark, 2011). We will for example collect and analyze quantitative data with regard to the quality of (integrated) care as perceived by healthcare profes-

sionals. Subsequently, these results will be followed up with in-depth qualitative data to explain and expand the quantitative results (e.g., unexpected results, significant differences between the groups in perceived quality of care).

Economic evaluation

The healthcare expenditures have increased substantially in the previous decades (OECD, 2015). Moreover, an increase in healthcare costs associated with aging is expected (van der Horst, van Erp, & de Jong, 2011). In response to these increases, challenges with respect to allocating scarce healthcare resources over interventions become apparent (Drummond, Sculpher, Claxton, Stoddart, & Torrance, 2015; Glick, Doshi, Sonnad, & Polsky, 2007). The decision to fund and implement one intervention over another will not only have an effect on patient outcomes, but also on (publicly funded) healthcare resources and resources outside healthcare. Accordingly, consideration of effects as well as costs is important in informing decisions related to the optimal resource allocation and reimbursement of healthcare approaches. Such decisions require evaluations that go beyond assessing merely effectiveness and processes of healthcare approaches, and should include an economic evaluation as well (Drummond et al., 2015).

The primary aim of our economic evaluation is to determine whether the FFF approach is cost-effective when compared to care as usual for frail community-dwelling older persons. We comparatively assess the costs and effects of the FFF integrated primary care approach and care as usual. The economic evaluation is performed from the societal perspective which implies that, in principle, all relevant costs and effects are incorporated in the analysis (Byford & Raftery, 1998; Drummond et al., 2015). Our economic evaluation comprises a cost-utility analysis and a cost-effectiveness analysis.

For the cost-utility analysis, the effectiveness is measured using quality-adjusted life-years (QALYs). QALYs are a preference-based health measure that comprises length and health-related quality of life (Whitehead & Ali, 2010). For the measurement of an older person's health-related quality of life, we use the EuroQol (EQ-5D-3L) health-related quality of life instrument that covers 5 health dimensions: mobility, self-care, usual activities, pain and discomfort, and anxiety and depression. Scores on a three-point scale indicate the older person's level of functioning: no problems (1), some or moderate problems (2) or severe problems (3) (Brooks, 1996; EuroQol Group, 1990). Utility scores are calculated by means of the Dutch tariff (Lamers, Stalmeier, McDonnell, Krabbe, & van Busschbach, 2005). The utility scores are used to calculate QALYs gained or lost during the follow-up period of the study by applying the area-under-the-curve method (Manca, Hawkins, & Sculpher, 2005; Matthews, Altman, Campbell, & Royston, 1990). Estimating QALYs allows the comparison of our outcomes with the cost-effectiveness of other integrated primary care approaches (Hakkaart-van Roijen, van der Linden, Bouwmans, Kanters, & Tan, 2015).

In economic evaluations of healthcare approaches that are aimed at improving well-being, it is recommended to use well-being instruments alongside the more conventional health-related quality of life instruments (Makai, 2014). QALYs focus mainly on health and to a lesser degree on well-being in general (Drummond et al., 2009). With respect to evaluating primary care approaches aimed at frail older people, it is crucial to have outcome measures that also go beyond health and evaluate a wider range of benefits for older people (Makai, Brouwer, Koopmanschap, Stolk, & Nieboer, 2014). Due to the lack of preference scores or utilities for well-being, a cost-effectiveness analysis is conducted with incremental effectiveness expressed as the difference in mean SPF-IL scores. Scores on the four-point scale of the multidimensional SPF-IL instrument range from never (1) to always (4). Higher mean scores indicate a greater well-being (Nieboer et al., 2005). Both the SPF-IL and the EuroQol (EQ-5D-3L) are completed by frail older patients at baseline (T0) and 12-month follow-up (T1).

Intervention costs, healthcare costs, and patient-related costs are considered relevant for the economic evaluation. *Intervention costs* consist of all costs that can be attributed to the delivery of the FFF approach, excluding the research-specific costs (e.g., executing the interviews with older patients and professionals). Examples are costs that are associated with the proactive case finding of frail elderly in the community and multidisciplinary consultations in GP practices. We assess the average amount of time for each of the activities related to the FFF approach using time registrations of healthcare professionals and by registering time during observations. *Healthcare costs* relate to (telephone) consultations with GPs and practice nurses, emergency GP, admissions to hospitals, nursing homes or homes for the elderly, homecare services, day care, nursing care, visits to paramedics, psychosocial care, and prescribed medications. Only consultations that are not already part of the FFF integrated care approach are included. Healthcare utilization is assessed by means of extracting data from electronic health records within GP practices and homecare organizations. Moreover, health service use is measured by asking older adults directly about their healthcare use during the interview (see paragraph 'Data collection and informed consent for the evaluation study'). Patients indicate at baseline (T0) and 12-month follow-up (T1) what type of care they received and how often (e.g., hours of homecare or days of hospitalization). *Patient-related costs* include costs that are covered by frail older people themselves, like purchasing assistive aids (e.g., wheeled walkers) or time investments related to the FFF approach. This data is collected during the interviews with older persons.

For the valuation of the healthcare costs, the latest version of the Dutch manual for costing in healthcare is used (Hakkaart-van Roijen et al., 2015). We multiply volumes of resource use (e.g., days in hospital) with standardized costs per unit of resource use (in euros) to estimate costs of each approach (i.e. FFF approach and care as usual). When these standardized costs per unit of resource use are not available, costs are estimated using true economic costs, average reimbursement fees or literature.

The economic evaluation includes calculations of the cost-effectiveness and cost-utility ratios. For comparing the costs and effectiveness of the FFF approach and usual care, incremental cost-effectiveness ratios are calculated (ICERs). In this way, the additional costs and effects of the FFF approach compared with usual care are determined. The ICER in the cost-effectiveness analysis represents the incremental costs per point improvement in well-being (SPF-IL score). The ICER in the cost-utility analysis expresses the incremental costs per QALY gained. In the ratio, the numerator includes the difference in costs and the denominator the difference in effects (Glick et al., 2007). Sensitivity analysis is performed to assess the robustness of a series of predefined assumptions. A cost-effectiveness plane and an acceptability curve are added.

Sample size

We aim to include 500 frail older patients (250 patients of intervention GP practices and 250 patients of control GP practices). We aim to optimize participation by means of personal home visits, however, we anticipate a drop-out rate of approximately 20% between T0 and T1 (e.g., due to death, refusal). Accordingly, we expect 400 patients at T1 in the intervention and control groups. Sample size calculations are based on the mean well-being score (SPF-IL) of a comparable Dutch population of frail community-dwelling older persons (N=945) (Cramm & Nieboer, 2015b). To detect a mean improvement in well-being of 1/4 standard deviation (SD) based on the SPF-IL, we need at least 198 older patients in each group (based on a mean SPF-IL score of 2.56 [SD = 0.45]; alpha (two-sided) = 0.05, beta = 0.20, ratio 1:1).

Statistical analyses

Descriptive statistics are used to describe the study population at the two time points in the evaluation study (baseline and 12-month follow-up). Baseline variables are compared to detect differences between patients and professionals in the intervention group (FFF approach) and control group (care as usual). To assess baseline differences between the groups we use unpaired Student's t-tests (continuous variables with normal distributions), Mann-Whitney U-tests (continuous variables with non-normal distributions) and Chi-square tests (categorical variables). Effect analyses are performed based on the intention-to-treat principle. Analyses of outcomes are performed by means of univariate, multivariate, and multilevel methods (to account for the nested structure of the data). To analyze the differences in outcomes between the intervention group and control group, we employ linear mixed models with random effects (multilevel analysis). To estimate the effects of the FFF approach after 12 months a difference in differences model will be used followed by a sensitivity analysis method specifically developed for difference in differences model based on more general methods of bounds developed by Rosenbaum (2002). Potential confounding and effect modification is accounted for when performing the analyses and, if necessary, adjustments for baseline differences are made. To handle missing data multiple imputation techniques will be used. Ultimate goals of these analyses are to test the assumptions of the theoretical framework with the instruments described in the study protocol. Finally, we

will assess clinical relevance of improvements made in cognitions and behaviors among both patients and professionals. The software package IBM SPSS statistics version 23 is used for all statistical analyses.

Timeline

Figure 2 shows a general timeline of the data collection among older adults and healthcare professionals, the analyses of the data and writing up the results of the evaluation study.

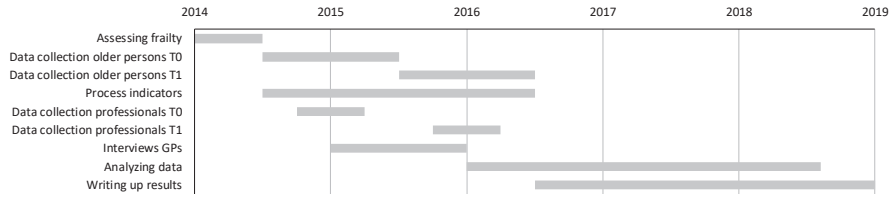

Figure 2 Timeline

DISCUSSION

Integration of health services is increasingly advocated as a means to develop more effective models of care and improve patient outcomes (WHO, 2015b). Much research in the field of integrated care for community-dwelling older adults has been conducted, however, these innovative interventions have had mixed effects on patient outcomes and there is a need for in-depth evaluations. This underlines the importance of sound theory-based evaluations of integrated primary care approaches. Consequently, in efforts to evaluate the effects of innovative integrated care approaches, insight into the underlying mechanisms explaining the (lack of) effectiveness of these complex multicomponent interventions is crucial. The present paper describes the design of a theory-based evaluation of a proactive integrated primary care approach to improve well-being among frail community-living older adults.

Strengths and limitations

A major strength of the study is the comprehensive and rigorous evaluation of the complex multicomponent integrated care approach FFF. We use a combination of quantitative and qualitative research methods and assess not only the effectiveness of the approach on frail older persons' well-being, but also the cost-effectiveness and processes. Selected outcome measures are based on the theoretical model, which facilitates a sound theory-based evaluation. We ultimately may reveal crucial underlying mechanisms of this integrated care approach. Therefore, the theory-based evaluation study is expected to contribute to the existing evidence on improvements in quality of care and patient outcomes, and a better understanding of explanatory mechanisms underlying integrated primary care approaches.

The proposed evaluation study has potential limitations and challenges. First, the absence of randomization makes the design more susceptible to bias (Eccles, Grimshaw, Campbell, & Ramsay, 2003). Especially selection bias is a major concern in non-randomized studies. Systematic differences between the groups result in incomparable groups which ultimately may lead to biased estimates of the intervention effect (Deeks et al., 2003). To reduce the impact of this bias on the outcome measures studied, we aim to control for important factors in the analysis of the data and by means of matching (Aussems, Boomsma, & Snijders, 2011). To ensure that the intervention and control groups are similar for key covariables, we use one-to-one matching to balance groups instead of matching on a higher level (at healthcare practice level). Moreover, when necessary we use case-mix adjustments to take into account important dissimilarities. However, it is stated by Deeks and colleagues (2003) that the degree to which techniques can sufficiently adjust for differences between the groups is still unclear, which ultimately provides no guarantee for unbiased study results (Deeks et al., 2003). In addition, unknown and unmeasured factors can still influence the outcome (Moses, 1995). Second, the design of the study makes it impossible to blind participating healthcare professionals and frail older patients. Knowledge of the status of the person (receiving either the FFF approach or care as usual) may have an influence on the responses and may affect compliance (Schulz & Grimes, 2002). Nevertheless, the interviewers that conduct the interviews with frail older persons are kept unaware of the group the person is in (intervention or control GP practice), so that the interviewers collecting outcome data are not influenced by that knowledge. Blinding of the interviewers aids to reduce differential outcome measurements (information bias) (Schulz & Grimes, 2002). Due to the nature of the evaluation study, however, it is possible that the patient inadvertently reveals his or her status during the interview (e.g., disclosing information that is specific to the FFF approach). Third, one of the core challenges of the evaluation study is the willingness of frail community-dwelling older patients to participate in the study, especially in the long-term. Recruitment of appropriate numbers of patients requires a sufficiently long period (Harris & Dyson, 2001). We aim to optimize participation in the evaluation study by means of home visits instead of interviews over the telephone, recruiting interviewers that live in the same region as the older adults, and sending letters to older patients on behalf of their own GP. Fourth, although control GP practices continue to provide usual care, GPs in the control group may start initiatives to improve care delivery for frail older patients. We collect data on various interventions that are implemented to improve care for older adults and we monitor and describe the activities performed by the GPs. In contrast to the intervention GP practices, control practices are not supported financially by the health insurers to implement elements of the FFF approach. Fifth, recall bias may potentially affect our study findings. Earlier research using a 12 months period of asking patients about their healthcare visits show both under-reporting and over-reporting effects (Brusco & Watts, 2015). Administrative data could be included to accurately capture resources for an economic evaluation (if filled in correctly). Sixth, while we included patients and professionals in our theoretical framework and study protocol we did not include informal caregivers. Given their important role in supporting

community-dwelling frail older people they are expected to influence the well-being of older persons as well. Given the complexity of the theoretical framework as presented in this paper we decided to first unravel the underlying mechanisms in the relationship between quality of care, cognitions and behaviors of patients and professionals and older persons' well-being. Future research should look at the role of informal caregivers and their cognitions and behaviors as well. It may be easier to improve outcomes if the patient's partner is a good self-manager with a positive frame of mind compared to a partner who is depressed, has low self-efficacy and poor investment behavior.

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Chapter 3

A cross-sectional study investigating the relationships between self-management abilities, productive patient-professional interactions, and well-being of community-dwelling frail older people

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ABSTRACT

Worldwide, the maintenance of well-being in ageing populations with associated frailty has become increasingly important. To maintain well-being during ageing, investment in frail older people's self-management abilities and the fostering of productive interactions with healthcare professionals may lead to higher levels of well-being. The aim of this study was to investigate the relationships between community-dwelling frail older people's self-management abilities, productive patient-professional interactions and well-being, while controlling for socio-demographic characteristics. The cross-sectional study included 588 community-dwelling frail older people (aged ≥ 75 years) from 15 general practitioner (GP) practices in the Netherlands. Well-being (Social Production Function Instrument for the Level of well-being short), productivity of interactions with GPs (relational coproduction instrument), and self-management abilities (Self-Management Ability Scale short) were measured during in-home face-to-face interviews by trained interviewers. Data were analysed using descriptive statistics, correlation analyses, and linear mixed-effects models. Significant relationships were detected between self-management abilities and the overall, social, and physical well-being of older people, and between productive interactions with GPs and overall and social well-being, but not physical well-being. In a time of ageing populations with associated frailty, investment in frail older people's self-management abilities and the productivity of patient-professional interactions may be beneficial for this population's well-being.

INTRODUCTION

Worldwide, the maintenance of ageing populations' well-being has become increasingly important (Steptoe, Deaton, & Stone, 2015). Frailty, defined as the presence of problems or losses in multiple domains (physical, psychological, and social) of human functioning (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010a), is associated with lower levels of well-being among community-dwelling older people (Andrew, Fisk, & Rockwood, 2012). Compared with the general population, frail older people have a compromised ability to realise and maintain well-being (Nieboer & Cramm, 2018). This is due to changes and declines in available physical and social resources, and in opportunities to realise well-being (Steverink, 2014). Consequently, maintaining the well-being of a frail population is a key challenge (Steptoe et al., 2015). To maintain well-being levels during ageing, investment in frail older people's self-management abilities and the fostering of productive interactions with healthcare professionals may lead to higher levels of well-being.

Individuals are motivated to improve their living situations to optimize their levels of well-being, although this endeavor is not always successful (Nieboer & Cramm, 2018; Steverink, 2014). The balance between resource gains and losses changes over the life span, with losses gradually dominating (Steverink, Lindenberg, & Ormel, 1998). Consequently, as people grow older, the maintenance of need fulfilment and management of losses therein become increasingly important (Steverink, Lindenberg, & Slaets, 2005; Steverink, 2014). The realisation and maintenance of well-being depend on the possession of adequate resources that aid the fulfilment of needs contributing to well-being, and, more importantly, the ability to manage these resources (Steverink, 2014). Self-management abilities consist of a diverse repertoire of cognitive and behavioural abilities to manage resources for fulfilling well-being needs and managing losses (Steverink et al., 2005; Steverink, 2014). Older people with better overall self-management abilities are expected to be more effective in creating, maintaining, and restoring their well-being (Steverink et al., 2005; Steverink, 2014).

In addition, healthcare professionals can support a person's development and maintenance of abilities that enable well-being in older age. Researchers and practitioners increasingly recognise the need for person-centered approaches that are responsive to frail older people's preferences and needs (beyond physical health and clinical outcomes) and are successively aimed at protecting their well-being (Cramm & Nieboer, 2015b; WHO, 2015). Productive interactions between frail older people and their healthcare professionals (Gittell & Douglass, 2012; Gittell, 2006; Gittell, 2002; Wagner et al., 2001) are assumed to be essential in enhancing care processes and optimising (abilities to maintain) well-being (Barr et al., 2003; Nolte & McKee, 2008; Wagner et al., 2001; Wagner et al., 2005; WHO, 2015). The quality of interactions is assumed to affect a person's well-being. The recognition of a person's needs may improve patient-professional

interactions by encouraging trust and affection (Kuipers, Cramm, & Nieboer, 2019), and may provide insight into unfulfilled needs and the associated changes required to protect a frail older person's well-being (Steverink & Lindenberg, 2006).

Previous research has shown that greater self-management abilities are associated with greater well-being among older people (Cramm et al., 2012; Cramm et al., 2013; Goedendorp & Steverink, 2017; Steverink & Lindenberg, 2008). Also, research has shown that the productivity of interactions is associated with the improved well-being of chronically ill patients (Cramm & Nieboer, 2015c; Kuipers et al., 2019). To our best knowledge, the relationship between productive patient-professional interaction and well-being has not been investigated in a population of independently living frail older people (75 years and older) in a primary care setting in the Netherlands. The primary care setting is considered to be among the most important settings for the delivery of care and support to community-dwelling frail older people (Cesari et al., 2016), with gatekeeping general practitioners (GPs) as central actors in Dutch primary care (Kroneman et al., 2016; van Campen, Broese van Groenou, Deeg, & Iedema, 2013). The aim of this study was to investigate the relationships between community-dwelling frail older people's self-management abilities, productive patient-professional interactions and well-being, while controlling for socio-demographic characteristics.

Theories of well-being, self-management, and productive interactions

Well-being of frail older people

Social production function (SPF) theory holds that individuals are active producers of their own subjective or psychological well-being via attempts to obtain universal needs of physical and social well-being (Lindenberg & Frey, 1993; Lindenberg, 1996; Nieboer & Cramm, 2018; Ormel, Lindenberg, Steverink, & Verbrugge, 1999; Ormel, Lindenberg, Steverink, & Von Korff, 1997). Overall well-being is considered to be the joint production of physical and social well-being (Ormel et al., 1999; Ormel et al., 1997). The SPF theory asserts that the production of physical well-being requires the fulfilment of two instrumental needs: comfort (the satisfaction of physical needs and absence of stimuli that create discomfort, e.g. pain and hunger) and stimulation (an adequate level of physical and mental activation, e.g. pleasant levels of physical effort, excitement, and arousal). Social well-being is achieved by obtaining status (a person's relative ranking, e.g. the sense of being respected and having valued resources), affection (being loved for who one is, irrespective of one's actions or status, e.g. the feeling of being liked, loved, and accepted, provided mainly in caring relationships), and behavioural confirmation (the sense of doing the "right" thing according to oneself or relevant others, e.g. the sense of being useful and doing good things) (Lindenberg, 1996; Ormel et al., 1999; Steverink, 2014). Each of these instrumental needs can be realised by (multifunctional) means, that is activities and endowments. For example, intimate

ties contribute significantly to a person's affection level (Nieboer, Lindenberg, Boomsma, & van Bruggen, 2005; Ormel et al., 1999).

Self-management of well-being

Self-management abilities aid the effective achievement, maintenance, and restoration of physical and social well-being, ultimately leading to the realisation of overall subjective well-being (Steverink et al., 2005; Steverink, 2014). Overall self-management ability is defined as "a generative capacity (consisting of several sub-abilities) to take care of one's own important resources, that is resources that contribute to well-being" (Steverink & Lindenberg, 2008, p.182). The premise of this conceptualisation is that behavioural and cognitive abilities are connected to the dimensions of well-being (i.e. comfort, stimulation, status, affection, and behavioural confirmation) (Steverink et al., 2005; Steverink & Lindenberg, 2008). According to the self-management of well-being (SMW) theory (Steverink et al., 2005), the core interrelated and mutually reinforcing self-management abilities are cognitive abilities (self-efficacy beliefs and having a positive frame of mind), active motivational abilities (taking initiative and investment behaviour), and resource combining abilities (multifunctionality of resources and variety in resources). (1) Self-efficacy belief refers to a person's belief in his or her competence to effectively achieve goals and realise aspects of well-being; and (2) having a positive frame of mind entails the ability to have a positive perspective on the future instead of focusing on losses. In addition, (3) taking initiative reflects a person's self-motivation to realise aspects of well-being in contrast to being passive or dependent, and (4) investment behaviour refers to the ability to invest in resources for the long-term. Finally, (5) multifunctionality of resources refers to the simultaneous contribution of resources and activities to multiple aspects of well-being in a mutually reinforcing way, and (6) variety in resources refers to the contribution of multiple resources and activities to single aspects of well-being. Although each ability is important on its own, the strengthening of all interacting abilities results in improved self-management for the realisation or maintenance of resources to satisfy well-being needs in later life (Steverink & Lindenberg, 2008).

Productivity of interactions

People try to achieve universal well-being needs by actively producing essential means (realising instrumental needs, e.g. sufficient comfort and affection) in the light of available resources and constraints (Lindenberg, 2013; Ormel et al., 1999; Steverink & Lindenberg, 2008). Especially for frail older people with disabilities, illnesses, and functional limitations, goal attainment and continued participation in important activities are facilitated by individual relationships and other resources, and can reduce or avoid the deterioration of well-being (Cramm & Nieboer, 2016b; Nieboer, 2013). To realise needs that promote well-being, care should centre on a person's preferences, needs, values, and goals (Greene, Tuzzio, & Cherkin, 2012; Rathert, Wyrwich, & Boren, 2013; Wagner et al., 2005). Persons partnering with (teams of) healthcare professionals who promote participation in managing life situations, focus on goals relevant for the maintenance

of well-being, and provide effective (self-management) support and follow-up are more likely to achieve better outcomes (Bergeson & Dean, 2006; Wagner et al., 2005). Consequently, productive patient-professional interactions are assumed to be essential in co-producing the best possible patient outcomes, including well-being (Barr et al., 2003; Wagner et al., 2001; Wagner et al., 2005; WHO, 2015). Productive interactions between professionals and patients are characterised by accurate, frequent, timely, and problem-solving communication. Effective communication is supported by relationships based on mutual respect, and high levels of shared goals and knowledge, and vice versa (Batalden et al., 2015; Gittell, 2012; Gittell & Douglass, 2012). The maintenance or improvement of frail older people's well-being is more likely to be realised when patient-professional interactions are characterised by effective communication and high-quality relationships (Batalden et al., 2015; Gittell, 2012; Gittell & Douglass, 2012).

DATA AND METHODS

Study design and setting

This cross-sectional study included GP practices in western North Brabant Province, the Netherlands, and was conducted from mid-2014 to mid-2015. Fifteen of 17 GP practices approached agreed to participate. This study is part of a large-scale evaluation of proactive, integrated primary care for community-dwelling frail older people, which has been described in detail elsewhere (Vestjens, Cramm, Birnie & Nieboer, 2018).

Participants and inclusion

The study sample consisted of community-dwelling frail older people (aged ≥ 75 years). Recruitment of this sample consisted of two steps. First, the frailty of all 3545 older people (aged ≥ 75 years) registered at the 15 GP practices was assessed using a postal questionnaire which included the 15-item Tilburg Frailty Indicator (Gobbens, van Assen, Luijkx, Wijnen-Sponselee, & Schols, 2010). The TFI is a self-report user-friendly questionnaire used assess frailty in the physical, psychological, and social domains; persons with scores ≥ 5 (range, 0-15) are considered to be frail (Gobbens et al., 2010). Reminders were sent by mail and telephone to non-responders. A response rate of 83.4% (n = 2956) was achieved. As the TFI may not fully encompass all essential aspects of frailty, its use in isolation is not recommended (van Dijk, 2015). Therefore, persons whose TFI scores did not indicate frailty (TFI score < 5), could also be identified as frail based on additional examinations or interviews by healthcare professionals. Second, the sample of frail older people derived from the screening (TFI and/or additional frailty examination by healthcare professionals) was assessed by GPs and researchers on eligibility criteria for study participation. We excluded (1) frail older people living in nursing homes or homes for older people, (2) people with estimated life expectancies of < 3 months, and (3) people who were not able to communicate in Dutch. Furthermore, GPs assessed whether reasonable grounds to suspect incapacity to par-

ticipate and/or to give consent existed (e.g. due to cognitive problems), and people were excluded in such cases. Of 834 potential participants, 588 persons were willing to participate in this study (70.5% response rate).

Data collection

To collect data, interviewers administered the questionnaires during in-home face-to-face interviews. The interviewers lived in western North Brabant Province and had backgrounds in healthcare; they were trained to conduct the interviews. On average, interviews lasted 60-75 minutes.

Measures

Well-being

Well-being was measured using the short version of the validated Social Production Function Instrument for the Level of well-being (SPF-ILs) (Nieboer et al., 2005). This 15-item instrument measures overall well-being, as well as levels of social (behavioural confirmation, status, and affection) and physical (comfort, and stimulation) well-being (Nieboer & Cramm, 2018; Nieboer et al., 2005; Ormel et al., 1999; Ormel et al., 1997). Answers to the questions are given on a 4-point scale ranging from 1 (never) to 4 (always), and mean scores are calculated. Higher scores indicate greater well-being (Nieboer et al., 2005). The instrument has been shown to provide a reliable and valid assessment of social and physical well-being among older people (Nieboer & Cramm, 2018; Nieboer et al., 2005). The Cronbach's alpha value for overall well-being measured with the SPF-ILs in this study was 0.84, indicating a high degree of reliability. Cronbach's alpha values for social and physical well-being were 0.80 and 0.77, respectively.

Productive patient-professional interactions

Frail older people's perceptions of the productivity of interactions were measured using the validated relational coproduction instrument (Gittell, 2000, 2012; Gittell et al., 2000; Gittell, Godfrey, & Thistlethwaite, 2013). In this study, productivity of interactions with GPs was assessed. The relational coproduction instrument consists of seven survey questions assessing dimensions of communication (frequency, timeliness, accuracy, and problem-solving nature) and relationships (mutual respect, shared goals, and shared knowledge). Together, these dimensions form the productive interaction construct (Gittell, 2000, 2012; Gittell et al., 2000; Gittell et al., 2013). The seven items are rated on a 5-point scale ranging from 1 (never) to 5 (always), and mean scores are calculated. Higher scores represent higher-quality interactions with the GP, as perceived by frail older people. The Cronbach's alpha value for the relational coproduction instrument in this study was 0.86, indicating a high degree of reliability.

Self-management abilities

The self-management abilities of frail older people were measured using the short version of the Self-Management Ability Scale (SMAS-S) (Cramm, Strating, de Vreede, Steverink, & Nieboer, 2012; Schuurmans et al., 2005). This 18-item questionnaire assesses a diverse repertoire of self-management abilities for the maintenance of physical and social well-being. The SMAS-S assesses cognitive abilities (self-efficacy beliefs and a positive frame of mind), active-motivational abilities (taking initiative and investment behaviour), and resource-combining abilities (multifunctionality of resources and variety in resources) (Cramm et al., 2012; Schuurmans et al., 2005). Mean SMAS-S scores range from 1 to 6, with higher scores indicating better self-management abilities. The Cronbach's alpha value for the SMAS-S in this study was 0.91, indicating a high degree of reliability.

Socio-demographic variables

The questionnaire contained items regarding the persons' age, sex, educational level, marital status, and (multi)morbidity. Morbidities were indicated on a list of 17 conditions, including diabetes, Chronic Obstructive Pulmonary Disease, heart failure, and hearing disorders. Educational level (elementary school or less and more than elementary school), marital status (married/living together and single/widowed/divorced), and (multi)morbidity (0 or 1 condition and ≥2 conditions) were dichotomised.

Ethical considerations

The medical research ethics committee of the Erasmus Medical Centre in Rotterdam, the Netherlands, reviewed the research proposal (study protocol number MEC-2014-444) and determined that the rules laid out in the Medical Research Involving Human Subjects Act did not apply. Frail older people were informed by telephone and during in-home visits about the study (e.g. purposes, procedures, confidentiality, and contact information for the researchers and interviewers). In addition, participants received a leaflet containing relevant research information. Written informed consent to participate in the study was obtained from all participants.

Statistical analyses

The socio-demographic characteristics of study participants were analysed using descriptive statistics. Bivariate associations between the study variables (self-management abilities, productive interactions, and well-being) were analysed using Pearson correlation coefficients. Linear mixed-effects models (588 frail older people nested in 15 GP practices) were employed to investigate relationships of self-management abilities and productive interactions with GPs to well-being (social, physical and overall). A random intercept was used on the GP practice level. The outcome estimates were adjusted for socio-demographic characteristics (age, sex, educational level, marital status, and multimorbidity). Social, physical and overall well-being served as the dependent variables, and the productivity of interactions and self-management abilities

served as independent variables. Assumptions of linear models (including linearity, normality, multicollinearity, homoscedasticity, and significant outliers) were tested and no large violations were found. In addition, we found no indication of a mediating effect between the variables (Hayes, 2018). Results were interpreted as significant when two-sided p-values were <0.05. The software package IBM SPSS (version 24 for Windows; IBM Corporation, Armonk, NY, USA) was used for all statistical analyses.

RESULTS

Table 1 shows descriptive statistics for the socio-demographic characteristics of the study sample, well-being, self-management abilities, and the productivity of interactions with GPs. Of the 588 participants, 68.5% were women, 61.7% were single, and 38.4% had low educational levels. Their mean age was 82.32 (standard deviation (SD), 5.19; range, 75-98) years. Almost 90% of the frail older people reported multimorbidity (≥2 conditions). The mean SPF-ILs score for overall well-being was 2.640 (SD, 0.492; range, 1-4). Mean scores for physical and social well-being were 2.578 (SD, 0.615; range, 1-4) and 2.678 (SD, 0.553; range, 1-4), respectively. The mean SMAS-S score for self-management abilities was 3.670 (SD, 0.879; range, 1-6) and the mean score for the productivity of interactions with GPs was 3.78 (SD, 1.144; range, 1-5).

Table 1 Descriptive statistics for socio-demographic characteristics, well-being, self-management abilities, and productive interactions among frail older people, $N = 588$

	Mean ± SD (range) or n (%)	*n*
Age (years)	82.32 ± 5.19 (75-98)	588
Sex (women)	403 (68.5%)	588
Marital status (single)	363 (61.7%)	588
Educational level (low)	226 (38.4%)	588
Multimorbidity (≥ 2 diseases)	523 (89.6%)	588
Overall well-being	2.640 ± 0.492	578
Physical well-being	2.578 ± 0.615	581
Social well-being	2.678 ± 0.553	570
Self-management abilities	3.670 ± 0.879	583
Productive interactions with GPs	3.783 ± 1.144	576

Table 2 shows the correlations among self-management abilities, the productivity of interactions with GPs, and well-being. Significant correlations were found between self-management abilities and overall ($r = 0.701$), physical ($r = 0.589$), and social ($r = 0.603$) well-being (all $p < 0.001$). Significant weak correlations were found between the productivity of interactions with GPs and overall ($r = 0.162$) and social ($r = 0.225$) well-being (both $p < 0.001$), but not with physical

well-being (p = 0.603). Self-management abilities were correlated weakly with the productivity of interactions with GPs (r = 0.126, p < 0.01).

Table 2 Pearson correlations among self-management abilities, productive interactions, and well-being among frail older people, N = 588

	Physical well-being	Social well-being	Overall well-being
	r	*r*	*r*
Self-management abilities	0.589***	0.603***	0.701***
Productive interactions with GPs	0.022	0.225***	0.162***

***p < 0.001 (two-tailed).

Table 3 displays the results of the linear mixed-effects models. Analyses controlled for socio-demographic characteristics revealed significant relationships between self-management abilities and overall, physical, and social well-being (all p < 0.001). They also revealed significant relationships between the productivity of interactions with GPs and overall (p < 0.05) and social (p < 0.001) well-being, but not physical well-being (p = 0.212).

Table 3 Relationships between self-management abilities, productive interactions, and well-being while controlling for socio-demographic characteristics, as revealed in linear mixed-effects models, among frail older people, N = 588

	Physical well-being		Social well-being		Overall well-being	
	n = 571		*n* = 560		*n* = 568	
	B	SE	B	SE	B	SE
Constant	0.720	0.367	0.954**	0.337	0.701**	0.264
Age (years)	0.012**	0.004	0.003	0.004	0.006*	0.003
Sex (women)	0.081	0.047	0.047	0.044	0.084*	0.034
Marital status (single)	0.051	0.042	-0.033	0.038	-0.003	0.034
Educational level (low)	0.019	0.042	-0.022	0.038	-0.014	0.030
Multimorbidity (≥ 2 diseases)	-0.164*	0.067	-0.066	0.061	-0.125**	0.048
Self-management abilities	0.376***	0.025	0.360***	0.023	0.391***	0.017
Productive interactions with GPs	-0.022	0.018	0.073***	0.016	0.032*	0.013

*p < 0.05, **p < 0.01, ***p < 0.001 (two-tailed).

DISCUSSION

This study aimed to investigate the relationships between community-dwelling frail older people's self-management abilities, productive patient-professional interactions and well-being, while controlling for socio-demographic characteristics. The study shows that self-management abilities were related significantly to physical, social, and overall well-being in this study sample. The productivity of interactions with GPs was related significantly to social and overall well-being, although the effect sizes were small.

Well-being and self-management

The finding of relationships between self-management abilities and well-being in a sample of community-dwelling frail older people underlines the importance of strengthening these abilities to manage resources to maintain well-being, and to effectively avoid or cope with losses, in later life (Steverink et al., 2005). The relative difficulty of fulfilling well-being needs increases with age as the availability of resources and opportunities to satisfy needs alters and declines (Steverink et al., 1998; Steverink, 2014). In the process of ageing, reserves and resources in several life domains decline, and losses in one domain can reinforce resource-loss in other domains, necessitating the possession of adequate and diverse self-management abilities (Steverink et al., 2005). According to Frieswijk and colleagues (2006), frail older people with deficits in multiple domains may benefit from interventions to improve general self-management abilities aimed at maintaining all aspects of well-being, instead of single target (health) problems (Frieswijk, Steverink, Buunk, & Slaets, 2006). Dutch governmental policies aim to enhance self-sufficiency and independent living in the community for as long as possible (de Klerk, Verbeek-Oudijk, Plaisier, & den Draak, 2019; van Campen, Iedema, Broese van Groenou, & Deeg, 2017), which makes the effective self-management of well-being even more important.

Well-being and productive patient-professional interactions

The present study showed that productive interactions with GPs in the primary care setting were related significantly to the social well-being and overall well-being (the joint production of physical and social well-being) of community-dwelling frail older people, even after controlling for self-management abilities (although the effect sizes were small); no significant relationship with physical well-being was found. This finding is in line with those from a recent cross-sectional study among patients with multimorbidity in the Netherlands. This study showed that productive interactions with healthcare professionals (GPs, nurse practitioners, and specialists) were related significantly to social well-being, but not physical well-being (Kuipers et al., 2019). The productivity of patient-professional interactions, as measured with the relational coproduction instrument (Gittell, 2000), consists largely of social aspects (e.g. quality of the patient-professional relationship based on mutual respect, and high levels of shared goals and knowledge) and may thus relate mainly to social well-being goals (Kuipers et al., 2019). In addition, a study of

Nieboer and Cramm (2018) has shown that frail older people report lower physical well-being levels compared with a general sample of community-dwelling older people. Frail older people reported lower comfort and stimulation levels, which serve as resources for physical well-being (Nieboer & Cramm, 2018). As frailty is related to developing adverse health outcomes (e.g. disability, falls, and hospitalisation) (Vermeiren et al., 2016), frail older people may experience more difficulties with physical well-being. It may be more difficult to affect physical well-being of frail older people through the quality of the patient-professional relationship and communication. The productivity of interactions with GPs explains only a small part of well-being; other factors contributing to older people's well-being include personal resources (Pinquart & Sörensen, 2000) and neighborhood characteristics (e.g. social cohesion) (Cramm, van Dijk, & Nieboer, 2013; Cramm & Nieboer, 2015d; Oswald, Jopp, Rott, & Wahl, 2011). Although the effect sizes in our study were small, our findings suggest that productive patient-professional interaction may be a resource for the maintenance of well-being and prevention of a decline in needs contributing thereto when facing age-related changes in physical, psychological, and social domains (Williams, Haskard, & DiMatteo, 2007).

GPs may contribute significantly to their frail older patients' social and overall well-being outcomes by investing in productive interactions with them. Effective communication between healthcare professionals and frail older people should therefore not focus solely on biomedical and psychosocial domains but should include emotional and affective care (Williams et al., 2007). A trusting patient-professional relationship can be considered to be central in the care process and may be therapeutic for patients, especially frail older people with multimorbidity (Williams et al., 2007). However, widespread problems with communication and collaboration between patients and healthcare professionals have been reported (Øvretveit, 2012). Suboptimal patient-professional communication involves healthcare professionals' failure to create environments and relationships that enable effective communication, suboptimal communication skills, patients' withholding of information, and healthcare professionals' failure to provide (understandable) information during consultations or about medications (Øvretveit, 2012). Problems with patient-professional collaboration include non-attendance of scheduled appointments, time constraints with respect to consultations, a lack of continuity with healthcare professionals, and the under-involvement of patients in decision-making processes (Øvretveit, 2011; Øvretveit, 2012). Suboptimal patient-professional communication and collaboration can hinder productive interactions (Cramm & Nieboer, 2015c). The findings of our study imply the need for healthcare professionals to invest in the quality of communication and relationships with frail older people. To enhance the productivity of interactions, frail older people need to be informed and activated; to whatever degree possible, they need to have goals and plans to protect or improve their health and well-being. To become active partners and wise decision-makers in their care processes, frail older people need high-quality information, and adequate skills, motivation, and confidence to manage their conditions and well-being effectively. They need to understand the importance

of information sharing and their own roles in managing their health and satisfying well-being needs. For interactions to be productive, healthcare professionals, including GPs, should be organised, equipped, and trained to conduct productive interactions with frail older people. They need relevant expertise, time, resources and patient information (Bodenheimer, Wagner, & Grumbach, 2002a, 2002b; Wagner, Austin, & Von Korff, 1996; Wagner et al., 2001; Wagner et al., 2005). The support of frail older people in protecting (the potential loss of) well-being requires relational competence to consider their preferences, needs, values and goals, empathise with their situations, and respect their needs and choices (Cramm & Nieboer, 2012; Cramm & Nieboer, 2015c).

Study limitations

Several limitations of this study should be considered. First, the cross-sectional design limited the investigation of causal relationships. The relationships of self-management abilities and productive interactions to well-being may be dynamic, and longitudinal research of these relationships among community-dwelling frail older people is recommended. Second, the study population was derived from a single province in the Netherlands, which may hamper the generalisability of our findings to other areas and populations of older people. Third, no information was available from non-responders in the study. Non-response to (postal) questionnaires may introduce bias (Edwards et al., 2002); for example, frailty may have been higher among non-responders. Fourth, in the present study, an integral perspective on frailty as defined by Gobbens and colleagues (2010b) was employed in which physical, psychological, and social domains of human functioning are incorporated and operationalised in the multidimensional TFI (Gobbens et al., 2010b). There is, however, still considerable uncertainty about an internationally recognised and comprehensive definition of frailty (Bergman et al., 2007; Brown & Covinsky 2018; Dent, Kowal, & Hoogendijk, 2016). Disagreements continue about what conceptual frailty approaches should be adopted (Hoogendijk et al., 2019), and instruments used to assess frailty in older people are based on different conceptualisations of the phenomenon. Dominating perspectives in the field include a frailty phenotype in which frailty is defined as a biological syndrome (Fried et al., 2001) or a multifactorial perspective on frailty by the accumulation of health deficits (Mitnitski, Mogilner, & Rockwood 2001; Rockwood & Mitnitski 2007). Increasingly, research on frailty stresses the need for a multidimensional perspective (Dury et al., 2018) in which not only physical aspects dominate but the contribution of multiple domains is taken into account (e.g. psychological, social, cognitive, and environmental) (De Witte et al., 2013; Gobbens et al. 2010b; Gustafsson, Edberg, & Dahlin-Ivanoff, 2012; Markle-Reid & Browne, 2003). Based on the continuous debate on defining frailty and its measurement, the TFI may not fully encompass all relevant aspects. However, the TFI is frequently used in the Netherlands and other countries in Europe (Op het Veld et al., 2019). The psychometric properties of the TFI have shown to be good (i.e. good internal consistency and construct validity) (Gobbens, van Assen et al., 2010; Gobbens et al., 2020; Metzelthin et al., 2010). A systematic review of Sutton and colleagues

(2016) comparing multicomponent frailty assessment tools has shown that the TFI has the most robust evidence supporting its reliability and validity. Fifth, other potentially important determinants of (relationships among) self-management abilities, productive interactions, and well-being were not investigated. For example, the quality of care delivery has been shown to be a significant determinant of self-management abilities (Cramm & Nieboer, 2015a) and productive patient-professional interactions among chronically ill patients (Cramm & Nieboer, 2014) and community-dwelling frail older people (Vestjens, Cramm, & Nieboer, 2019). In addition, research of Dury and colleagues (2018) has shown that frail older people possess balancing factors for frailty (i.e. resources to fulfil psychological, social, physical, environmental, and/or cognitive challenges). Balancing factors were present at the individual (e.g. resilience), environmental (e.g. neighbourhood characteristics), and macro level (e.g. financial income), and might contribute to dealing effectively with frailty and increase positive outcomes, such as maintaining well-being. Also, negative and positive turning points and life events such as death of the partner or birth of a grandchild might affect their frailty and outcomes (Dury et al., 2018). In the current study, balancing factors were not explicitly considered, although multiple balancing factors may (partly) overlap or interact with, for example, self-management abilities (e.g. abilities and resources to stay positive or invest in social contacts). Sixth, moderate associations found between frail older people's self-management abilities and their well-being may be explained (partly) by the use of the SMW theory (Steverink et al., 2005), which is based on the SPF theory (Lindenberg, 1996). The core abilities specified in the SMW theory form the construct of self-management ability and are linked explicitly to the dimensions of well-being proposed in the SPF theory (Steverink et al., 2005). Finally, only the productivity of interactions with the GPs was examined, not those with other healthcare professionals in the primary care setting such as elderly care physicians and home care nurses. GPs serve a gatekeeping function and are central actors in primary care (Kroneman et al., 2016; van Campen et al., 2013). Other studies have shown that interactions with GPs tend to be more productive than those with other healthcare professionals (Cramm & Nieboer, 2015c; Cramm & Nieboer, 2016a). This may be explained by the central role of GPs in the Dutch primary care system and the nature of their relationships with older people. GPs are among the most frequently contacted healthcare professionals in primary care, and they often have long histories with their patients (Jansen, Spreeuwenberg, & Heijmans, 2012; Kroneman et al., 2016). These factors may provide more opportunities for the strengthening of relationships and communication between GPs and frail older people. Further investigation of the productivity of interactions with other healthcare professionals is recommended.

Conclusions

It can be concluded that self-management abilities and productive patient-professional interactions are related to the well-being of community-dwelling frail older people in the Netherlands. In a time of ageing populations with associated frailty, investment in self-management abilities

and productive patient-professional interactions in GP practices is expected to be beneficial for the well-being of frail older people.

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Chapter 4

An integrated primary care approach for frail community-dwelling older persons: a step forward in improving the quality of care

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ABSTRACT

Background

High-quality care delivery for frail older persons, many of whom have multiple complex needs, is among the greatest challenges faced by healthcare systems today. The Chronic Care Model (CCM) may guide quality improvement efforts for primary care delivery to frail older populations. Objectives of this study were to assess the implementation of interventions in CCM dimensions, and to investigate the quality of primary care as perceived by healthcare professionals, in practices following the Finding and Follow-up of Frail older persons (FFF) integrated care approach and those providing usual care.

Methods

Structured interviews were conducted with general practitioners (GPs) from 11 intervention practices and 4 control practices to assess the implementation of interventions. A longitudinal survey (12-month period, 2 measurement timepoints) was conducted to assess the quality of primary care as perceived by healthcare professionals (intervention and control GP practices) using the Assessment of Chronic Illness Care Short version (ACIC-S). Independent-samples *t*-tests were used to assess differences in ACIC-S scores between groups. Interviews were conducted with GPs from the intervention practices to gain a deeper understanding of their experiences with the FFF approach.

Results

Intervention practices implemented significantly more interventions congruent with (dimensions of) the CCM compared with control GP practices. With respect to the quality of primary care as perceived by healthcare professionals, mean ACIC-S scores for all CCM dimensions and overall mean ACIC-S scores were significantly higher in the intervention group than in the control group at the follow-up timepoint. The number of implemented interventions was associated positively with perceived quality of primary care (ACIC-S scores) at follow-up. Important motives of GPs to implement the FFF approach were the aging of the population and transformations in the primary care sector. Proactive care delivery and multidisciplinary collaboration were considered to be essential. Major challenges to the implementation and embedding of the FFF approach were structural financing and manpower, and the availability of a facilitating information and communication technology system.

Conclusions

Our study showed that proactive, integrated care that is based on (elements of) the CCM may be a step forward in improving quality of care for frail older persons.

BACKGROUND

Increasing age and increasing level of frailty tend to go together (Clegg, Young, Iliffe, Olde Rikkert, & Rockwood, 2013; Fried et al., 2001). Frailty refers to a dynamic state that affects an older adult who experiences problems or losses in several domains of human functioning (physical, psychological, and social domains) (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010). Frail older people have substantially increased risks of disability, institutionalization, multimorbidity, and mortality (Ensrud et al., 2008; Ensrud et al., 2009; Fried et al., 2001; Fried, Ferrucci, Darer, Williamson, & Anderson, 2004; Puts, Lips, & Deeg, 2005; Rockwood et al., 1999). The healthcare needs of community-living frail older people are often multifaceted and complex. In addition, the co-occurrence of frailty, disability, and/or multimorbidity increases the complexity of older patients' healthcare needs and the need for high-quality care (Fried et al., 2004).

High-quality care delivery for frail older persons, many of whom have multiple complex needs, is one of the greatest challenges faced by healthcare systems (Banerjee, 2015; WHO, 2015b). In the Netherlands, care for frail older adults is increasingly being delivered in a primary care setting, with gatekeeping general practitioners (GPs) at the core of the system (Schäfer et al., 2010; van Campen, Broese van Groenou, Deeg, & Iedema, 2013). However, current primary healthcare systems are ill equipped to meet long-term complex healthcare needs of frail older persons, given that primary care services are predominantly fragmented, reactive, and disease oriented (De Lepeleire, Iliffe, Mann, & Degryse, 2009; Nolte & McKee, 2008).

In response to the challenges posed by the growing complexity of patients' healthcare needs, models of integrated care delivery have emerged. Integrated care is increasingly being advocated as a means to improve quality of care and patient outcomes for community-dwelling frail older patients (WHO, 2015a; WHO, 2015b). Integrated care can be defined as "a well planned and well organized set of services and care processes, targeted at the multi-dimensional needs/problems of an individual client, or a category of people with similar needs/problems" (Nies & Berman, 2004). Integrated care approaches need to be patient centered, which can be achieved by establishing partnerships between older patients and healthcare professionals who work together to optimize patient outcomes (Nolte & McKee, 2008). The delivery of effective and high-quality integrated primary care for frail community-living older patients requires fundamental and comprehensive changes to the design of practice (Wagner et al., 2001). To guide quality improvement efforts in primary care delivery, Wagner and colleagues (Bodenheimer, Wagner, & Grumbach, 2002a, 2002b; Wagner, Austin, & Von Korff, 1996b; Wagner et al., 2001) developed the Chronic Care Model (CCM). The CCM is based on the premise that high-quality care and improved patient outcomes result from the provision of proactive, patient-centered, integrated care (Wagner et al., 2005). It entails six interrelated key system elements for the provision of effective care in primary care practices: (1) self-management support, (2) delivery system design, (3) decision support,

(4) clinical information systems, (5) the healthcare system, and (6) the community. Ongoing self-management support (1) needs to be provided to frail older patients by (teams of) professionals. This process involves the collaborative assistance of frail older patients in acquiring the necessary knowledge, skills, and confidence to self-manage their health and well-being successfully. A well-designed proactive delivery system (2) facilitates effective, efficient care and self-management support. It requires, for example, a well-functioning team of professionals, planned patient interactions, regular follow-up, and case management for patients with complex needs. To deliver optimal care to frail older persons, evidence-based guidelines should be embedded in daily practice through reminders and feedback. Moreover, specialist expertise needs to be incorporated in primary care (3). Clinical information systems (4) need to facilitate communication among involved healthcare professionals and the delivery of effective care by providing reminders, sharing information, monitoring performance, and organizing patient-related data. These primary care-based components reside in the broader healthcare system (5), which in turn is embedded in the larger community (6), with all of its resources and policies (Bodenheimer et al., 2002a; Wagner, 1998; Wagner et al., 2001).

Many studies have assessed the effectiveness of care programs that are based on the CCM. For example, Coleman, Austin, Brach, and Wagner (2009) reviewed evidence of the CCM's effectiveness for a diverse range of patients in primary care practice. In general, care that is congruent with dimensions of the CCM can lead to improved care delivery and better patient outcomes. Changes in practices falling within the scope of multiple components of the CCM have been associated with better care quality. However, most studies have focused on patients with specific chronic conditions, such as diabetes and asthma (Coleman et al., 2009). Studies involving broader populations of older patients, without focusing on particular chronic conditions, are limited (Spoorenberg et al., 2013).

We aimed to increase our knowledge about CCM implementation for frail older persons in the primary care setting and to assess the quality of proactive, integrated primary care. We thus comparatively assessed a proactive, integrated care program and usual primary care for community-living frail older persons. Our first objective was to examine the implementation of interventions in the six areas of system redesign proposed by the CCM, i.e., linkages to community resources, organization of healthcare, self-management support, delivery system design, decision support, and clinical information systems. We assessed the congruency of primary care with (elements of) the CCM in the practices of GPs who implemented a proactive, integrated care program and those delivering usual primary care. Second, we aimed to investigate the quality of primary care as perceived by healthcare professionals involved in care delivery in these settings.

In the present study, we evaluated the "Finding and Follow-up of Frail older persons" (FFF) program, which aims to improve the quality of care and well-being of frail community-dwelling

persons aged 75 years and older. The proactive FFF approach to integrated care was implemented in several GP practices in the western part of North Brabant Province, the Netherlands, to effectively redesign the fragmented and reactive primary care system. Its ultimate goals are to meet the long-term, complex healthcare needs and preferences of frail older adults and to improve their well-being. The FFF approach combines multiple interrelated and promising components that are assumed to encourage the provision of high-quality integrated primary care to frail older persons, such as proactive case finding, case management, medication review, self-management support, and multidisciplinary teamwork. These interrelated key components are combined in a comprehensive integrated primary care approach which is expected to improve quality of primary care, and ultimately to influence older patients' well-being.

METHODS

Study design and setting

The present study is part of a large-scale evaluation of the effectiveness of the FFF approach in improving the quality of primary care and older persons' well-being. It was conducted in the western part of North Brabant Province, the Netherlands. The evaluation study had a quasi-experimental design and was performed between 2014 and 2017. GP practices were considered to be eligible for participation in the intervention group of the study if they recently implemented the FFF approach and were not involved in other research projects. GP practices were considered eligible for participation in the control group if they were not engaged in proactively screening for frailty among their older patient population yet. In addition, GP practices that already follow-up older persons in a systematic way were not considered to be eligible to participate as control practices. We approached 17 GP practices for participation in this study (12 intervention practices and 5 control practices). In total, 11 GP practices that implemented the FFF approach (intervention group) and 4 GP practices that provided primary care as usual (control group) participated in the evaluation. The study protocol was reviewed by the medical ethics committee of the Erasmus Medical Centre in Rotterdam, the Netherlands (study protocol number MEC-2014-444). The committee decided that the rules laid down in the Medical Research Involving Human Subjects Act did not apply (for a detailed study protocol, see Vestjens, Cramm, Birnie, and Nieboer, 2018).

The present study had a mixed-methods (quantitative and qualitative) design. To assess the quality of primary care and gain a deeper understanding of experiences with proactive integrated care, we examined the implementation of interventions falling under the scope of the CCM dimensions in participating GP practices. We collected qualitative data in face-to-face interviews with GPs from practices providing care according to the FFF approach, and carried out a longi-

tudinal questionnaire survey among healthcare professionals to assess the quality of primary care in FFF and usual care practices.

Quality of primary care: Implementation of interventions falling under CCM dimensions

In structured interviews with the 11 participating GPs from FFF practices, conducted in 2015, we assessed exactly how care was delivered and which interventions were implemented successfully. We also assessed the provision of usual care to community-dwelling older patients by conducting structured interviews with the 4 GPs from control practices in 2015. All interviews were conducted at the GPs' practices using a template based on the six areas of system redesign proposed in the CCM (Bodenheimer et al., 2002a; Wagner et al., 1996b; Wagner, 1998; Wagner et al., 2001). The interview template was initially developed for the assessment of interventions implemented in disease management programs for chronically ill patients (Cramm & Nieboer, 2015). It was adjusted to include important interventions related to primary care delivery for frail older patients. All interventions were classified according to the six areas of system change in the interview format (Table 1). Lincoln and Guba (1985) argue that ensuring credibility is one of the most important aspects in establishing trustworthiness when it comes to qualitative research. This means that the specific procedures employed, such as the line of questioning pursued in the data gathering sessions and the methods of data analysis, should be derived, where possible, from those that have been successfully utilized in previous comparable projects (Shenton, 2004). Therefore, we used a template based on the six areas which has already been successfully used before (Cramm & Nieboer, 2015).

During interviews, all GPs (n = 15) were asked to indicate which interventions falling within the scope of the CCM dimensions were implemented in their practices. GPs were also allowed to mention and add interventions that were not included in the interview format. All interviews were approximately 60–75 minutes in length and were recorded with permission of the GPs. Altogether, an extensive description of implemented interventions was retrieved.

Quality of primary care, as perceived by healthcare professionals

Longitudinal survey

The longitudinal survey study involved two measurement timepoints to enable detection of potential differences over a 12-month period. At baseline (T0; autumn 2014), a questionnaire was sent to all 112 professionals involved in care provision at participating intervention and control GP practices. A total of 75 healthcare professionals (57 in the intervention group and 18 in the control group) completed the questionnaire (67% response rate). One year later (T1; autumn 2015 and beginning of 2016), we approached all 108 professionals who were (still) involved in care provision at the participating practices. A total of 78 healthcare professionals (55 in the

intervention group, 23 in the control group) completed the questionnaire at T1 (72.2% response rate). Some responding professionals in the intervention group, such as elderly care physicians, were involved simultaneously in several of the intervention GP practices.

Healthcare professionals were asked to complete the Assessment of Chronic Illness Care Short version (ACIC-S) (Cramm, Strating, Tsiachristas, & Nieboer, 2011). This comprehensive instrument focuses on the organization of healthcare, rather than conventional outcome measures or process indicators (Bonomi, Wagner, Glasgow, & Von Korff, 2002). The ACIC-S is based on the six areas of system change advocated by the CCM to affect the quality of healthcare: linkages to community resources, organization of healthcare, self-management support, delivery system design, decision support, and clinical information systems (Bodenheimer et al., 2002a; Wagner et al., 1996b; Wagner, 1998; Wagner et al., 2001). The questionnaire is composed of three items per area, which represent a continuum from poor to optimal organization and support of CCM-based care delivery. Participants were asked to indicate the degree of implementation of each component on a four-point scale ranging from "little or no implementation" to "fully implemented." For example, for the "linkages to community resources" area, little or no implementation suggests that partnerships with community organizations do not exist and full implementation is in place when such partnerships are actively sought to develop formal supportive programs and policies throughout the entire system. Within each of the four levels of implementation, participants were asked to rate the degree to which the description applied on a three-point scale. The resulting scale ranged from 0 to 11, with categories defined as little or no support (0–2), basic or intermediate support (3–5), advanced support (6–8), and optimal or comprehensive integrated care (9–11) (Bonomi et al., 2002; Cramm et al., 2011). We derived subscale scores for individual CCM dimensions by calculating the average of the three item scores. Subscale scores were derived when responses for at least two of the three items were available. Total scores were calculated by averaging subscale scores when at least four of six such scores were available. Cronbach's alpha values for the ACIC-S were 0.90 at T0 and 0.93 at T1.

Statistical analyses

Descriptive statistics were used to characterize the population of healthcare professionals in the control and intervention groups. We used independent-samples *t*-tests and chi-squared tests to investigate differences between groups. Independent-samples *t*-tests were used to assess differences between intervention and control practices regarding the aggregated mean number of interventions implemented in both groups. Correlation analysis was used to assess the association between the number of interventions implemented and the perceived quality of primary care. Results were considered statistically significant when two-sided *p*-values were <0.05.

Qualitative interviews

In addition to the structured interviews with GPs to assess the implementation of interventions, we interviewed the 11 GPs from intervention practices extensively to provide a deeper and richer understanding of their experiences with the FFF approach in their practices. Subjects central to the interviews were: (1) motives for FFF approach implementation, (2) differences between the FFF approach and usual care and among intervention GP practices, and (3) challenges related to the implementation and embedding of the FFF approach. GPs were encouraged to discuss their experiences in detail, and allowed to introduce new subjects. These face-to-face interviews were conducted at the GPs' practices and recorded with their permission.

Analysis of qualitative interview data

Latent content analysis (Graneheim & Lundman, 2004; Hsieh & Shannon, 2005), which focuses primarily on the underlying meaning of content (Babbie, 2010), was used to examine qualitative interview data. Interview texts were in Dutch and were translated into English during the writing of the report. All interview texts were read multiple times to gain a holistic understanding. Meaning units were extracted, coded, and categorized. Underlying meanings of categories were expressed in themes (Graneheim & Lundman, 2004). The results were presented by interview subject.

RESULTS

Motives of GPs in the intervention group to implement the FFF approach

Interviews with the GPs in the intervention group revealed that the aging of the population makes the implementation of proactive, integrated care delivery, as in the FFF approach, important. They explained that their patient population shows an evident increase in the proportion of community-living (frail) older persons with often complex (healthcare) needs. Moreover, GPs emphasized that the transformation of the healthcare sector is an important reason to redesign primary care delivery for older adults and improve the quality of primary care. GPs mentioned that enabling older persons to live independently in the community for as long as possible is the avowed ambition of policy makers. They noted a shift toward more primary and community care: "Especially the changes in the healthcare sector are important. Nursing homes are closing. We sat together with two other colleagues from three GP practices. We can do two things: we can wait and see what happens or we can anticipate." These were the most important motives of GPs to implement the FFF approach.

Implementation of interventions in the intervention and control GP practices

Table 1 shows the interventions implemented in the intervention and control GP practices according to CCM dimension. On average, more interventions that were in line with the CCM were implemented in intervention than in control GP practices (n = 33 (range, 23–42) vs. n = 23 (range, 14–33)). This difference was significant (p = 0.014; n = 15). Intervention GP practices redesigned their care delivery and processes when considering the implementation of interventions related to the FFF approach. More such interventions (e.g., use of individualized care plans, delegation of care from GPs to (practice) nurses, systematic follow-up of patients, meetings of professionals in different disciplines to exchange information, proactive monitoring of high-risk patients, proactive screening for frailty, and medication reviews) were implemented in intervention than in control GP practices.

Table 1 Overview of interventions implemented in intervention (FFF approach) and control (usual primary care) GP practices

CCM dimension	Intervention	Intervention practices (n = 11)		Control practices (n = 4)	
		n	%	n	%
Healthcare organization	Integrated financing	2	18	0	0
Healthcare organization	Specific policies and subsidies for immigrant population	0	0	0	0
Healthcare organization	Sustainable financing agreements with health insurers	4	36	0	0
Healthcare organization	Financing Geriatric Care Module	10	91	0	0
Community linkages	Multidisciplinary and transmural collaboration	3	27	1	25
Community linkages	Shared structural approach between hospital and primary care	3	27	2	50
Community linkages	Setting up transmural care pathways/care protocols	3	27	2	50
Community linkages	Referral and information exchange arrangements between primary and hospital care	5	45	3	75
Community linkages	Cooperation with external community partners	11	100	4	100
Community linkages	Joint treatment plan between primary and hospital care	3	27	1	25
Community linkages	Involvement of patient groups and panels in care design	0	0	0	0
Community linkages	Communication platform between stakeholders about patients	2	18	0	0
Community linkages	Role model in the area	5	45	0	0
Community linkages	Regional training course	9	82	2	50
Community linkages	Regional collaboration for the care of frail older persons	8	73	1	25
Community linkages	Family participation	11	100	4	100
Community linkages	Geriatric network	1	9	0	0
Self-management support	Promotion of disease-specific information	11	100	3	75

Table 1 Overview of interventions implemented in intervention (FFF approach) and control (usual primary care) GP practices (continued)

CCM dimension	Intervention	Intervention practices (n = 11)		Control practices (n = 4)	
Self-management support	Individual care plan	10	91	2	50
Self-management support	Diagnosis and treatment of mental health issues	10	91	3	75
Self-management support	Lifestyle intervention (e.g., physical activity, diet, smoking)	8	73	2	50
Self-management support	Support of self-management (e.g., Internet)	5	45	3	75
Self-management support	Telemonitoring	1	9	0	0
Self-management support	Personal coaching	10	91	4	100
Self-management support	Motivational interviewing	6	55	1	25
Self-management support	Reflection interviews	0	0	0	0
Self-management support	Informational meetings	2	18	0	0
Self-management support	Group session for patient and family	1	9	0	0
Self-management support	Cognitive behavioral therapy	3	27	2	50
Decision support	Care standards/clinical guidelines	11	100	4	100
Decision support	Uniform treatment protocol in outpatient and inpatient care	2	18	1	25
Decision support	Training and independence of practice nurses	9	82	3	75
Decision support	Professional education and training for care providers	9	82	3	75
Decision support	Audit and feedback	4	36	1	25
Decision support	Use of care protocols for immigrants	0	0	0	0
Decision support	Structural participation in knowledge exchange/best practices	3	27	0	0
Decision support	Quality of life questionnaire	7	64	1	25
Decision support	Automatic measurement of process/outcome indicators	3	27	1	25
Decision support	Evaluation of healthcare via focus groups with patients	0	0	1	25
Decision support	Measurement of patient satisfaction	5	45	2	50
Decision support	Guideline Finding and Follow-up of Frail older persons	10	91	0	0
Decision support	Guideline Geriatric Care Module	11	100	0	0
Delivery system design	Delegation of care from GP to (practice) nurse	9	82	2	50
Delivery system design	Substitution of inpatient with outpatient care	8	73	2	50
Delivery system design	Intensifying collaboration with ongoing projects	6	55	2	50
Delivery system design	Systematic follow-up of patients	9	82	2	50
Delivery system design	Specific plan for immigrant population	0	0	0	0
Delivery system design	Joint Medical Consult	1	9	0	0
Delivery system design	Meetings of professionals from different disciplines to exchange information	11	100	2	50

Table 1 Overview of interventions implemented in intervention (FFF approach) and control (usual primary care) GP practices (continued)

CCM dimension	Intervention	Intervention practices (n = 11)		Control practices (n = 4)	
Delivery system design	Joint consultations	0	0	0	0
Delivery system design	Proactive monitoring of high-risk patients	11	100	1	25
Delivery system design	Board of clients	0	0	0	0
Delivery system design	Bottleneck analysis between professionals and patients	0	0	0	0
Delivery system design	Stepped care method	4	36	0	0
Delivery system design	Expansion of chain of care to the secondary care setting	3	27	1	25
Delivery system design	Proactive screening for frailty	11	100	0	0
Delivery system design	Medication review	11	100	3	75
Clinical information systems	Electronic patient records system with patient portal	3	27	1	25
Clinical information systems	GP information system	11	100	4	100
Clinical information systems	Chain information system (e.g., COPD, diabetes)	11	100	4	100
Clinical information systems	Use of ICT for internal and/or regional benchmarking relevant for frail older patients	4	36	0	0
Clinical information systems	Systematic registration by every caregiver	9	82	3	75
Clinical information systems	Creation of a safe environment for data exchange	8	73	4	100
Clinical information systems	Exchange of information among care disciplines	8	73	3	75
Average number of interventions implemented		**33**		**23**	

COPD, Chronic Obstructive Pulmonary Disease; FFF, Finding and Follow-up of Frail older persons; GP, general practitioner; ICT, information and communication technology.

Differences between the FFF approach and usual care, as experienced by GPs

GPs providing care according to the FFF approach considered proactive care delivery (e.g., monitoring of high-risk patients and screening for frailty) and multidisciplinary collaboration (e.g., meetings of professionals from different disciplines and delegation of care from GPs to (practice) nurses) to be particularly important. The majority of GPs indicated that the traditional primary care system for (frail) older persons was mostly reactive and fragmented, and did not enable effective coping with the complex (healthcare) needs of community-dwelling older patients: "Especially when it is very busy in the GP practice there is a risk of providing reactive care, while at this moment [with the FFF approach] you are forced to deliver proactive care and anticipate." GPs indicated that proactive care and case finding of frail community-dwelling older persons could minimize acute (health) problems and promote the use of preventive care in some cases. The majority of GPs considered multidisciplinary collaboration, including multidisciplinary consultation, to be important. Participants stated that multidisciplinary collaboration can, for example, enhance the expertise of involved professionals and promote a holistic view of an older person's (complex) health problems and demands: "It is good that someone else is involved too, an elderly care physician for example. It is easier to consult others. A specialist's viewpoint can

be included." Some GPs indicated that care can be tailored to the needs and wishes of patients and that more attention can be paid to frail older patients. Several GPs also explained that case managers had important coordinating roles in the care process.

Variation among intervention GP practices, as experienced by GPs

Interviews revealed that GPs also observed differences among intervention GP practices with regard to the implementation and execution of (elements of) the FFF approach. We mention the most important of these differences. First, although all GPs used the same screening instrument to identify frailty among community-living older adults, the selection of patients prioritized for screening differed among practices. For example, several GPs indicated that they selected older patients based on gut feelings, i.e., a "sense of alarm," whereas others explained that they prioritized patients who had no regular contact with professionals in their practices. Moreover, the (number of) professionals involved in frailty screening differed among GP practices. Whereas homecare, geriatric, and practice nurses screened for frailty in some practices, professionals from only one of these disciplines performed screening in others. Second, aspects of multidisciplinary consultation, such as frequency, the number of older patients discussed, and the professionals involved, differed among GP practices. One important difference was the degree of professionals' involvement in social care, which ranged from close collaboration to non-involvement in multidisciplinary consultation and care for frail older patients. Finally, GPs considered that the guidelines on the long-term follow-up of frail older persons were not comprehensive enough. Differences existed with respect to who served the lead role and the organization of follow-up. The training of professionals focused mainly on screening procedures, with little addressing of the long-term follow-up of frail older adults. One GP reported non-use of individualized care plans to report plans and actions, which were reported only in the practice's information system.

Quality of primary care, as perceived by healthcare professionals

In addition to the interviews held with GPs, we used a longitudinal questionnaire survey to assess perceived quality of primary care among all healthcare professionals in the intervention and control practices. Here, we report results concerning the quality of primary care, as assessed using the ACIC-S.

Baseline characteristics of healthcare professionals

Table 2 shows the baseline characteristics of healthcare professionals in the intervention and control groups. At T0, 57 healthcare professionals in the intervention group completed the questionnaire. This group consisted of GPs (21.1%), homecare nurses (15.8%), case managers and geriatric nurses (15.8%), GP assistants (8.8%), practice nurses (7.0%), physiotherapists (7.0%), occupational therapists (7.0%), elderly care physicians (5.3%), and other professionals (e.g., social workers and dieticians; 12.2%). The mean age of these professionals was 42.6 years; almost 81% of them were female and nearly 95% had high educational levels (higher professional

education or university). Almost 65% of professionals in the intervention group had worked at their organizations for at least 3 years, and more than 84% worked at least 22 hours per week. Eighteen healthcare professionals in the control group completed the questionnaire at T0. This group consisted of GPs (33.3%), GP assistants (27.8%), practice nurses (16.7%), physiotherapists (5.6%), homecare nurses (5.6%), dieticians (5.6%), and other professionals (5.4%). The mean age of control professionals was 44.7 years; nearly 78% of them were female and more than 72% had high educational levels. More than 83% of these professionals had worked in their organizations for at least 3 years, and nearly 78% worked at least 22 hours per week. The percentages of healthcare professionals with high educational levels differed significantly between the intervention and control groups (chi-squared test, $p < 0.05$; Table 2).

Table 2 Characteristics of healthcare professionals at baseline

Characteristic	**Control group** ($n = 18$)	**Intervention group** ($n = 57$)
	n (%) or mean (SD)	n (%) or mean (SD)
Age (years)	44.72 (12.39)	42.60 (11.38)
Gender (female)	14 (77.8%)	46 (80.7%)
Educational level (high)	13 (72.2%)	54 (94.7%)*
Working in organization (≥ 3 years)	15 (83.3%)	37 (64.9%)
Working hours (≥22 per week)	14 (77.8%)	48 (84.2%)

No value is missing in either group. SD, standard deviation. *$p < 0.05$ (two-tailed), independent-samples t-test and chi-squared test.

Table 3 shows ACIC-S scores at T0 and T1. Average baseline scores in the control group ranged from 3.78 (standard deviation (SD) = 2.31) for the healthcare organization dimension to 6.18 (SD = 2.28) for the clinical information systems dimension. The overall mean baseline ACIC-S score in the control group was 5.26 (SD = 1.61), indicating basic or intermediate support for integrated care for frail older persons. Average baseline scores in the intervention group ranged from 5.54 (SD = 1.68) for the decision support dimension to 7.67 (SD = 1.33) for the delivery system design dimension. The overall mean baseline ACIC-S score in the intervention group was 6.45 (SD = 1.32), indicating advanced support for integrated care for frail community-dwelling older adults. At T0, the mean overall ACIC-S score was significantly higher in the intervention group than in the control group ($p < 0.05$). The mean scores for the healthcare organization and delivery system design dimensions were also significantly higher in the intervention group than in the control group (6.92 (SD = 1.57) vs. 3.78 (SD = 2.31) and 7.67 (SD = 1.33) vs. 5.24 (SD = 2.07), respectively; both $p < 0.001$). At T1, independent samples t-tests showed that the mean overall ACIC-S score and scores for all six dimensions were significantly higher in the intervention group than in the control group (Table 3). We also checked the results without the five additional respondents in the control group at T1, but this revealed the same picture. Also paired analyses revealed similar findings.

Table 3 Quality of primary care as perceived by healthcare professionals at baseline (T0) and follow-up (T1)

ACIC-S dimension	Control group T0 $n = 18$[a]	Intervention group T0 † $n = 57$[b]	Control group T1 $n = 23$[c]	Intervention group T1 † $n = 55$[d]
	mean (SD)	mean (SD)	mean (SD)	mean (SD)
Healthcare organization	3.78 (2.31)	6.92 (1.57)**	4.85 (2.43)	6.96 (1.33)*
Community linkages	5.50 (1.70)	6.46 (1.83)	5.31 (2.17)	7.55 (1.32)**
Self-management support	5.47 (2.03)	6.03 (1.86)	4.80 (1.83)	7.03 (1.80)**
Decision support	5.07 (1.84)	5.54 (1.68)	3.98 (1.72)	5.47 (1.77)*
Delivery system design	5.24 (2.07)	7.67 (1.33)**	6.22 (2.13)	7.75 (1.65)*
Clinical information systems	6.18 (2.28)	6.10 (2.18)	4.95 (2.39)	7.01 (1.33)*
Total[e]	5.26 (1.61)	6.45 (1.32)*	5.05 (1.74)	6.98 (1.04)**

[a]0–2 missing values; [b]0–4 missing values; [c]0–2 missing values; [d]0–3 missing values; [e]range, 0–11; † Intervention group compared with control group at T0 and at T1; ACIC-S, Assessment of Chronic Illness Care Short version; SD, standard deviation. *$p < 0.05$ (two-tailed); **$p < 0.001$ (two-tailed); independent-samples *t*-test.

Association between interventions implemented and perceived quality of primary care

Our study results show that proactive, integrated care for frail older persons following the FFF approach is associated with better quality of primary care. The number of interventions implemented was associated positively with ACIC-S scores at T1 ($r = 0.56$, $p < 0.05$), indicating that primary care that is congruent with (dimensions of) the CCM was of higher quality, as perceived by healthcare professionals at T1.

Challenges related to the implementation and embedding of the FFF approach, as experienced by GPs

Although the FFF approach seems to be promising in terms of improving the quality of primary care as perceived by healthcare professionals, GPs of the intervention group identified several challenges that may hamper its sustainability and spread. The implementation and embedding of the FFF approach in GP practices requires several organizational preconditions. The identification of possible challenges experienced by the GPs is important to achieve a successful and sustainable transformation of care delivery, and to continue quality improvement in the primary care setting. Based on face-to-face interviews with the GPs, two (possible) important challenges were identified. First, the majority of GPs explained that structural financing and manpower are necessary to continue implementation of the FFF approach in the long term: "If this [the FFF approach] becomes routine care delivery, […] available means should not become unattainable, so that we have to figure it out for ourselves." Second, GPs indicated that a facilitating information and communication technology (ICT) system is essential for accurate, uniform, and joint communication and reporting. All GPs used GP and chain information systems, which enables the exchange of information among different care disciplines. The chain information system includes disease-specific modules (e.g., for chronic obstructive pulmonary disease and diabetes

care). Four GPs indicated that they implemented this system with a multi-disease module for the care of frail older patients, which can facilitate, for example, uniform reporting of individualized care plans and communications related to multidisciplinary consultations and frailty screening. However, the other seven GPs explained they had not yet implemented this module and that they experienced insufficient integration among the various databases: "I am convinced that when one would have a collective electronic platform, coordination would become even better. This can be a problem at the moment. You have to do so many things through different channels." The aim, however, is to implement the chain information system with a module for the care of frail older patients in all GP practices that work according to the FFF approach. Other possible challenges mentioned by GPs include investment in integrated networks of involved professionals, close collaboration with specialists working at the hospital, time investment by involved professionals, and the need to plan all activities related to the FFF approach: "It is crucial to plan. At the end of each multidisciplinary consultation we plan a new appointment together. I believe that if you do not do this, we will lose ground. We should follow-up on our intended actions."

DISCUSSION

The CCM incorporates important elements of healthcare systems that promote high-quality primary care delivery (Bodenheimer et al., 2002a, 2002b; Wagner, Austin, & Von Korff, 1996a; Wagner et al., 2001). The aims of our study were to increase our knowledge of the use of the CCM in primary care and to assess the quality of proactive, integrated primary care for frail community-dwelling older adults. The first study objective was to assess the implementation of interventions in the six areas of system redesign described in the CCM. Congruency of care with (elements of) the CCM in intervention GP practices that implemented the FFF approach and control GP practices delivering primary care as usual was assessed. We found that intervention GP practices implemented significantly more interventions in line with CCM dimensions on average, compared with control GP practices. The second objective was to investigate the quality of primary care as perceived by healthcare professionals in the intervention and control groups. To address this objective and gain a deeper understanding of experiences with the FFF approach, we conducted a longitudinal survey study among all involved healthcare professionals and qualitative interviews with GPs from the intervention practices. At T0, mean ACIC-S scores for the healthcare organization and delivery system design dimensions were significantly higher in the intervention group than in the control group. Consequently, the overall mean ACIC-S score was significantly higher in the intervention group than in the control group at T0. The baseline perception of higher-quality care by professionals in the intervention practices can be explained by the timing of baseline measurement. In the autumn of 2014, GP practices in the intervention group had already begun to implement elements of the FFF approach, and the majority of practices received financing for these measures via reimbursement regulations

related to primary care for frail older patients. Moreover, they had already met several important preconditions, such as organizational goals and improvement strategies related to care for frail older persons. At T0, the majority of intervention GP practices was screening for frailty and holding multidisciplinary meetings. In the FFF approach, GPs select potentially frail adults in the community for screening during planned visits, and the screening results are then discussed during multidisciplinary consultations. These (partially) implemented elements of the FFF approach fall under the healthcare organization and delivery system design CCM dimensions, which may explain the higher baseline scores for these two dimensions in the intervention group. One year later, all ACIC-S scores were significantly higher in the intervention group than in the control group. Within the intervention group, professionals perceived significant improvements in the overall quality of care delivery (ACIC-S), as well as in the community linkages, self-management support, and clinical information systems dimensions, over time.

We also found that the number of interventions implemented was associated positively with the quality of primary care as perceived by healthcare professionals at T1. This finding indicates that primary care for frail older persons that is congruent with (dimensions of) the CCM is associated with better quality of primary care as perceived by healthcare professionals at the follow-up measurement.

Motives, differences, and challenges

The main motives of GPs in the intervention practices to implement the FFF approach were the aging of the population and the need to anticipate on current transformations in the primary healthcare sector. In the Netherlands, and in many other western countries, primary care delivery is challenged by the aging of populations and the increased demand for care (Schäfer et al., 2010). The Dutch government's reforms in long-term care delivery intend to facilitate the tendency whereby older adults live independently in the community for as long as possible and access to long-term care facilities is limited (van Campen, Iedema, Broese van Groenou, & Deeg, 2017). Care for older persons is increasingly being delivered in the primary healthcare setting by GP practices (van Campen et al., 2013), which requires the redesign of primary care delivery for frail community-dwelling older patients. GPs in the intervention group considered proactive care delivery and multidisciplinary collaboration to be essential. GPs reported considerable differences among intervention practices with respect to the implementation and execution of (elements of) the FFF approach, including proactive screening, multidisciplinary consultation, and guidelines for patient follow-up. Identification of these differences is important in determining, for example, the quality of proactive integrated care program implementation (Craig et al., 2008). Important challenges related to the implementation and embedding of the FFF approach, as perceived by GPs, were structural financing and manpower, and access to a facilitating ICT system. The latter should include a multi-disease module for the care of frail older patients.

Strengths and limitations

An important strength of our study was the use of a control group, which enabled us to comparatively assess the quality of care delivery and changes over time between practices providing primary care as usual and those following the FFF approach. Moreover, we used a mixed-methods design, which enabled us to gain better insight into and understanding of the implementation of (elements of) a complex proactive, integrated care approach based on the CCM and (changes in) quality of care.

The study has several limitations. First, we examined the quality of primary care as perceived by healthcare professionals. Further longitudinal research is necessary to examine the quality of primary care as experienced by frail community-dwelling older persons. Research on chronically ill patients has shown that the quality of care delivery as perceived by healthcare professionals predicted more positive experiences of patients with care delivery (Cramm & Nieboer, 2013). Moreover, the effects of the FFF approach on important patient outcomes, such as the well-being of frail older persons, service use, and associated costs, should be examined in future research. Second, healthcare professionals in the control and intervention groups showed considerable variability in occupational background and educational level. Multidisciplinary work is a core element of the FFF approach, which explains the systematic involvement of professionals in certain disciplines (e.g., elderly care physicians) in intervention, but not control, GP practices. Third, the implementation of interventions is a continuous process. As a result of national transformations in the primary healthcare sector in the Netherlands, the control GP practices were also in the process of implementing several interventions, such as medication reviews, systematic follow-up of older patients, and meetings of professionals from different disciplines to exchange information. Developments in the primary care setting and the implementation of interventions in GP practices should be monitored in the future to observe possible further improvement. Finally, we measured quality of primary care using the ACIC-S instrument, which earlier research shows is one of the available instruments which can be used to assess quality of primary care (Stange et al., 2010). The ACIC-S measures the six dimensions of the CCM (the community, the healthcare system, self-management support, delivery system design, decision support and clinical information systems) which are needed to support frail older people and people with chronic diseases in the primary care setting. Others defined primary care by four main characteristics: comprehensive, coordinated, continuous, and accessible care and identified the Primary Care Assessment Tool (PCAT) as the best available instrument to assess such primary care features. Although both instruments clearly measure overlapping concepts and are both used regularly to assess quality of primary care (Stange et al., 2010), use of other instruments, however, may have yielded other findings.

Conclusions

The present study showed that the FFF approach can have positive effects on the quality of primary care delivery to frail older persons, as perceived by healthcare professionals. In times of population aging and increased pressures on primary healthcare systems, proactive integrated care delivery for community-dwelling frail older persons, such as that based on the FFF approach, can be introduced to improve the perceived quality of primary care.

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Chapter 5

Quality of primary care delivery and productive interactions among community-living frail older persons and their general practitioners and practice nurses

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ABSTRACT

Background

Although there is evidence with respect to the effectiveness of Chronic Care Model (CCM)-based programs in terms of improved patient outcomes, less attention has been given to the effect of high-quality care on productivity of patient-professional interactions, especially among frail older persons. The aim of our study was therefore to examine whether frail community-dwelling older persons' perspectives on quality of primary care according to the dimensions of the CCM are associated with the productivity of the patient-professional interactions.

Methods

Our study was part of a large-scale evaluation study with a matched quasi-experimental design to compare outcomes of frail community-dwelling older persons that participated in a proactive, integrated primary care approach based on (elements of) the CCM and those that received usual primary care. Frail older persons' perceptions of quality of care were assessed with the Patient Assessment of Chronic Illness Care Short version (PACIC-S). Productive interactions with general practitioners (GPs) and practice nurses were assessed using a relational coproduction instrument. Measurements were performed at baseline (T0) and 12 months thereafter (T1). In total, 232 frail older persons were participating in the intervention group at T0 and matched to 232 frail older persons in the control group. At T1, 182 persons were in the intervention group and 176 in the control group.

Results

Paired sample *t*-tests showed significant improvements in overall quality of care, the majority of underlying quality of care items, and productive interactions within the intervention group and control group over time. Multilevel analyses revealed that productive interaction with the GP and practice nurse at T1 was significantly related to perceived productive interaction with them at T0, the perceived quality of primary care at T0, and the change in perceived quality of primary care over time (between T0 and T1).

Conclusions

Frail community-dwelling older persons' perspectives on quality of primary care were associated with perceived productivity of their interactions with the GP and practice nurse in both the intervention group and the control group. We found no significant differences in overall perceived quality of care and perceived patient-professional interaction between the intervention group and control group at baseline and follow-up. In times of population aging it is necessary to invest in high-quality care delivery for frail older persons and productive interactions with them.

BACKGROUND

Providing essential components of high-quality, proactive, integrated primary care and support for frail community-dwelling older persons is a great challenge for current healthcare systems (Banerjee, 2015; Prince et al., 2015; WHO, 2015). Redesign of the primary healthcare system is inevitable to facilitate the provision of high-quality, proactive, integrated care, which requires comprehensive and complex transformations in a primary care setting (Wagner et al., 2001). The Chronic Care Model (CCM) proposes important system changes that can guide primary care practices to improve quality of care and patients' outcomes (Bodenheimer, Wagner, & Grumbach, 2002a, 2002b; Wagner, Austin, & Von Korff, 1996; Wagner et al., 2001). Organizational change is proposed in six key areas: delivery system design, self-management support, decision support, clinical information systems, the healthcare system, and the community (Bodenheimer et al., 2002a; Wagner, 1998; Wagner et al., 2001).

The premise of the CCM is that system changes are considered essential in fostering productive interactions between (teams of) healthcare professionals and their patients and, ultimately, improve patient outcomes (Wagner et al., 2005). These productive patient-professional interactions should emphasize shared decision-making and partnerships between professionals and patients to produce the best possible outcomes (Coulter & Collins, 2011). Productive patient-professional interactions involve reciprocal interrelating between healthcare professionals and patients (Gittell, 2002, 2006; Gittell & Douglass, 2012) and can be thought of as a mutually reinforcing cycle of communicational and relational aspects (Gittell, 2012). Improved patient outcomes are more likely to be achieved when the patient and the healthcare professionals communicate effectively (frequent, timely, accurate, and problem-solving communication). Effective communication is reinforced by the nature of relationships between patients and healthcare professionals. These relationships include shared goals, shared knowledge, and mutual respect. In turn, these relational dimensions are reinforced by frequent, timely, accurate, and problem-solving communication between patients and professionals (Batalden et al., 2015; Gittell, 2012; Gittell & Douglass, 2012). Productive interactions are accomplished by, for example, providing systematic assessments, supporting patients' self-management abilities, optimizing treatments, and providing sufficient follow-up. A necessity for interactions to be productive is that patients are activated and informed actors in their care process. Therefore, patients need to have relevant information, sufficient skills, and confidence to be involved in decision-making processes. Besides the changing roles of older patients in the care process, the roles of healthcare professionals also need to change. High-quality care is characterized by proactive and prepared (teams of) healthcare professionals that have the necessary expertise, patient information, time, and resources to conduct productive interactions and to ensure effective care coordination (Wagner et al., 2001). Productive interactions between activated and informed patients and prepared and proactive healthcare professionals are at the heart of patient-centered care delivery. Patients' preferences

and needs should be respected, patients should be engaged in the decision-making process, and care should be tailored to optimize patient outcomes (Jayadevappa & Chhatre, 2011). Especially in the care for older persons with often long-term complex (healthcare) needs and (multiple) chronic conditions productive patient-professional interactions seem to be important. Holman and Lorig (2000) underline that chronic illness care compared with acute care practices necessitates patients to be active partners in managing their health and (chronic) illnesses. This requires a continuous process in which the person contributes and participates at almost all levels of decision-making and action taking (Holman & Lorig, 2000).

The CCM and productive interactions – previous research

Although there is evidence with respect to the effectiveness of CCM-based programs in terms of, for example, improved quality of care delivery and patient outcomes (Coleman, Austin, Brach, & Wagner, 2009), less attention has been given to the effect of high-quality care on the productivity of the patient-professional interactions. According to Cramm and Nieboer (2014), evidence that care based on (elements of) the CCM leads to productive patient-professional interactions is limited (Cramm & Nieboer, 2014). Productive interaction is an essential element of person centered care (Jayadevappa & Chhatre, 2011) and considered important for improving patient outcomes (Wagner et al., 1996; Wagner et al., 2001; Wagner et al., 2005).

Research has shown that (changes in) the quality of care as perceived by professionals and chronically ill patients enhanced productivity of interactions (Cramm & Nieboer, 2014; Cramm & Nieboer, 2016). Productive patient-professional interactions, in turn, are associated with improved outcomes like well-being among patients with (multiple) chronic conditions (Cramm & Nieboer, 2015; Kuipers, Cramm, & Nieboer, 2019). Besides, the relationship between patients' perceptions of quality of care and their well-being was mediated by productive interactions. Therefore, with respect to improving patient outcomes, it is important to establish productive interactions between healthcare professionals and patients and to invest in high-quality integrated care delivery (Cramm & Nieboer, 2015). To our knowledge, however, in a population of community-dwelling frail older persons evidence with respect to the relationship between perceived quality of care delivery that is in line with (elements of) the CCM and productivity of patient-professional interactions is lacking. Care approaches based on (elements of) the CCM have primarily focused on patients with specific chronic conditions (Adams et al., 2007; Coleman et al., 2009). There are only few comprehensive approaches aimed at delivering integrated (healthcare) services according to elements of the CCM in (frail) older persons in a primary care setting (Boult et al., 2013; Hoogendijk et al., 2016; Spoorenberg, Wynia, Uittenbroek, Kremer, & Reijneveld, 2018). In times of population aging, research into the perceived quality of CCM-based care approaches and the relationship with the productivity of patient-professional interactions in a population of community-dwelling frail older persons is crucial.

Study aim

The aim of our study was to examine whether frail community-dwelling older persons' perspectives on quality of primary care according to the dimensions of the CCM are associated with the productivity of the interactions with the general practitioner (GP) and practice nurse. We aimed to comparatively assess quality of care and productive patient-professional interactions in a population of frail older persons receiving a proactive, integrated primary care approach called *Finding and Follow-up of Frail older persons (FFF approach)* and frail older persons receiving usual primary care in the Netherlands.

METHODS

Context of the study: primary care in the Netherlands

According to Erler and colleagues (2011), primary care is considered 'the spine' of the healthcare system in the Netherlands (Erler et al., 2011). Dutch primary healthcare organization is strong compared with primary healthcare in many European countries (Kringos et al., 2013). Dutch primary care includes a broad range of services and (health) professions (e.g., physiotherapists, and pharmacists). Central to the primary care system are GP practices and GPs with a gatekeeping function. Hospital and specialist care are in most cases only accessible upon referral (Kringos, Boerma, Hutchinson, & Saltman, 2015; Kroneman et al., 2016). Almost all Dutch citizens are registered with a GP, mainly in the persons' living area. Patients consult their GP generally on their own initiative. Appointments are commonly planned within 2 days and general practice care is excluded from the mandatory deductible associated with the obligatory basic health insurance. In the Netherlands, GPs are commonly non-interventionist, with low prescription and referral rates to secondary care (Kroneman et al., 2016). Over the years, the primary care setting and the division of labor among primary care professionals has been reformed. GPs increasingly work in teams and larger organizations, like group practices. Task delegation and differentiation is occurring and as a result other professions such as practice nurses are working in GP practices (Dutch College of General Practitioners, 2011; Kringos et al., 2015; Kroneman et al., 2016). GPs and practice nurses are the most frequently consulted healthcare providers in primary care (Jansen, Spreeuwenberg, & Heijmans, 2012). One important pillar of the reforms in the long-term care over the past years is the transition from institutional care to care in the home-setting (Maarse & Jeurissen, 2016). Care for older persons with often complex (healthcare) needs and multiple chronic conditions is increasingly organized in the primary care setting (de Groot, de Veer, Versteeg, & Francke, 2018; van Campen, Broese van Groenou, Deeg, & Iedema, 2013). As a result, the complexity of patient care in the primary care setting is increasing (Boeckxstaens & De Graaf, 2011; de Groot et al., 2018). Fragmentation between primary healthcare and other sectors is still predominant and has been considered an important barrier in enhancing coordination and continuity in the care for persons with complex (healthcare) needs (Elissen, Duimel-Peeters,

Spreeuwenberg, Vrijhoef, & Nolte, 2015; Sinnott, Mc Hugh, Browne, & Bradley, 2013; Wallace et al., 2015). Traditionally, primary care is largely focused on providing reactive and curative care and focuses less on proactive and preventive care (Boeckxstaens & De Graaf, 2011; Erler et al., 2011).

Study design

The current study is part of a large-scale evaluation study with a matched quasi-experimental design to compare outcomes of frail community-dwelling older persons that participated in the proactive, integrated primary care approach FFF (intervention group) and those that received usual primary care (control group). The study was conducted in the western part of the Province of North Brabant in the Netherlands between 2014 and 2017. We approached 17 GP practices for participation in the evaluation study (12 intervention GP practices and 5 control GP practices). In total, 1 intervention practice and 1 control practice were not willing to participate due to the workload and time constraints. The intervention group consisted of frail community-living older persons of 11 GP practices providing care and support according to the FFF approach. The control group consisted of frail independently living older persons of 4 GP practices providing care as usual. Participating GP practices varied in practice size, practice location (urban or rural locations; although the distance to other healthcare facilities remained limited), solo or duo/group practices and (number of) disciplines in the practice (e.g., practice nurses). Measurements were performed at baseline (T0) and at 12 months thereafter (T1). The research proposal has been reviewed by the medical ethics committee of the Erasmus Medical Centre in Rotterdam, the Netherlands (study protocol number MEC-2014-444). The committee decided that the rules laid down in the Medical Research Involving Human Subjects Act (Dutch acronym: WMO) did not apply. Consequently, further examination for ethics approval was waived by the medical ethics committee. Written informed consent to participate in the study was obtained from all participants. The assignment of the intervention was not under the discretion of the investigators, consequently registration of our study as a trial was not required. More details of the study design have been published elsewhere (Vestjens, Cramm, Birnie, & Nieboer, 2018).

Participants and inclusion

The study population consisted of frail independently living older persons in the age of 75 years and older. With increasing age, the prevalence of frailty increases (Fried et al., 2001; Rockwood et al., 2004). We used a four-stepped approach to assess frailty, include older persons in the FFF approach and in the evaluation study, and perform one-to-one matching. *Step 1:* We assessed frailty among all community-dwelling older persons registered at the 15 participating GP practices, i.e. 4 control GP practices and 11 intervention GP practices. All older persons received a postal questionnaire, including the 15-item Tilburg Frailty Indicator (TFI), which was developed and validated by Gobbens and colleagues (Gobbens, van Assen, Luijkx, Wijnen-Sponselee, & Schols, 2010). The TFI is used to assess frailty in the physical, psychological, and social domains

(Gobbens et al., 2010). The TFI is based on the definition of frailty as proposed by Gobbens and colleagues (2010), that is 'Frailty is a dynamic state affecting an individual who experiences losses in one or more domains of human functioning (physical, psychological, social), which is caused by the influence of a range of variables and which increases the risk of adverse outcomes' (Gobbens et al., 2010). Respondents with a TFI score of 5 or higher (range 0-15) were identified as frail (Gobbens et al., 2010). The aim of this frailty assessment was twofold, namely (i) to assess frailty in community-living older persons, and (ii) to attain frailty scores for the matching procedure (Step 4). *Step 2:* Frailty scores were provided to the participating GPs in order to give them insight into the proportion of frail older persons in their GP practice. *Step 3:* GPs in intervention GP practices selected older persons that were included in the FFF approach. This selection could be guided by older persons' frailty scores and/or additional interviews or measures that were performed by healthcare professionals as part of their care delivery. *Step 4:* The persons that were included in the FFF approach were assessed on inclusion criteria for participation in the evaluation study by the researchers. Frail older persons eligible for inclusion in the evaluation study (i) were living independently in the community, (ii) did not have an estimated life expectancy of less than 3 months, and (iii) were able to communicate in Dutch. The researchers matched each older person in the intervention group to one older person in the control group on key covariables, namely sex (male or female), score on the TFI, and educational level (low or high). Quasi-experimental research designs are more susceptible to bias due to the absence of randomization (Stuart & Rubin, 2008; Stuart, 2010). One-to-one matching was performed to increase the comparability of the intervention and control groups.

Written informed consent was obtained from all included older persons before the baseline data collection. As illustrated by Figure 1, 232 frail older persons were participating in the intervention group at T0 and matched to 232 frail older persons in the control group. At T1, 182 older persons were in the intervention group and 176 in the control group (loss to follow-up rates of 21.6 and 24.1% respectively).

Intervention and control groups

Community-dwelling older persons in the intervention group (11 GP practices) received the proactive, integrated primary care approach FFF (for a description of the approach see paragraph 'Intervention: steps in the FFF approach'). In the control group (4 GP practices), frail older persons received usual care services as provided by GP practices and other healthcare and community organizations. The control GP practices were instructed not to implement (elements of) the FFF approach. See paragraph 'Context of the study: primary care in the Netherlands' for more information about the Dutch primary healthcare system.

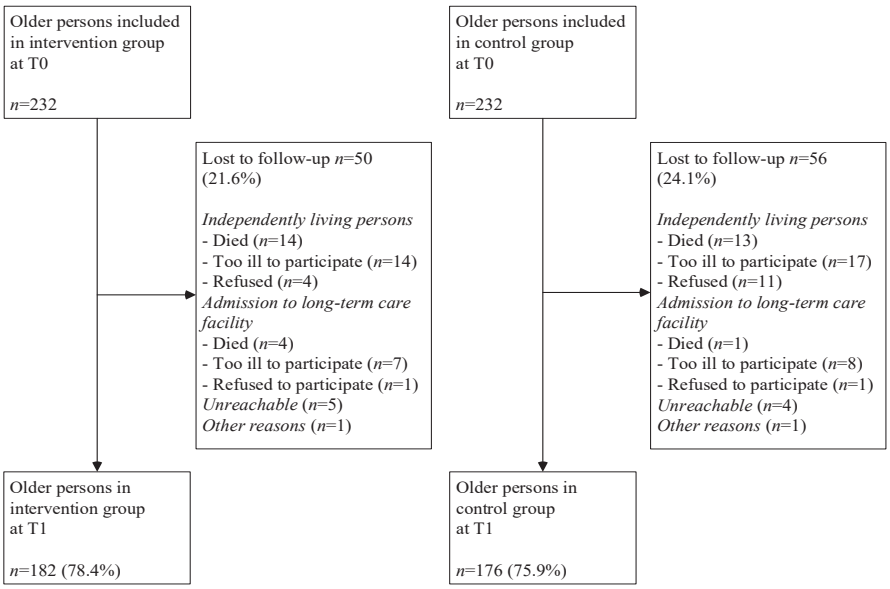

Figure 1 Flowchart of study participation

Intervention: steps in the FFF approach

The FFF approach is aimed at providing high-quality proactive, integrated primary care for community-dwelling frail older persons (75 years and older) in order to meet their often complex and long-term (healthcare) needs and protect their well-being. The FFF approach consists of several steps (see Figure 2). First, community-living older persons aged 75 years and older are screened for frailty by means of the TFI (Gobbens et al., 2010) by the geriatric nurse or practice nurse during a home visit. Additional measures are performed when necessary (e.g., Mini–Mental State Examination (MMSE)). The results of the home visit are discussed with the elderly care physician, i.e., primary care expert in geriatric medicine and care for older patients with complex needs (Koopmans, Lavrijsen, Hoek, Went, & Schols, 2010; Verenso, 2014). The results are reported and submitted to the GP and serve as input for the multidisciplinary consultation. Second, each frail older person is discussed in multidisciplinary consultation. The multidisciplinary practice team includes preferably the practice nurse, geriatric nurse, elderly care physician, and is led by the GP. This practice team can be strengthened by other disciplines, like physiotherapists or professionals in social care. Each frail older person is discussed in multidisciplinary consultation at least once a year. Needs and demands of the frail older person are discussed and reported according to the SFSPC-model (Somatic, Functional, Social, Psychological, and Communicative indications) in an individualized care plan. The practice team discusses and agrees upon (self-management) interventions. Over-the-counter and prescribed medicines are examined in a medication review by the GP, pharmacist and/or elderly care physician. Additional actions can be introduced, like coordinating medication use between primary care and second-line medical care, and a consult

of the elderly care physician to provide specific information about medicines to the frail older person. A case manager is appointed for each frail older person. The discipline that is most frequently involved in the care and support for the older person takes up the coordination role in the care process. The individualized care plan including proposed (self-management) interventions is discussed with the frail older patient and adjusted to the person's needs and wishes. Finally, follow-up of the frail older person is provided by a multidisciplinary team involving disciplines relevant for the (healthcare) needs and demands of the frail older person, e.g., GP, elderly care physician, physiotherapist, geriatric nurse, and social worker. The case manager coordinates and evaluates the effectiveness of the executed (self-management) interventions (during home visits) at least every 3 months. The elderly care physician and the geriatric nurse work in tandem to provide specialized geriatric expertise in the follow-up of frail older patients. The GP can obtain advice about, for example, multimorbidity, dementia, depression, and falls. Progress is evaluated and discussed in multidisciplinary consultation. Additional interventions or disciplines are introduced when necessary (see Figure 2).

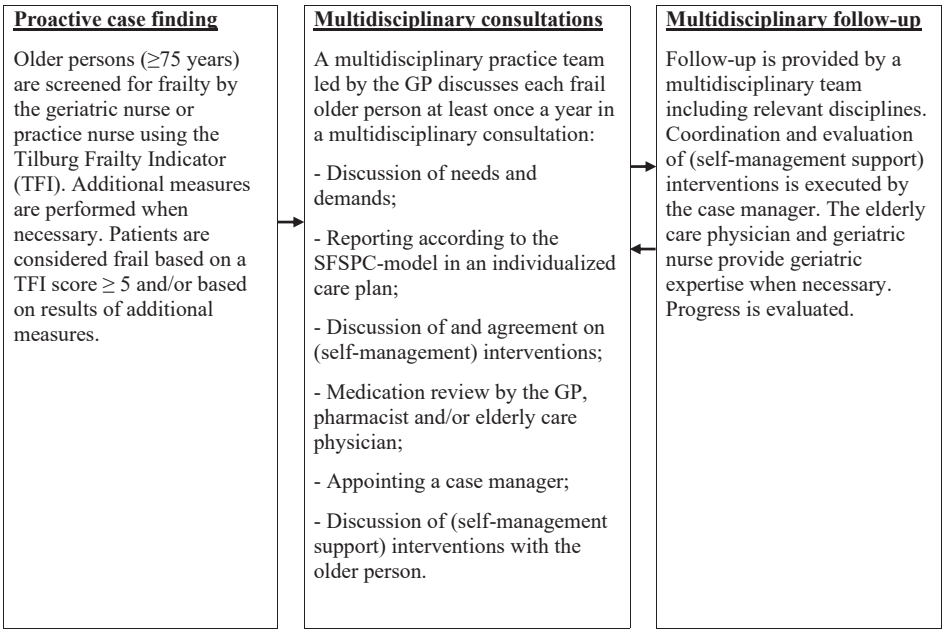

Figure 2 Overview of phases in the proactive, integrated FFF approach

The FFF approach and the CCM

The FFF approach was based on (elements of) the CCM. The comprehensive FFF approach combines multifaceted interventions related to changes in the *delivery system design* that enable effective care delivery, such as implementing case management, and working in multidisciplinary teams. Several *self-management support* interventions are provided, like providing educational

interventions, personal coaching, and individualized care plans and goals. The integrated care approach provides *decision support* for healthcare professionals by implementing guidelines for geriatric care in the primary care setting and professional training for care providers, and aims to enhance *clinical information systems* (e.g., facilitate exchange of information among care disciplines). The *healthcare system* promotes care improvement and strategies at multiple organizational levels (e.g., financing geriatric care modules and agreements with health insurers) and supports regional collaboration with *community* organizations. In line with the premises of the CCM, the FFF approach aims to improve quality of primary care, foster productive patient-professional interactions, and subsequently influence frail older persons' well-being.

Data collection and measures

Quality of primary care, productive patient-professional interactions and background characteristics of frail older persons were assessed by means of interviews (i.e. administering questionnaires) at home by trained interviewers at T0 and T1 (12 months follow-up). Interviewers were kept blinded to the group the older person was in (intervention or control group). On average, interviews lasted 60 to 75 minutes.

Measuring perceptions of quality of primary care

Frail older persons' perceptions of quality of primary care delivery were assessed with the 11-item Patient Assessment of Chronic Illness Care Short version (PACIC-S), which was validated by Cramm and Nieboer (2012a). The PACIC-S was based on the 20-item Patient Assessment of Chronic Illness Care (PACIC) as developed and validated by Glasgow and colleagues (2005). The PACIC assesses patients' perspectives on care delivery according to the dimensions of the CCM (Glasgow et al., 2005). Frail older persons were asked to indicate the extent to which they received CCM-related actions and care on a five-point scale ranging from '(almost) never' to '(nearly) always.' Higher scores represent higher-quality primary care delivery as perceived by frail older persons. Cronbach's alpha values for the PACIC-S were 0.77 at T0 and 0.76 at T1.

Measuring productive interactions with the GP and practice nurse

Productive patient-professional interactions were assessed using a relational coproduction instrument which measures dimensions of communication and relationships (Cramm & Nieboer, 2012b; Gittell, 2000; Gittell et al., 2000; Gittell, Godfrey, & Thistlethwaite, 2013). We focused specifically on productive interactions with the GP and the practice nurse. The relational coproduction instrument contains seven survey questions assessing frequency, timeliness, accuracy, and problem-solving nature of communication and the quality of the relationships in terms of shared goals, shared knowledge, and mutual respect. These dimensions of communication and relationships constitute jointly the relational coproduction construct (Cramm & Nieboer, 2012b; Gittell, 2000; Gittell et al., 2000; Gittell et al., 2013). Example questions are: 'Do these professionals communicate accurately with you?' and 'Do these professionals share the same

goals as you?' Frail independently living older persons assessed the quality of the communication and relationships with their GP and practice nurse on a five-point scale ranging from 'never' to 'always.' Higher scores represent higher-quality productive patient-professional interactions as perceived by frail older persons. Cronbach's alpha values for the productive patient-professional interactions were good (with the GP 0.86 at T0 and 0.88 at T1, and with the practice nurse 0.89 at T0 and 0.84 at T1).

Statistical analyses

The study population at baseline was described by means of descriptive statistics. Independent samples *t*-tests and chi-squared tests were used to assess baseline differences. Paired sample *t*-tests were used to investigate differences in scores at T0 and T1 on individual PACIC-S items, mean overall PACIC-S scores, and mean overall scores on relational coproduction within the intervention group and control group. Independent samples *t*-tests were used to assess differences between groups in mean PACIC-S scores and mean scores on relational coproduction at T0 and T1. Linear mixed-effects models were used to investigate the relationships between (changes in) frail older persons' perceptions of quality of primary care and productivity of interactions with the GP and practice nurse. Multilevel models are considered appropriate for investigating relationships in data sets with continuous dependent variables and a clustered structure of the data (West, Welch, & Gatecki, 2015). A random intercept was used on the level of the individual GP practices. Outcome estimates in the multilevel analyses were adjusted for baseline values of the outcome variables, background variables (i.e., age, sex, marital status, educational level, and multimorbidity) and the group (control and intervention group) was included in the model. Results were considered statistically significant when two-sided p-values were <0.05. We used software package IBM SPSS for Windows (version 24) for all statistical analyses.

RESULTS

Baseline characteristics

Table 1 shows the baseline characteristics of the older persons at baseline. At baseline, older persons in the intervention group were significantly less often single compared with older persons in the control group. No significant differences between the intervention group and control group were found with respect to age, sex, educational level, frailty or multimorbidity.

Table 1 Baseline characteristics of older persons

	Intervention group *n* = 232	**Control group** *n* = 232
Age (years)	82.45 (5.44)	82.41 (5.16)
Sex (female)	168 (72.4%)	168 (72.4%)
Marital status (single)	134 (57.8%)	160 (69.0%)*
Educational level (low)	101 (43.5%)	91 (39.2%)
Frailty (score on TFI)	7.38 (2.40)	7.38 (2.39)
Multimorbidity (≥ 2 diseases)	214 (92.6%)	206 (89.6%)

Values are presented as mean (SD, standard deviation) or number (%)
Independent samples *t*-tests and Chi-squared tests. * $p < 0.05$ (two-tailed)
Note: Characteristics of the population were based on the baseline measurement T0

Perceived quality of primary care

Table 2 shows the mean quality of primary care delivery scores as measured with the PACIC-S (mean overall scores) as well as mean scores on individual PACIC-S items for frail independently living older persons in the intervention group and control group. Paired sample *t*-tests showed significant improvements in the mean overall PACIC-S score within the intervention group over time and within the control group over time. We found significant improvements in mean scores on 9 out of 11 individual PACIC-S items over time in the intervention group as well as in the control group. Improvements were seen in the following quality of care items: 'given choices on treatment to think about', 'satisfied that my care was well organized', 'helped to set specific goals to improve my eating or exercise', 'encouraged to go to a specific group/class to help me cope with my (chronic) illness', 'asked questions about my health habits', 'helped to make a treatment plan that I could do in my daily life', 'helped to plan ahead so I could take care of my illness even in hard times', 'asked how my (chronic) illness affects my life' and 'told how my visits with other (healthcare) professionals helped my treatment'. No significant differences in mean scores on items 'given a copy of my treatment plan' and 'contacted after a visit of the GP, nurse or medical specialist to see how things were going' were found in both the intervention group and control group between T0 and T1. Moreover, independent samples *t*-tests showed no significant differences in mean overall scores of the PACIC-S between the control and intervention groups at T0 (1.83 (SD = 0.61) vs. 1.84 (SD = 0.56); $p = 0.80$) and at T1 (2.25 (SD = 0.69) vs. 2.31 (SD = 0.63); $p = 0.38$).

Table 2 Quality of primary care as experienced by frail older persons in the intervention and control groups over time (T0 and T1) based on paired data

	Intervention group $n = 149$[b]		**Control group** $n = 144$[c]	
Item characteristics of the PACIC-S[a]	**T0**	**T1**	**T0**	**T1**
Given choices on treatment to think about	2.25 (1.36)	2.89 (1.56)***	2.11 (1.39)	2.99 (1.73)***
Satisfied that my care was well organized	4.22 (1.11)	4.52 (0.93)**	4.17 (1.25)	4.52 (1.04)**
Helped to set specific goals to improve my eating or exercise	1.74 (1.09)	2.57 (1.49)***	1.52 (0.99)	2.27 (1.51)***
Given a copy of my treatment plan	1.44 (1.08)	1.36 (0.75)	1.35 (0.94)	1.49 (1.11)
Encouraged to go to a specific group/class to help me cope with my (chronic) illness	1.28 (0.76)	1.70 (0.76)***	1.20 (0.63)	1.56 (1.04)**
Asked questions about my health habits	1.98 (1.30)	2.34 (1.34)**	1.74 (1.26)	2.29 (1.48)***
Helped to make a treatment plan that I could do in my daily life	1.40 (0.89)	1.85 (1.03)***	1.38 (0.91)	1.66 (0.99)*
Helped to plan ahead so I could take care of my illness even in hard times	1.39 (0.85)	1.91 (1.11)***	1.41 (0.94)	1.66 (0.99)*
Asked how my (chronic) illness affects my life	1.53 (1.07)	1.79 (1.03)*	1.51 (1.11)	1.78 (1.15)*
Contacted after a visit of the GP, nurse or medical specialist to see how things were going	1.81 (1.27)	1.81 (1.18)	1.59 (1.14)	1.66 (1.13)
Told how my visits with other (healthcare) professionals helped my treatment	1.83 (1.29)	2.81 (1.47)***	1.62 (1.13)	2.73 (1.64)***
Mean overall score of the PACIC-S[a]				
Perceived quality of primary care	1.90 (0.56)	2.32 (0.63)***	1.78 (0.54)	2.24 (0.70)***

Values are presented as mean (SD, standard deviation)

[a]PACIC-S, Patient Assessment of Chronic Illness Care Short version, range 1-5; [b]149 persons of the 182 older persons included in the intervention group at T1 completed both measurements (T0 and T1) for the PACIC-S, 0-1 missing per item of the PACIC-S; [c]144 persons of the 176 older persons included in the control group at T1 completed both measurements (T0 and T1) for the PACIC-S, 0-1 missing per item of the PACIC-S

Paired sample *t*-tests. *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); *** $p < 0.001$ (two-tailed)

Perceived productive interactions with the GP and practice nurse

Table 3 shows frail older persons' perceptions of productive interactions with their GP and practice nurse (mean scores on the relational coproduction instrument). Paired sample *t*-tests showed significant improvements in perceived productive interactions with the GP in the intervention group over time and within the control group over time. We also found significant improvements with respect to frail older patients' perceived productive interactions with the practice nurse in the intervention group over time and within the control group over time. Moreover, independent samples *t*-tests showed no significant differences between the control and intervention groups with respect to productive interactions with the GP and practice nurse at T0 (3.77 (SD = 1.19) vs. 3.80 (SD = 1.11); $p = 0.75$, and 2.44 (SD = 1.69) vs. 2.64 (SD = 1.68); $p = 0.21$ respectively) and at T1 (4.45 (SD = 0.85) vs. 4.33 (SD = 1.04); $p = 0.23$, and 3.86 (SD = 1.70) vs. 3.77 (SD = 1.68); $p = 0.61$ respectively).

Table 3 Perceived productive interaction with the GP and practice nurse in the intervention group and control group over time (T0 and T1) based on paired data

Perceived productive interactions	*n*	T0	T1
Intervention group			
Productive interaction with the GP	172	3.90 (1.03)	4.35 (1.01)***
Productive interaction with the practice nurse	172	2.84 (1.70)	3.76 (1.68)***
Control group			
Productive interaction with the GP	165	3.78 (1.19)	4.45 (0.86)***
Productive interaction with the practice nurse	164	2.45 (1.67)	3.87 (1.69)***

Values are presented as mean (SD, standard deviation)
[b]Relational coproduction instrument, range 1-5
Paired sample *t*-tests. *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); *** $p < 0.001$ (two-tailed)

Determinants of productive interactions with the GP and practice nurse

Tables 4 and 5 show the results of the multilevel analyses. Productive interaction with the GP at T1 was significantly related to the perceived productive interaction with the GP at T0, the perceived quality of primary care at T0, and the change in perceived quality of primary care over time (between T0 and T1). There was no significant relationship with background characteristics and the group the frail older patient was in, i.e. intervention group or control group (Table 4). Analyses showed that the perceived productive interaction with the practice nurse at T0, the perceived quality of primary care at T0, and the change in perceived quality of primary care over time were significantly related to productive interaction with the practice nurse at T1. Also, we found no significant relationship with background characteristics and the group the patient was in (Table 5).

Table 4 Determinants of productive interactions with the **GP** at T1 as assessed with multilevel analysis ($n = 292$)

	B	SE
Constant	2.64**	0.85
Intervention group	-0.12	0.09
Perceived productive interaction with GP T0	0.15**	0.04
Perceived quality of primary care T0	0.37**	0.11
Change in perceived quality of primary care (T1 – T0)	0.37***	0.07
Age	0.01	0.01
Sex (female)	-0.18	0.11
Marital status (single)	0.08	0.10
Educational level (low)	0.02	0.10
Multimorbidity	-0.23	0.18

SE, standard error; Multilevel analyses included respondents that filled in the questionnaires at both T0 and T1. Deletion of missing cases resulted in 292 cases.
*$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)

Table 5 Determinants of productive interactions with the **practice nurse** at T1 as assessed with multilevel analysis (n = 291)

	B	SE
Constant	3.04	1.72
Intervention group	-0.31	0.27
Perceived productive interaction with practice nurse T0	0.15*	0.06
Perceived quality of primary care T0	0.46*	0.22
Change in perceived quality of primary care (T1 – T0)	0.45**	0.14
Age	0.001	0.02
Sex (female)	-0.23	0.22
Marital status (single)	0.18	0.21
Educational level (low)	0.06	0.20
Multimorbidity	-0.28	0.37

SE, standard error; Multilevel analyses included respondents that filled in the questionnaires at both T0 and T1. Deletion of missing cases resulted in 291 cases.
*$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)

DISCUSSION

The aim of our study was to investigate whether frail community-dwelling older persons' perspectives on quality of primary care according to the dimensions of the CCM are associated with perceived productivity of interactions with their GP and practice nurse. We have found significant improvements in perceived care quality, perceived productive interaction with the GP, and perceived productive interaction with the practice nurse over time in both the intervention group (proactive, integrated primary care) and the control group (usual care delivery). There were no significant differences between the intervention group and control group with regard to overall perceived quality of primary care and perceived interactions with the GP and practice nurse at baseline and at follow-up. Productive interactions with the GP and practice nurse were significantly related to the perceived productive interaction at T0, the perceived quality of primary care at T0, and the change in perceived quality of primary care over time (between T0 and T1). The quality of the communication and relationships between frail community-dwelling older persons and their GPs and practice nurses is associated with the perceived quality of primary care delivery.

The rich history of the central position of the GP in primary care may explain why on average community-living frail older persons scored the productivity of interactions with their GP higher compared with the interactions they encounter with the practice nurse, a relatively newer professional within GP practices. Still the perceived productive interaction with the practice nurse was scored relatively high in our sample of frail community-dwelling older persons. A

study among COPD patients has shown the highest degree of productivity of interactions with the nurse practitioner and GP compared with other professionals such as specialists (Cramm & Nieboer, 2016).

Earlier research has shown that care delivery in accordance with the CCM is associated with productive patient-professional interactions as perceived by chronically ill patients (Cramm & Nieboer, 2014; Cramm & Nieboer, 2016). In addition, productive patient-professional interactions mediated the relationship between care quality as perceived by chronically ill patients and their well-being (Cramm & Nieboer, 2015). Our study adds to this knowledge by showing that perceived quality of primary care is associated with perceived productive patient-professional interaction in a sample of frail community-living older persons, which is expected to influence their well-being as well. This stresses the necessity to invest in high-quality care delivery and interactions between frail older patients and their healthcare professionals.

The outcomes should be viewed in the light of the setting in which we conducted our study. The effectiveness of the FFF approach in improving quality of primary care and productive patient-professional interactions may depend on the organization of the healthcare setting. Considering the strongly developed Dutch primary care system, the contrasts between proactive, integrated care as provided in the FFF approach and usual care delivery might not have been large enough. Based on a comparison of the results of three studies investigating integrated care programs for community-dwelling frail older persons in the Netherlands (Bleijenberg et al., 2016; Hoogendijk et al., 2016; Metzelthin et al., 2013), Hoogendijk (2016) states that integrated care adds little to the usual care delivery in the Dutch primary care setting. Jackson, Scott, and Gutierrez (2017) state that the effects of integrated healthcare would be greater in healthcare systems that are more fragmented, like the healthcare system in the United States.

We have found suboptimal implementation of elements related to the FFF approach in intervention GP practices. For example, GP practices differed in their organization of multidisciplinary consultations (e.g., how often consultations were organized, number of older persons discussed, which type of (healthcare) professionals were involved) and the way they arranged long-term follow-up of frail older persons. Moreover, during the study period initiatives to improve care delivery for older persons were also reported in the control GP practices. Even though these practices did not deliver care and support according to the FFF approach, systematic follow-up of older patients, implementing chain information systems, creating a structural approach between hospital and primary care, and the delegation of care from GP to the (practice) nurse are examples of changes that also took place in several control GP practices (Vestjens, Cramm, & Nieboer, 2018). Quality improvement initiatives and possibly other trends in primary care for older persons may have contributed to improvements over time. For a detailed description of

implemented interventions in intervention and control GP practices see Vestjens, Cramm, and Nieboer (2018).

Limitations of the study

The study has several (potential) limitations. First, we measured frail community-dwelling older persons' perceived productivity of interactions with their GP and practice nurse. We decided to limit our selection of professionals to the GP and practice nurse, which are the most frequently contacted professionals in general practice in the Netherlands (Jansen et al., 2012). We experienced problems with measuring productive interactions with other healthcare professionals that were part of the practice team supporting frail older patients, such as elderly care physicians and social workers. In general, it was difficult for participants to recognize the disciplines that were less visible to them than their GP or practice nurse which made it complicated to successfully investigate older patients' perceived productive interactions with these professionals. The productivity of interactions with other healthcare professionals requires therefore further investigation. This is important as multidisciplinary teamwork is an important element of the proactive, integrated care approach FFF. Second, the control GP practices that agreed to join may already have had high-levels of quality of care and may have been highly motivated to improve the quality of their care delivery. These GP practices may have perceived that the FFF program would add no value to their usual care delivery, and subsequently may have been particularly eager to participate in the control group. Healthcare practices with medium or low levels of quality of care delivery may decline requests to participate in evaluation studies whereas those who are doing well may be more likely to join. This may hamper our ability to detect changes between intervention practices and care as usual. Third, based on the theoretical underpinnings of the CCM (Bodenheimer et al., 2002a; Wagner, 1998; Wagner et al., 2001), we investigated the relationships between (changes in) care quality and productive patient-professional interactions. This relationship, however, may be considered dynamic. Higher-quality productive interactions are expected to result in higher-quality primary care for frail older persons (e.g., improved self-management support) (Cramm & Nieboer, 2012b). Furthermore, we did not include other potential predictors of (the relationship between) care quality and productive interactions. For example, continuity of care is found to be an important predictor of high quality of primary care (Campbell et al., 2001). In the current study we did not take into account the duration and/or intensity of patient care provided by the GP or practice nurse. Although we applied matching methods and controlled for important factors in the data analyses, this provides no guarantee for unbiased results. Other unknown and unmeasured factors to confound our study results may exist. Finally, our study focused on older persons' perceptions of quality of primary care and productive patient-professional interactions only. We did not investigate whether improvements resulted in improved patient outcomes, like health-related quality of life or well-being of community-dwelling frail older persons. The effects on patient outcomes should be investigated in future research.

Conclusions

The aim of the study was to investigate whether frail community-dwelling older persons' perspectives on quality of primary care are associated with the productivity of patient-professional interactions. Frail community-dwelling older persons' perspectives on quality of primary care were associated with perceived productivity of their interactions with the GP and practice nurse in both the intervention group receiving proactive, integrated care based on (elements of) the CCM and the control group receiving care as usual. We found no significant differences in overall perceived quality of care and perceived patient-professional interaction between the intervention group and control group at baseline and follow-up. Our study contributes to previous research by showing that perceived quality of primary care is associated with perceived productive patient-professional interaction among frail community-dwelling older persons. In general, less research has been conducted with respect to the relationship between quality of care and productivity of patient-professional interactions, while effective interactions are assumed to positively influence patient outcomes. In times of population aging it is therefore necessary to invest in high-quality care delivery and patient-professional interactions. The effects of improvements in quality of primary care and productive patient-professional interactions on patient outcomes of frail community-dwelling older persons need to be examined in future research.

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Chapter 6

Cost-effectiveness of a proactive, integrated primary care approach for community-dwelling frail older persons

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ABSTRACT

Background

The article reports on the cost-effectiveness of the proactive, integrated primary care program *Finding and Follow-up of Frail older persons* (FFF) compared with usual primary care for community-dwelling frail older persons in the Netherlands.

Methods

This study had a matched quasi-experimental design (pretest and posttest). The economic evaluation was performed from a healthcare perspective with a time horizon of 12 months. The target population consisted of community-dwelling frail older persons aged ≥ 75 years in the FFF intervention group (11 general practitioner (GP) practices) and in the control group receiving usual care (4 GP practices). The effectiveness measures for the cost-effectiveness and cost-utility analyses were subjective well-being (Social Production Function Instrument for the Level of well-being short; SPF-ILs) and QALYs (EuroQol; EQ-5D-3L), respectively. Costs were assessed using resource use questionnaires. Differences in mean effectiveness between groups were assessed using univariate, multilevel and propensity score matched analyses, with and without imputation of missing values. Differences in costs were assessed using Mann-Whitney *U*-tests and independent samples *t*-tests. Bootstrapping was performed, and predicted incremental cost-effectiveness ratios (ICERs) and incremental cost-utility ratios (ICURs) were depicted on cost-effectiveness planes.

Results

The various analyses showed slightly different results with respect to differences in estimated costs and effects. Multilevel analyses showed a small but significant difference between the groups for well-being, in favor of the control group. No significant differences between groups in terms of QALYs were found. Imputed data showed that mean total costs were significantly higher in the intervention group at follow-up.

Conclusion

Proactive, integrated care for community-dwelling frail older persons as provided in the FFF program is most likely not a cost-effective initiative, compared with usual primary care in the Netherlands, in terms of well-being and QALYs over a 12-month period.

BACKGROUND

This article reports on the cost-effectiveness of a proactive, integrated primary care approach compared with usual primary care for community-dwelling frail older persons in the Netherlands. We evaluated the *Finding and Follow-up of Frail older persons* (FFF) approach, which aims to maintain or improve older people's well-being and is implemented by part of the Dutch general practitioners (GPs). The FFF approach consists of proactive identification of frail older persons in the community and subsequent multidisciplinary (including professionals with geriatric expertise) consultations and individualized follow-up coordinated by case managers. Integrated care and support is widely acknowledged to be a key initiative in improving care and support for older persons (Harvey, Dollard, Marshall, & Mittinty, 2018). In addition, integrated care approaches, like the FFF program, may help to maintain community-dwelling frail older persons' well-being (Nieboer & Cramm, 2018). Over the years, a shift has occurred from a disease-oriented care model toward a more proactive and integrated approach (Hopman et al., 2016). Traditional disease-specific care delivery approaches for frail older persons, who often have multiple conditions, do not meet these individuals' comprehensive (healthcare) needs (Boyd et al., 2005; De Lepeleire, Iliffe, Mann, & Degryse, 2009; Guthrie, Payne, Alderson, McMurdo, & Mercer, 2012; Nolte & McKee, 2008; van Weel & Schellevis, 2006). Moreover, frailty has been associated with increased utilization of primary, hospital, and nursing home care (e.g. Ilinca & Calciolari, 2015; Rochat et al., 2010). The provision of high-quality care and support to the growing number of frail older persons poses a challenge (Banerjee, 2015; WHO, 2015), and the comprehensive (healthcare) needs of this population place a burden on healthcare resources (Chatterji, Byles, Cutler, Seeman, & Verdes, 2015). Integrated care initiatives are assumed to improve quality of care and ultimately aim to enhance patient outcomes while making efficient use of healthcare resources (Mattke, Seid, & Ma, 2007; Wagner et al., 2005). Important elements of integrated care are: (i) a proactive approach that is coordinated effectively around a person's health and social care needs; (ii) a patient-centered approach in which a person is involved in decision-making and care processes, and the person's needs are taken into consideration; (iii) an approach in which multiple interventions are delivered (simultaneously); and (iv) a multidisciplinary approach in which professionals from multiple disciplines are involved (Hopman et al., 2016). GPs are considered to be key actors in the implementation of promising initiatives targeting frail older persons (Ilinca & Calciolari, 2015). Many integrated care initiatives have emerged and are implemented in the primary healthcare sector, but evidence of their effectiveness and cost-effectiveness remains mixed (Blom et al., 2018; de Bruin et al., 2012; Eklund & Wilhelmson, 2009; Hopman et al., 2016; Looman, Huijsman, & Fabbricotti, 2018; Low, Yap, & Brodaty, 2011; Smith, Wallace, O'Dowd, & Fortin, 2016). Integrated primary care programs for frail older persons have shown no effect on the majority of outcomes, and evidence for their cost-effectiveness is limited (Looman et al., 2018). Although the FFF approach has been found to have positive effects on the quality of care as perceived by healthcare professionals (Vestjens, Cramm, & Nieboer, 2018b),

and to achieve improvements in older persons' perceived care quality and coproduction of care over time (Vestjens, Cramm, and Nieboer, 2019), its cost-effectiveness has yet to be investigated. Therefore, the aim of the present study was to evaluate the cost-effectiveness of the FFF approach in a population of community-dwelling frail older persons.

METHODS

Design, setting and participants

This longitudinal evaluation study had a matched quasi-experimental design with one pretest and one posttest (12-month follow-up period). The study was conducted in 15 GP practices located in the western part of North Brabant Province, the Netherlands, between 2014 and 2017. The intervention group consisted of community-dwelling frail persons aged 75 years and older who were registered at 11 GP practices that implemented the proactive, integrated primary care approach FFF. The control group consisted of community-dwelling frail older persons (≥ 75 years of age) who were registered at 4 GP practices that delivered usual primary care. Written informed consent to participate in the study was obtained from all participants. All participants in the intervention group were individually matched one-to-one to participants in the control group based on sex (male/female), educational level (low/high), and frailty score. As shown in Figure 1, each group consisted of 232 frail older persons at baseline. At T1, 182 older persons remained in the intervention group and 176 older persons remained in the control group (loss to follow-up rates of 21.6% and 24.1% respectively). The medical research ethics committee of the Erasmus Medical Centre in Rotterdam, the Netherlands, concluded that the rules laid out in the Medical Research Involving Human Subjects Act did not apply (study protocol number MEC-2014-444). More details of the study design have been published elsewhere (Vestjens, Cramm, Birnie, & Nieboer, 2018a).

Usual primary care

Compared with the primary care systems in many countries in Europe, the Dutch primary care system is strongly developed. Many different (healthcare) providers, including GPs, primary care psychologists and physiotherapists, are involved in primary care delivery in the Netherlands (Kroneman et al., 2016). GPs have a central role in the healthcare sector and a strong gatekeeping function (Schäfer et al., 2010), implying that referral is generally necessary to access most hospital and specialist care (Kringos, Boerma, Hutchinson, & Saltman, 2015; Kroneman et al., 2016). Each patient is registered at a GP practice of his or her choice, usually located in the person's neighborhood. GPs are commonly patients' first contact with the healthcare system, and most first encounters take place after the occurrence of a (medical) problem. In general, GPs in the Netherlands are considered to be non-interventionist, resulting in relatively low prescription and referral rates. In comparison with GPs in other European countries, Dutch GPs provide a

broad scope of (healthcare) services to their patients. Collaboration between GPs and (practice) nurses is common (Kroneman et al., 2016). An example of a nurse-led service is the provision of diabetes management in primary care (Kringos et al., 2015). In the care for community-dwelling frail older persons, GPs can consult elderly care physicians with expertise in geriatric medicine (Koopmans, Lavrijsen, Hoek, Went, & Schols, 2010). The primary care system lacks, however, sufficient coordination and continuity (with specialist care) and is reactive and characterized by fragmentation (Boeckxstaens & De Graaf, 2011). Frail older persons in this study's control group received usual care services provided by their GP practices and local health and community organizations. For a detailed description of care delivery and implemented interventions in control and intervention GP practices, see Vestjens, Cramm, and Nieboer (2018b).

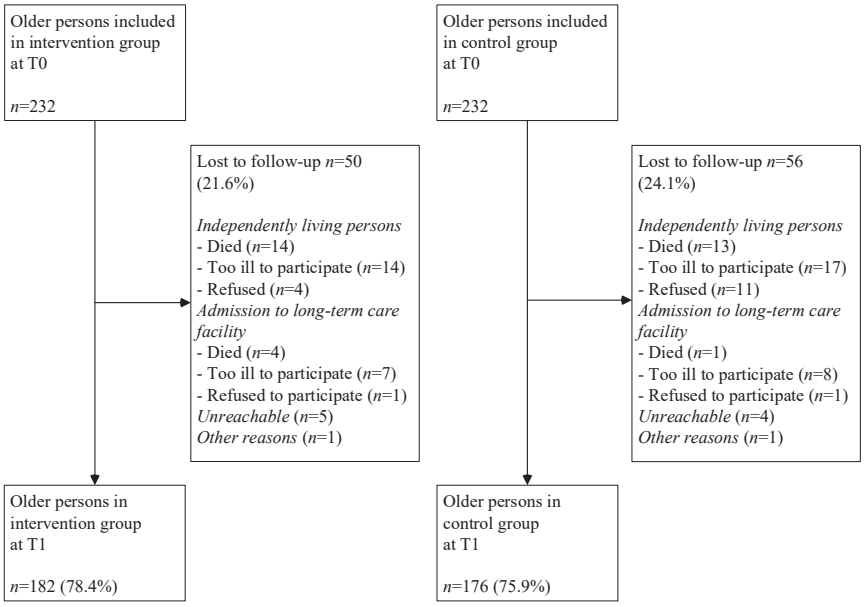

Figure 1 Flowchart of study participation

Intervention

Frail older persons in the intervention group received primary care according to the FFF approach. This approach combines several interrelated components (see Table 1) with the aim of providing high-quality proactive, integrated primary care for frail community-dwelling older persons. A decline of the well-being of community-dwelling frail older persons may be expected over time (Nieboer & Cramm, 2018). Consequently, the aim of the FFF program is to maintain or improve frail older people's well-being and protect against its deterioration. The FFF approach is implemented in GP practices and led by GPs. Community-dwelling older patients registered at the GP practices are screened for frailty using the Tilburg Frailty Indicator (TFI) (Gobbens,

van Assen, Luijkx, Wijnen-Sponselee, & Schols, 2010) during a home visit by the practice nurse, homecare nurse or geriatric nurse. This 15-item questionnaire assesses frailty in the physical, psychological, and social domains. Scores range from 0 to 15, and persons with scores ≥ 5 are identified as frail (Gobbens et al., 2010). Persons with TFI scores < 5 can also be identified as frail based on additional examination by professionals. Problems and needs are reported in multiple domains according to the SFSPC-model, i.e., somatic (e.g., pain, fall risk), functional (e.g., limitations in activities of daily living like problems with eating or household activities), social (e.g., social network), psychological (e.g., fear, coping, depression), and communication (e.g., visual or hearing impairments). Outcomes of this in-home assessment are reported and discussed with the GPs and elderly care physicians, i.e., physicians in primary care with expertise in geriatric medicine (Koopmans et al., 2010). Multidisciplinary primary care teams and collaboration among different disciplines in multiple FFF-related activities are central to the FFF approach. Geriatric expertise is easily accessible by close involvement of elderly care physicians and geriatric nurses. Older persons' (healthcare) needs are discussed in multidisciplinary consultation at least once a year. Individualized care plans include reported problems and (healthcare) needs, tailored (self-management) interventions, plans for multidisciplinary follow-up and evaluation. The care plan is discussed with the older person during a home visit by the practice nurse, homecare nurse or geriatric nurse. The care plan is then tailored to the person's needs and wishes. Follow-up of older patients is arranged by a multidisciplinary team of (healthcare) professionals and an appointed case manager, who coordinates and evaluates the process, and provides support in goal setting and self-management. Older patients' medication use is examined at least annually by GPs, elderly care physicians or pharmacists and discussed with the patients and their informal

Box 1 A case of a frail older person participating in the FFF approach

Mr. Buys is 82 years old and has always lived in his parental home in the countryside near Roosendaal. His wife passed away 2 years ago and his two sons live and work in the capital city, Amsterdam. A diabetes check-up by his practice nurse raised alarm regarding Mr. Buys' physical and social well-being. In response, the practice nurse screened Mr. Buys for frailty during a home visit; his TFI score was 8. In addition, Mr. Buys reported problems in the somatic, functional, and social domains. It became apparent that Mr. Buys misses having people around him and experiences problems in his daily life due to fatigue and difficulty in walking. He explained to the practice nurse that he lacks contact with his social network. After discussion with the GP and elderly care physician, a preliminary individualized care plan was established and Mr. Buys' case was discussed in multidisciplinary consultation. Based on Mr. Buys' reported problems and needs, a physiotherapist, geriatric nurse, and social worker were included in the multidisciplinary team, along with the practice nurse, GP, and elderly care physician. The geriatric nurse was appointed as Mr. Buys' case manager (responsible for, e.g., discussing the (self-management) interventions that were proposed in the multidisciplinary consultation and adjusting the care plan to his wishes). The elderly care physician examined Mr. Buys' medication use and arranged a home visit to evaluate his diabetes management. The physiotherapist visited Mr. Buys regularly to improve his physical functioning and to minimize fall risk through, e.g., walking and balance exercises. The case manager discussed several options to improve Mr. Buys' social contact and independence. He decided to visit a day care center twice a week to be involved in meaningful activities and contact with older persons in his area of residence. The geriatric nurse contacted Mr. Buys (by home visit or telephone) and evaluated his follow-up regularly.

caregivers or relatives. Box 1 illustrates the application of the FFF approach. Further details on the components of the FFF approach have been published elsewhere (Vestjens et al., 2018a; 2018b).

Cost-utility and cost-effectiveness analyses

The economic evaluation of the FFF approach consisted of a cost-utility analysis (CUA) and a cost-effectiveness analysis (CEA) from a healthcare perspective with a time horizon of 12 months. Costs and effects were measured at baseline (T0) and 12 months (T1). Trained interviewers administered questionnaires during in-home interviews to collect data regarding healthcare utilization and outcomes. The incremental cost-utility ratio (ICUR) and the incremental cost-effectiveness ratio (ICER) represent the difference in mean total costs adjusted for baseline costs between the intervention and control groups in the numerator and the difference in mean effectiveness adjusted for baseline effectiveness in the denominator.

Outcomes and measures

The primary outcome of the CUA was quality-adjusted life-years (QALYs). The validated EuroQol (EQ-5D-3L) was used as a preference-based health status measure to estimate utilities in the QALY measure (Brooks, 1996; EuroQol Group, 1990). The descriptive system of the EQ-5D measures health-related quality of life in five health dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) on a three-point scale (1 = no problems, 2 = some or moderate problems, 3 = severe problems), resulting in 243 distinct health states (Brooks, 1996; EuroQol Group, 1990). The EQ-5D health states were transformed into utility scores using the Dutch EQ-5D tariffs. Utilities based on the Dutch tariff range from -0.33 to 1 (<0 = health state considered worse than death, 0 = death or health state regarded to be equivalent to death, 1 = full health) (Lamers, Stalmeier, McDonnell, Krabbe, & van Busschbach, 2005). For the CEA, the primary outcome was subjective well-being, measured with the validated short form of the Social Production Function Instrument for the Level of well-being (SPF-ILs) (Nieboer, Lindenberg, Boomsma, & van Bruggen, 2005). This 15-item instrument assesses whether five instrumental goals (comfort, stimulation, status, behavioral confirmation, and affection) are met in order to optimize universal goals of social and physical well-being (Nieboer & Cramm, 2018; Nieboer et al., 2005; Ormel, Lindenberg, Steverink, & Verbrugge, 1999; Ormel, Lindenberg, Steverink, & Von Korff, 1997). Mean SPF-ILs scores range from 1 to 4, with higher scores indicating greater subjective well-being (Nieboer et al., 2005). EQ-5D and SPF-ILs outcomes were measured among frail older patients in the intervention and control groups at T0 and T1.

Healthcare utilization and costs

Total costs of intervention and control care at T0 and T1 were estimated as the summation of resources used multiplied by prices or valuations. Volumes of healthcare utilization were determined by the administration of resource use questionnaires during in-home interviews at T0 and T1. Frail older persons reported the types and frequencies (e.g., days of hospitalization or

number of visits to the GP) of care they had received. To determine volumes of resource use, the following data were collected: numbers of GP consultations, out-of-hours GP consultations (i.e., at home or in the care clinic on evenings/nights/weekends), admissions to hospital/nursing home/home for the elderly, and visits to the physiotherapist/exercise therapist/psychologist/psychiatrist/social worker/medical specialist; and types of homecare service (i.e., household activities, personal care and nursing care at home), and elderly daycare or daycare treatment received. We also included costs related to the purchase of assistive aids (e.g., wheelchair) and in-home modifications as patient-related costs. Intervention costs included all costs related to the FFF activities, i.e., selection of patients, proactive screening for frailty, provision of feedback information, multidisciplinary consultation, individualized care plan development, medication review, and follow-up of frail older persons (see Table 1). We estimated the average amount of time spent on intervention related activities per patient by (a combination of) different healthcare professionals involved. Information for this estimation was collected by the FFF project leader and was based on registers of the contact persons for GP practices, minutes from multidisciplinary consultations, and observations made during frailty screening. The healthcare professionals involved in FFF-related activities differed among GP practices and frail older patients, due to the compositions of the practice teams, (healthcare) disciplines with services accessible in the region, and tailoring of the FFF approach to the wishes and needs of individual patients. FFF follow-up involved healthcare utilization (e.g., consultation with the practice nurse or social worker). To avoid duplicate inclusion of costs, we included such service use in the healthcare costs, and not in the intervention costs. Only consultations with healthcare professionals that were not registered on the resource use questionnaires were included in the intervention costs. Study-related activities and costs were excluded. We did not consider costs related to the training of involved healthcare professionals.

Healthcare resource volumes were valued using the Dutch manual for costing in healthcare (Hakkaart-van Roijen, van der Linden, Bouwmans, Kanters, & Tan, 2015). Volumes of resource use were multiplied by standardized cost prices per unit of resource use (in euros) to estimate costs. Prices were inflated to 2015 (reference year) using the general consumer price index of 0.6% (Statistics Netherlands). When standardized costs per unit of resource use were unavailable, we estimated costs using true economic costs in the year 2015. To estimate costs related to out-of-hour GP consultations, we used the true economic weighted mean costs for this service in western North Brabant Province provided by the Dutch Healthcare Authority. Average expenditures based on Internet sources and expenditures obtained in previous research using the same resource use questionnaire were used to value purchased assistive aids and in-home modifications (van Dijk, Cramm, Lötters, van Exel, & Nieboer, 2015). Annual depreciation costs were calculated according to the annuity method (Hakkaart-van Roijen et al., 2015). Intervention costs were based on the average amount of time invested per FFF element and hourly wages

of the professionals involved, with proportional time investment applied when more than one professional was involved.

Missing data

Results are presented with and without imputation of missing values. Missing values were imputed according to the type of parameter (cost volume, utility, QALYs, SPF-ILs score), time point (T0, T1) and, for T1, reason for drop-out (see Figure 1). Missing cost volumes at T0 were imputed with the mean cost volume of the specific service for the intervention group or control group at T0. The imputation of QALYs at T0 depended on the number of missing EQ-5D domains. When only one EQ-5D domain score was missing, the EQ-5D utility score was imputed using the median utility score of other persons in the same (intervention or control) group who had the same scores on the non-missing EQ-5D domains. When no participant in the same group had the same scores or more than one domain was missing, the missing utility score was replaced with the median utility score for the respective group. The mean SPF-ILs score was calculated when at least 10 of the 15 items were reported. Missing values at T0 were replaced with the mean SPF-ILs score in the respective group at T0. Missing costs, utilities, QALYs and SPF-ILs scores for participants in the intervention and control groups at T1 were imputed the same way as at T0. Missing costs and effects on T1 questionnaires of older persons that were lost to follow-up in the intervention group and control group between T0 and T1 (n = 50 and n = 56 respectively; see Figure 1) were imputed as follows. Based on registrations of case managers and GPs, we estimated the number of months that a person lived at home, lived in a nursing/elderly home, and the number of months lost due to mortality. For each older person that was lost to follow-up, missing costs at T1 were imputed with the sum of (1) the number of months the person lived at home multiplied by the mean monthly healthcare costs (excluding the costs of nursing/elderly home admission) in the respective group at T1, and when applicable, (2) the number of months the person lived in a nursing/elderly home multiplied by monthly costs of nursing/elderly home admission, and (3) costs were set at zero from the month a participant died during the follow-up period. For persons for whom nothing further was known (n = 11), we used the mean healthcare costs in the respective group at T1. Missing QALYs at T1 were replaced with the sum of (1) the number of months a person lived at home multiplied by the median utility score at T1, and (2) the number of months a person lived in a nursing/elderly home multiplied by the utility score of 0.5 (Makai, Brouwer, Koopmanschap, & Nieboer, 2012), and (3) a utility score of 0 was assigned from the month a person died. For persons for whom nothing further was known (n = 11), we used the QALYs in the respective group at T1. Finally, missing SPF-ILs values were imputed with the mean SPF-ILs group score at T1 due to the lack of SPF-ILs norm values. Additional file 1: Table S1 outlines the number of participants with missing data.

Statistical analyses

We assessed differences in baseline characteristics between the intervention and control groups using independent samples *t*-tests (for continuous variables with approximately normal distributions) and Chi-squared tests (for categorical variables). Unadjusted differences in mean SPF-ILs scores and QALYs between groups were assessed using independent samples *t*-tests. Unadjusted differences in mean SPF-ILs scores and QALYs over time within each group were assessed using paired sample *t*-tests. Furthermore, these univariate analyses were complemented with multilevel analyses (linear mixed-effects models) to investigate effectiveness of the FFF approach. Multilevel models are considered appropriate for investigating relationships in data sets with continuous dependent variables and a clustered structure of the data (persons within GP practices) (West, Welch, & Gatecki, 2015). A random intercept was used on the level of the individual GP practices. Outcome estimates in the multilevel analyses were adjusted for baseline values of the respective outcome variable, background variables (i.e., age, sex, marital status, educational level, frailty score and multimorbidity) and control/intervention group. We performed the multilevel models (with QALYs and well-being as outcome estimates) using data with and without imputation of missing values.

Volumes of healthcare utilization were presented as means (and corresponding standard deviations; SDs) per service use category. Differences in costs between groups were tested using Mann-Whitney *U*-tests (skewed data) and independent samples *t*-tests (for mean values). Differences in costs over time within each group were assessed using related-samples Wilcoxon signed rank tests and paired sample *t*-tests.

Furthermore, propensity score matching was used to deal with potential different distributions of covariates between the intervention and control groups at baseline (Indurkhya, Mitra, & Schrag, 2006). According to Indurkhya, Mitra, and Schrag (2006), the propensity score is considered the probability that a person is assigned to the intervention group conditional on the person's covariate information. For each individual person, the propensity to be part of the intervention group was estimated using a binary logistic regression model predicting assignment to the intervention group from baseline covariates. The covariates in the first logistic regression model (Model 1) were age, sex, marital status, educational level, frailty score, and multimorbidity. Next to these covariates, we also included baseline SPF-ILs, QALYs and costs in the second logistic regression model (Model 2). We then compared observed outcomes between intervention and control groups conditional on the propensity matched scores (Rosenbaum & Rubin, 1983).

We performed nonparametric bootstrapping (percentile method) to generate 1500 samples from the original sample of 232 matched pairs. Predicted ICERs and ICURs were depicted on cost-effectiveness planes to show uncertainty therein. A statistical significance level of 5% (two-sided) was used in the analyses. All statistical analyses were performed with IBM SPSS Statistics version 24.

Table 1 Activities related to the FFF integrated primary care approach

FFF related activities	Explanation	Disciplines involved	Mean time per patient
Selection of patients	Selecting patients that are eligible for proactive frailty screening	GP or practice nurse	5 minutes
Proactive frailty screening	Home visit for administering the Tilburg Frailty Indicator (TFI) to assess frailty. Consultation with the patient and reporting needs and problems based on the SFSPC-model, i.e. model for reporting on Somatic, Functional, Social, Psychological, and Communicative indications.	Practice nurse, geriatric nurse, or homecare nurse	90 minutes
Feedback information	Feedback information about the screening (e.g., TFI score) and problem analysis (SFSPC-model) to the GP and elderly care physician. First draft of individualized care plan for the patient.	Practice nurse, geriatric nurse, or homecare nurse	100 minutes
Multidisciplinary consultation	Discussing the older patient in multidisciplinary consultation in the GP practice. Discussion of screening, problems listed according to SFSPC-model, possible (self-management) interventions, and involvement of (healthcare) professionals.	*In general* GP Practice nurse Homecare nurse Elderly care physician Geriatric nurse *Frequently involved* Physiotherapist, occupational therapist and/or social worker	On average patients are discussed once or twice per year for 15 minutes
Individualized care plan	Definitive version of the individualized care plan is established, including (self-management) interventions discussed in multidisciplinary consultation.	Practice nurse, geriatric nurse, or homecare nurse	10 minutes
Medication review	Older persons' medication use is examined in a medication review.	GP, pharmacist, or elderly care physician	10 minutes
Multidisciplinary follow-up	Individual follow-up of patients by a multidisciplinary team of (healthcare) professionals. A case manager is responsible for coordination and evaluation of the follow-up. An elderly care physician and geriatric nurse can provide geriatric expertise.	Involvement of (healthcare) professionals based on the needs and wishes of the patient and can include, but are not limited to, practice nurses, physiotherapists, medical specialists, social workers, and so on.	4 to 10 hours

RESULTS

Table 2 shows the background characteristics of the study population at baseline. In total, 72.4% of participants were female, 41.8% had a low educational level, and 94.4% were considered to be frail according to the TFI (mean TFI score, 7.38) in both groups. At baseline, compared with participants in the control group, older persons in the intervention group were significantly less often single ($p < 0.05$). No significant difference in mean age or the proportion of older persons with multimorbidity was observed between the groups.

Table 2 Background characteristics of older persons in the two study groups at baseline

	Care as usual (*n* = 232)	**FFF approach (*n* = 232)**
Characteristics		
Age	82.41 (5.16)	82.45 (5.44)
Sex (female)	168 (72.4%)	168 (72.4%)
Marital status (single)	160 (69.0%)	134 (57.8%)*
Education (low)	97 (41.8%)	97 (41.8%)
Frailty score (TFI)	7.38 (2.39)	7.38 (2.40)
Frail (TFI score ≥ 5)	219 (94.4%)	219 (94.4%)
Multimorbidity (≥ 2 conditions)	208 (89.7%)	215 (92.6%)

Values are presented as mean (SD) or number (%)
TFI: Tilburg Frailty Indicator (range, 0-15)
Independent samples *t*-tests or Chi-squared tests
*$p < 0.05$ (two-tailed)

Table 3 shows the mean QALYs (with utilities based on the EQ-5D) and mean well-being scores (SPF-ILs) at T0 and T1 using the imputed dataset. Independent samples *t*-tests showed no statistically significant differences in QALYs between groups at T0 or T1 (univariate analysis). Paired sample *t*-tests showed a statistically significant improvement in QALYs over time in the control group (Δ0.05; $p < 0.05$), but not in the intervention group (Δ0.04; $p = 0.07$). Without imputation of missing values, the data also showed a significant improvement in terms of QALYs in the intervention group over time (paired sample *t*-test, Δ0.05; $p < 0.05$). Well-being did not differ significantly at T0 or T1 between the control and intervention groups, or over time in either group. Additional file 2: Table S2 displays the mean QALYs and SPF-ILs results of the univariate analyses based on data without imputation of missing values. Analyses based on data of matched participants, i.e., pairs with complete data, yielded comparable findings; independent samples *t*-tests showed no significant differences in mean QALYs and mean well-being scores between the groups at T0 and T1 (see Additional file 3: Tables S4-S7).

Table 3 Well-being and QALYs at baseline (T0) and 12 months (T1)

		Care as usual (*n* = 232)	FFF approach (*n* = 232)
Outcome measures			
Well-being (SPF-ILs)	T0	2.62 (0.50)	2.63 (0.49)
	T1	2.67 (0.49)	2.59 (0.46)
QALYs (utilities based on EQ-5D-3L)	T0	0.66 (0.24)	0.63 (0.26)
	T1	0.71 (0.20)*[a]	0.67 (0.24)

Values are presented as mean (SD)
SPF-ILs: Social Production Function Instrument for the Level of well-being short (range, 1-4); EQ-5D-3L: five-dimensional three-level EuroQol (range for utilities, -0.33-1)
Data from univariate analyses after imputation of missing values
Paired sample *t*-tests or independent samples *t*-tests
*$p < 0.05$ (two-tailed)
[a] Significant improvement in QALYs in the control group over time based on paired data

Multilevel analyses of SPF-ILs scores adjusted for background variables and baseline values showed a small but significant difference between the intervention group and control group for well-being at follow-up, in favor of the control group (-0.09 (with imputation) and -0.10 (without imputation)). No significant differences between the groups in terms of QALYs were observed (-0.03 (with imputation) and -0.02 (without imputation)) (Additional file 4: Tables S8-S11). Regression analyses to investigate multivariable relationships among the variables yielded comparable results as the multilevel analyses (details not shown). The multilevel analyses were redone for the propensity score matched group which showed a significant difference between the groups for well-being in favor of the control group (-0.09 (with imputation) and -0.10 (without imputation)). We found no significant differences in QALYs between the intervention group and control group (-0.03 (with imputation) and -0.02 (without imputation)). For details see Additional file 5: Tables S12-S19.

For the imputed dataset, mean total costs were 7717 euros (SD, 9824 euros) in the control group and 9182 euros (SD, 11,754 euros) in the intervention group at baseline (independent samples *t*-test, $p = 0.15$; Mann-Whitney *U*-test, $U = 28{,}618.50$, $t = 1.18$, $p = 0.24$; Table 4). At 12 months, mean total costs were significantly higher in the intervention group (11,659 [SD, 14,600] euros; including intervention costs) than in the control group (8902 [SD, 11,227] euros) (independent samples *t*-test, $p < 0.05$; Table 5). In addition, differences in the median total costs at follow-up were statistically significant (Mann-Whitney *U*-test, $U = 29{,}952.00$, $t = 2.11$, $p < 0.05$). The mean total costs increased significantly over time in the intervention group (paired sample *t*-test, $p < 0.05$), but not in the control group (paired sample *t*-test, $p = 0.14$). The difference in median costs between T0 and T1 was significant in the intervention group (related-samples Wilcoxon signed rank test, $t = 3.18$, $p < 0.05$) and in the control group (related-samples Wilcoxon signed rank test, $t = 2.34$, $p < 0.05$). Based on the data without imputation of missing values, no statistically significant differences in total costs between the control and intervention groups were found at

Table 4 Healthcare use and costs (in euros) per patient per year in the intervention and control groups at baseline

	Care as usual (*n* = 232)		**FFF approach (*n* = 232)**	
	Mean use[a] (SD)	Total costs (SD) in €	Mean use[a] (SD)	Total costs (SD) in €
Healthcare				
Hospital (days)	1.87 (4.90)	893.66 (2327.38)	1.76 (5.53)	845.29 (2634.78)
Consultations with the GP	3.51 (2.93)	116.43 (94.87)	3.80 (3.90)	126.25 (126.85)
Consultations out-of-hours GP	0.23 (0.67)	22.12 (63.01)	0.28 (0.70)	26.74 (65.77)
Professional homecare (hours per week)				
- Household activities (homecare or personal budget)	1.58 (1.77)	1780.95 (1967.73)	1.67 (1.76)	1887.95 (1955.74)
- Household activities (private)	0.52 (1.20)	582.04 (1320.02)	0.59 (1.80)	664.86 (1988.32)
- Personal care	0.88 (1.89)	2315.93 (4766.32)	1.04 (2.22)	2731.71 (5583.19)
- Nursing care	0.28 (1.48)	1085.97 (5512.92)	0.29 (1.57)	1108.73 (5757.76)
Care home (weeks)	0.11 (0.96)	129.16 (1128.74)	0.13 (1.37)	151.08 (1613.16)
Nursing home (weeks)	0.07 (0.71)	77.49 (838.43)	0.14 (1.09)	162.03 (1285.98)
Elderly day care (days per week)	0.03 (0.27)	213.34 (1889.62)	0.09 (0.49)	606.89 (3397.51)
Day care treatment (days per week)	0.00 (0.00)	0.0 (0.0)	0.03 (0.23)	375.02 (3269.36)
Physiotherapist (consultations)	6.77 (15.34)	224.68 (506.64)	6.75 (16.22)	224.06 (537.29)
Exercise therapist (consultations)	0.28 (1.94)	9.41 (65.98)	0.72 (5.77)	24.75 (195.62)
Medical specialist (consultations)	2.71 (4.58)	248.02 (408.44)	2.33 (3.36)	213.07 (301.12)
Social worker (sessions)	0.09 (1.03)	6.05 (66.81)	0.02 (0.21)	1.14 (13.56)
Psychologist or psychiatrist (sessions)	0.06 (0.47)	3.99 (29.69)	0.25 (1.30)	15.96 (83.10)
Assistive aids and in-home modifications				
- Wheelchair	0.03 (0.18)	1.63 (8.65)	0.04 (0.20)	2.04 (9.63)
- Alarm system	0.06 (0.25)	1.61 (6.14)	0.06 (0.23)	1.40 (5.74)
- Wheeled walker	0.09 (0.29)	1.86 (5.91)	0.13 (0.34)	2.66 (6.91)
- Stairlift	0.0 (0.0)	0.0 (0.0)	0.02 (0.15)	6.71 (45.30)
- Adjusted doorsteps	0.004 (0.07)	0.08 (1.23)	0.02 (0.13)	0.32 (2.44)
- Adjusted bathroom	0.09 (0.29)	3.31 (10.24)	0.11 (0.31)	3.76 (10.84)
Mean total costs[b]		7717.72 (9824.92)		9182.42 (11,754.75)

[a]Means (SDs) were calculated including persons without healthcare utilization; [b]Mean total costs calculated after imputation of missing healthcare costs

baseline (independent samples *t*-test, $p = 0.15$; Mann-Whitney *U*-test, $U = 17{,}165.50$, $t = 0.60$, $p = 0.55$) and 12 months (independent samples *t*-test, $p = 0.09$; Mann-Whitney *U*-test, $U = 14{,}375.50$, $t = 1.09$, $p = 0.28$). For details see Additional file 2: Table S3. In addition, univariate analyses for the propensity score matched group yielded comparable results; for the imputed dataset mean total costs were significantly higher in the intervention group compared with the control group at 12 months. Based on data without imputation of missing values, no significant differences in mean total costs between groups were observed at both time points. Univariate analyses based on data of matched participants, i.e., pairs with complete data, showed no significant difference in mean total costs between the groups at baseline and follow-up. See Additional file 3: Tables S4-S7.

Using the imputed dataset, estimated differences in effectiveness and costs were both in favor of usual care, producing an ICER of -14,788 euros per SPF-ILs point and an ICUR of -126,711 euros per QALY, indicating the FFF approach is inferior in both approaches. In Figure 2 (cost-effectiveness plane for costs versus effects in terms of well-being; SPF-ILs), 0.9% of all bootstrapped ICERs appear in the southeast quadrant (dominance; FFF approach is more effective and less costly), 78.9% appear in the northwest quadrant (inferiority; FFF intervention is more expensive and less effective), 1.5% appear in the northeast quadrant (FFF intervention is more effective, but also more expensive) and 18.7% appear in the southwest quadrant (FFF intervention is less costly, but also less effective). The probability that the FFF approach is cost-effective ranges between 0.9% and 21.1%, depending on the cost-effectiveness ratio a decision maker could apply for policy decisions. In Figure 3 (cost-effectiveness plane for costs versus effects in terms of QALYs), 9.0% of bootstrapped ICURs are located in the southeast quadrant, 54.4% appear in the northwest quadrant, 26.1% are located in the northeast quadrant, and 10.5% are located in the southeast quadrant. The probability that the FFF approach is cost-effective ranges between 9.0% and 45.6%, depending on the cost-effectiveness ratio applied.

Table 5 Healthcare use and costs (in euros) per patient per year in the intervention and control groups at 12 months

	Care as usual (*n* = 176)		**FFF approach (*n* = 182)**	
	Mean use[a] (SD)	Total costs (SD) in €	Mean use[a] (SD)	Total costs (SD) in €
Healthcare				
Hospital (days)	2.66 (6.92)	1275.14 (3305.59)	2.14 (9.55)	1026.89 (4546.80)
Consultations with the GP	3.57 (3.41)	118.61 (111.78)	3.83 (3.44)	127.14 (113.30)
Consultations out-of-hours GP	0.25 (0.88)	24.23 (82.89)	0.22 (0.60)	21.05 (56.49)
Professional homecare (hours per week)				
- Household activities (homecare or personal budget)	1.16 (1.50)	1302.25 (1671.23)	1.58 (1.63)	1772.57 (1816.37)
- Household activities (private)	0.76 (1.37)	850.15 (1520.05)	0.46 (1.21)	520.28 (1344.72)
- Personal care	0.92 (1.91)	2393.81 (4928.75)	1.37 (2.83)	3574.16 (7270.45)
- Nursing care	0.11 (0.50)	432.95 (1871.74)	0.31 (1.33)	1182.55 (4976.57)
Care home (weeks)	0.20 (1.27)	236.61 (1496.48)	0.17 (1.18)	197.18 (1387.62)
Nursing home (weeks)	0.09 (0.81)	102.85 (962.21)	0.28 (2.15)	330.47 (2524.32)
Elderly day care (days per week)	0.05 (0.37)	358.45 (2624.88)	0.05 (0.33)	350.48 (2361.89)
Day care treatment (days per week)	0.02 (0.23)	246.11 (3264.99)	0.04 (0.30)	641.70 (4244.80)
Physiotherapist (consultations)	6.01 (10.89)	199.39 (361.68)	8.64 (18.07)	286.74 (594.85)
Exercise therapist (consultations)	0.31 (3.48)	10.75 (118.69)	1.36 (9.63)	46.36 (327.42)
Medical specialist (consultations)	2.65 (4.07)	242.74 (371.38)	2.25 (3.17)	227.60 (287.96)
Social worker (sessions)	0.06 (0.45)	3.72 (29.43)	0.45 (4.06)	29.59 (263.51)
Psychologist or psychiatrist (sessions)	0.04 (0.38)	2.58 (24.20)	0.22 (1.20)	13.95 (76.65)
Assistive aids and in-home modifications				
- Wheelchair	0.01 (0.11)	0.54 (5.03)	0.03 (0.18)	1.57 (8.47)
- Alarm system	0.06 (0.23)	1.41 (5.78)	0.08 (0.28)	2.06 (6.87)
- Wheeled walker	0.07 (0.25)	1.40 (5.20)	0.09 (0.29)	1.93 (6.00)
- Stairlift	0.01 (0.11)	3.54 (33.09)	0.02 (0.13)	5.16 (39.74)
- Adjusted doorsteps	0.02 (0.15)	0.42 (2.79)	0.0 (0.0)	0.0 (0.0)
- Adjusted bathroom	0.09 (0.28)	2.97 (9.76)	0.03 (0.16)	0.96 (5.72)
Mean total costs[b]		8902.06 (11,227.42)		11,426.21 (14,600.79)
Mean total intervention costs		n/a		233

[a]Means (SDs) were calculated including persons without healthcare utilization; [b]Mean total costs calculated after imputation of missing healthcare costs including persons lost to follow-up between T0 and T1 (*n* = 50 in the intervention group and *n* = 56 in the control group)

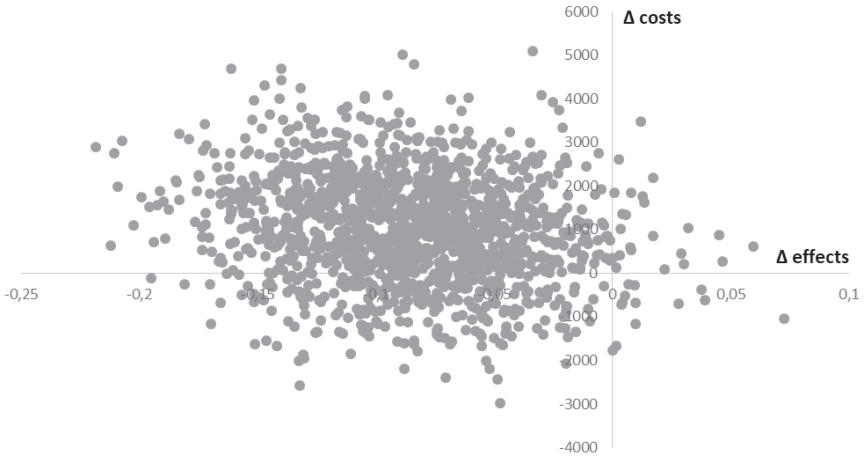

Figure 2 Cost-effectiveness plane for costs (in euros) versus effects (SPF-ILs; range, 1-4) adjusted for baseline differences; data after imputation of missing values

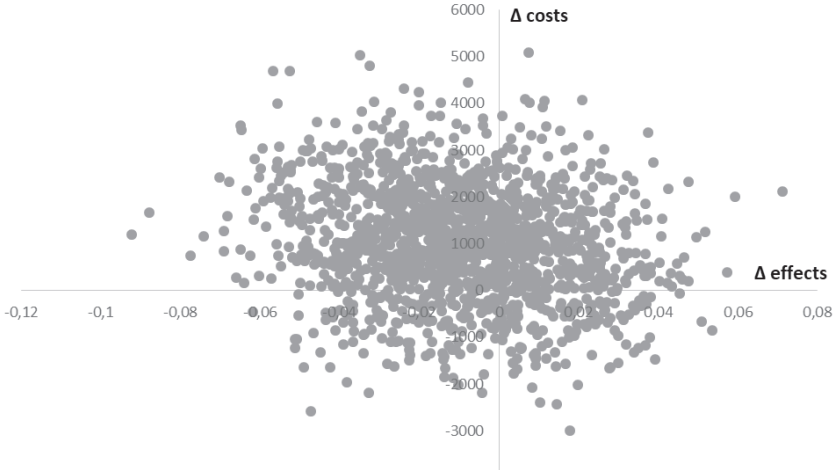

Figure 3 Cost-effectiveness plane for costs (in euros) versus effects (QALYs; range, -0.33-1) adjusted for baseline differences; data after imputation of missing values

Although different analyses (e.g., univariate, multilevel, and propensity score matched analyses, with and without imputation) showed slightly different results with respect to estimated costs and effects, the data suggest that the FFF approach is most likely not cost-effective compared with usual primary care in the Netherlands in terms of well-being and QALYs over a 12 month-period, irrespective of analytical approach and method of handling missing values.

DISCUSSION

The results of our economic evaluation indicate that proactive, integrated care for community-dwelling frail older persons as provided in the FFF program is most likely not a cost-effective initiative compared with usual primary care in the Netherlands, in terms of well-being and QALYs over a 12-month period. Our results are in line with outcomes of other studies investigating the cost-effectiveness of integrated care for frail older persons in the primary care setting in the Netherlands (e.g. Hoogendijk, 2016). The comparability of integrated care programs and evaluation studies is limited due to differences in study populations, interventions and outcomes (Looman et al., 2018).

One explanation for the lack of effect may be the conceivably small difference between the FFF approach and usual primary care services in the Netherlands. There are indications that reforms in the primary care system in the Netherlands resulted in developments in the control GP practices to improve their care delivery. Although these practices did not provide care and support according to the FFF approach, several control GP practices implemented interventions, such as systematic follow-up of older adults and multidisciplinary consultation, during the study period (Vestjens et al., 2018b). In addition, the lack of effectiveness of complex interventions may be partly due to failure to (fully) implement the programs as intended (Øvretveit & Gustafson, 2002). Indeed, we have found suboptimal implementation of intervention components in GP practices organizing care according to the FFF approach (Vestjens et al., 2018b). Most interventions, and especially complex care programs like the FFF approach, require extensive time and effort to achieve full implementation (Faes, Reelick, Esselink, & Rikkert, 2010; van de Wetering, Olde Rikkert, van der Wilt, & Adang, 2014). We noted differences among intervention GP practices with respect to the implementation and execution of the FFF program, including differences in the selection of older persons for proactive screening, the (number of) professionals involved in screening procedures, the organization of multidisciplinary consultations (e.g., frequency, number of patients discussed, (type of) professionals involved), and (the organization) of long-term follow-up of frail older persons (Vestjens et al., 2018b). These differences may obscure the added value of the FFF approach in terms of QALYs and well-being. Analyses based on matched participants of intervention GP practices with a high degree of implementation of (FFF-related) interventions (i.e., practices that implemented more interventions than average) (Vestjens et al., 2018b), showed that the mean SPF-ILs score was higher, indicating greater subjective well-being, compared with participants in other intervention GP practices (Additional file 6: Tables S20-S23). Therefore, the degree of implementation may have an effect on effectiveness of complex interventions like the FFF approach. For a detailed description of implemented (FFF-related) interventions in the GP practices see Vestjens, Cramm and Nieboer (2018b). Even with optimal implementation of such interventions, clinically meaningful improvement in outcomes is not guaranteed in the short term (van de Wetering et al., 2014). The length of the study period,

being 12 months, may have been too short to detect improvements in older persons' outcomes (Eklund & Wilhelmson, 2009). Especially in the short term, variations in costs and effects can be expected (van de Wetering, Woertman, & Adang, 2012). Patterns of healthcare utilization show, for example, a substantial increase in primary and hospital care utilization in frail older persons (Ilinca & Calciolari, 2015). Consequently, the identification of frailty and introduction of interventions to postpone or prevent a decline into worse health states (Lang, Michel, & Zekry, 2009) may result in higher healthcare costs in the short term, but might reduce use of more expensive healthcare services and adverse outcomes in the long term (Ilinca & Calciolari, 2015). Another explanation might be related to the heterogeneity of the population of older persons considered to be frail. No consensus has been reached about the conceptualization and measurement of frailty in older persons. Major approaches include the frailty phenotype, which focuses on physical aspects of frailty (Fried et al., 2001; Fried, Ferrucci, Darer, Williamson, & Anderson, 2004), and a multidimensional approach to frailty including, for example, physical, social, and psychological factors (Gobbens, van Assen, Luijkx, & Schols, 2012). Although we used a multidimensional approach to assess frailty in this study, Looman and colleagues (2018) showed that distinction among domains of frailty does not fully capture its complexity. The TFI (Gobbens et al., 2010), which we used to measure (the degree of) frailty in older persons, does not discern among types of underlying problems in these domains or weigh different domains (Looman et al., 2018). Researchers have suggested that the heterogeneity of frailty should be taken into account in the evaluation of integrated care programs (Looman et al., 2018), especially to better understand how interventions can be optimally aligned with different well-being needs of frail older persons (Nieboer & Cramm, 2018).

Strengths and limitations

One strength of this study is that we measured the subjective well-being of community-dwelling frail older persons along with health-related quality of life. QALY measures in economic evaluations are based predominantly on aspects of health-related quality of life alone. Care programs for older persons may also aim to improve non-health related domains of quality of life. Thus, the sole use of health-related quality of life measures in economic evaluations may not be appropriate, as it may not capture broader benefits of such interventions beyond health (Makai, Brouwer, Koopmanschap, Stolk, & Nieboer, 2014). Consequently, Makai and colleagues (2014) recommended the inclusion of well-being measures with health measures like the EQ-5D in economic evaluations of care programs for older persons. We did so, although the different perspectives did not lead to different recommendations regarding the preference of the FFF intervention. Another strength of our study is the quality of the data gathered. We used dedicated, trained interviewers who collected the data in face-to-face interviews during home visits. All interviewers lived in the western North Brabant Province, assuring a cultural fit, and had backgrounds in healthcare. Moreover, we used a detailed resource use questionnaire covering a wide range of healthcare categories to assess healthcare utilization at the individual level. We

included care disciplines that are frequently not included in studies, such as paramedical (e.g., physiotherapy) and psychological care, which may have increased content validity. Our study also has several potential limitations. First, we used a quasi-experimental design, which is more susceptible to bias due to the absence of randomization (Eccles, Grimshaw, Campbell, & Ramsay, 2003). To increase comparability of the intervention and control groups, we used one-to-one matching based on key covariables. Despite this effort, the control group contained significantly more single persons than did the intervention group. Moreover, we noted indications (based on interviews with healthcare professionals and (project) managers) of a strong motivation to organize care and support for the elderly population in some control GP practices. Professionals in these practices may have perceived that the FFF program would not add value to their usual care practices and were therefore perhaps especially eager to participate in the control group. Second, recall bias might have occurred due to the retrospective assessment of service use in the preceding 12 months. Under-reporting and over-reporting of effects have been found in previous research in which health service utilization was assessed retrospectively (Brusco & Watts, 2015). Unfortunately, we were not able to include administrative or registry data to complement the reported healthcare service use. Nonetheless, given the same data collection procedure in both groups, we have no indication that recall bias varied significantly between the intervention and control groups. Third, mean standard costs of the FFF program were estimated, instead of assessing intervention costs for individual participants. We attempted to avoid duplicate inclusion of costs by including service use related to the follow-up of older patients in the FFF context only in healthcare costs, and not in intervention costs. The implementation and execution of (elements of) the FFF approach differed among intervention GP practices (Vestjens et al., 2018b). However, results of sensitivity analyses in which intervention costs were varied to test the robustness of the estimated ICER and ICUR did not affect the overall recommendation regarding the preference of the FFF program. Fourth, despite recommendations (Hakkaart-van Roijen et al., 2015), we were unable to collect data on informal care due to practical considerations. The impact of informal care costs on the mean total costs in the intervention and control groups remains unknown, although we found no indication (based on interviews with healthcare professionals, (project) managers, and frail older persons) of unequal distribution of informal care costs between groups. In addition, we did not account for medication costs in either group or intervention training and implementation costs in the FFF group. We have noted no indication that medication use differed between groups.

Conclusions

Our study findings add to the current unconvincing body of evidence with respect to the cost-effectiveness of integrated primary care aimed at community-dwelling frail older persons. Future economic evaluations should use sufficiently long follow-up periods to assess durable costs and effects, adopt a societal perspective, and take into account the degree of implementation and the

target population. Continued effort is required to unravel the black box of integrated care and find (cost-)effective (components of) programs for community-dwelling frail older persons.

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APPENDIX

Additional file 1. Overview of missing data

Table S1 Number of participants with missing data on the EQ-5D-3L, SPF-ILs and resource use questionnaire at T0 and T1 (total *n* = 464)

	T0			T1		
	EQ-5D-3L	SPF-ILs	Resource use	EQ-5D-3L	SPF-ILs	Resource use
Data completely missing[a]	3	4	0	108[c]	108[c]	106[c]
Data partially missing[b]	1	4	100	0	1	30

SPF-ILs: Social Production Function Instrument for the Level of well-being short; EQ-5D-3L: five-dimensional three-level EuroQol. [a]Data completely missing = none of the items in the questionnaires are answered. [b]Data partially missing EQ-5D-3L = 1-4 missings of the 5 questions on the EQ-5D-3L; Data partially missing SPF-ILs = 6-14 missings of the 15 questions on the SPF-ILs; Data partially missing resource use = 1-21 missings of the 22 questions on the resource use instrument. [c]Including persons lost to follow-up between T0 and T1 (total *n* = 106, see Fig. 1)

Additional file 2. Outcomes and cost estimates without imputation of missing values

Table S2 Well-being and QALYs at baseline (T0) and 12 months (T1) ***without*** data imputation

		Care as usual	***n***	**FFF approach**	***n***
Outcome measures					
Well-being (SPF-ILs)	T0	2.62 (0.50)	230	2.63 (0.50)	226
	T1	2.71 (0.53)	176	2.60 (0.50)	179
QALYs (utilities based on EQ-5D-3L)	T0	0.66 (0.25)	230	0.63 (0.26)	230
	T1	0.72 (0.21)*[a]	176	0.70 (0.25)*[a]	180

Values are presented as mean (SD)
SPF-ILs: Social Production Function Instrument for the Level of well-being short (range, 1-4); EQ-5D-3L: five-dimensional three-level EuroQol (range for utilities, -0.33-1)
Data from univariate analyses ***without*** imputation of missing values
*$p < 0.05$ (two-tailed)
Paired sample *t*-tests or independent samples *t*-tests
[a] Significant improvement in QALYs in the control group and intervention group over time based on paired data

Table S3 Healthcare costs (in euros) at baseline (T0) and 12 months (T1) ***without*** data imputation

	Care as usual	***n***	**FFF approach**	***n***
Healthcare costs				
Mean total costs at T0[a]	7023.18 (9499.67)	180	8635.90 (11,735.34)	184
Mean total costs at T1[a]	7798.13 (10,442.08)	160	10,209.36 (14,598.36)	168

[a]Means (SDs) were calculated including persons without healthcare utilization

Additional file 3. Analyses based on matched participants

Table S4 Analyses based on matched participants, i.e., pairs with complete data on EQ-5D-3L and resource use, at T0 (n = 146 pairs) and at T1 (n = 111 pairs)

		Care as usual	FFF approach
QALYs (utilities based on EQ-5D-3L)	T0	0.66 (0.24)	0.63 (0.24)
	T1	0.74 (0.20)	0.71 (0.23)
Mean total costs[a] (resource use questionnaire)	T0	6742.44 (9958.21)	8829.61 (11,594.37)
	T1	8330.41 (11,368.95)	9029.57 (12,942.87)

Values are presented as mean (SD); [a]Means (SDs) were calculated including persons without healthcare utilization
EQ-5D-3L: five-dimensional three-level EuroQol (range for utilities, -0.33-1)
*$p < 0.05$ (two-tailed)
Independent samples t-tests or Mann-Whitney U-tests

Table S5 Analyses based on matched participants, i.e., pairs with complete data on SPF-ILs and resource use, at T0 (n = 145 pairs) and T1 (n = 111 pairs)

		Care as usual	FFF approach
Well-being (SPF-ILs)	T0	2.64 (0.49)	2.64 (0.47)
	T1	2.75 (0.53)	2.62 (0.53)
Mean total costs[a] (resource use questionnaire)	T0	6878.86 (10,038.26)	8651.38 (11,287.80)
	T1	8330.41 (11,368.95)	9029.57 (12,942.87)

Values are presented as mean (SD); [a]Means (SDs) were calculated including persons without healthcare utilization
SPF-ILs: Social Production Function Instrument for the Level of well-being short (range, 1-4)
*$p < 0.05$ (two-tailed)
Independent samples t-tests or Mann-Whitney U-tests

Table S6 Analyses based on matched participants, i.e., pairs with complete data on EQ-5D-3L and resource use on ***both*** T0 and T1 (n = 71 pairs)

		Care as usual	FFF approach
QALYs (utilities based on EQ-5D-3L)	T0	0.68 (0.24)	0.68 (0.22)
	T1	0.74 (0.21)	0.73 (0.21)
Mean total costs[a] (resource use questionnaire)	T0	6071.65 (9243.57)	7435.85 (9709.72)
	T1	7848.30 (11,386.60)	9038.16 (13,728.47)

Values are presented as mean (SD); [a]Means (SDs) were calculated including persons without healthcare utilization
EQ-5D-3L: five-dimensional three-level EuroQol (range for utilities, -0.33-1)
*$p < 0.05$ (two-tailed)
Independent samples t-tests or Mann-Whitney U-tests

Table S7 Analyses based on matched participants, i.e., pairs with complete data on SPF-ILs and resource use on ***both*** T0 and T1 (n = 70 pairs)

		Care as usual	FFF approach
Well-being (SPF-ILs)	T0	2.74 (0.49)	2.68 (0.48)
	T1	2.78 (0.52)	2.65 (0.53)
Mean total costs[a] (resource use questionnaire)	T0	6107.91 (9305.23)	7508.36 (9761.75)
	T1	7952.83 (11,434.45)	9135.14 (13,803.08)

Values are presented as mean (SD); [a]Means (SDs) were calculated including persons without healthcare utilization
SPF-ILs: Social Production Function Instrument for the Level of well-being short (range, 1-4)
*$p < 0.05$ (two-tailed)
Independent samples t-tests or Mann-Whitney U-tests

Additional file 4. Multilevel analyses

Table S8 Multilevel analysis of well-being (SPF-ILs) at T1, after data imputation (n = 464)

	B	SE
Constant	2.20***	0.31
Intervention group	-0.09**	0.04
Age	-0.01	0.003
Sex (female)	0.03	0.04
Educational level (low)	-0.03	0.04
Marital status (single)	-0.07	0.04
Frailty score	-0.03***	0.01
Multimorbidity	-0.02	0.05
Well-being at T0	0.48***	0.04

SE, standard error; *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)
Analysis shows the impact of intervention group, adjusted for age, sex, educational level, marital status, frailty score, multimorbidity, well-being at T0 and GP practice (random effect)

Table S9 Multilevel analysis of well-being (SPF-ILs) at T1, ***without*** data imputation (n = 354)

	B	SE
Constant	2.28***	0.44
Intervention group	-0.10*	0.05
Age	-0.01	0.01
Sex (female)	0.04	0.06
Educational level (low)	-0.03	0.05
Marital status (single)	-0.08	0.05
Frailty score	-0.04***	0.01
Multimorbidity	-0.03	0.08
Well-being at T0	0.47***	0.05

SE, standard error; *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)
Analysis shows the impact of intervention group, adjusted for age, sex, educational level, marital status, frailty score, multimorbidity, well-being at T0 and GP practice (random effect)

Table S10 Multilevel analysis of QALYs at T1, after data imputation (n = 464)

	B	SE
Constant	1.07***	0.16
Intervention group	-0.03	0.02
Age	-0.01**	0.002
Sex (female)	-0.04	0.02
Educational level (low)	0.04*	0.02
Marital status (single)	0.02	0.02
Frailty score	-0.01*	0.01
Multimorbidity	-0.02	0.03
QALYs at T0	0.27***	0.04

SE, standard error; *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)
Analysis shows the impact of intervention group, adjusted for age, sex, educational level, marital status, frailty score, multimorbidity, QALYs at T0 and GP practice (random effect)

Table S11 Multilevel analysis of QALYs at T1, ***without*** data imputation (n = 355)

	B	SE
Constant	0.95***	0.19
Intervention group	-0.02	0.02
Age	-0.004	0.002
Sex (female)	-0.06*	0.03
Educational level (low)	0.04	0.02
Marital status (single)	0.03	0.03
Frailty score	-0.01*	0.01
Multimorbidity	-0.04	0.04
QALYs at T0	0.35***	0.05

SE, standard error; *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)
Analysis shows the impact of intervention group, adjusted for age, sex, educational level, marital status, frailty score, multimorbidity, QALYs at T0 and GP practice (random effect)

Additional file 5. Propensity score matching

Table S12 Multilevel analysis well-being, using propensity score matching (Model 1)[a] and data imputation (*n* = 463)

	B	SE
Constant	2.19***	0.31
Intervention group	-0.09*	0.04
Age	-0.01	0.004
Sex (female)	0.03	0.04
Educational level (low)	-0.03	0.04
Marital status (single)	-0.07	0.04
Frailty score	-0.03***	0.01
Multimorbidity	-0.02	0.05
Well-being at T0 (SPF-ILs)	0.48***	0.04

SE, standard error; *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)
[a]Logistic regression model 1 with covariates: age, sex, marital status, educational level, frailty score, and multimorbidity

Table S13 Multilevel analysis well-being, using propensity score matching (Model 2)[a] and data imputation (*n* = 459)

	B	SE
Constant	2.16***	0.32
Intervention group	-0.09*	0.04
Age	-0.01	0.004
Sex (female)	0.04	0.04
Educational level (low)	-0.03	0.04
Marital status (single)	-0.08	0.04
Frailty score	-0.03***	0.01
Multimorbidity	-0.02	0.05
Well-being at T0 (SPF-ILs)	0.49***	0.04

SE, standard error; *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)
[a]Logistic regression model 2 with covariates: age, sex, marital status, educational level, frailty score, and multimorbidity, and baseline SPF-ILs, QALYs and costs

Table S14 Multilevel analysis well-being, using propensity score matching (Model 1)[a] and ***without*** data imputation (n = 353)

	B	SE
Constant	2.27***	0.44
Intervention group	-0.10*	0.05
Age	-0.01	0.01
Sex (female)	0.04	0.06
Educational level (low)	-0.03	0.05
Marital status (single)	-0.08	0.05
Frailty score	-0.04***	0.01
Multimorbidity	-0.03	0.08
Well-being at T0 (SPF-ILs)	0.47***	0.05

SE, standard error; *p < 0.05 (two-tailed); **p < 0.01 (two-tailed); ***p < 0.001 (two-tailed)
[a]Logistic regression model 1 with covariates: age, sex, marital status, educational level, frailty score, and multimorbidity

Table S15 Multilevel analysis well-being, using propensity score matching (Model 2)[a] and ***without*** data imputation (n = 349)

	B	SE
Constant	2.22***	0.44
Intervention group	-0.10*	0.05
Age	-0.01	0.01
Sex (female)	0.05	0.06
Educational level (low)	-0.03	0.05
Marital status (single)	-0.09	0.05
Frailty score	-0.04***	0.01
Multimorbidity	-0.03	0.08
Well-being at T0 (SPF-ILs)	0.49***	0.05

SE, standard error; *p < 0.05 (two-tailed); **p < 0.01 (two-tailed); ***p < 0.001 (two-tailed)
[a]Logistic regression model 2 with covariates: age, sex, marital status, educational level, frailty score, and multimorbidity, and baseline SPF-ILs, QALYs and costs

Table S16 Multilevel analysis QALYs, using propensity score matching (Model 1)[a] and data imputation (*n* = 463)

	B	SE
Constant	1.07***	0.16
Intervention group	-0.03	0.02
Age	-0.01**	0.002
Sex (female)	-0.04	0.02
Educational level (low)	0.04*	0.02
Marital status (single)	0.02	0.02
Frailty score	-0.01*	0.01
Multimorbidity	-0.02	0.03
QALYs at T0 (utilities based on EQ-5D-3L)	0.26***	0.04

SE, standard error; *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)
[a]Logistic regression model 1 with covariates: age, sex, marital status, educational level, frailty score, and multimorbidity

Table S17 Multilevel analysis QALYs, using propensity score matching (Model 2)[a] and data imputation (*n* = 459)

	B	SE
Constant	1.05***	0.16
Intervention group	-0.03	0.02
Age	-0.01**	0.002
Sex (female)	-0.05*	0.02
Educational level (low)	0.04*	0.02
Marital status (single)	0.02	0.02
Frailty score	-0.01*	0.004
Multimorbidity	-0.02	0.03
QALYs at T0 (utilities based on EQ-5D-3L)	0.25***	0.04

SE, standard error; *$p < 0.05$ (two-tailed); **$p < 0.01$ (two-tailed); ***$p < 0.001$ (two-tailed)
[a]Logistic regression model 2 with covariates: age, sex, marital status, educational level, frailty score, and multimorbidity, and baseline SPF-ILs, QALYs and costs

Table S18 Multilevel analysis QALYs, using propensity score matching (Model 1)[a] and ***without*** data imputation (n = 354)

	B	SE
Constant	0.95***	0.19
Intervention group	-0.02	0.02
Age	-0.004	0.002
Sex (female)	-0.06*	0.03
Educational level (low)	0.04	0.02
Marital status (single)	0.03	0.03
Frailty score	-0.01*	0.01
Multimorbidity	-0.04	0.04
QALYs at T0 (utilities based on EQ-5D-3L)	0.35***	0.05

SE, standard error; *p < 0.05 (two-tailed); **p < 0.01 (two-tailed); ***p < 0.001 (two-tailed)

[a]Logistic regression model 1 with covariates: age, sex, marital status, educational level, frailty score, and multimorbidity

Table S19 Multilevel analysis QALYs, using propensity score matching (Model 2)[a] and ***without*** data imputation (n = 351)

	B	SE
Constant	0.91***	0.19
Intervention group	-0.02	0.02
Age	-0.004	0.002
Sex (female)	-0.06*	0.03
Educational level (low)	0.04	0.02
Marital status (single)	0.03	0.03
Frailty score	-0.009	0.01
Multimorbidity	-0.04	0.04
QALYs at T0 (utilities based on EQ-5D-3L)	0.34***	0.05

SE, standard error; *p < 0.05 (two-tailed); **p < 0.01 (two-tailed); ***p < 0.001 (two-tailed)

[a]Logistic regression model 2 with covariates: age, sex, marital status, educational level, frailty score, and multimorbidity, and baseline SPF-ILs, QALYs and costs

Additional file 6. Analyses based on subgroup of intervention GP practices with high degree of implementation

Table S20 Analyses of participants of intervention GP practices with high degree of implementation and matched controls ***without*** data imputation

		Care as usual	*n*	FFF approach	*n*
Outcome measures					
Well-being (SPF-ILs)	T0	2.62 (0.45)	92	2.65 (0.48)	91
	T1	2.70 (0.53)	68	2.70 (0.53)	79
QALYs (utilities based on EQ-5D-3L)	T0	0.66 (0.24)	92	0.64 (0.28)	93
	T1	0.70 (0.23)	68	0.70 (0.25)	80

Values are presented as mean (SD)
SPF-ILs: Social Production Function Instrument for the Level of well-being short (range, 1-4); EQ-5D-3L: five-dimensional three-level EuroQol (range for utilities, -0.33-1)
*$p < 0.05$ (two-tailed)
Independent samples *t*-tests

Table S21 Healthcare costs (in euros) of participants of intervention GP practices with high degree of implementation and matched controls ***without*** data imputation

	Care as usual	*n*	FFF approach	*n*
Healthcare costs				
Mean total costs at T0[a]	8085.43 (12,226.46)	70	7736.96 (10,915.11)	80
Mean total costs at T1[a]	8989.07 (12,264.61)	65	9942.37 (14,985.58)	76

[a]Means (SDs) were calculated including persons without healthcare utilization

Table S22 Analyses of participants of intervention GP practices with high degree of implementation and matched controls, after data imputation

		Care as usual	*n*	FFF approach	*n*
Outcome measures					
Well-being (SPF-ILs)	T0	2.62 (0.45)	93	2.65 (0.48)	93
	T1	2.67 (0.48)	93	2.67 (0.51)	93
QALYs (utilities based on EQ-5D-3L)	T0	0.66 (0.23)	93	0.64 (0.28)	93
	T1	0.70 (0.21)	93	0.68 (0.25)	93

Values are presented as mean (SD)
SPF-ILs: Social Production Function Instrument for the Level of well-being short (range, 1-4); EQ-5D-3L: five-dimensional three-level EuroQol (range for utilities, -0.33-1)
*$p < 0.05$ (two-tailed)
Independent samples *t*-tests

Table S23 Healthcare costs (in euros) of participants of intervention GP practices with high degree of implementation and matched controls, after data imputation

	Care as usual	*n*	FFF approach	*n*
Healthcare costs				
Mean total costs at T0[a]	8940.79 (11,902.79)	93	8804.80 (12,128.38)	93
Mean total costs at T1[a]	10,337.77 (12,419.17)	93	10,060.00 (13,858.17)	93

[a]Means (SDs) were calculated including persons without healthcare utilization

Chapter 7

General discussion

INTRODUCTION

The main objective of this thesis was to evaluate the added value of a proactive, integrated primary care approach for community-dwelling frail older persons aged 75 years and older in the Dutch primary care setting; the *Finding and Follow-up of Frail older persons (FFF)* approach. The aim of the multicomponent FFF approach is to maintain or improve well-being in this population through proactive case finding of frail older persons in the community, case management, medication review, self-management support, and multidisciplinary teamwork led by general practitioners (GPs). In this thesis, (elements of) a newly developed theoretical model were used to evaluate the added value of the FFF approach in terms of care quality, cognitive and behavioral abilities of healthcare professionals and frail older persons, and (cost-)effectiveness. In this chapter, the main findings of the research conducted for this thesis are discussed. Furthermore, the theoretical and methodological considerations, and the implications of the research for practice and future research are described.

Main research findings

Research aim 1: To develop a theoretical model to facilitate theory-guided evaluation of integrated primary care approaches for community-dwelling frail older people.

The theoretical model developed as part of the thesis research facilitates examination of the mechanisms assumed to underlie favorable outcomes and the effectiveness of integrated primary care delivery to community-dwelling frail older persons (Chapter 2; Figure 1).

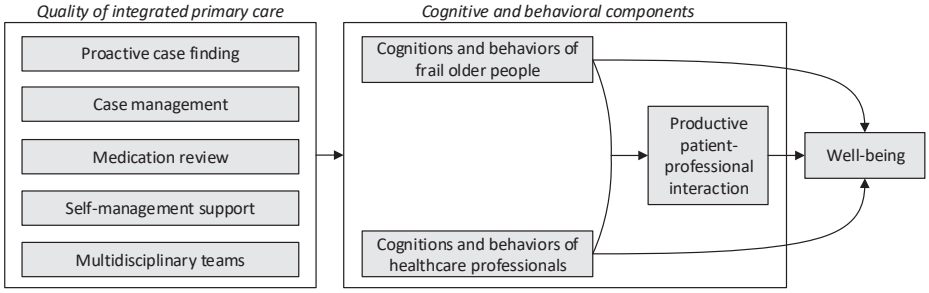

Figure 1. Theoretical model to facilitate a theory-based evaluation of integrated primary care approaches for community-dwelling frail older persons (Chapter 2)

The use of an organizational approach to (re)design healthcare involves the incorporation of interrelated key components in multiple domains that are assumed to be essential for the achievement of high-quality integrated primary care (i.e., proactive case finding, case management, medication reviews, self-management support, and multidisciplinary team working) (Bodenheimer, Wagner, & Grumbach, 2002a, 2002b; Wagner, Austin, & Von Korff, 1996b; Wagner et

al., 2001). These promising elements are used commonly in integrated care approaches for older persons (Briggs, Valentijn, Thiyagarajan, & Araujo de Carvalho, 2018) and are in line with the recommendations of the World Health Organization for integrated health services (WHO, 2016; WHO, 2017). The model, based on existing theory and evidence, shows that underlying mechanisms explaining the effectiveness of integrated primary care in terms of improved well-being include cognitive and behavioral components of the persons that deliver and receive such care (Hartgerink et al., 2013; Lemmens, Nieboer, van Schayck, Asin, & Huijsman, 2008). Using perspectives on organizational knowledge creation (Nonaka, von Krogh, & Voelpel, 2006), situation awareness was identified as a central construct in decision making and performance in this dynamic, complex healthcare setting (Endsley, 2013). Healthcare professionals possess the situated awareness required to fulfill their responsibilities (Endsley, 1995), including sufficient knowledge for optimal care delivery (Wagner et al., 1996b). Moreover, cognitive diversity, reflecting differences in knowledge, beliefs, preferences, and perspectives among professionals, was identified. Complex patient populations may particularly benefit from a multiplicity of knowledge and skills possessed by various healthcare professionals (Miller, Burke, & Glick, 1998). The integration of diverse cognitions increases knowledge development among healthcare professionals working in teams (Miller et al., 1998; Mitchell & Nicholas, 2006). The theoretical model also shows that behavioral components such as coordination and collaboration among diverse healthcare professionals are assumed to influence the effectiveness of integrated care (Hartgerink et al., 2013; Lemmens et al., 2008). Coordination is believed to be essential for performance; effectively coordinated work processes are assumed to enhance outcomes efficiently (Gittell, 2006; Gittell et al., 2000). Coordination was conceptualized using a theory of coordination that emphasizes the importance of underlying relational processes; it holds that coordination entails not only the management of interdependence between tasks (Malone & Crowston, 1994), but also of that between people performing the tasks (Gittell, 2011). The relational coordination theory shares similarities with other intersubjective or relational approaches to coordination (e.g. Bechky, 2006; Faraj & Xiao, 2006; Quinn & Dutton, 2005; Weick & Roberts, 1993), however, specifically conceptualizes relational dynamics of coordination, among others (Gittell, 2011). Using insights from social psychological theories, this approach conceptualizes relational and communication links among healthcare professionals that form the basis of coordinated collective action (Gittell, 2011; Gittell, 2006). Next to cognitions and behaviors of healthcare professionals, cognitive and behavioral components of frail older persons who receive integrated primary care are diverse abilities to manage resources for the satisfaction of well-being needs (Steverink, Lindenberg, & Slaets, 2005). In contrast to various disease-specific self-management approaches focusing on (chronic) health conditions (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Newman, Steed, & Mulligan, 2004), this approach assumes that older persons benefit from broader cognitive (e.g., self-efficacy beliefs) and behavioral (e.g., investment behavior) abilities affecting their overall well-being (Kremers, Steverink, Albersnagel, & Slaets, 2006; Schuurmans, 2004). The model shows that these cognitions and behaviors of healthcare professionals and older persons

are assumed to influence frail older persons' well-being directly and indirectly via enhanced productive patient-professional interactions characterized by communication and good relationship dynamics.

Research aim 2: To identify the relationship between cognitive and behavioral (self-management) abilities of community-dwelling frail older persons and their well-being.
The cross-sectional study described in Chapter 3 showed that community-dwelling frail older persons' self-management abilities were related significantly to their physical, social, and overall well-being. Thus, the strengthening of this population's self-management abilities is expected to be beneficial for their well-being. Moreover, the study showed that the productivity of interactions with GPs, as perceived by frail older persons, was related significantly to their social and overall well-being, even after controlling for self-management abilities. Effect sizes for these relationships, however, were small, and no significant relationship with physical well-being was observed. These findings suggest that GPs may contribute to frail older persons' social and overall well-being by fostering interaction with them.

The findings of this study are in line with previous research showing that greater self-management abilities were related to greater well-being among older people (Cramm et al., 2012; Cramm et al., 2013; Goedendorp & Steverink, 2017; Steverink & Lindenberg, 2008). Effective self-management abilities are assumed to be particularly important for frail older persons, who have more difficulty realizing well-being needs due to declines in resources and opportunities (Steverink, 2014). Our findings suggest, however, that healthcare professionals also have important roles in protecting older persons' well-being and preventing resource loss in old age. Productive interactions with GPs contributed uniquely to frail older persons' well-being, in agreement with previous studies documenting the importance of productive patient-professional interactions for the well-being of chronically ill patients (Cramm & Nieboer, 2015; Kuipers, Cramm, & Nieboer, 2019).

Research aim 3: To evaluate the quality of integrated primary care delivery and usual care delivery, and its association with productive patient-professional interactions.
In the mixed-methods study described in Chapter 4, we assessed (1) the implementation of interventions in several areas of system redesign in GP practices (11 FFF and 4 control), (2) healthcare professionals' perceptions of the quality of primary care, and (3) GPs experiences with the FFF components. The examination of successfully implemented interventions was guided by the six areas of system redesign of the Chronic Care Model (CCM); self-management support, delivery system design, decision support, clinical information systems, healthcare system, and community (Wagner et al., 2001). The study showed that GP practices following the FFF approach implemented on average significantly more interventions falling under the scope of the CCM than did control GP practices.

Several reviews have shown that integrated care programs can have a beneficial impact on the (perceived) care quality (e.g., Baxter et al., 2018; de Bruin et al., 2012; Ouwens, Wollersheim, Hermens, Hulscher, & Grol, 2005). Many quality improvement evaluations based on the CCM have been conducted. In a review, Coleman and colleagues (2009) concluded that integrated programs modelled on (elements of) the CCM generated improvements in primary care quality. Most CCM-based programs have been developed for chronically ill patients; few programs target primary care for (frail) older persons (Boult et al., 2013; Hoogendijk et al., 2016; Spoorenberg, Wynia, Uittenbroek, Kremer, & Reijneveld, 2018). Our study indicated that primary care for frail older persons that is aligned with (elements of) the CCM was associated with higher levels of quality.

The longitudinal survey showed that healthcare professionals perceived that the FFF approach can have positive effects on the quality of primary care. Compared with the perceived quality of care in usual primary care practices, healthcare professionals in the integrated care approach FFF reported higher quality of care at follow-up (overall care quality as well as higher scores on the six separate dimensions of the CCM). This study indicated that proactive, integrated care for community-dwelling frail older persons is associated with greater care quality as perceived by healthcare professionals in the primary care setting.

These findings are in line with those of previous studies, such as Dutch healthcare professionals' perceptions of improved care quality with the implementation of disease management programs (Cramm & Nieboer, 2012; Cramm & Nieboer, 2013) and a CCM-based integrated care program targeting older persons (Uittenbroek, Kremer, Spoorenberg, Reijneveld, & Wynia, 2017). Some of these studies, however, did not involve a control group, which prohibited comparison with the perceived quality of usual primary care.

Qualitative interviews indicated that GPs' main motives for FFF approach implementation were populational aging and transformations in Dutch primary healthcare. Proactive care delivery (e.g., frailty screening) and multidisciplinary collaboration (e.g., consultation) were considered to be particularly important elements of this approach. Differences in the FFF implementation and execution among GP practices were found mainly in screening (e.g., patient selection), multidisciplinary consultation (e.g., disciplines involved), and the organization of long-term follow-up of frail older persons. The lack of structural financing and manpower, and inadequacy of ICT systems were considered to be essential barriers to the implementation and embedding of the FFF approach in general practice.

In line with our findings, a review of CCM implementation (Kadu & Stolee, 2015) revealed variation in the adaptation of (elements of) these programs in primary care organizations. Important barriers to their implementation and maintenance were related to the internal organization set-

ting and corresponded to barriers experienced by GPs in our study (i.e., related predominantly to organization capacity, e.g., lack of financial resources and staff) (Kadu & Stolee, 2015).

In the longitudinal study described in Chapter 5, we assessed (the relationship between) community-dwelling frail older persons' perspectives on the quality of primary care (FFF and usual) in accordance with the CCM and the perceived productivity of patient-professional interactions. The outcomes showed significant improvements in perceived quality of primary care, perceived productive interaction with the GP and practice nurse over time in both the intervention and control group. There were, however, no significant differences in overall quality of care and productive patient-professional interactions between the intervention and control group at baseline and at 12-month follow-up. Perceived care quality was associated significantly with the perceived productivity of interactions with GPs and practice nurses in both groups. This study adds to the existing research by showing that quality of care as perceived by frail older persons enhanced the productivity of their interactions with GPs and practices nurses.

Insufficient attention has been paid to older persons' experiences with care (Briggs et al., 2018). Previous studies have shown that older persons perceive that integrated care provided in accordance with (elements of) the CCM is of greater quality than usual primary care (Boyd et al., 2010; Uittenbroek et al., 2017). Disease management program implementation was also found to significantly improve the experienced quality of care among chronically ill patients (Cramm, Rutten-van Mölken, & Nieboer, 2012; Cramm, Jolani, van Buuren, & Nieboer, 2015). Although our study also showed significant improvements in the perceived quality of primary care among community-dwelling frail older persons, this perception did not differ between the intervention and control groups; quality improvements over time were found in both groups. This finding may be explained by the suboptimal implementation of the FFF approach and quality improvement initiatives (and possibly other trends in primary care) in the control practices during the study period. Nevertheless, previous research has shown that (changes in) care quality as perceived by healthcare professionals improved chronically ill patients' experiences of care delivery over time (Cramm & Nieboer, 2013).

Although evidence supports the ability of CCM-based programs to improve the quality of care, less research has been conducted on the effect of care quality on the productivity of patient-professional interactions. In line with findings from chronically ill patients (Cramm & Nieboer, 2014; Cramm & Nieboer, 2016), we found that high-quality care fosters the productivity of community-dwelling frail older persons' interactions with GPs and practice nurses. Ultimately, such productive interactions lie at the heart of healthcare delivery (Goodwin, 2016) and are considered to be important in enhancing patient outcomes (Wagner et al., 1996b; Wagner et al., 2001; Wagner et al., 2005); indeed found that productive interactions with GPs are related to frail older persons' well-being (Chapter 3).

Research aim 4: To evaluate the integrated primary care approach regarding well-being and determine the (cost-)effectiveness of the approach, relative to the provision of usual primary care to community-dwelling frail older persons.

In the longitudinal study with a matched quasi-experimental design described in Chapter 6, the (cost-)effectiveness of the FFF approach was compared with that of usual primary care for community-dwelling frail older persons. Cost-utility and cost-effectiveness analyses were conducted. Different analyses (including univariate, multilevel and propensity score matched analyses) yielded slightly different results regarding the estimated costs and effects. Irrespective of the approaches to analysis and missing data, however, the findings suggest that the FFF approach is most likely not (cost-)effective compared with usual primary care delivery in terms of quality-adjusted life years (QALYs) and subjective well-being over a 12 month-period.

These findings are in line with the inconclusive evidence for the (cost-)effectiveness of proactive integrated care interventions (e.g. Blom et al., 2018; de Bruin et al., 2012; Eklund & Wilhelmson, 2009; Hopman et al., 2016; Low, Yap, & Brodaty, 2011). A systematic review of such interventions for frail older persons (Looman, Huijsman, & Fabbricotti, 2018b) revealed no effect on most reported outcomes and limited evidence for cost-effectiveness, but the authors suggested that frail older persons' well-being is a less frequently reported but more promising outcome in terms of effectiveness (Looman et al., 2018b). The incorporation of well-being measures in evaluations of care approaches targeting older persons is recommended, as these measures may represent a wider range of benefits that transcend health domains (Makai, Brouwer, Koopmanschap, Stolk, & Nieboer, 2014). Despite the inclusion of frail older persons' subjective well-being as a primary outcome along with health-related quality of life in our evaluation, however, we found no effect. The lack of evidence for the (cost-)effectiveness of the FFF approach compared with usual primary care was not an isolated finding; it underlines the complexity of integrated care and its evaluation.

Various explanations for the lack of effect in our study can be postulated. The effectiveness of integrated care programs depends on their implementation (Øvretveit & Gustafson, 2002), which is challenging due to the complexity of such programs (Moore et al., 2015). Suboptimal implementation of (elements of) the FFF approach was found in our research, which may have impacted the (lack of) effects (Craig et al., 2008; Moore et al., 2015; Steckler & Linnan, 2002). The delivery of usual primary care also can be complex and susceptible to changes over time (Tsiachristas, Stein, Evers, & Rutten-van Mölken, 2016). The Dutch primary healthcare system is more strongly developed than are systems in many other European countries (Kroneman et al., 2016). During the period of this research, important policy reforms may have impacted primary care delivery to community-dwelling frail older persons. A major reform of long-term care in the Netherlands, including the introduction of the new Long-term Care Act [Wet Langdurige Zorg, WLZ], was introduced during our data collection period. As of 2015, a pillar of this reform was

the shift from institutional care to care in the home-setting, with limited admission to nursing homes (Koopmans, Pellegrom, & van der Geer, 2017; Maarse & Jeurissen, 2016). The responsibility for the provision of adequate care to community-dwelling older persons has been shifted increasingly to the primary care setting (Koopmans et al., 2017). Moreover, other non-residential forms of care, including support and services for older persons, were decentralized to municipalities under the WMO 2015 (Maarse & Jeurissen, 2016). Resulting challenges in primary care include residence of more frail older persons in the community and their reliance on informal and home care (Koopmans et al., 2017). Policy reforms that impact the organization of primary care may have fostered the shift toward more integrated care delivery in the control GP practices included in this research; these practices reported in general "basic or intermediate support for integrated care" (Chapter 4), which may indicate the provision of low intensity integrated care (Tsiachristas et al., 2016). The high standards of the Dutch healthcare system, (recent) developments in primary care favoring service integration, and the suboptimal implementation of the FFF approach in intervention practices could have resulted in an insufficient contrast between the study groups, which may have obscured the added value of the FFF approach.

Theoretical reflection

The theoretical model presented in this thesis was developed to identify and increase our understanding of mechanisms underlying integrated primary care approaches for community-dwelling frail older persons. Many theoretical models have been developed to gain insight into the core elements of successful integrated care programs; the CCM, developed by Wagner and colleagues (2001), is well-known and widely used (Amelung et al., 2017). The CCM and its derivates, such as the expanded CCM (Barr et al., 2003), provide valuable frameworks for the design of (components of) integrated care approaches to improve care quality and patient outcomes. However, these models have limited ability to reveal and operationalize the mechanisms underlying integrated care delivery. Wagner and colleagues (2001) emphasized that the CCM is predominantly a synthesis of evidence-based system changes that is useful in directing quality improvement initiatives, and not an explanatory theory. According to this model, improved patient outcomes result from high-quality integrated care provision via productive patient-professional interactions (Bodenheimer et al., 2002a, 2002b; Wagner, Austin, & Von Korff, 1996a); the model, however, does not provide for sufficient operationalization of components such as essential features of productive interactions (Realpe & Wallace, 2010) or theorization about underlying mechanisms through which favorable outcomes are produced (Higa & Davidson, 2017). Other, more analytical, frameworks have been developed to aid the systematic understanding of (the impact of) integrated care (e.g. Minkman, Vermeulen, Ahaus, & Huijsman, 2013; Valentijn, Schepman, Opheij, & Bruijnzeels, 2013; van der Klauw, Molema, Grooten, & Vrijhoef, 2014); but little attention has been given to the importance of underlying cognitive and behavioral components that may drive the effectiveness of integrated primary care. By drawing on existing theory and evidence, our theoretical model represents a next step, allowing the identification of

underlying mechanisms and operationalization of model components to facilitate the evaluation of integrated primary care approaches; it highlights the cognitive and behavioral mechanisms underlying (integrated) primary care delivery. Taking an approach rooted in cognitive and behavioral psychology, Hartgerink and colleagues (2013) conceptualized professionals' cognitions and behaviors (e.g., interprofessional collaboration), as well as the team and organizational contexts, as critical for integrated care provision in hospitals (Hartgerink et al., 2013). Lemmens and colleagues (2008) developed a theoretical model for the evaluation of disease management that also has professional- and patient-related components. Our model complements these theoretical underpinnings by explicitly conceptualizing the cognitions and behaviors of older persons as drivers of effectiveness in terms of overall well-being. A person's ability to adapt and self-manage is considered to be crucial when facing social, physical and emotional challenges (Huber et al., 2011; Huber et al., 2016); both cognitive and behavioral self-management abilities aimed at maintaining well-being were included in the model. In line with the reasoning of the CCM, our model also acknowledges the importance of productive patient-professional interactions, but it does not consider them to be prerequisite to improved patient outcomes. Indeed, our research showed that self-management abilities and productive interactions were related significantly to frail older persons' subjective well-being, whereas we found no significant indirect effect of self-management abilities on well-being via productive patient-professional interactions. Based on theory and empirical findings, our theoretical model assumes that patient outcomes can be impacted directly or indirectly via enhanced productive patient-professional interactions.

Although the model facilitates a theory-guided evaluation of integrated care initiatives in the primary care setting, it features little elaboration on contextual factors associated with integrated care delivery and patient outcomes, such as policies and financing at the macro-level (Leijten et al., 2018) and the influence of local communities and neighborhoods at the meso-level (Cramm, van Dijk, & Nieboer, 2013; van Dijk, Cramm, & Nieboer, 2016). In addition, not all (relationships among) model components were tested empirically in the studies presented for this thesis. In particular, healthcare professionals' cognitions and behaviors should be examined more accurately, such as with empirical testing of the effect of situation awareness on integrated care by means of an increased understanding of patient's needs and critical information among healthcare professionals (Mosier & Fischer, 2010; Reader, Flin, Mearns, & Cuthbertson, 2011; Wright & Endsley, 2008).

Methodological considerations

Study design

This research was conducted using a quasi-experimental design, which is suggested to be appropriate for the evaluation of the (cost-)effectiveness of complex integrated care approaches when adequate matching is performed (Craig et al., 2008; Tsiachristas et al., 2016), despite the greater

susceptibility of such designs to bias. Experimental designs, including randomized controlled trials, are considered to be most robust for the evaluation of intervention effectiveness; they increase the confidence that differences in outcomes can be attributed to intervention effects (Bonell, Fletcher, Morton, Lorenc, & Moore, 2012; Eccles, Grimshaw, Campbell, & Ramsay, 2003). Integrated care approaches, however, involve organizational and professional changes, and the contamination of control groups is likely, and may cause biased estimates of their effects (Eccles et al., 2003). The performance of cluster randomized trials, in which random allocation is performed at the group level (e.g., patients in a single GP practice), has been proposed to minimize contamination bias (Eccles et al., 2003; Raine et al., 2016). Still, the possibility of hidden contextual differences with which the intervention and control groups interact remains (Rickles, 2009), and the inclusion of an adequate number of clusters is required to provide sufficient power, which was not feasible in this research (given the limited number of (participating) GP practices in the study area). We thus used a matched quasi-experimental design with one pretest and one posttest over a 12-month follow-up period. Older persons in the intervention group were matched one-to-one with older persons in the control group based on sex, educational level, and frailty scores. The control group obtained significantly more single persons than did the intervention group. Although outcome estimates were adjusted for observed differences between groups, unobserved differences may have affected the results.

The choice of an adequate comparator in evaluations of integrated care is challenging (Craig et al., 2008; Kadu, Ehrenberg, Stein, & Tsiachristas, 2019). Tsiachristas and colleagues (2016) stated that the provision of usual care, or standard practice, is often considered to be a suitable control. A limited number of control GP practices (n = 4, compared to n = 11 intervention GP practices) was included in the present research, but we performed matching at the individual, rather than practice, level when assessing the (cost-)effectiveness of the FFF approach. More important may be the risk of contamination; FFF-based and usual primary care were delivered in the same region, alongside one another. Due to the proximity of GP practices and existing collaboration in the study area, healthcare professionals in the control group may have adopted practices from the intervention group. In addition, interviews with participating control practices revealed some healthcare professionals' strong motivation and eagerness to organize care and support for their older populations. Thus, control GP practices included in our study may have been initiating developments toward integrated care delivery, at least more than average. They may have perceived that the FFF approach would not add to their usual care delivery and may have been particularly eager to serve as comparators in this research.

A considerable strength of this study was the theory-guided evaluation of the FFF approach. Such theoretical approach to the evaluation of complex interventions is considered to be essential to gain a deeper understanding of their working mechanisms (Craig et al., 2008). This approach enabled empirical testing of the proposed (relationships among) model components with (inte-

grated) primary care in a real-life setting. In addition, given the complexity of the FFF approach and its implementation, a mixed methods approach was used to extensively examine FFF and usual primary care implementation processes. Interventions in relevant areas of system redesign, according to the CCM, were examined systematically and described. Qualitative interviews with GPs provided a richer understanding of the variation among practices in the implementation of (elements of) the FFF approach and revealed barriers to such implementation. The combined examination of quantitative and qualitative data provided a deeper understanding of the complexities and processes of (integrated) care provision in the participating GP practices.

Setting and participants

The FFF approach was initiated and implemented in western North Brabant Province, the Netherlands. The setting and participants were determined by the GP practices in the region and the willingness of healthcare professionals and frail older persons to participate. We applied several eligibility criteria for frail older persons that may have affected the generalizability of the findings. We adopted a multidimensional perspective on frailty (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010), although considerable debate surrounds the meaning, conceptualization, and measurement of frailty (Bergman et al., 2007; Brown & Covinsky, 2018; Dent, Kowal, & Hoogendijk, 2016; Junius-Walker et al., 2018; Vergara et al., 2019). The TFI is used to assess physical, social and psychological domains of frailty (Gobbens, van Assen, Luijkx, Wijnen-Sponselee, & Schols, 2010); it has good psychometric properties (Gobbens et al., 2010; Gobbens, Boersma, Uchmanowicz, & Santiago, 2020; Metzelthin et al., 2010; Zhang et al., 2020) and is used frequently in the Netherlands and other European countries (Op Het Veld et al., 2019; Zhang et al., 2020). We acknowledge that the use of the TFI may not yield full insight on essential aspects and components of frailty. Healthcare professionals participating in the study could perform additional examinations or interviews to assess frailty, even with persons whose TFI scores did not indicate frailty. Furthermore, use of a multidimensional perspective on frailty resulted in a heterogeneous population of frail older persons. Persons with constellations of deficits in multiple domains (i.e., physical, social, and psychological) are expected to have different healthcare needs than do persons with physical frailty alone. This heterogeneity among frail older people is increasingly recognized (Looman et al., 2018a; Manthorpe & Iliffe, 2015) and may contribute to the limited effectiveness of integrated care (Eklund & Wilhelmson, 2009; Hoogendijk, 2016; Looman et al., 2018b; Spoorenberg, 2017). Whether the FFF approach is more beneficial for certain subpopulations of frail older persons should be investigated further.

Measures

The outcomes evaluated in this research were measured using validated and reliable instruments. Most of these instruments are used commonly with older populations, including the SPF-ILs, used to measure our primary outcome of well-being (Cramm et al., 2013; Frieswijk, Steverink, Buunk, & Slaets, 2006; Nieboer & Cramm, 2018). The importance of well-being is increasingly

acknowledged in research, policy and practice (Linton, Dieppe, & Medina-Lara, 2016; Steptoe, Deaton, & Stone, 2015), and this outcome should be included in evaluations of integrated care approaches. In addition, the relational coordination instrument was used to assess the productivity of patient-professional interactions (Gittell, 2000; Gittell, Godfrey, & Thistlethwaite, 2013). The assessment of the perceived productivity of patient-professional interactions with professionals from several disciplines was difficult, as many older persons could not differentiate the healthcare professionals. For example, many older persons included in this research could not remember the elderly care physician and had difficulty differentiating between homecare and geriatric nurses involved in their care. We were, however, able to reliably assess their interactions with GPs and practice nurses, who are considered to be among the most important and frequently consulted healthcare professionals in the Dutch primary care setting (Jansen, Spreeuwenberg, & Heijmans, 2012; Kroneman et al., 2016). Furthermore, we primarily used self-perceived outcomes, instead of objective measures, as in many evaluations of complex interventions. To increase validity, we used trained, blinded interviewers who conducted interviews with frail older persons in their homes. All interviewers had a healthcare background and lived in the research area to assure a cultural fit.

Our theoretical model emphasizes the importance of coordination and collaboration among healthcare professionals in integrated care delivery. The small number (75 at baseline, 78 at 12-months) and diversity (e.g., GPs, elderly care physicians, practice nurses) of participating professionals made reliable assessment of coordination among them using the relational coordination instrument difficult. In addition, social desirability is considered to be a risk in the use of self-reported measures with healthcare professionals. Naturally, healthcare professionals were aware of their group allocations, which may have increased the tendency to provide socially desirable answers with respect to, for example, their perceived quality of care. We did, however, also include more objective measures of care quality, such as the successful implementation of interventions in the intervention and control GP practices, which yielded similar findings; perceived and objective care quality (in terms of implemented system redesign interventions) was higher in the intervention GP practices (Chapter 4). In addition, our findings are in line with reviews showing the beneficial effects of integrated care on the (perceived) quality of care (e.g. Baxter et al., 2018; de Bruin et al., 2012; Ouwens et al., 2005).

Despite strong recommendations to adopt a societal perspective (Hakkaart-van Roijen, van der Linden, Bouwmans, Kanters, & Tan, 2015), the economic evaluation was performed from the narrower healthcare perspective, which still dominates in such evaluations of integrated care (Kadu et al., 2019). A limitation of the current study is that informal care measures were not considered in the economic evaluation, due primarily to the lack of resources for the collection of reliable data on informal care delivery among frail older persons. However, interviews with healthcare professionals, (project) managers, and frail older persons provided (limited) insight

into informal caregiving in the study population; no indication of an inequal distribution of informal care costs between groups was found. Nevertheless, the impact of informal care in our economic evaluation remains unknown.

Implications for practice

Our findings confirm the important contributions of frail older persons and healthcare professionals to the maintenance of well-being in this population. Effective self-management abilities of frail older persons may become increasingly important with the establishment of governmental policies aiming to enhance this population's self-sufficiency and independent living in the community for as long as possible (de Klerk, Verbeek-Oudijk, Plaisier, & den Draak, 2019; van Campen, Iedema, Broese van Groenou, & Deeg, 2017). Instead of focusing on the management of chronic conditions, the self-management of overall well-being should be supported in integrated care programs via, for example, interventions aiming to enhance broader cognitive and behavioral self-management abilities (Steverink, 2014). Increasing numbers of frail older persons receive care and support in the primary care setting. Productive patient-professional interactions may be an important resource for the maintenance of their well-being and prevent a decline in needs contributing to well-being as these persons face age-related changes in multiple domains (Williams, Haskard, & DiMatteo, 2007).

Although the (cost-)effectiveness of the FFF approach could not be demonstrated, integrated care delivery represents a step forward in improving the (perceived) quality of care. GPs in the intervention practices valued many elements of the FFF approach, such as multidisciplinary teamwork, the availability of geriatric expertise in the primary care setting, and the proactive organization of care and support. Promising findings with respect to the quality of care, with recognition of the challenges of implementing and evaluating integrated care approaches in real-life settings, warrant further investigation of the FFF approach in the primary care setting.

Recommendations for future research

Despite the comprehensive research conducted on the organization of FFF-based and usual primary care, whether the lack of (cost-)effectiveness is attributable to the ineffectiveness of the FFF approach or implementation problems in the GP practices remains unknown. The degree to which frail older persons in the control GP practices received elements of FFF-based care also remains unknown. Extensive research on fidelity (the extent to which a program is delivered as intended in practice) is recommended (Moore et al., 2015). In addition, the length of the evaluation should be considered; a follow-up period of 12 months as in this research (and many other evaluations of complex interventions), may be insufficient to capture the impact of integrated care. Furthermore, systematic collection of qualitative data from frail older persons is recommended to gain a deeper understanding of their experiences with care delivery. Finally, careful consideration of the choice of the control group in evaluations of integrated care approaches is

strongly recommended. Usual primary care delivery, although frequently considered to be an appropriate comparator (Tsiachristas et al., 2016), can be complex in itself and well-performing practices may be particularly eager to participate as control, which may hamper sound evaluation.

Conclusion

This thesis research indicated that the FFF approach to the provision of integrated primary care to community-dwelling frail older persons holds promise for the improvement of care quality, a prominent goal of this approach. FFF implementation did not, however, impact well-being over the 1-year follow-up period, as expected. The added value of integrated care in terms of frail older persons' well-being has not been demonstrated, which adds to the inconclusive body of evidence regarding the (cost-)effectiveness of these programs in the primary care setting. The use of a sound theoretical framework to evaluate (the complexities of) integrated primary care is key; it enables the construction of a cumulative understanding of underlying mechanisms, beyond the presence of the program's components. Cognitions and behaviors of healthcare professionals and frail older persons are considered to be core mechanisms driving the (lack of) effects of integrated care. Populational aging and the implementation of policy reforms that promote aging in place necessitate a deeper understanding of the mechanisms underlying integrated primary care and facilitate sound evaluation of these complex programs in real-life settings.

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SUMMARY

Traditional primary healthcare for community-dwelling frail older persons is predominantly reactive and fragmented and ill equipped to meet the long-term complex needs of this population. In response, proactive and integrated primary care approaches have emerged to improve the quality of care and older persons' outcomes. Currently, evidence for their (cost-)effectiveness is mixed and the mechanisms explaining (a lack of) effectiveness remain largely unclear. The main objective of this thesis was to determine the added value of a proactive, integrated primary care approach for community-dwelling frail older persons and gain insight into underlying mechanisms of integrated primary care.

In Chapter 2 a research protocol is presented that describes the design of a theory-based evaluation of integrated primary care targeting community-dwelling frail older persons. First, a theoretical model is presented that facilitates the investigation of mechanisms that are assumed to produce favourable outcomes and effectiveness of integrated primary care for community-dwelling frail older persons. It assumes that multiple interrelated key components (e.g., self-management support, case management) are important for achieving high-quality integrated care. By drawing on previous research (Hartgerink et al., 2013; Lemmens et al., 2008), the model shows that underlying mechanisms explaining the effectiveness of integrated primary are assumed to be cognitive and behavioural aspects of healthcare professionals and frail older persons. Situation awareness and cognitive diversity (cognitions), and coordination and collaboration (behaviors), are presumed to impact effectiveness of integrated care. In addition, important cognitive (e.g., self-efficacy) and behavioral abilities (e.g., investment behaviors) of frail older persons who receive integrated primary care are incorporated. The model shows that these underlying cognitions and behaviors of healthcare professionals and older persons are assumed to influence frail older persons' well-being directly and indirectly via productive patient-professional interactions. Second, the design of the theory-guided evaluation of the integrated primary care approach *Finding and Follow-up of Frail older persons* (FFF; in Dutch: Vroegsignalering Kwetsbare Ouderen en Opvolging) is reported. The FFF approach consists of interrelated promising components (e.g., case management, proactive case finding) to provide high-quality proactive and integrated care and support to community-dwelling frail older persons (aged ≥ 75 years). It is implemented in several GP practices in the Netherlands and aims to maintain or improve frail older persons' well-being. Effects, costs and underlying processes were proposed to be investigated using a longitudinal study with a matched quasi-experimental design (12 months follow-up). The adoption of the abovementioned theoretical model in the evaluation allowed us to gain a deeper insight into the mechanisms underlying the effectiveness of the FFF approach.

The cross-sectional study presented in Chapter 3 investigated relationships among cognitive and behavioural self-management abilities, productive patient-professional interactions, and

well-being of 588 community-dwelling frail older persons from 15 GP practices. Significant relationships were observed between frail older persons' self-management abilities and their overall, social and physical well-being. Strengthening these cognitive and behavioural abilities was considered to be important for maintaining well-being. The management of resources to realise or maintain well-being may be especially important in later life as reserves and resources in multiple domains change and decline. Moreover, the research showed that the productivity of interactions with GPs was related significantly to the social and overall well-being of frail older persons, even after controlling for self-management abilities. Although the relationship was significant, effect sizes were small, and no significant relationship with physical well-being was observed. It may be more difficult to impact physical well-being through the patient-professional relationship and communication. Overall, the findings imply that productive patient-professional interactions may be a resource for maintaining social and overall well-being in later life, which indicates the need to invest in the quality of communication and good relationships with frail older people in primary care.

The mixed-methods study presented in Chapter 4 investigated (1) how care was delivered and which interventions were implemented successfully in GP practices, (2) the quality of care as perceived by healthcare professionals in the primary care setting, and (3) the experiences of GPs with the FFF approach. First, the implementation of care interventions in the six areas of system redesign as proposed by the Chronic Care Model (Wagner et al., 2001) was assessed in 11 GP practices following the FFF approach (intervention) and 4 GP practices delivering usual primary care (control). The study showed that intervention GP practices implemented, on average, significantly more care interventions than did control GP practices, indicating greater quality of primary care that was congruent with (elements of) the CCM. Second, the longitudinal study among healthcare professionals in intervention and control GP practices (n = 75 at baseline, and n = 78 at 12-month follow-up) showed that the FFF approach improved the quality of primary care as perceived by healthcare professionals. All CCM areas of system redesign were valued significantly higher in the intervention group than in the control group at follow-up. Healthcare professionals in the intervention group perceived significant improvements in the overall quality of care delivery over time. The findings suggest that proactive integrated care as provided in the FFF approach may improve the perceived care quality. Third, qualitative interviews with 15 GPs of practices following the FFF approach indicated that integrated primary care delivery, such as provided in the FFF approach, is essential due to populational aging and the perceived need to anticipate on transformations in the primary healthcare sector. Important components of the FFF approach were mainly the proactive screening for frailty in the community and multidisciplinary collaborations. The interviews did, however, reveal important differences in FFF implementation and execution among GP practices, and barriers to its implementation and embedding (e.g., inadequate ICT systems and the lack of financial resources and manpower). Overall, the findings of the mixed-methods study suggest that the FFF approach can have positive effects on the

quality of primary care to frail older persons, which may be particularly important in times of population aging and pressures on healthcare systems.

The longitudinal study presented in Chapter 5 investigated (the relationship between) community-dwelling frail older persons' perspectives on the quality of primary care and the perceived productivity of interactions with their GPs and practice nurses. We thereby comparatively examined the quality of care and productive patient-professional interactions among frail older persons receiving the FFF approach and usual primary care (n = 464 at baseline, and n = 358 at 12-month follow-up). Significant improvements over time in the perceived care quality and productive patient-professional interactions were observed in both groups. No significant differences in perceived quality of care and patient-professional interaction was observed between the groups. Frail older persons' perspectives on quality of primary care were significantly associated with the perceived productivity of the interactions with GPs and practice nurses. The effect of high-quality care on the productivity of the patient-professional interactions has received little attention in research; our findings underline the importance of research into the (relationship with) productivity of patient-professional interactions. Investments in high-quality care delivery and patient-professional interactions are considered to be important.

The evaluation of the (cost-)effectiveness of the FFF was presented in Chapter 6. Using a matched quasi-experimental design, the (cost-)effectiveness of the FFF approach was compared with usual primary care for community-dwelling frail older persons (n = 464 at baseline, and n = 358 at 12-month follow-up). The findings demonstrated that the FFF approach is most likely not a cost-effective initiative, compared with usual primary care in the Netherlands, in terms of well-being and quality-adjusted life-years (QALYs) over a 12-month period. Several possible explanations of the lack of effect were described, including the small difference between usual care in the Dutch primary care setting and the FFF approach, the suboptimal implementation of integrated care components, and the length of the evaluation period. The findings add to the inconclusive evidence with respect to the (cost-)effectiveness of integrated primary care approach targeting community-dwelling frail older persons.

In the general discussion presented in Chapter 7, the main findings of the studies that are part of this thesis are described and discussed. Furthermore, the theoretical considerations are reflected upon. Specifically, the theoretical model that was presented in this thesis is discussed in the light of other models (e.g., CCM). It is argued that the model complements previous theoretical underpinnings by, for example, also conceptualizing cognitive and behavioural components of frail older persons impacting effectiveness in terms of their well-being. A limitation of the model presented in this thesis was the limited focus on contextual factors that are related to integrated care delivery and patient outcomes. Furthermore, methodological considerations, such as the quasi-experimental design, are also presented. Implications for practice include the

important contribution of both frail older persons and healthcare professionals in maintaining well-being in later life. In addition, integrated care delivery provides a step forward in improving the (perceived) care quality; these promising results warrant further examination of integrated care in the primary care setting. Finally, recommendations are described for future research, such as extensive research on fidelity and the choice of the control group in evaluations of complex integrated care approaches.

This thesis demonstrated that integrated primary care for community-dwelling frail older persons as provided in the FFF approach holds promise to improve quality of care, which is an important goal. The integrated primary care approach did, however, not (yet) meet its expectations to impact well-being over a period of one year. The added value of the FFF approach in terms of frail older person's well-being has not been demonstrated. These findings add to the inconclusive body of evidence regarding the (cost-)effectiveness of such programs in the primary care setting. A sound theoretical framework through which to understand and evaluate (the complexities of) integrated primary care is important; this enables the construction of a cumulative understanding of underlying mechanisms, beyond the presence of the program's components. Cognitive and behavioural aspects of healthcare professionals and frail older persons are considered to be core mechanisms driving (lack of) effects of integrated care. Aging of the population and policy reforms promoting aging in place, necessitate a deeper understanding of the mechanisms underlying integrated primary care and facilitates sound evaluations of these complex programs in real-life settings.

SAMENVATTING

De traditionele eerstelijnszorg voor thuiswonende kwetsbare ouderen is overwegend reactief en gefragmenteerd en slecht toegerust om te voldoen aan de complexe langetermijnbehoeften van deze mensen. Als reactie daarop zijn er in de eerste lijn proactieve en integrale zorgbenaderingen ontstaan om de kwaliteit van de zorg en de uitkomsten van ouderen te verbeteren. Het bewijs voor de (kosten)effectiviteit hiervan is inconsistent, en de mechanismen die (een gebrek aan) effectiviteit verklaren, blijven grotendeels onduidelijk. De belangrijkste doelstelling van dit proefschrift was het bepalen van de toegevoegde waarde van proactieve, integrale eerstelijnszorg voor thuiswonende kwetsbare ouderen en inzicht krijgen in de onderliggende mechanismen van integrale eerstelijnszorg.

In hoofdstuk 2 wordt een onderzoeksprotocol gepresenteerd dat de opzet van een theorie gestuurde evaluatie van integrale eerstelijnszorg voor thuiswonende kwetsbare ouderen beschrijft. Ten eerste wordt een theoretisch model gepresenteerd dat inzicht geeft in onderliggende mechanismen die mogelijk leiden tot gunstige uitkomsten en effectiviteit van integrale eerstelijnszorg voor thuiswonende kwetsbare ouderen. Het model veronderstelt dat meerdere, onderling samenhangende componenten (bijv. zelfmanagementondersteuning, casemanagement) van belang zijn voor kwalitatief hoogwaardige integrale zorg. Gebaseerd op eerder onderzoek (Hartgerink et al., 2013; Lemmens et al., 2008), veronderstelt het model dat onderliggende mechanismen die de effectiviteit van integrale zorg verklaren, cognitieve en gedragsmatige componenten van zorgprofessionals en kwetsbare ouderen omvatten. Situationeel bewustzijn en cognitieve diversiteit (cognities), en coördinatie en samenwerking (gedrag), worden verondersteld de effectiviteit van integrale zorg te beïnvloeden. Daarnaast worden belangrijke cognitieve (bijv. geloof in eigen kunnen, ook wel self-efficacy genoemd) en gedragsmatige (bijv. het vermogen om te investeren) aspecten van kwetsbare ouderen die integrale zorg ontvangen, meegenomen. Het model laat zien dat deze onderliggende cognities en gedragingen van zorgprofessionals en ouderen verondersteld worden het welzijn van kwetsbare ouderen direct en indirect te beïnvloeden via productieve interacties tussen patiënten en zorgprofessionals. Ten tweede wordt de opzet gepresenteerd van de theorie gestuurde evaluatie van een integrale zorgbenadering in de eerste lijn, genaamd 'Vroegsignalering Kwetsbare Ouderen en Opvolging' (VKO). Dit is een zorgbenadering die onderling samenhangende kansrijke componenten combineert (bijv. casemanagement, proactieve signalering) om kwalitatief hoogwaardige proactieve en integrale zorg en ondersteuning te bieden aan thuiswonende kwetsbare ouderen (≥ 75 jaar). Deze aanpak werd geïmplementeerd in verschillende huisartsenpraktijken in Nederland en heeft als doel het welzijn van kwetsbare ouderen te behouden of te verbeteren. Om de effecten, kosten en onderliggende processen te onderzoeken, werd een longitudinaal onderzoek met een quasi-experimentele opzet (12 maanden follow-up) voorgesteld. Door het bovengenoemd theoretisch model toe te passen

bij de evaluatie verkregen we dieper inzicht in de mechanismen die ten grondslag liggen aan de effectiviteit van VKO.

De cross-sectionele studie in hoofdstuk 3 betrof het onderzoek naar de relaties tussen cognitieve en gedragsmatige zelfmanagementvaardigheden, productieve interacties tussen patiënten en professionals en het welzijn van 588 thuiswonende kwetsbare ouderen uit 15 huisartsenpraktijken. Er werden significante relaties gevonden tussen de zelfmanagementvaardigheden van kwetsbare ouderen en hun algeheel, sociaal en fysiek welzijn. Het versterken van deze cognitieve en gedragsmatige vaardigheden werd beschouwd als belangrijk voor het behoud van het welzijn. Het managen van hulpbronnen om welzijn te realiseren of te behouden kan vooral belangrijk zijn in het latere leven – wanneer de reserves en hulpbronnen op meerdere domeinen veranderen en afnemen. Bovendien toonde het onderzoek aan dat de productiviteit van de interacties met huisartsen significant gerelateerd is aan het sociale en algehele welzijn van kwetsbare ouderen, zelfs na correctie voor zelfmanagementvaardigheden in de analyse. Hoewel de relatie significant was, was het effect klein en werd er geen significante relatie met het fysieke welzijn gevonden. Mogelijk is het moeilijker om het fysieke welzijn te beïnvloeden via de patiënt-professional interactie en communicatie. Over het algemeen impliceren de bevindingen dat productieve patiënt-professional interacties mogelijk bij kunnen dragen aan het behoud van sociaal en algeheel welzijn op latere leeftijd. Dit geeft aan dat het nodig is om te investeren in de kwaliteit van de communicatie en goede relaties met kwetsbare ouderen in de eerste lijn.

In de mixed-methods studie in hoofdstuk 4 is onderzocht (1) hoe de zorg is geleverd en welke interventies met succes zijn geïmplementeerd in huisartsenpraktijken, (2) hoe zorgprofessionals in de eerste lijn de kwaliteit van de zorgverlening ervaren, en (3) wat de ervaringen van huisartsen zijn met het VKO-programma. Ten eerste is de implementatie van zorginterventies binnen de zes onderdelen van het herontwerp van het gezondheidszorgsysteem, zoals voorgesteld in het Chronische Zorgmodel (Wagner et al., 2001), beoordeeld in 11 huisartsenpraktijken die volgens VKO werken (interventiegroep) en in 4 huisartsenpraktijken die reguliere eerstelijnszorg leveren (controlegroep). Het bleek dat de huisartsenpraktijken in de interventiegroep gemiddeld significant meer zorginterventies implementeerden dan de huisartsenpraktijken in de controlegroep, wat duidt op een hogere kwaliteit van de eerstelijnszorg in overeenstemming met (elementen van) het Chronische Zorgmodel. Ten tweede bleek uit het longitudinale onderzoek onder zorgprofessionals in beide groepen (n = 75 bij de nulmeting en n = 78 bij 12-maanden follow-up) dat de kwaliteit van de zorg door VKO was verbeterd, zoals beoordeeld door zorgprofessionals. Bij de follow-up meting werden alle onderdelen van het herontwerp van het gezondheidszorgsysteem, zoals voorgesteld in het Chronische Zorgmodel, significant hoger gewaardeerd in de interventiegroep dan in de controlegroep. Zorgprofessionals in de interventiegroep zagen in de loop van de tijd een aanzienlijke verbetering van de algehele kwaliteit van de zorgverlening. De bevindingen suggereren dat de proactieve integrale zorg die kenmerkend is voor VKO, de geper-

cipieerde kwaliteit van de zorg kan verbeteren. Ten derde bleek uit kwalitatieve interviews met 15 huisartsen uit praktijken die volgens VKO werkten dat integrale eerstelijnszorg essentieel is gezien de vergrijzing van de bevolking en de geziene noodzaak om te anticiperen op transformaties in de zorgsector. Belangrijke onderdelen van de VKO-werkwijze waren vooral de proactieve screening op kwetsbaarheid en de multidisciplinaire samenwerkingsverbanden. De interviews brachten echter belangrijke verschillen tussen huisartsenpraktijken aan het licht wat betreft de implementatie en uitvoering van het VKO-programma. Ook werd gewezen op belemmeringen voor de implementatie en inbedding van VKO, zoals ontoereikende ICT-systemen en het gebrek aan financiële middelen en mankracht. Over het geheel genomen suggereren de bevindingen van het mixed-methods onderzoek dat VKO een positief effect kan hebben op de kwaliteit van de eerstelijnszorg aan kwetsbare ouderen, wat vooral van belang kan zijn in tijden van vergrijzing en druk op het zorgstelsel.

De longitudinale studie in hoofdstuk 5 betrof het onderzoek naar (de relatie tussen) de perceptie van thuiswonende kwetsbare ouderen over de kwaliteit van de eerstelijnszorg en de gepercipieerde productiviteit van de interacties met hun huisartsen en praktijkondersteuners. We vergeleken hierbij kwetsbare ouderen uit huisartsenpraktijken die volgens VKO werkten versus huisartsenpraktijken die reguliere eerstelijnszorg leverden (n = 464 bij de nulmeting, en n = 358 bij 12-maanden follow-up). In beide groepen werden door de tijd heen significante verbeteringen geobserveerd wat betreft de gepercipieerde kwaliteit van de zorg en productieve patiënt-professional interacties. Er werden geen significante verschillen in de gepercipieerde kwaliteit van zorg en productieve patiënt-professional interacties gevonden tussen beide groepen. De percepties van kwetsbare ouderen op de kwaliteit van de eerstelijnszorg waren significant geassocieerd met de gepercipieerde productiviteit van de interacties met huisartsen en praktijkondersteuners. Het effect van kwalitatief hoogwaardige zorg op de productiviteit van de patiënt-professional interacties heeft weinig aandacht gekregen in onderzoek; onze bevindingen onderstrepen het belang van onderzoek naar de (relatie met) de productiviteit van patiënt-professional interacties. Investeringen in kwalitatief hoogwaardige zorgverlening en patiënt-professional interacties worden belangrijk geacht.

De evaluatie van de (kosten)effectiviteit van VKO is te vinden in hoofdstuk 6. Aan de hand van een gematcht quasi-experimenteel design werd de (kosten)effectiviteit van VKO vergeleken met die van de reguliere eerstelijnszorg voor thuiswonende kwetsbare ouderen (n = 464 bij de nulmeting, en n = 358 bij 12-maanden follow-up). Uit de resultaten blijkt dat werken volgens VKO hoogstwaarschijnlijk niet kosteneffectief is, vergeleken met reguliere eerstelijnszorg in Nederland, wat betreft het welzijn en voor kwaliteit gecorrigeerde levensjaren (QALY's), over een periode van 12 maanden. Als mogelijke verklaringen zijn aangevoerd het geringe verschil tussen de reguliere eerstelijnszorgzorg in Nederland en het werken volgens VKO, de suboptimale implementatie van integrale zorgcomponenten, en de duur van de evaluatieperiode. De

bevindingen dragen bij aan het gebrek aan overtuigend bewijs voor de (kosten)effectiviteit van integrale eerstelijnszorg voor thuiswonende kwetsbare ouderen.

In de algemene discussie in hoofdstuk 7 worden de belangrijkste bevindingen van de studies in dit proefschrift beschreven en besproken. Verder wordt een licht geworpen op de theoretische overwegingen. In het bijzonder wordt het theoretische model dat in dit proefschrift werd gepresenteerd, besproken in het licht van andere modellen (bijv. Chronische Zorgmodel). Er wordt betoogd dat het model een aanvulling vormt op eerdere theoretische benaderingen omdat dit model bijvoorbeeld ook cognitieve en gedragscomponenten van kwetsbare ouderen conceptualiseert die van invloed zijn op de effectiviteit van integrale eerstelijnszorg voor hun welzijn. Een beperking van dit model is de geringe aandacht voor contextuele factoren die verband houden met integrale zorg en patiëntuitkomsten. Daarnaast worden ook methodologische overwegingen gepresenteerd, zoals de quasi-experimentele opzet. Implicaties voor de praktijk zijn onder meer de belangrijke bijdrage van zowel kwetsbare ouderen als zorgprofessionals aan het behoud van het welzijn op latere leeftijd. Daarnaast biedt integrale zorg een stap voorwaarts bij het verbeteren van de (ervaren) kwaliteit van de zorg; deze veelbelovende resultaten rechtvaardigen verder onderzoek naar integrale zorg in de eerste lijn. Tot slot worden aanbevelingen beschreven voor toekomstig onderzoek, zoals uitgebreid onderzoek naar de mate waarin zorgprogramma's worden uitgevoerd zoals werd beoogd en de keuze van de controlegroep bij evaluaties van complexe, integrale zorgbenaderingen.

Uit dit proefschrift blijkt dat integrale eerstelijnszorg voor thuiswonende kwetsbare ouderen – zoals in het VKO-programma – veelbelovend is voor de verbetering van de kwaliteit van de zorg; een belangrijk doel van integrale zorg. Deze aanpak leverde echter (nog) niet de verwachtte impact op het welzijn over een periode van een jaar. De toegevoegde waarde van de VKO-werkwijze voor het welzijn van kwetsbare ouderen is niet aangetoond. Deze bevindingen staven het uiteenlopende niet doorslaggevende bewijs voor de (kosten)effectiviteit van dergelijke programma's in de eerste lijn. Een theoretisch kader om (de complexiteit van) integrale eerstelijnszorg te begrijpen en te evalueren is belangrijk; dit maakt het mogelijk om een steeds beter inzicht te krijgen in de onderliggende mechanismen, hetgeen uitstijgt boven de specifieke elementen van het programma. De cognitieve en gedragsmatige componenten van zorgprofessionals en kwetsbare ouderen worden beschouwd als kernmechanismen die (het gebrek aan) effecten van integrale zorg beïnvloeden. Vanwege de vergrijzing van de bevolking en beleidshervormingen waarbij ouderen zo lang mogelijk zelfstandig thuis blijven wonen, is een diepgaander begrip nodig van de mechanismen die ten grondslag liggen aan integrale eerstelijnszorg. Dit faciliteert een gedegen evaluatie van deze complexe zorgprogramma's in de praktijk.

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CURRICULUM VITAE

PhD Portfolio	
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Presentation at International Association of Gerontology and Geriatrics European Region Congress (IAGG-ER): "Effects of an integrated primary care approach to improve well-being of community-dwelling frail older persons", Gothenburg (Sweden)	2019
Poster at International Association of Gerontology and Geriatrics European Region Congress (IAGG-ER): "Self-management abilities and well-being of community-dwelling frail older persons", Gothenburg (Sweden)	2019
Presentation at International Conference on Integrated Care: "The influence of quality of primary care on productive interactions among community-living frail older persons and their general practitioners and practice nurses", Utrecht (the Netherlands)	2018
Presentation at International Conference on Integrated Care: "Quality of integrated primary care and coproduction of care with community-living frail older persons", Dublin (Ireland)	2017
Presentation at International Conference on Integrated Care: "Effectiveness and cost-effectiveness of an integrated primary care approach to improve well-being of frail community-dwelling older persons", Dublin (Ireland)	2017
Presentation at the regional symposium VKO: "Evaluatie vroegsignalering kwetsbare ouderen en opvolging (VKO)", Roosendaal (the Netherlands)	2017
Presentation at British Society of Gerontology Conference: "A theory-based evaluation of an integrated primary care approach for frail older people", Stirling (Scotland)	2016
Presentation at International Conference on Integrated Care: "A model for the evaluation of integrated care approach for frail older people", Barcelona (Spain)	2016
Presentation at International Conference on Integrated Care: "An evaluation of an integrated primary care approach to improve well-being among frail community-dwelling older people", Barcelona (Spain)	2016

Presentation at ESHPM seminar: "An integrated primary care approach to improve well-being among frail community-living older people: a theory-guided study protocol", Rotterdam (the Netherlands)	2016
Presentations for healthcare organizations TWB, TanteLouise Vivensis, Groenhuysen and Zorggroep West-Brabant (e.g., the design of the evaluation study, integrated care in the primary care setting, preliminary results of the effects of the FFF approach, frailty in community-dwelling older persons in western North Brabant Province), Roosendaal (the Netherlands)	2014-2016

Courses	
Project management	2019
Multilevel modelling in public health and health services research NIVEL	2016
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Examination I – Assessment and feedback	2015
Examination II	2015
Thesis supervision	2015
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Teaching activities	
Bachelor Health Policy and Management	
Thesis supervision	2014-2020
Reading committee Bachelor theses	2018-2019
Quality and efficiency in Health Care – Supervising business cases	2018
Quality and efficiency in Health Care – Tutor workgroups	2014-2016
Introduction research Methods & Techniques – Tutor workgroups	2014-2015
Quantitative research methods – Instructor SPSS practicum	2014-2015
Master Health Care Management	
Patient Centred Care Delivery – Course coordinator	2020
Thesis supervision	2019-2020
Reading committee Master theses	2019-2020
Patient Centred Care Delivery – Lecturer	2016-2020
Patient Centred Care Delivery – Tutor workgroups	2015-2020

International publications

Vestjens, L., Cramm, J.M., & Nieboer, A.P. (2020). A cross-sectional study investigating the relationships between self-management abilities, productive patient-professional interactions, and well-being of community-dwelling frail older people. *European Journal of Ageing*, 1-11.

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Lotte Vestjens was born on the 5th of December 1988. She studied Health Sciences at Maastricht University and she continued her education with the Research Master in Health Sciences of which she obtained her master degree (cum laude) in 2014. Lotte completed her thesis on the identification of behavior change techniques in a multicomponent intervention to reduce concerns about falls in older persons, which was published in Health Education Research. During her studies, Lotte worked in residential care for persons with severe intellectual disabilities. In 2014, she started as a PhD candidate at Erasmus School of Health Policy & Management (Erasmus University Rotterdam). She was involved in the integrated care program Finding and Follow-up of Frail older persons (Vroegsignalering Kwetsbare Ouderen en Opvolging). In her PhD trajectory, she evaluated this integrated primary care approach for community-dwelling frail older persons, which resulted in this dissertation. The results of her research were presented at national and international conferences and were published in international peer-reviewed journals. In addition, Lotte taught various courses, such as quality and efficiency in healthcare. Furthermore, she is the coordinator of the course patient-centered care delivery in the master program Healthcare Management. Lotte continues to work as an assistant professor at Erasmus School of Health Policy & Management.

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