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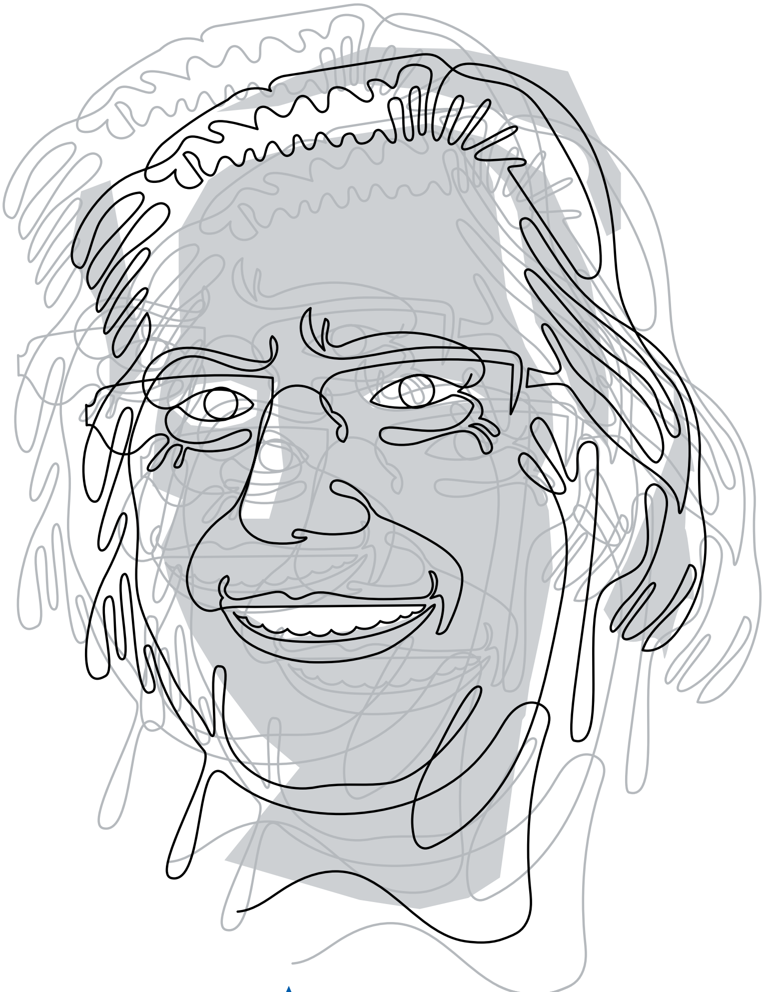

FRAILTY

Exploring the effectiveness of integrated care for frail older people

WILLEMIJN LOOMAN

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Facing Frailty
Exploring the effectiveness of integrated care for frail older people

Kwetsbaarheid onder ogen zien
Verkennen van de effectiviteit van integrale zorg voor kwetsbare ouderen

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Table of contents

CHAPTER 1

General introduction

Mrs F was 93 years old and lived independently in the house she used to have a grocery store in. Even her children had been growing up in this house. For twenty years, she had been suffering from severe rheumatism. Due to difficulties in climbing the stairs, a stair lift had been installed in her house. Seven years ago, her husband had died of heart failure and she missed him every day ever since. Unfortunately, her physical complaints kept increasing and walking became more and more difficult. In the beginning, she refused to walk with a walking frame because she felt ashamed and was too proud. However, during her regular walks to the cemetery, she became increasingly afraid to fall so she started using her walking frame. But as her health kept deteriorating, walking outside became impossible. In the end, she spent her days reading the newspaper and watching television because she was still very interested in the world around her. However, she was bound to stay at home and went to bed very early. As time passed by, Mrs F started to feel lonelier and she became more and more emotional and slightly depressed. Mrs F always said: “I had a beautiful life”. She did not want to complain but she was not feeling well and became forgetful. When she talked about her life and her husband, she often started crying.

Her children and grandchildren visited her regularly because Mrs F became increasingly dependent on their support. Her son became her main care giver and dropped by every day. Every morning he made coffee for her, which she could no longer do herself due to her rheumatism. Her daughter came by every other weekend and Mrs F was looking forward to her visits. They spent time at the kitchen table talking and reading the newspaper. Her daughter cooked and prepared meals that were supposed to last for several days. Her granddaughter bought groceries every Saturday. The house was cleaned by a cleaning lady every other week. Home care visits was arranged to undo the support stockings every night. Mrs F had an alarm system that she could use in case of emergencies. The GP visited her on several occasions, mostly because of her rheumatism. A few times she was admitted to the hospital because she fell, had low blood pressure levels or developed a kidney failure. During the recovery process in the hospital, she felt safe and she also liked the personal attention of both professionals and family. When she got discharged from the hospital, Mrs F’s daughter arranged weekly visits to a community centre such that Mrs. F felt less lonely. Initially, Mrs F was not enthusiastic but as time passed by she actually enjoyed the activities and the company.

Unfortunately, the situation became more and more problematic and eventually untenable. Her son still came by every day getting her dressed, cooking her dinner but had difficulties with providing personal care. At some point in time Mrs F developed injuries to her feet which hindered her going out of bed to use the toilet. When, on top of that, she developed problems breathing, she got admitted to the hospital again. Mrs F slept continuously, was confused and her health was deteriorating rapidly. The doctors were not able to determine a final diagnosis and they referred her to a revalidation hotel. During the referral process, the hospital accidently forgot to inform the revalidation hotel that Mrs F. should take blood thinner medication. Not long thereafter, Mrs F. fell out of bed in the revalidation hotel, causing her blood circulation in her leg to stop. She got re-admitted to the hospital where she passed away.

Frailty

This is the story of my 93 years old grandmother and her ageing process. We know that ageing processes strongly differ between people due to genetic and environmental differences (Slaets, 2006). In other words: older people are not homogeneous (Lacas & Rockwood, 2012). Chronological age is not particularly informative since it does not reveal the severity of the ageing process or the health care needs of older people. Their health condition ranges from healthy agers to being completely care dependent (World Health Organization, 2015). The ‘grey’ area between these two extremes is referred to as frailty.

The term frail elderly was introduced by Charles F Fahey and the United States Federal Council of Ageing (Gobbens, 2010). Frailty is an important part of geriatric medicine and gerontology (Rockwood, Fox, Stolee, Robertson, & Beattie, 1994) and is clinically relevant to explain differences between older people. In fact, frailty has become a real buzz word (Manthorpe & Iliffe, 2015) and has been described as the most problematic expression of population ageing (Clegg, Young, Iliffe, Rikkert, & Rockwood, 2013). Research has shown that frailty is strongly related to a wide range of negative outcomes such as functional decline, loss of mobility, risk of falling, poor quality of life, hospitalization, institutionalization and mortality (Clegg et al., 2013; Fried et al., 2001; Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010). However, still no clear consensus exists on the conceptualization of frailty (Dent, Kowal, & Hoogendijk, 2016). In general, we could say that frailty represents vulnerability to adverse outcomes of people of the same chronological age caused by accumulations of deteriorations in domains of human functioning (Clegg et al., 2013; Fried et al., 2001; Gobbens et al., 2010; Lacas & Rockwood, 2012; Slaets, 2006). Frailty is characterized by its complexity because the underlying problems in these domains influence and reinforce each other (Bergman et al., 2007; Gobbens et al., 2010).

Yet, researchers have not agreed upon the specific definition of frailty and what domains of human functioning should be included. Formerly, frailty was related to the physical domain of functioning. Fried and colleagues (2001) introduced the frailty phenotype with five characteristics: unintentional weight loss, exhaustion, weakness (low grip strength), slow walking speed and low physical activity. More recently frailty is also conceptualized from a broader, multidimensional perspective that not only incorporates the physical domain but also the psychological and social deficits (Gobbens et al., 2010; Markle-Reid & Browne, 2003; Rockwood & Mitnitski, 2007; Schuurmans, Steverink, Lindenberg, Frieswijk, & Slaets, 2004), including depression, feelings of anxiety and loneliness. Rockwood and colleagues developed the frailty index and consider frailty as an accumulation of a range of deficits (Rockwood et al., 2007). The prevalence of frailty strongly depends on the conceptualization of frailty and ranges from 4.0 to 59.1 % of the community-dwelling older people (Collard, Boter, Schoevers, & Oude Voshaar, 2012).

Context

Frailty should be considered in the context of population ageing. The age composition of the world population is changing and the absolute and relative number of older people that grow old is increasing rapidly. The number of people of 60 years and older worldwide will increase by 56 percent between 2015 and 2050. The group of oldest-old is also increasing rapidly (United Nations, 2015). The proportion of people of 60 years and older will increase to 30% in several countries (World Health Organization, 2015). Population ageing is caused by the increased life expectancy – rising to over 90 years old – and the decreased fertility rates (World Health Organization, 2015).

Due to this rapid increase of older people, national health policies are under pressure. Health and social care budgets are shrinking and have to be divided under this increasing number of older people. Health care systems throughout the world have encountered great challenges urging innovation in the organization of elderly care (Pavolini & Ranci, 2008). The need to provide high-quality, effective care for frail older people increases and it is essential to explore whether and how available resources can be optimally used.

An important aim of national health policies is the prevention of institutionalization because it is expensive. This implies ‘ageing in place’ (Wiles, Leibing, Guberman, Reeve, & Allen, 2012), which corresponds to the preference of older people to grow old in their own homes (Friedman, Steinwachs, Rathouz, Burton, & Mukamel, 2005). This also implies that frail older people with their complex needs in multiple domains remain living in the community rather than being institutionalized in residential care or nursing homes (Wiles et al., 2012; de Groot, de Veer, Versteeg, & Francke, 2018). At the same time, national governments are shifting responsibilities to municipalities (Grootegoed & Van Dijk, 2012; Pavolini & Ranci, 2008). Citizens are stimulated to take their responsibility and use their own social network to address care needs (Grootegoed & Van Dijk, 2012). This asks for self-reliance and a more prominent role for informal caregiving in the care for frail older people.

Care for frail older people

Due to ageing in place, GPs and other primary care professionals become mainly responsible for the care for this growing number of frail older people. This means that the degree of complexity of the patient population in primary care is increasing (Boeckxstaens & De Graaf, 2011). Primary care professionals struggle with this complexity and the quality of care is under pressure (Schers, Koopmans, & Rikkert, 2009).

A major criticism on the current way of care delivery is the fragmentation. The increasing complexity of modern healthcare has led to specialization of health care professionals (Enthoven, 2009). Moreover, healthcare is characterized by silo thinking in all domains: policy, financing, organization, professionals and service delivery (Kodner, 2009). In order to address the needs of frail older people, cooperation between professionals with different backgrounds working in different organizations is required. Even though primary care professionals have a more generalist approach (Boeckxstaens & De Graaf, 2011), they are originally disease-orientated and tend to focus on single and acute health problems (Lette, Baan, van den Berg, & de Bruin, 2015). However, frail older people also have problems in the psychological and social domain that are strongly interrelated with health outcomes (Lloyd & Wait, 2005). Their needs extend the medical domain to the areas of prevention, care, housing and welfare (Ex, Gorter, & Janssen, 2003).

The fragmentation of care is further characterized by a lack of continuity and coordination (Kodner, 2009), leading to inefficient and ineffective care (Gröne & Garcia-Barbero, 2001; Lloyd & Wait, 2005). Services are not delivered coherently, nor in accordance with the dynamic needs of frail older people (Lloyd & Wait, 2005; Nies, 2004). Transfers between primary and secondary care (and reverse) need improvement, because information exchange is generally limited and professionals in secondary care have knowledge deficiencies on services in the community (Boeckxstaens & De Graaf, 2011). Moreover, no one is truly responsible for the coordination of the care for community-dwelling frail older people. Professionals mostly communicate bilateral by referral letters and sporadic phone calls. GPs have insufficient time to coordinate care and often have little knowledge of the available services outside the GP practice (Boeckxstaens & De Graaf, 2011).

In addition, the current methods of delivering primary care are reactive rather than proactive with a minor role for prevention. Frail older people consult care professionals such as their GP on their own initiative. The needs of frail older people are often not addressed in a timely manner, leading to crisis situations such as visits to the Emergency Departments (Boeckxstaens & De Graaf, 2011; Vedel et al., 2009). The early recognition of frailty could prevent further deterioration and even delay negative health and social outcomes and institutionalization (Challis, Chessum, Chesterman, Luckett, & Woods, 1987). Prevention is an important task of primary care but the current approach is quite narrow and related to specific disease-related problems such as stimulating physical activity for diabetes patients or fall prevention programmes for older people (Boeckxstaens & De Graaf, 2011). Prevention may well focus on maintaining quality of life and independence of frail older people.

Preventive, integrated care

In view of the problems concerning the care for frail community-dwelling older people, integrated care is advocated to solve these problems. Integrated care is described as "a well-planned and well-organised set of services and care processes, targeted at multi-dimensional needs/problems of an individual client, or a category of persons with similar needs/problems" (Nies, 2004). Integrated care is an umbrella term that is related to terms such as managed care, transmural care, disease management and care management (Kodner & Spreeuwenberg, 2002; Kodner, 2009). Two crucial features of integrated care are person-centeredness and continuity. First, integrated care is demand oriented rather than supply oriented, implying that care is delivered according to client needs (Mur-Veeman, Hardy, Steenbergen, & Wistow, 2003) by professionals from different disciplines and sectors cooperating to address these needs (Grone, Garcia-Barbero 2001; Kodner Kyriacou 2000). The second important feature of integrated care is continuity: the set of services should be delivered coherently, seamlessly and in accordance with clients' changing needs (Lloyd & Wait, 2005; Nies, 2004). Preventive, integrated care for frail older people starts with the identification of the target group who would benefit most from integrated care (Collard et al., 2012). Frailty should be identified quickly and correctly (Challis 1987; Strandberg & Pitkala 2007) to prevent or postpone the negative outcomes of frailty.

Integrated care is a complex phenomenon and involves overcoming several barriers in the fragmented health care system (Kodner, 2009; Valentijn, Schepman, Opheij, & Bruijnzeels, 2013). Numerous interventions for frail older people have been developed (Oliver, Foot, & Humphries, 2014) and consist of many different (interacting) elements to integrate care such as screening, comprehensive geriatric assessments, preventive home visits, case management, multidisciplinary teams, protocols and discussions, information systems (Beswick et al., 2008; Fabbricotti, 2007; Hebert, Durand, Dubuc, Tourigny, & Group, 2003; Huss, Stuck, Rubenstein, Egger, & Clough-Gorr, 2008; Johri, Beland, & Bergman, 2003; Kodner & Kyriacou, 2000). In particular, case management is a well-known strategy to integrate care around complex patients such as frail older people and pays close attention to informal caregivers (Ross et al 2011). Since all aspects of the health care system tend to be fragmented (Kodner, 2009), integration should also occur at different levels of the health care system, such as the service delivery, professional, organization, financial and policy level (Kodner & Spreeuwenberg, 2002; Lloyd & Wait, 2005; Valentijn et al., 2013). The assumption is that adopting more strategies at different levels is essential to achieve effectiveness (Kodner & Kyriacou, 2000; Kodner & Spreeuwenberg, 2002).

Despite the complexity of integrated care, professionals, policy makers and researchers perceive integrated care as a promising solution. They have high expectations of integrated care (Minkman, 2012; World Health Organization, 2016) and the wide range of aims it might achieve. Integrated care should lead to greater coherence in the care process, improvements in the quality of care, clinical results, quality of life, consumer satisfaction, higher system efficiency, and cost-effectiveness (Kodner & Spreeuwenberg, 2002; Kodner, 2009; Leichsenring, 2004). Therefore, researchers have increasingly been involved in the evaluation of integrated care in order to test its effectiveness (Eklund & Wilhelmson, 2009; Kodner, 2009) and more recently also its cost-effectiveness (Evers & Paulus, 2015; Tsiachristas, Stein, Evers, & Rutten-van Mölken, 2016).

Relevance

It remains unclear whether integrated care can meet these high and diverse expectations. This thesis will, therefore, provide more in-depth insights in the effectiveness and cost-effectiveness of preventive, integrated care for frail older people. Integrated care is a relatively new research field and several questions remain unsolved (Minkman, 2016). One of the assumptions that needs to be verified is whether vulnerable and complex patients will benefit the most from integrated care (Kodner, 2009; Leutz, 1999). Moreover, there remains a need for examining what specific combination of integrated care elements and level of integration is optimal to achieve outcomes (Kodner & Spreeuwenberg, 2002). In this thesis, the effectiveness and cost-effectiveness of a specific intervention, the Walcheren Integrated Care Model (WICM), will be explored and will be related with comparable (inter)national preventive, integrated care interventions for frail older people. Similar to integrated care, the research field of frailty is currently expanding rapidly (Clegg et al., 2013; Manthorpe & Iliffe, 2015). However, a clear conceptualization of frailty is still lacking (Dent et al., 2016) which implies that frail older people receiving integrated care interventions are a diverse group that strongly differs between interventions. However, in integrated care research, frailty is narrowed to a binary identity (not frail-frail). In this thesis, frailty will be specified by developing frailty subpopulations that will be set against the effectiveness of integrated care.

Furthermore, research is necessary to explore whether integrated care is able to solve current problems in elderly care. Currently care is fragmented, lacks coordination and is reactive. On local, national and international level, we are still searching for innovative ways to improve elderly care and providing value for money. This thesis will investigate whether integrated care is the innovative solution. But after all, it is about the older people facing frailty every day. Older people do not identify themselves with the term frailty (van Campen, 2011) and they do not care about interventions. Integrated care for them is about seamless, smooth care processes (Lloyd & Wait, 2005) addressing their needs and being able to prevent or postpone negative outcomes of frailty and, most of all, maintain their quality of life.

Research aims & outline of this thesis

The research aim of this thesis is to explore to what extent preventive, integrated care for community-dwelling frail older people is effective and cost-effective.

The four subquestions of this thesis are:
- Is the WICM effective and cost-effective?
- What is the evidence on the effectiveness and cost-effectiveness of preventive, integrated care for community-dwelling frail older people?

- To what extent can frailty subpopulations in integrated care arrangements be distinguished?
- Is preventive, integrated care more effective for certain subpopulations of frail older people?

Part A of this thesis contains the empirical evaluation of the effectiveness and cost-effectiveness of a promising preventive, integrated care intervention, the WICM. In 2008 in the Netherlands, the Dutch National Care for the Elderly Program was enrolled in which several proactive, integrated care interventions for older person with complex care needs were developed, implemented and evaluated in close collaboration with older people. More than 50 interventions were evaluated with The Older Persons and Informal Caregivers Survey Minimum Dataset to collect uniform information (Lutomski et al., 2013). One of these projects is the WICM. Walcheren is a specific region of the Netherlands in which the proportion of older people is increasing more rapidly than in other regions of the Netherlands. Younger people move to other parts of the Netherlands which also leads to a decrease in the capacity of health care professionals. In close collaboration with these professionals, the WICM was developed including many different elements that were effective in singularity were combined into one comprehensive intervention with specific attention for prevention and the informal caregiver.

The intervention is presented in figure 1.1. All GP patients aged 75 and older were screened with the Groningen Frailty Indicator; a 15-item questionnaire screening for frailty that measures decreases in physical, cognitive, social and psychological functioning. GFI scores range from 0 to 15; patients with a score of 4 or higher were considered frail (Peters, Boter, Slaets, & Buskens, 2013; Schuurmans et al., 2004). Frail older patients are visited by a nurse practitioner who assessed their functional, cognitive, mental and psychological functioning using EASYcare, an evidence-based instrument to assess care needs (Melis et al., 2008). A multidisciplinary treatment plan is then formulated in consultation with the elderly and their informal caregiver(s). Case management is provided by the nurse practitioner who coordinated care within the multidisciplinary team which implies monitoring the frail older person's condition, arranging the admittance to the required services, being the contact person for the involved professionals to coordinate their care and periodically evaluating the multidisciplinary treatment plan. The evaluation occurs in multidisciplinary meetings. Multidisciplinary meetings are attended by the GP, the nurse practitioner and other professionals, depending on the care required by the frail older people, such as geriatric physiotherapists, geriatricians, pharmacists, district nurse, nursing home doctors and mental health workers. The entire process is supported by web-based patient files and multidisciplinary protocols. In the WICM, the GP functions as care coordinator and as a partner in prevention. The GP practice is a single entry point for the elderly, their informal caregivers and health professionals. The intervention requires task reassignment and delegation between nurses and doctors, and among GPs, nursing home doctors and geriatricians. Consultations occur among primary, secondary, and tertiary care providers. At the organizational level, a steering group serves as an umbrella organization under which the WICM is developed and disseminated. This steering group, which consists of representatives from all involved organizations, forms a Joint Governing Board that provides the necessary provider network.

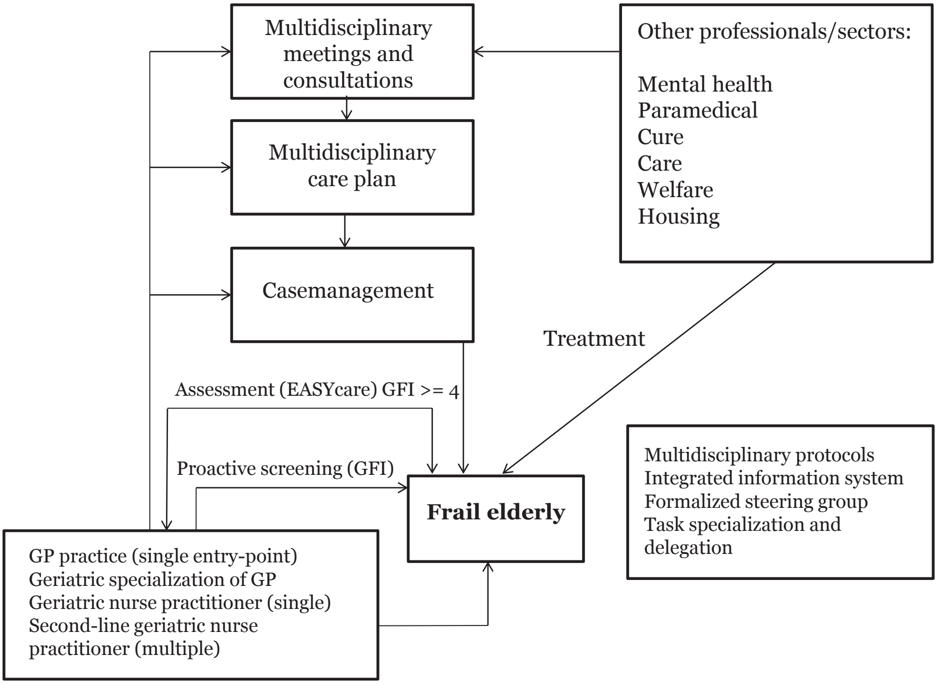


Figure 1.1: Walcheren Integrated Care Model

The WICM combines effective elements such as geriatric assessments, case management, multidisciplinary teams, a single entry point (Johri et al., 2003), multidisciplinary protocols and discussions, web-based patient files, and a network structure (Fabbricotti, 2007; Hebert et al., 2003; Kodner & Kyriacou, 2000) into one intervention. The intervention focuses on the entire chain, from detection to the provision of care, in the fields of prevention, cure, care, welfare and residence, in primary, secondary and tertiary care.

The evaluation study of the WICM has a quasi-experimental design with before and after measurements, at three and twelve months. The intervention is implemented in three GP practices in Walcheren and compared with care as usual and the control group is recruited in the same region and consists of six GP practices. Effectiveness is determined for a wide range of outcomes including health outcomes, functional abilities and quality of life. The cost-effectiveness of the WICM is determined, being an important aim of integrated care. With the current budget cuts in health and social care, it is crucial to provide good value for money. The cost-effectiveness analysis is studied from a societal perspective which means all costs are considered irrespective who pays for them, including the costs of informal care. The intervention costs of the WICM are studied extensively with data from different sources such as questionnaires, GP files and time registrations. This means that the intervention costs such as time spent on multidisciplinary meetings and case management could be determined for each individual frail older person participating in the WICM.

Part B of the thesis questions the concepts and methodologies used to explore the (cost-) effectiveness of integrated care for frail older people and places the results of part A in a broader perspective. A systematic review presents the current body of evidence on preventive, integrated care for community-dwelling frail older people, including the WICM. All types of outcomes of integrated care interventions are considered; being able to present the bigger picture. Furthermore, different elements and levels of integration adapted from the Rainbow Model of Integrated Care (Valentijn et al., 2013) are explicitly related to the outcomes of integrated care. In part B of thesis, the target group of the integrated care interventions is also examined more closely. Frailty is widely acknowledged in both research and practice but has also converted into a container term without a clear conceptualization (Dent et al., 2016). Therefore, frail older people are a heterogeneous group of older people who have different health issues and needs. In this thesis, frailty is further specified by developing frailty profiles are developed with the TOPICS-MDS dataset containing data from 40,000 older people. Latent class analysis is used to develop subpopulations of similar individuals within this larger population. The individuals within these subpopulations have more in common with each other than with the individuals in the other subpopulations. By identifying frailty profiles, care may be tailored to the needs of specific frailty subgroups. Therefore, the frailty profiles are related to integrated care by exploring whether the effectiveness of integrated care differs for certain profiles of frail older people. This is tested by means of an individual-patient-data analysis of eight integrated care interventions. The data of the WICM and seven comparable integrated primary care interventions of Dutch National Care for the

Elderly Program are combined in order to explore the effectiveness of integrated care for each profile in terms of health outcomes, functional abilities and quality of life.

Reading guide

Chapter 2 is the study protocol of the WICM describing the intervention and its different integrated care elements and level of integration in detail. Moreover, the methodology of the evaluation study is extensively described such as the study design, data collection and instruments. Chapter 3 is the short-term evaluation of the WICM with a follow-up period of three months in order to investigate whether quick wins of preventive, integrated care can be expected. Chapter 4 contains the evaluation of the WICM after twelve months in terms of health outcomes, functional abilities and quality of life to explore the full potential of the intervention. Chapter 5 reports on the cost-effectiveness of the WICM.

Part B starts with a systematic review on the effectiveness and cost-effectiveness of preventive, integrated for frail older people in chapter 6. In chapter 7 frailty profiles are developed that are used in chapter 8 to explore whether integrated care is (more) effective for certain profiles of frail older people. Chapter 9 is the general discussion of this thesis which contains the main findings of this thesis, the theoretical and methodological reflections and a future research agenda on integrated care for frail older people.

References

Bergman, H., Ferrucci, L., Guralnik, J., Hogan, D. B., Hummel, S., Karunananthan, S., & Wolfson, C. (2007). Frailty: An emerging research and clinical paradigm—issues and controversies. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 62*(7), 731-737.

Beswick, A. D., Rees, K., Dieppe, P., Ayis, S., Gooberman-Hill, R., Horwood, J., & Ebrahim, S. (2008). Complex interventions to improve physical function and maintain independent living in elderly people: A systematic review and meta-analysis. *The Lancet, 371*(9614), 725-735.

Boeckxstaens, P., & De Graaf, P. (2011). Primary care and care for older persons: Position paper of the European forum for primary care. *Qual Prim Care, 19*, 369-389.

Challis, D., Chessum, R., Chesterman, J., Luckett, R., & Woods, B. (1987). Community care for the frail elderly: An urban experiment. *British Journal of Social Work, 18*(supp), 13-42.

Clegg, A., Young, J., Iliffe, S., Rikkert, M. O., & Rockwood, K. (2013). Frailty in elderly people. *The Lancet, 381*(9868), 752-762.

Collard, R. M., Boter, H., Schoevers, R. A., & Oude Voshaar, R. C. (2012). Prevalence of frailty in community-dwelling older persons: A systematic review. *J Am Geriatr Soc, 60*(8), 1487-1492.

de Groot, K. , Veer, A. de, Versteeg, S., & Francke, A. (2018). *Het organiseren van langdurige zorg en ondersteuning voor thuiswonende patiënten: ervaringen van praktijkondersteuners in de huisartsenzorg. [The organization of long-term care and support for community-dwelling patients: experiences from practice nurses in GP care]*. Utrecht: Nivel.

Dent, E., Kowal, P., & Hoogendijk, E. O. (2016). Frailty measurement in research and clinical practice: A review. *European Journal of Internal Medicine, 31*, 3-10.

Eklund, K., & Wilhelmson, K. (2009). Outcomes of coordinated and integrated interventions targeting frail elderly people: A systematic review of randomised controlled trials. *Health Soc Care Community, 17*, 447-458.

Enthoven, A. C. (2009). Integrated delivery systems: The cure for fragmentation. *American Journal of Managed Care, 15*(12), S284.

Evers, S., & Paulus, A. (2015). Health economics and integrated care: A growing and challenging relationship. *Int J Integr Care, 15*(2)

Ex, C., Gorter, K., & Janssen, U. (2003). *Providing integrated health and social care for older persons in the Netherlands*. Utrecht: Verwey Jonker Institute.

Fabbricotti, I. N. (2007). *Zorgen voor zorgketens [Taking care of integrated care]*. PhD Thesis, Erasmus University Rotterdam.

Fried, L. P., Tangen, C. M., Walston, J., Newman, A. B., Hirsch, C., Gottdiener, J., . . . Cardiovascular Health Study Collaborative Research Group. (2001). Frailty in older adults: Evidence for a phenotype. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 56*(3), M146-56.

Friedman, S. M., Steinwachs, D. M., Rathouz, P. J., Burton, L. C., & Mukamel, D. B. (2005). Characteristics predicting nursing home admission in the program of all-inclusive care for elderly people. *The Gerontologist, 45*(2), 157-166.

Gobbens, R. J. J. (2010). *Frail elderly towards an integral approach*. PhD Thesis, University of Tilburg.

Gobbens, R. J. J., Luijkx, K. G., Wijnen-Sponselee, M. T., & Schols, J. M. G. A. (2010). Towards an integral conceptual model of frailty. *The Journal of Nutrition, Health & Aging, 14*(3), 175-181.

Gröne, O., & Garcia-Barbero, M. (2001). Integrated care. *International Journal of Integrated Care, 1*(1)

Grootegoed, E., & Van Dijk, D. (2012). The return of the family? welfare state retrenchment and client autonomy in long-term care. *Journal of Social Policy, 41*(4), 677-694.

Hebert, R., Durand, P. J., Dubuc, N., Tourigny, A., & Group, P. (2003). PRISMA: A new model of integrated service delivery for the frail older people in Canada. *Int J Integr Care, 3*, e08.

Huss, A., Stuck, A. E., Rubenstein, L. Z., Egger, M., & Clough-Gorr, K. M. (2008). Multidimensional preventive home visit programs for community-dwelling older adults: A systematic review and meta-analysis of randomized controlled trials. *J Gerontol A Biol Sci Med Sci, 63*(3), 298-307.

Johri, M., Beland, F., & Bergman, H. (2003). International experiments in integrated care for the elderly: A synthesis of the evidence. *International Journal of Geriatric Psychiatry, 18*, 222-235.

Kodner, D. L. (2009). All together now: A conceptual exploration of integrated care. *Healthcare Quarterly (Toronto, Ont.), 13 Spec No*, 6-15.

Kodner, D. L., & Kyriacou, C. K. (2000). Fully integrated care for frail elderly: Two American models. *Int J Integr Care, 1*, e08.

Kodner, D. L., & Spreeuwenberg, C. (2002). Integrated care: Meaning, logic, applications, and implications - a discussion paper. *Int J Integr Care, 14*(2)

Lacas, A., & Rockwood, K. (2012). Frailty in primary care: A review of its conceptualization and implications for practice. *BMC Med, Jan 11*(10), 4.

Leichsenring, K. (2004). Developing integrated health and social care services for older persons in Europe. *Int J Integr Care, 4*(3)

Lette, M., Baan, C. A., van den Berg, M., & de Bruin, S. R. (2015). Initiatives on early detection and intervention to proactively identify health and social problems in older people: Experiences from the netherlands. *BMC Geriatr., 15*(143).

Leutz, W. N. (1999). Five laws for integrating medical and social services: Lessons from the United States and the United Kingdom. *The Milbank Quarterly, 77*(1), 77-110.

Lloyd, J., & Wait, S. (2005). *Integrated care: A guide for policymakers*. Alliance for Health and the Future.

Lutomski, J. E., Baars, M. A. E., Schalk, B. W. M., Boter, H., Buurman, B. M., den Elzen, W. P. J., . . . Melis, R. J. F. (2013). The development of the older persons and informal caregivers survey minimum DataSet (TOPICS-MDS): A large-scale data sharing initiative. *PLoS One, 8*(12), e81673.

Manthorpe, J., & Iliffe, S. (2015). Frailty – from bedside to buzzword? *Journal of Integrated Care, 23*(3), 120-128.

Markle-Reid, M., & Browne, G. (2003). Conceptualizations of frailty in relation to older adults. *J.Adv.Nurs., 44*, 58-68.

Melis, R. J. F., van Eijken, M. I. J., Teerenstra, S., van Achterberg, T., Parker, S. G., Borm, G. F., . . . Rikkert, M. (2008). A randomized study of a multidisciplinary program to intervene on geriatric syndromes in vulnerable older people who live at home (Dutch EASYcare study). *J.Gerontol.Ser.A-Biol.Sci.Med.Sci., 63*, 283-290.

Minkman, M. (2012). Developing integrated care. Towards a development model for integrated care. *Int J Integr Care, 12*, e196.

Minkman, M. (2016). Values and principles of integrated care. *Int J Integr Care, 16*(1)

Mur-Veeman, I., Hardy, B., Steenbergen, M., & Wistow, G. (2003). Development of integrated care in England and the Netherlands: Managing across public–private boundaries. *Health Policy, 65*(3), 227-241.

Nies, H. (2004). Integrated care: Concepts and background. In H. Nies, & P. C. Berman (Eds.), *Integrating services for older people: A resource book for managers* (pp. 17-32). Dublin: Ehma.

Oliver, D., Foot, C., & Humphries, R. (2014). Making our health and care systems fit for an ageing population. *London: The King's Fund.*

Pavolini, E., & Ranci, C. (2008). Restructuring the welfare state: Reforms in long-term care in western European countries. *Journal of European Social Policy, 18*(3), 246-259.

Peters, L. L., Boter, H., Slaets, J. P. J., & Buskens, E. (2013). Development and measurement properties of the self assessment version of the INTERMED for the elderly to assess case complexity. *J.Psychosomat.Res., 74*, 518-522.

Rockwood, K., & Mitnitski, A. (2007). Frailty in relation to the accumulation of deficits. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 62*(7), 722-727.

Rockwood, K., Fox, R. A., Stolee, P., Robertson, D., & Beattie, L. (1994). Frailty in elderly people: An evolving concept. *Cmaj, 150*(4), 489-495.

Schers, H., Koopmans, R., & Rikkert, M. O. (2009). De rol van de huisarts bij kwetsbare ouderen [The role of the GP for frail elderly. an internet survey among GPs]. *Huisarts En Wetenschap, 52*(13), 626-630.

Schuurmans, H., Steverink, N., Lindenberg, S., Frieswijk, N., & Slaets, J. P. (2004). Old or frail: What tells us more? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 59*(9), M962-M965.

Slaets, J. P. J. (2006). Vulnerability in the elderly: Frailty. *Medical Clinics of North America, 90*, 593-601.

Tsiachristas, A., Stein, K., Evers, S., & Rutten-van Mölken, M. (2016). Performing economic evaluation of integrated care: Highway to hell or stairway to heaven? *Int J Integr Care, 16*(4)

United Nations, Department of Economic and Social Affairs, Populations Division. (2015). *World population ageing* 2015. (No. (ST/ESA/SER.A/390)).

Valentijn, P. P., Schepman, S. M., Opheij, W., & Bruijnzeels, M. A. (2013). Understanding integrated care: A comprehensive conceptual framework based on the integrative functions of primary care. *Int J Integr Care, 13*(1), 655-679.

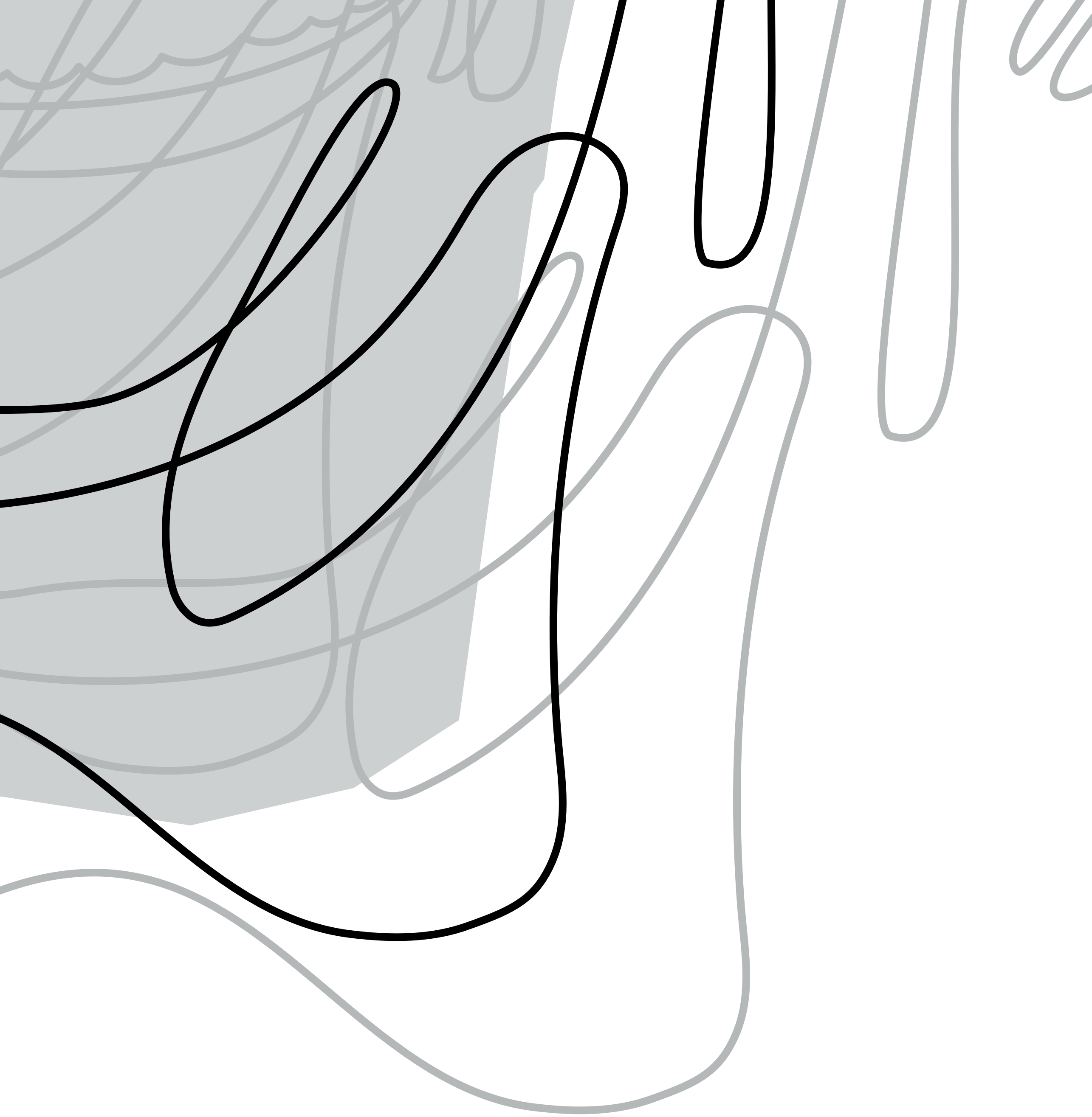
van Campen, C. (2011). *Kwetsbare ouderen [Frail elderly].* The Hague: The Netherlands Institute for Social Research.

Vedel, I., De Stampa, M., Bergman, H., Ankri, J., Cassou, B., Blanchard, F., & Lapointe, L. (2009). Healthcare professionals and managers' participation in developing an intervention: A pre-intervention study in the elderly care context. *Implementation Science, 4*(1), 1.

Wiles, J. L., Leibing, A., Guberman, N., Reeve, J., & Allen, R. E. (2012). The meaning of "aging in place" to older people. *The Gerontologist, 52*(3), 357-366.

World Health Organization. (2015). *World report on ageing and health*. Geneva: World Health Organization.

World Health Organization. (2016). *WHO framework on integrated people-centred health services*. Geneva: World Health Organization.



CHAPTER 2

Study protocol of the Walcheren Integrated Care Model

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Abstract

Background

Frail elderly persons living at home are at risk for mental, psychological, and physical deterioration. These problems often remain undetected. If care is given, it lacks the quality and continuity required for their multiple and changing problems. The aim of this project is to improve the quality and efficacy of care given to frail elderly living independently by implementing and evaluating a preventive integrated care model for the frail elderly.

Methods/design

The design is quasi-experimental. Effects will be measured by conducting a before and after study with control group. The experimental group will consist of 220 elderly of 8 GPs (General Practitioners) who will provide care according to the integrated model (the Walcheren Integrated Care Model). The control group will consist of 220 elderly of 6 GPs who will give care as usual. The study will include an evaluation of process and outcome measures for the frail elderly, their caregivers and health professionals as well as a cost-effectiveness analysis. A concurrent mixed methods design will be used. The study population will consist of elderly 75 years or older who live independently and score a 4 or higher on the Groningen Frailty Indicator, their caregivers and health professionals. Data will be collected prospectively at three points in time: T0, T1 (3 months after inclusion), and T2 (12 months after inclusion). Similarities between the two groups and changes over time will be assessed with t-tests and chi-square tests. For each measure regression analyses will be performed with the T2-score as the dependent variable and the T0-score, the research group and demographic variables as independent variables.

Discussion

A potential obstacle for this study will be the willingness of the elderly and their caregivers to participate. To increase willingness, the request to participate will be sent via the elders' own GP. Interviewers will be from their local region and gifts will be given. A successful implementation of the integrated model is also necessary. The involved parties are members of a steering group and have contractually committed themselves to the project.

Background

With an aging population, caring for the increasing number of the frail elderly is a challenge for the Dutch healthcare system (Slaets, 2006; van Campen, 2011). The frail elderly are those with a disease or infirmity associated with advanced age, which is manifested by demonstrable mental, psychological, emotional or physical dysfunction to the extent that the person is incapable of adequately providing for his or her own health and personal care presently or in the near future (Fried et al., 2001; Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010). In 2010, 16% (2.6 million) of the Dutch population was 65 years or older, of which 10% was 75 years or older and 7% was 80 years or older (Zantinge, Van der Wilk, Van Wieren, & Schoemaker, 2011). Of the elderly population in 2010, 25% were considered frail. As a result of reduced mortality rates and the demographic shift, there will be a higher frail population in need of long-term care in the near future. The percentage of the frail elderly is estimated to increase to 68% in 2030 (van Campen, 2011). In the meantime, the demand for services already strains the professional workforce and caregiver burden (Donelan et al., 2002; Iecovich, 2008; van Eijken, 2007).

The frail elderly are an important group within the elderly population because their diminished compensation capacities make them, their caregivers, and society most able to benefit from changes in social and healthcare arrangements (Fairhall et al., 2011; Fried, Ferrucci, Darer, Williamson, & Anderson, 2004). Due to their complex and continuously changing health and social problems, the frail elderly need a wide range of services over a long period of time (Espinoza & Walston, 2005). However, the reluctance of the frail elderly to report their growing impairments to their doctors impedes interventions at a stage when preventive care could diminish further mental, psychological or physical deterioration (Challis, Chessum, Chesterman, Luckett, & Woods, 1987). Approximately 30% of the Dutch frail elderly receive no domestic, personal, home or private care (de Klerk, 2004). They solely rely on their own judgment or that of their caregivers for seeking help or for performing their daily activities. Timely recognition of unmet needs can avoid crisis situations or the overburdening of the caregiver. It can also improve social wellbeing (Bleijenberg et al., 2012; Daniels et al., 2011; Landi et al., 2007).

Changes also occur in the attitudes of the elderly toward care. These changes also necessitate changes in the organization of care. The frail elderly no longer silently accept the care that they are given and now demand their care meets their needs. Patient-centeredness has become a legitimating base for healthcare provision and has been reinforced by laws that strengthen patient’s rights. These laws also force providers to provide the care that the elderly want and need at the right time and place (Ekdahl, Andersson, & Friedrichsen, 2010; Haug, 1994; Leichsenring, 2004; Zantinge et al., 2011). A supply-oriented approach and the fragmentation in the organization of the elderly care today inhibit progress on this issue. Service is still often characterized by a lack of continuity and coordination on the behalf of involved providers. Responsibility for the whole continuum of care is absent and results in inefficient and ineffective care (Bergman et al., 1997; Gröne & Garcia-Barbero, 2001). The specific needs of the frail elderly and their caregivers, budget restraints and patient-centered views call for new and more effective organizational structures.

The integration of health services and social services for the frail elderly has gained tremendous attention as a means to accomplish this. There is a widespread belief that the integration of these will enhance satisfaction, quality of life, efficiency, and health outcomes and will also decrease costs (Ganz, Fung, Sinsky, Wu, & Reuben, 2008; Hebert, Durand, Dubuc, Tourigny, & Group, 2003; Kodner & Kyriacou, 2000; Reed, Cook, Childs, & McCormack, 2005). The rationale behind this stems from the fact that a single service provider is usually unable to respond to all the needs. This prohibits efficiency in the delivery process. To meet the multiple needs of the frail elderly in an efficient and effective manner, some claim that numerous service providers will need to combine their efforts in a coordinated manner (Fabbricotti, 2007; Glendinning, 2003; Hardy, Mur-Veeman, Steenbergen, & Wistow, 1999). There is also mounting evidence that confirms beliefs that the development of integrated care arrangements can be cost effective and enhance quality (Bernabei et al., 1998; Eklund & Wilhelmson, 2009; Elkan et al., 2001; Hébert et al., 2010; Johri, Beland, & Bergman, 2003; Kodner, 2008; Leveille et al., 1998; Tourigny, Durand, Bonin, Hebert, & Rochette, 2004; van Hout et al., 2010)

Though widely acknowledged and pursued, the implementation and evaluation of integrated services for the frail elderly has not yet reached its full potential. Much is still unknown regarding how services can be integrated and the effects of integration. In this study, a new integrated model for the frail elderly, the Walcheren Integrated Care Model, will be developed and evaluated. Walcheren refers to the region in the Netherlands where the study takes place. The Walcheren Integrated Care Model is in accordance with scientific evidence and addresses the design elements that affect the quality of care. It has an umbrella organizational structure involving case management, multidisciplinary teams, protocols, consultations, and patient files. It will be an organized provider network with evidence-based needs assessments (Fabbricotti, 2007; Johri et al., 2003; Kodner, 2008). All elements are embedded in the model. However, more types of health professionals participate in the model than other studies have previously investigated. General practitioners, geriatricians, home health care workers, paramedics, social workers, pharmacists, and mental health care professionals all take part in the designed model. In contrast with other models, this model also contains a preventive element: a screening tool to detect frailty in the elderly. Finally, the model is being evaluated on a broader range to obtain a comprehensive evaluation and determine possible trade-offs between effects.

This article describes the study design of the evaluation of the Walcheren Integrated Care Model compared with traditional care. The development and evaluation of the model are part of the National Care for the Elderly Program (NPO), which is funded by the Netherlands Organization for Health Research and Development (ZonMW; project number 313030201)

The intervention: the Walcheren Integrated Care Model

The Walcheren Integrated Care Model (WICM) is a comprehensive integrated model for the detection and assessment of needs and the assignment and evaluation of care for independently living frail elderly. The model comprises ten elements: a screening tool for the detection of frailty in the elderly, a single entry point, an evidence-based comprehensive need assessment tool, a multidisciplinary individualized service plan, case management, multidisciplinary team consultation and meetings, protocol-led care assignment, a steering group, task specialization and delegation, and a chain computerization system.

The frail elderly aged 75+ years are identified by their general practitioner (GP) by the Groningen Frailty Indicator (GFI), a tool for the detection of frailty. The GFI is a 15-item questionnaire that measures decreases in physical, cognitive, social, and psychological functioning. Scores can range from 0 to 15 (Schuurmans, Steverink, Lindenberg, Frieswijk, & Slaets, 2004; Steverink, Slaets, Schuurmans, & Van Lis, 2001). A geriatric nurse practitioner that works at the GP practice sends the GFI questionnaire to the homes of the elderly and then contacts them by telephone if they do not respond. When necessary, elderly are helped at home to complete the questionnaire. A geriatric nurse practitioner and GP calculate the GFI score. Elderly with a GFI ≥4 are identified as frail and assigned to a case manager. The geriatric nurse practitioner is the case manager for elderly with single needs. A secondary line geriatric nursing specialist is assigned as case manager if the needs are multiple or of a complex nature.

The case manager then sets up a meeting with the elderly to assess their needs with the EASYcare instrument. EASYcare is an evidence-based comprehensive need assessment instrument that assesses (instrumental) activities of daily life, cognition, and mood. It also contains a module for converting care requirements relating to welfare, residence, and care into treatment goals (Melis et al., 2008). The goals are drawn up in consultation with the elderly and their caregivers. Explicit attention is paid to the necessary support and guidance of the caregivers. The results of the assessment are described by the case manager in an individualized care plan. The case manager also creates a proposal for required care and care objectives.

The proposed plan is then discussed in a multidisciplinary meeting led by the GP. Depending on treatment goals, the meeting is also attended by other health professionals who may be needed. During the meeting, a multidisciplinary care plan will be approved, actions and care paths will be discussed, and agreements will be made about the care to be deployed and the activities of all persons involved. The treatment plans of each professional are included in the care plan. The GP harmonizes the care plan with the elderly and their caregiver and obtains permission for its implementation. A chain computerization system accessible by the health professionals involved will be used for the multidisciplinary care plan. The professionals will automatically receive an email in the event of changes in use of care or a transfer.

The case manager is responsible for admittance to the required services, the planning and coordination of care delivery, and periodical evaluation of the care plan. Thus, the case manager arranges obligatory need assessment, monitors the elderly at least every six months for one year, and supports the multidisciplinary team by arranging meetings and streamlining the necessary exchange of information. The responsibilities and activities of the involved professionals and case manager are formalized in agreed protocols with predefined modes of referral and collaboration. During the process, the GP practice functions as a single entry point. It is the gate through which elderly and professionals can access the expertise and services of all health and social care professionals and organizations. The GP and case manager work in close collaboration to ensure timely and correct care assessment and provision. To be able to fulfill their tasks, the GPs must have completed an executive training in geriatric care, a course in GP consults and EASYcare training. The case managers must have successfully attended the EASYcare training and a course in case management.

Methods and design

Aim

The aim of the project is to improve the quality and efficacy of care given to frail elderly living independently by their caregivers and health professionals. It seeks to do this by implementing, evaluating, and disseminating an integral care model for the frail elderly. Living independently is defined as living at home or in a sheltered accommodation without receiving other forms of integrated care. The research questions for the evaluation study is as follows: What are the effects of the Walcheren Integrated Care Model on the caregivers, health professionals, the organization of care and the healthcare costs for the frail elderly, and what are the effects on the quality and efficacy of the care given to the frail elderly living independently?

Study design

The study has a quasi-experimental design in which the effects will be measured before and after the study. A control group will also be used. The study includes an evaluation of process and outcome measures for the frail elderly, their caregivers, and health professionals, as well as a cost-effectiveness analysis. To evaluate the effects, a combination of qualitative and quantitative research methods will be used. (See tables 2.1-2.4). The study protocol has been reviewed by the medical ethics committee of the Erasmus Medical Centre, Rotterdam, the Netherlands, under protocol number MEC-2013-058. They waived further examination as the rules laid down in the Medical Research Involving Human Subjects Act did not apply.

Power calculation

We will include 220 elderly in both the experimental and control group. We expect a 10% loss to follow-up (due to mortality, re-housing, impossibility or unwillingness to participate further) between inclusion and T1 and a 20% loss between T1 and T2. The sample is sufficient to detect changes in our primary measure of quality of life. Assuming an average effect size of 0.5 and significance of 5%, this gives a power of 0.997. If we assume a small effect size of 0.3 with a significance of 5%, this still supplies sufficient power at 0.837. Interfering variables will also play a role. At an average effect size of 0.15 and significance of 5%, assuming five independent variables, the power is 0.97. Even with 15 independent variables, the power remains sufficient at 0.856.

Study sample: sampling and eligibility criteria

Sampling will take place at GP practices in Walcheren. The experimental group will consist of the elderly patients of 8 GPs from 3 GP practices located in the east of

Walcheren who will provide care according to the WICM. The control group will consist of 6 GPs from 5 GP practices in the north, south, and west of Walcheren who will provide traditional care. All elderly aged 75+ years in these practices who live independently will be asked to complete the GFI, along with several demographic questions and a consent form. Approximately 900 elderly in both the experimental and control practices will be contacted. The questionnaire is accompanied by a letter from the GP to raise the likelihood of response and assure that the elderly are well informed. After being sent a reminder, the elderly will be contacted by telephone or visited at home to be asked to participate and to help complete the questionnaire if necessary. These activities are expected to result in an 80% response rate. Elderly will be included if they score ≥4 on the GFI, if they have signed the consent form, or if they are able to make that decision themselves. Exclusion criteria are as follows: elderly on a waiting list for a nursing home, elderly who are not able to decide themselves if they want to participate (e.g., in case of dementia), and elderly with a life expectancy of <6 months due to a terminal illness. Included elderly will be asked to provide contact information for their informal caregiver. The caregivers will be contacted either by telephone or face-to-face during the first visit from the researchers at the home of the elderly subjects. They will be asked to fill in a written consent form if they agree to participate. Non-respondents will be contacted again by telephone. A response rate of 60% is expected. Health professionals will be selected based on their function and region of employment. An estimated 400 questionnaires will be sent to health professionals in the experimental and control groups. We expect a response rate of 50%.

Data collection and instruments: frail elderly

Outcome data and data on demographics (age, sex, living arrangement, education, and marital status) will be collected with questionnaires and file research at three points in time: T0, T1 (3 months after inclusion), and T2 (12 months after inclusion). Research has shown that effects can be expected 3 months after starting to use the EASYcare instrument (Melis et al., 2008). The T2 measurement takes place to determine long-term effects. All elderly will be visited at home by trained interviewers recruited from the region of Walcheren to ensure a cultural fit with the elder. Interviewers will have a background in healthcare to ensure a high-quality interview. Every elder will be given a gift at T1 as a token of appreciation and to motivate further participation. File research will occur at the GP practices. The following instruments will be used (see table 2.1):

Table 2.1: Outcome measures and data collection frail elderly

Outcome and instrument	**Method**	**Data collection time**		
		T0	T1	T2
Primary outcomes				
Quality of life				
ICECAP	interview elderly	x	x	x
EQ-6d	interview elderly	x	x	x
SF-36	interview elderly	x	x	x
Cantril's self-anchoring ladder	interview elderly	x	x	x
Secondary outcomes				
Perceived health				
SF-36	interview elderly	x	x	x
Social functioning				
SF-36	interview elderly	x	x	x
Mental well being				
SF-36	interview elderly	x	x	x
Physical functioning				
KATZ-15	interview elderly	x	x	x
Health care use				
Self-reported	interview elderly	x	x	x
Reported by GP	file research	x	x	x

Perceived health

SF-36 The SF-36 measures eight concepts: physical functioning, bodily pain, role limitations due to physical, personal, and emotional health problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions (Brazier et al., 1992; Ware Jr & Sherbourne, 1992). The items regarding perceived current health and changes in health will be used.

Social functioning

SF-36 The SF-36 question on social functioning 'During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?' will be used.

Mental wellbeing

SF-36 The 5-items scale on emotional wellbeing from the SF-36 will be used.

Quality of life

ICECAP The ICECAP instrument was developed for elderly and measures their quality of life using the following 5 dimension on the capacity to perform certain actions and achieve certain states: attachment, security, role, enjoyment, and control. Each dimension consists of one question that can be scored on four levels (Makai, Brouwer, Koopmanschap, & Nieboer, 2012).

EQ-6d The EuroQol (EQ6D) is used to measure quality of life in terms of valued health and is composed of the dimensions mobility, self-care, usual activities, pain/discomfort, anxiety/depression, and cognitive functioning (EuroQol Group, 1990; Krabbe, Stouthard, Essink-Bot, & Bonsel, 1999). Each dimension is scored on three levels: 'no problems,' 'some problems,' and 'severe problems.' The EQ-6d will also be used to calculate cost-utilities of health care.

SF-36 Questions based on the SF-36 on perceived current quality of life and the quality of life compared with one year ago will be used.

Cantril's self-anchoring ladder Perceived quality of life will be measured with the Cantril's ladder, a measurement technique that asks subjects to mark their satisfaction with life from 0 to 10 (Cantril, 1965).

Physical functioning

KATZ-15 The Katz-15 will be administered to measure physical functioning by means of 15 yes or no questions covering domains of activities of daily functioning, such as bathing, transferring, eating, and dressing (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963; Weinberger et al., 1992).

Health care use

Questions on self-reported use Use of healthcare will be measured with 16 questions regarding the use of seven domains of care (hospital admissions, unplanned care, respite care, medical, paramedic, psychosocial care, and daycare). Elderly will be asked if they make use of care, and if so, how often (in days or hours depending on the type of care).

File research The files of the elderly from the GPs will be analyzed regarding health care use. Data will be collected on the same domains as described above and compared with self-reported use.

Data collection and instruments: caregivers

Outcome data and demographic data (e.g., age, sex, income, relationship, and living with loved one) from the caregivers will be collected with questionnaires at three time points: T0, T1 (3 months after inclusion), and T2 (12 months after inclusion).

Caregivers will be sent a questionnaire or interviewed at the same time as the elder at their home. Caregivers will also be given a gift at T1. The questionnaire is composed of the following instruments (see table 2.2):

Table 2.2: Outcome measures and data collection caregivers

Outcome and instrument	Method	Data collection time		
		T0	T1	T2
Perceived health				
SF-36	interview caregiver or mailed questionnaire	x	x	x
Objective burden				
Short version iBMG instrument objective burden informal care	interview caregiver or mailed questionnaire	x	x	x
Subjective burden				
Carer-Qol	interview caregiver or mailed questionnaire	x	x	x
SRB	interview caregiver or mailed questionnaire	x	x	x
CSI+	interview caregiver or mailed questionnaire	x		x
Perseverance time	interview caregiver or mailed questionnaire	x		x
ASIS	interview caregiver or mailed questionnaire	x		x
Quality of life				
SF-36	interview caregiver or mailed questionnaire	x	x	x
Cantril's self-anchoring ladder	interview caregiver or mailed questionnaire	x	x	x
Use of community services				
Self-reported	interview caregiver or mailed questionnaire	x	x	x
CSAI	interview caregiver or mailed questionnaire	x		x

Perceived health

SF-36 As for the elderly, the items on perceived current health and changes in health from the SF-36 health survey will be used.

Objective burden

Short version Erasmus iBMG instrument "objective burden informal care" This instrument measures and divides the time spent on the elderly into the following domains: household tasks, personal care, help with moving and contacts with family, friends and health care providers, and medical technical tasks (Van den Berg & Spauwen, 2006). Caregivers will be asked if they give help, and if so, how many hours per week.

Subjective burden

CarerQol: The CarerQol will be used to measure the impact of informal care (Brouwer, Van Exel, Van Gorp, & Redekop, 2006; Hoefman, van Exel, Foets, & Brouwer, 2011). The CarerQol-VAS assesses happiness with a horizontal Visual Analogue Scale

(VAS) with 0 ('completely unhappy') and 10 ('completely happy') as endpoints. The CarerQol-7d describes seven dimensions of burden: fulfillment, support, relational and mental health problems, problems with combining daily activities, finances, and physical health. The answer categories are 'no', 'some' and 'a lot of problems.'

Self-related burden VAS (SRB) The SRB will be used to measure the overall perceived burden. The SRB asks how straining the care for the loved one is with a horizontal VAS ranging from 0 ('not straining at all') to 10 ('much too straining') (van Exel et al., 2004).

Caregiver Strain Index+ (CSI+) The CSI+ will be used to measure perceived strain. The CSI+ is an extended version of the 13-item instrument CSI, which only measures negative dimensions of the caregiver situation. The CSI+ adds 5 items on positive dimensions covering the areas of patient characteristics, subjective perceptions of the care-taking relationship by caregivers, and emotional health of caregivers (Al-Janabi, Frew, Brouwer, Rappange, & Van Exel, 2010; Robinson, 1983)

Question on perseverance time The question of how long the caregiver anticipates being able to pursue his tasks as a caregiver will be asked, with answers ranging from less than two weeks to more than two years (Kraijo, Brouwer, de Leeuw, Schrijvers, & van Exel, 2012).

Assessment of the informal care situation (ASIS) To assess the desirability of the caregiving situation, the ASIS will be used, which is a horizontal VAS ranging from 0 ('worst imaginable caregiving situation') to 10 ('best imaginable caregiving situation') (Hoefman et al., 2011).

Quality of life

The same *SF-36* based questions and Cantril's self-anchoring ladder for the elderly will be used.

Use of community services

Community Service Attitude Inventory (CSAI) The CSAI is a 25-item Likert-type scale that will be used to measure the attitude and willingness of caregivers toward the use of community services (Collins, Stommel, King, & Given, 1991).

Survey question Caregivers will be asked if they use community services.

Data collection and instruments: health professionals

Data on the outcomes will be collected from GPs, nursing home doctors, geriatrists, geriatric nurse practitioners, secondary line geriatric nursing specialists, specialists in hospitals, home care employees, mental health professionals, and paramedical specialties with the following instruments (see table 2.3):

Table 2.3: Outcome measures and data collection health professionals

Outcome and instrument	Method	Data collection time		
		T0	T1	T2
Knowledge				
Self-constructed VAS	mailed questionnaire	x		x
Job satisfaction				
Job satisfaction scale	mailed questionnaire	x		x
Subjective burden				
SRB	mailed questionnaire	x		x
Objective burden				
Self-reported by elder	interview elderly	x	x	x
Self-reported by professional	time tracking form	x	x	x
Reported by GP	file research	x	x	x

Knowledge

Questionnaire At the end of the project, a questionnaire will be distributed to the health professionals involved in the experimental and control groups by their organization of employment. This will help ensure the privacy of contact information. The questionnaire is composed of two questions regarding the assessment of the health professional. It assesses his or her knowledge on the frail elderly and his or her knowledge of the roles and tasks of other health professionals involved in the care for the frail elderly. Answers are given for the current situation and the situation 18 months previously and are measured with a VAS ranging from 0 to 10.

Job satisfaction

Job Satisfaction Scale The job satisfaction scale will be part of the questionnaire. This instrument is a 10-item questionnaire with questions on extrinsic and intrinsic job satisfaction (Hills, Joyce, & Humphreys, 2012; Warr, 1990). Health professionals will be asked to assess how satisfied they are now and 18 months previously on a scale ranging from 1 ('extremely unsatisfied') to 7 ('extremely satisfied').

Subjective burden

Self-related burden VAS Inspired by the SRB, a similar VAS will be used to measure the overall perceived burden. As the SRB was developed for caregivers, the question will be transformed into the question ‘How straining is it to give care to the frail elderly?’ Scoring measures the current situation and the situation 18 months previously with a horizontal VAS ranging from 0 (‘not straining at all’) to 10 (‘much too straining’).

Objective burden

File research and questionnaire File research and the questions on healthcare use by the elder as mentioned above will be used to determine the time spent on care. For the time calculation, the volume of care will be multiplied by a mean time determined by consensus with the health professionals (e.g., 40 minutes per house visit by a GP).

Time tracking form The GPs, geriatric nurse practitioner and secondary line geriatric nursing specialist will also keep track of the time spent on managing cases and coordinating tasks, time spent on conferring with health professionals, and time spent on multidisciplinary meetings per elder. A time tracking format will be developed to this end.

Data collection and instruments: cost-effectiveness

The question that is central to the economic analysis is whether the WICM is cost-effective compared with traditional care. The outcome parameter used is cost per QALY (quality-adjusted life-year). For this, the EuroQol (EQ-6D) will be used to measure the quality of life of the elderly persons and will subsequently be converted into disability-adjusted life-years (DALYs). For the cost calculation, the volume of care will be linked to the actual, integral cost per medical service. This will be used to make the instructions for cost research in economic evaluations (Oostenbrink, Bouwmans, Koopmanschap, & Rutten, 2004). Thus, the total care consumption of the elderly will be determined. The above-mentioned patient files, questionnaire, and time tracking form will provide insight into which care was received per elder, how much and from whom.

Data collection and instruments: process indicators

To determine the level of coordination, coherence, and satisfaction with care processes, the following process indicators will be measured with questionnaires, file research, interviews, diaries, and focus groups (see table 2.4).

Degree of integration

Questionnaire To determine the degree of coherence, continuity, and co-operation, a questionnaire will be developed based on a systematic review of integration indicators and instruments for measuring integration. The questions will be part of the questionnaire sent to the health professionals as described above. Health professionals are again asked to assess the current levels of integration and those 18 months previously.

Table 2.4: Process measures and data collection

Outcome and instrument	Method	Data collection time		
		T0	T1	T2
Degree of integration				
Self-constructed questionnaire	mailed questionnaire	x		x
Satisfaction health professionals	mailed questionnaire	x		x
Self-constructed questionnaire	mailed questionnaire	x	x	x
Relational coordination Survey	diaries	x		
Self-reported satisfaction	interviews		x	x
	focusgroups	x		x
Satisfaction frail elderly				
CQ-index	interview elderly	x	x	x
Self-constructed questionnaire	interview elderly	x	x	x
Satisfaction caregiver				
CQ-index	interview caregiver or mailed questionnaire	x	x	x
Self-constructed questionnaire	interview caregiver or mailed questionnaire	x	x	x

Health professionals' experiences with the quality and process of care

Questionnaire Questions on satisfaction with the process of care and level of integration will be derived from the above-mentioned results of the systematic review.

Relational coordination survey for patient care The quality of the relationships and communications between health professionals will be measured with the relational coordination survey for patient care, an instrument covering the following dimensions: shared goals, knowledge and respect, frequency and timing of communication, and problem-solving orientation of the communication (Gittell, 2002; Gittell, 2006).

Diaries The geriatric nurse practitioner and secondary line geriatric nursing specialist will be asked to keep a diary of their experience with the WICM. Every 3 months, a researcher will briefly interview the geriatric nurses over the telephone to discuss their experiences based on the diary.

Interviews After the completion of the experiment, interviews will be held with involved professionals. Discussions will cover their experience with the WICM, conducive and non-conducive factors that played a role and any adjustments that the model may require.

Focus groups For both the experimental and control regions, 3 focus groups will be organized for the health professionals and patient organizations involved. These focus groups will be used to gain insight into satisfaction with the model and its integration. The groups will also strengthen the analysis by reflecting on the results of the study.

The frail elderly and caregiver experiences with the quality and process of care

Consumer Quality Index (CQ-index) The CQ-index, a Dutch standardized method for measuring experiences of patients/clients with health care, will be used. Covered domains are quality of the health professionals, information, participation, treatment, communication, and received care (Delnoij, 2006; Delnoij & Hendriks, 2008). CQ-questionnaires are developed for different types of care. The CQ-questionnaire for home care will be used as a reference point and be completed with questions on the coherence and coordination of care. Elderly will be asked at T0, T1, and T2 regarding their experience of the care and care processes. Caregivers will be asked at T0, T1, and T2 regarding their experiences of the care given to their elder and the care and attention that they receive from health professionals.

Data analysis

The experimental and control groups will be described at every point in time with descriptive statistics. Similarity of characteristics between the two groups will be assessed with t-tests, chi-square tests, and Fisher's exact tests. Bivariate analyses and regressions with the demographic characteristics will determine multicollinearity and correlations with the process and outcome measures. All analyses will be controlled for differences in baseline characteristics and demographic characteristics. For the self-constructed questionnaires, factor analyses and reliability analyses will be performed to determine construct validity. To determine changes over time, t-tests will be performed for each process and outcome measure. For each measure, regression analyses will be performed with the T2-score as the dependent variable and the T0-score, the research group (experimental or control), and demographic variables as independent variables. With subgroup analyses, potential variation between study results between subgroups will be analyzed.

Discussion

Implementation of the model

The development, evaluation, and dissemination of the Walcheren Integrated Care Model depends on its successful implementation. Research has shown that the implementation of integrated care is a very difficult and laborious task (Kodner, 2003; van Raak, Mur-Veeman, Hardy, Steenbergen, & Paulus, 2003), especially regarding the proposed model because it focuses on integration across the entire continuum of care for all frail elderly. Other developmental strategies mainly focus on small programs for a targeted group or on a small part of the care process (Reed et al., 2005). Additionally, when integrated arrangements are being implemented successfully in one setting, one is often unable to achieve dissemination on a wider scale (Johri et al., 2003). Furthermore, developing integrated care arrangements is as much a process of social and cultural integration as it is structural integration. The success of implementation is shaped by the interests and cultures of the health professionals and the social relationships between them. Integration involves aligning the work of health professionals and convincing them to work together from a patient-centered viewpoint (Mur-Veeman, Eijkelberg, & Spreeuwenberg, 2001). Several activities are and will be deployed to ensure that these challenges are overcome.

The involved professionals are all represented in a steering group that forms the umbrella under which the model is developed and disseminated. The steering group forms a Joint Governing Board that provides the necessary provider network, which is further strengthened with guidelines and protocol-led agreements. All patient representatives support the project, and the health insurer CZ is supporting the project financially. The basis for collaboration is also laid down in the formalization of agreements on the regional policy and involves integrated care for all elderly: the so-called ‘structured care of the elderly module.’ The project follows from these structures and will be able to make use of them.

Though administratively secure, the project will eventually be affected by the willingness of the partners to review tasks and delegate and accept new responsibilities thrust upon them. Acceptance of the role of a GP as coordinator is an essential aspect of this. GPs cannot claim this coordinating role for themselves. It will have to be given to them based on the confidence of all ‘players’ and by an agreement that a coordinating role for the GP is a suitable mechanism for improving the care for the frail elderly. A basis for this has already been established. The Walcheren GP Co-operation Care Group, the GP Co-operation in Veere, a working group of elderly patients and various partners in the region have agreed, within the recommendations and preconditions of the National Association for GPs (NHG), that creating a single entry point from the GP practices is the point of departure for setting up structured care of the elderly in Walcheren.

The feasibility of the experiment will also be enhanced by knowledge obtained in the region regarding instruments and collaboration that includes the elderly. Knowledge about using the GFI instrument was obtained during a pilot with the GFI instrument among elderly persons aged 85+ years. Consultations with elderly patients aged 65+ years have already started in three practices. Due to the broad involvement and experiences of health professionals, no major obstacles are expected regarding the model implementation. The pressures on providing care may increase for GPs because the use of the GFI instrument will provide them with information about the frail elderly who were previously unknown. This additional work pressure will be calculated in advance to prepare the GPs for the workload. The extra burden on GPs in the control region is particularly related to time registration and participation in interviews. These extra efforts will also be discussed with them in advance.

Embedding the experiment in other projects is essential over the long term. The experiment does not stand alone. A dementia care-chain and CVA care-chain are also being developed in Walcheren. The protocols developed will guarantee the link with the EASYcare instrument as used in this experiment. The steering group will ensure coherence between the various projects. The GPs in this project are also involved with developing the dementia care-chain. Their personal involvement in both projects will guarantee harmonization.

Evaluation study

The choice for a quasi-experimental design instead of a randomized control trial may seem suboptimal to some. However, in many studies on organizational change, randomization is impractical, impossible or even undesirable (Berkhout, 2000). This is the case in our study as health professionals cannot give traditional care and care according to the model at the same time. Blinding is impossible. For the elderly, it is undesirable to receive care from a different GP or organization from one previously used.

However, choosing for a quasi-experimental design presents our study with some challenges. The absence of randomization makes results subject to contamination by confounding variables (Robson, 2002). Potentially confounding variables have been accurately defined based on literature, experiences of health professionals and comparable studies. Inclusion and exclusion criteria are set. However, there is no guarantee that some confounding variables will be missed. It is also conceivable that differences found in the experimental group are not the result of the intervention but of the additional attention given by both health professionals and interviewers (Polit & Hungler, 1999). It is debatable if this “Hawthorne-effect” is really problematic because increased and patient-centered attention for the frail elderly is one of the goals of the model. Irrespective of the design chosen, the biggest potential obstacle is the willingness of the elderly and their caregivers to participate in this study over the longer term. To increase willingness, a request to participate will be sent, as described above, via the elders' own GPs, interviewers will be from the region and gifts will be given.

References

Al-Janabi, H., Frew, E., Brouwer, W., Rappange, D., & Van Exel, J. (2010). The inclusion of positive aspects of caring in the caregiver strain index: Tests of feasibility and validity. *International Journal of Nursing Studies, 47*(8), 984-993.

Bergman, H., Beland, F., Lebel, P., Contandriopoulos, A. P., Tousignant, P., Brunelle, Y., . . . Clarfield, M. (1997). Care for Canada's frail elderly population: Fragmentation or integration? *Can Med Assoc J, 157*, 1116-1121.

Berkhout, A. J. M. D. (2000). *Resident-oriented care in nursing homes: An evaluation study of the model of resident-oriented care, the implementation and the effects.* PhD Thesis, Maastricht University.

Bernabei, R., Landi, F., Gambassi, G., Sgadari, A., Zuccala, G., Mor, V., . . . Carbonin, P. (1998). Randomised trial of impact of model of integrated care and case management for older people living in the community. *Br Med J, 316*, 1348-1351.

Bleijenberg, N., Drubbel, I., Ten Dam, V. H., Numans, M. E., Schuurmans, M. J., & de Wit, N. J. (2012). Proactive and integrated primary care for frail older people: Design and methodological challenges of the utrecht primary care PROactive frailty intervention trial (U-PROFIT). *BMC Geriatr, 12*, 16.

Brazier, J. E., Harper, R., Jones, N. M., O'Cathain, A., Thomas, K. J., Usherwood, T., & Westlake, L. (1992). Validating the SF-36 health survey questionnaire: New outcome measure for primary care. *BMJ (Clinical Research Ed.), 305*(6846), 160-164.

Brouwer, W., Van Exel, N., Van Gorp, B., & Redekop, W. (2006). The CarerQol instrument: A new instrument to measure care-related quality of life of informal caregivers for use in economic evaluations. *Quality of Life Research, 15*(6), 1005-1021.

Cantril, H. (1965). *Pattern of human concerns*. New Brunswick: Rutgers University Press.

Challis, D., Chessum, R., Chesterman, J., Luckett, R., & Woods, B. (1987). Community care for the frail elderly: An urban experiment. *British Journal of Social Work, 18*(supp), 13-42.

Collins, C., Stommel, M., King, S., & Given, C. (1991). Assessment of the attitudes of family caregivers toward community services. *The Gerontologist, 31*(6), 756-761.

Daniels, R., van Rossum, E., Metzelthin, S., Sipers, W., Habets, H., Hobma, S., . . . de Witte, L. (2011). A disability prevention programme for community-dwelling frail older persons. *Clin Rehabil, 25*, 963-974.

de Klerk, M. (2004). *Zorg en wonen voor kwetsbare ouderen [Care and housing for frail elderly].* The Hague: The Netherlands Institute for Social Research.

Delnoij, D. (2006). *Klantervaringen in de zorg meten met CQ index [Measuring client experiences in health care with the CQ index]*. Utrecht: Nivel.

Delnoij, D., & Hendriks, M. (2008). De CQ-index: Het meten van klantervaringen in de zorg [The CQ-index: Measuring client experiences in health care]. *TSG, 86*(8), 440-446.

Donelan, K., Hill, C. A., Hoffman, C., Scoles, K., Feldman, P. H., Levine, C., & Gould, D. (2002). Challenged to care: Informal caregivers in a changing health system. *Health Affairs, 21*(4), 222-231.

Ekdahl, A. W., Andersson, L., & Friedrichsen, M. (2010). "They do what they think is the best for me." frail elderly patients' preferences for participation in their care during hospitalization. *Patient Education and Counseling, 80*(2), 233-240.

Eklund, K., & Wilhelmson, K. (2009). Outcomes of coordinated and integrated interventions targeting frail elderly people: A systematic review of randomised controlled trials. *Health Soc Care Community, 17*, 447-458.

Elkan, R., Kendrick, D., Dewey, M., Hewitt, M., Robinson, J., Blair, M., . . . Brummell, K. (2001). Effectiveness of home based support for older people: Systematic review and meta-analysis. *BMJ (Clinical Research Ed.), 323*(7315), 719-725.

Espinoza, S., & Walston, J. D. (2005). Frailty in older adults: Insights and interventions. *Cleve Clin J Med,* 72(12):1105-1112.

EuroQol Group. (1990). EuroQol- a new facility for the measurement of health-related quality of life. *Health Policy, 16*(3), 199-208.

Fabbricotti, I. N. (2007). *Zorgen voor zorgketens [Taking care of integrated care].* PhD Thesis, Erasmus University Rotterdam.

Fairhall, N., Langron, C., Sherrington, C., Lord, S. R., Kurrle, S. E., Lockwood, K., . . . Cameron, I. D. (2011). Treating frailty-a practical guide. *BMC Med., 6*(9), 83.

Fried, L. P., Ferrucci, L., Darer, J., Williamson, J. D., & Anderson, G. (2004). Untangling the concepts of disability, frailty, and comorbidity: Implications for improved targeting and care. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 59*(3), 255-263.

Fried, L. P., Tangen, C. M., Walston, J., Newman, A. B., Hirsch, C., Gottdiener, J., . . . Cardiovascular Health Study Collaborative Research Group. (2001). Frailty in older adults: Evidence for a phenotype. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 56*(3), M146-56.

Ganz, D. A., Fung, C. H., Sinsky, C. A., Wu, S., & Reuben, D. B. (2008). Key elements of high-quality primary care for vulnerable elders. *J Gen Intern Med, 23*, 2018-2023.

Gittell, J. H. (2002). Coordinating mechanisms in care provider groups: Relational coordination as a mediator and input uncertainty as a moderator of performance effects. *Management Science, 48*(11), 1408-1426.

Gittell, J. H. (2006). Relational coordination: Coordinating work through relationships of shared goals, shared knowledge and mutual respect. In O. Kyriakidou, & M. F. Ozbilgin (Eds.), *Relational perspectives in organizational studies. A research companion.* (pp. 74-94). Cheltenham: Edward Elgar Publishing Limited.

Glendinning, C. (2003). Breaking down barriers: Integrating health and care services for older people in England. *Health Policy, 65*(2), 139-151.

Gobbens, R., Luijkx, K., Wijnen-Sponselee, M. T., & Schols, J. (2010). Towards an integral conceptual model of frailty. *The Journal of Nutrition, Health & Aging, 14*(3), 175-181.

Gröne, O., & Garcia-Barbero, M. (2001). Integrated care. *Int J Integr Care, 1*(1)

Hardy, B., Mur-Veeman, I., Steenbergen, M., & Wistow, G. (1999). Inter-agency services in England and the Netherlands. A comparative study of integrated care development and delivery. *Health Policy, 48*(2), 87-105.

Haug, M. R. (1994). Elderly patients, caregivers, and physicians: Theory and research on health care triads. *Journal of Health and Social Behavior, 35*(1), 1-12.

Hébert, R., Raîche, M., Dubois, M. F., Gueye, N. R., Dubuc, N., & Tousignant, M. (2010). Impact of PRISMA, a coordination-type integrated service delivery system for frail older people in Quebec (Canada): A quasi-experimental study. *J Gerontol B Psychol Sci Soc Sci, 65 B*, 107-118.

Hebert, R., Durand, P. J., Dubuc, N., Tourigny, A., & Group, P. (2003). PRISMA: A new model of integrated service delivery for the frail older people in Canada. *Int J Integr Care, 3*, e08.

Hills, D., Joyce, C., & Humphreys, J. (2012). Validation of a job satisfaction scale in the Australian clinical medical workforce. *Evaluation & the Health Professions, 35*(1), 47-76.

Hoefman, R. J., van Exel, N Job A, Foets, M., & Brouwer, W. B. (2011). Sustained informal care: The feasibility, construct validity and test–retest reliability of the CarerQol-instrument to measure the impact of informal care in long-term care. *Aging & Mental Health, 15*(8), 1018-1027.

Iecovich, E. (2008). Caregiving burden, community services, and quality of life of primary caregivers of frail elderly persons. *Journal of Applied Gerontology, 27*(3), 309-330.

Johri, M., Beland, F., & Bergman, H. (2003). International experiments in integrated care for the elderly: A synthesis of the evidence. *International Journal of Geriatric Psychiatry, 18*, 222-235.

Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., & Jaffe, M. W. (1963). Studies of illness in the aged. the index of ADL: A standardized measure of biologic and psychologic function. *Jama, 185*(21), 914-919.

Kodner, D. L. (2008). Integrated care networks for the vulnerable elderly: North American prototypes, performance and lessons. *Int J Integr Care, 8*(5)

Kodner, D. L. (2003). Consumer-directed services: Lessons and implications for integrated systems of care. *Int J Integr Care, 3*, e12.

Kodner, D. L., & Kyriacou, C. K. (2000). Fully integrated care for frail elderly: Two American models. *Int J Integr Care, 1*, e08.

Krabbe, P. F., Stouthard, M. E., Essink-Bot, M., & Bonsel, G. J. (1999). The effect of adding a cognitive dimension to the EuroQol multiattribute health-status classification system. *Journal of Clinical Epidemiology, 52*(4), 293-301.

Kraijo, H., Brouwer, W., de Leeuw, R., Schrijvers, G., & van Exel, J. (2012). Coping with caring: Profiles of caregiving by informal carers living with a loved one who has dementia. *Dementia, 11*(1), 113-130.

Landi, F., Onder, G., Carpenter, I., Cesari, M., Soldato, M., & Bernabei, R. (2007). Physical activity prevented functional decline among frail community-living elderly subjects in an international observational study. *Journal of Clinical Epidemiology, 60*(5), 518-524.

Leichsenring, K. (2004). Developing integrated health and social care services for older persons in Europe. *Int J Integr Care, 4*(3)

Leveille, S. G., Wagner, E. H., Davis, C., Grothaus, L., Wallace, J., LoGerfo, M., & Kent, D. (1998). Preventing disability and managing chronic illness in frail older adults: A randomized trial of a community-based partnership with primary care. *J Am Geriatr Soc, 46*, 1191-1198.

Makai, P., Brouwer, W. B., Koopmanschap, M. A., & Nieboer, A. P. (2012). Capabilities and quality of life in Dutch psycho-geriatric nursing homes: An exploratory study using a proxy version of the ICECAP-O. *Quality of Life Research, 21*(5), 801-812.

Melis, R. J. F., van Eijken, M. I. J., Teerenstra, S., van Achterberg, T., Parker, S. G., Borm, G. F., . . . Rikkert, M. (2008). A randomized study of a multidisciplinary program to intervene on geriatric syndromes in vulnerable older people who live at home (Dutch EASYcare study). *J.Gerontol.Ser.A-Biol.Sci.Med.Sci., 63*, 283-290.

Mur-Veeman, I., Eijkelberg, I., & Spreeuwenberg, C. (2001). How to manage the implementation of shared care-A discussion of the role of power, culture and structure in the development of shared care arrangements. *Journal of Management in Medicine, 15*(2), 142-155.

Oostenbrink, J., Bouwmans, C., Koopmanschap, M., & Rutten, F. (2004). *Handleiding voor kostenonderzoek. Methoden en standaard kostprijzen voor economische evaluaties in de gezondheidszorg. [Dutch Manual for Costing: Methods and Standard Costs for Economic*

Evaluations in Health Care (actualized version 2004)]. Diemen: College voor zorgverzekeringen.

Polit, D. F., & Hungler, B. P. (1999). *Nursing research principles and methods*. Philadelphia: Lippincott Williams and Wilkins.

Reed, J., Cook, G., Childs, S., & McCormack, B. (2005). A literature review to explore integrated care for older people. *Int J Integr Care, 5*(1).

Robinson, B. C. (1983). Validation of a caregiver strain index. *Journal of Gerontology, 38*(3), 344-348.

Robson, C. (2002). *Real world research: A resource for social scientists and practitioner-researchers* (2nd ed.). Hoboken: John Wiley & Sons.

Schuurmans, H., Steverink, N., Lindenberg, S., Frieswijk, N., & Slaets, J. P. (2004). Old or frail: What tells us more? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 59*(9), M962-M965.

Slaets, J. P. J. (2006). Vulnerability in the elderly: Frailty. *Medical Clinics of North America, 90*, 593-601.

Steverink, N., Slaets, J., Schuurmans, H., & Van Lis, M. (2001). Measuring frailty: Development and testing of the Groningen Frailty Indicator (GFI). *Gerontologist, 41*(1), 236-237.

Tourigny, A., Durand, P., Bonin, L., Hebert, R., & Rochette, L. (2004). Quasi-experimental study of the effectiveness of an integrated service delivery network for the frail elderly. *Can J Aging, 23*, 231-246.

van Campen, C. (2011). *Kwetsbare ouderen [Frail elderly].* The Hague: The Netherlands Institute for Social Research.

Van den Berg, B., & Spauwen, P. (2006). Measurement of informal care: An empirical study into the valid measurement of time spent on informal caregiving. *Health Economics, 15*(5), 447-460.

van Eijken, M. I. J. (2007). *Strategies for improving community health care for the elderly*. Nijmegen: Radboud University.

van Exel, N. J., op Reimer, W. J. M., Brouwer, W. B. F., van den Berg, B., Koopmanschap, M. A., & van den Bos, G. A. M. (2004). Instruments for assessing the burden of informal caregiving for stroke patients in clinical practice: A comparison of CSI, CRA, SCQ and self-rated burden. *Clinical Rehabilitation, 18*(2), 203-214.

van Hout, H. P., Jansen, A. P., van Marwijk, H. W., Pronk, M., Frijters, D. F., & Nijpels, G. (2010). Prevention of adverse health trajectories in a vulnerable elderly population through nurse home visits: A randomized controlled trial [ISRCTN05358495]. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 65*(7), 734-742.

van Raak, A., Mur-Veeman, I., Hardy, B., Steenbergen, M., & Paulus, A. (2003). *Integrated care in Europe: Description and comparison of integrated care in six EU countries*. Maarssen: Elsevier Gezondheidszorg.

Ware Jr, J. E., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. conceptual framework and item selection. *Medical Care*, 473-483.

Warr, P. (1990). The measurement of well-being and other aspects of mental health. *Journal of Occupational and Organizational Psychology, 63*(3), 193-210.

Weinberger, M., Samsa, G. P., Schmader, K., Greenberg, S. M., Carr, D. B., & Wildman, D. S. (1992). Comparing proxy and patients' perceptions of patients' functional status: Results from an outpatient geriatric clinic. *Journal of the American Geriatrics Society, 40*(6), 585-588.

Zantinge, E., Van der Wilk, E., Van Wieren, S., & Schoemaker, C. (2011). *Gezond ouder worden in Nederland [Healthy aging in the Netherlands].* Bilthoven: The National Institute for Public Health and the Environment.

CHAPTER 3

Short-term effects of the Walcheren Integrated Care Model

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Abstract

Background

This study explores the short-term value of integrated care for the frail elderly by evaluating the effects of the Walcheren Integrated Care Model on health, quality of life, health care use and satisfaction with care after three months.

Intervention

Frailty was preventively detected in elderly living at home with the Groningen Frailty Indicator. Geriatric nurse practitioners and secondary care geriatric nursing specialists were assigned as case managers and coordinated the care agreed upon in a multidisciplinary meeting. The general practitioner (GP) practice functions as a single entry point and supervises the coordination of care. The intervention encompasses task reassignment between nurses and doctors and consultations between primary, secondary and tertiary care providers. The entire process was supported by multidisciplinary protocols and web-based patient files.

Methods

The design of this study was quasi-experimental. In this study, 205 frail elderly patients of three GP practices that implemented the integrated care model were compared with 212 frail elderly patients of five GP practices that provided usual care. The outcomes were assessed using questionnaires. Baseline measures were compared with a three-month follow-up by chi-square tests, *t*-tests and regression analysis.

Results and conclusion

In the short term, the integrated care model had a significant effect on the attachment aspect of quality of life. The frail elderly patients were better able to obtain the love and friendship they desire. The use of care did not differ despite the preventive element and the need for assessments followed up with case management in the integrated care model. In the short term, there were no significant changes in health. As frailty is a progressive state, it is assumed that three months is too short to influence changes in health with integrated care models. A more longitudinal approach is required to study the value of integrated care on changes in health and the preservation of the positive effects on quality of life and health care use.

Background

With the aging of the population, the number of frail elderly people is increasing rapidly and the need to find effective care arrangements for this elderly group has gained importance (Johri, Beland, & Bergman, 2003; Slaets, 2006). The frail elderly suffer from age-related problems in the physical, psychological and social domains of daily functioning (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010; Slaets, 2006; van Campen, 2011). Problems in these three domains often influence each other, which may lead to accumulating problems (Gobbens et al., 2010; van Campen, 2011). Thus, the needs of the frail elderly are often part of a complex and dynamic process. Because the condition of the frail elderly declines gradually, timely detection is crucial as it may prevent further deterioration (Challis, Chessum, Chesterman, Luckett, & Woods, 1987). Research stresses the importance of detecting frailty, showing a strong relationship between frailty and quality of life (Gobbens, van Assen, Luijkx, Wijnen-Sponselee, & Schols, 2010) as well as severe problems such as disability, health care use and even death (Gobbens et al., 2010).

The current organisation of care is not adequate to address these complex and changing needs of the frail elderly. Current health care for the frail elderly is reactive, and frailty is often undetected by health professionals. About 30% of Dutch frail elderly people receive no domestic, personal, home or private care (de Klerk, 2004). Health care is supply-orientated and the complex needs of the frail elderly are separately addressed by professionals focusing on their own discipline. Because the frail elderly have diverse needs in the areas of prevention, care, cure, residence and welfare (Ex, Gorter, & Janssen, 2003) and professionals from these disciplines do not cooperate, care is fragmented. Fragmentation of care is further affected by a lack of continuity and coordination (Kodner, 2009), leading to inefficient and ineffective care (Gröne & Garcia-Barbero, 2001). Reorganization of care for the frail elderly is essential for creating a sustainable health care system in the future.

Integrated care is increasingly perceived as the way to reorganise care for the frail elderly. Integrated care is defined as “a well planned and well organised set of services and care processes, targeted at multi-dimensional needs/problems of an individual client, or a category of persons with similar needs/problems” (Nies, 2004). The focus of integrated care is continuity; the set of services should be delivered seamlessly (Lloyd & Wait, 2005). Moreover, integrated care aims to provide demand-driven care, directed at the needs of the individual client, even when these needs are multi-dimensional. Both continuous and demand-driven care must be achieved when care is delivered from various care disciplines or sectors (Kodner & Kyriacou, 2000).

Integrated care is expected to have a high level of effects (Minkman, 2012). It should result in more coherence in the care process, improve the quality of care, and enhance clinical results, quality of life, system efficiency, and consumer satisfaction (Kodner & Spreeuwenberg, 2002; Kodner, 2009). To explore whether these high expectations can be achieved, studies have focused on the value of integrated care and have shown mixed results. Some studies demonstrated positive effects on the functional abilities (Bernabei et al., 1998; Melis, Eijken, & Teerenstra, 2008) and well-being (Melis et al., 2008) of the frail elderly; however, other studies found no effect on functional abilities and showed an increase in the use of most types of care (Hébert, Dubois, Raiche, Dubuc, & Group, 2008). In a systematic review, the results suggested that there was a reduction in the use of health care as a result of integrated care (Eklund & Wilhelmson, 2009). Some studies found a decrease in hospitalization and institutionalization (Bernabei et al., 1998; Montgomery & Fallis, 2003), whereas others found no effect of integrated care on health care utilization (Newcomer, Maravilla, Faculjak, & Graves, 2004; Rockwood et al., 2000). However, this growing body of evidence comes from studies that evaluated different integrated care models, including various components of integrated care (Eklund & Wilhelmson, 2009; Kodner, 2009). Moreover, the study periods differed considerably, and most studies focussed on the long-term effects, using a diverse range of non-valid outcome measures (Eklund & Wilhelmson, 2009).

This study aims to address these shortcomings by exploring the short-term effects of a comprehensive integrated care model. The Walcheren Integrated Care Model has been developed and implemented in the Walcheren region, in the southwest region of The Netherlands. The project is part of The National Care for the Elderly Programme, which aims to improve Dutch elderly care through the support of projects that respond to the needs of the elderly. The project has been developed in collaboration with the elderly themselves. The Walcheren Integrated Care Model was initiated by the Walcheren General Practitioner (GP) Co-operation Care Group and developed in consultation with representatives of the elderly and health professionals in the region. The elderly indicated that the care process required greater coherence and coordination of care by a single portal near their homes, preferably the GP. This became the point of departure for the Walcheren Integrated Care Model.

This study is relevant because of three reasons. Firstly, the Walcheren Integrated Care Model is a comprehensive model. It includes several integrated care elements determined to be effective for the elderly: a single entry point system, case management, geriatric assessment with the EASYcare, and multidisciplinary teams (Johri et al., 2003). Furthermore, the model includes a network structure, multidisciplinary protocols, discussions and web-based patient files (Fabbricotti, 2007; Hebert, Durand, Dubuc, Tourigny, & Group, 2003; Kodner, 2009). Another distinctive feature of the intervention is the focus on prevention to reduce the risk of severe problems in the physical, psychological and/or social domains for frail elderly people living independently. Thus far, only some of these elements have been combined into an integrated care model; hence, none of the models studied to date have been comprehensive.

Secondly, this study focuses on the short-term effects of integrated care. As previously stated, most studies investigate the long-term effects. Only three studies have evaluated the short-effects of integrated care models (Eklund & Wilhelmson, 2009; Melis et al., 2008; Ouwens, Wollersheim, Hermens, Hulscher, & Grol, 2005), but these models were not as comprehensive as the Walcheren Integrated Care Model. Furthermore, it is important to explore when integrated care models start to reach their aims to keep professionals enthusiastic and involved.

Thirdly, the effects of the Walcheren Integrated Care Model were studied in terms of a broad range of valid health, quality of life and care outcomes. Health outcomes were assessed with the RAND, and ability to cope was measured with the KATZ. Diverse quality of life measures were used, including measures related to health (EQ-5D) and well-being (ICECAP). The care outcomes included the use of care and satisfaction with the provision of care.

Methods

Study design

The design of this study was quasi-experimental and included before and after measurements with a control group (for a more detailed description of the methods (see also (Fabbricotti et al., 2013)). The study focused on frail elderly people living independently (living in their own homes or in some form of assisted living). The experimental group consisted of the elderly patients of eight GPs from three GP practices located in the east of Walcheren who provided care according to the Walcheren Integrated Care Model. The control group consisted of the patients of six GPs from five GP practices located in the northern, southern and western parts of Walcheren who provided care as usual.

Participants

The study population consisted of the entire elderly patient population of the GPs in both the experimental and control groups. The inclusion criteria were being 75 years or older, not being on a waiting list for a nursing home, not being terminally ill with a life expectancy of less than six months, and being frail. Frailty was assessed with the Groningen Frailty Indicator, a 15-item questionnaire that measures decreases in physical, cognitive, social and psychological functioning (Peters, Boter, Slaets, & Buskens, 2013; Schuurmans, Steverink, Lindenberg, Frieswijk, & Slaets, 2004). The score ranges from 0 to 15. Elderly with a score of 4 or more were considered as being frail. GPs in the control group could not treat the included frail elderly patients differently as they were not given information on who participated in the study. As such, the chance of bias was minimized (Smelt, van der Weele, Blom, Gussekloo, & Assendelft, 2010).

Intervention

The Walcheren Integrated Care Model is a comprehensive integrated care model. The GP functions as a coordinator of care and a partner in prevention. The GP practice is a single entry point for the elderly, their informal caregivers and health professionals. The GPs detected frailty in their patient population with the Groningen Frailty Indicator. Elderly patients with a score of 4 or more were visited by their nurse practitioner, who assessed their functional, cognitive, mental and psychological functioning using EASYcare, an evidence-based instrument used to assess care needs (Melis et al., 2008). The assessment was discussed in a multidisciplinary meeting, attended by the GP, the nurse practitioner, a secondary-line geriatric nurse practitioner, a nursing home doctor and other professionals, depending on the care needed by the frail elderly. A multidisciplinary treatment plan was then formulated in consultation with the elderly person and his or her informal caregiver(s). Case management was provided by a specialized nurse practitioner or a secondary-line geriatric nursing practitioner, depending on the complexity of the elderly person's problems. Case management in this model implies responsibility for admittance to the required services, the planning and coordination of care delivery and periodical evaluation and monitoring of the treatment plan (Ross, Goodwin, & Curry, 2011). The evaluation took place in multidisciplinary meetings. The entire process was supported with web-based patient files and multidisciplinary protocols describing the responsibilities and activities of the involved professionals and case manager. The Walcheren Integrated Care Model requires task reassignment and delegation between nurses and doctors and between GPs, nursing home doctors and geriatricians. Consultations take place between primary, secondary, and tertiary care providers. At the organisational level, a steering group serves as an umbrella organisation under which the Walcheren Integrated Model is developed and disseminated. The steering group, with representatives from all involved organisations, forms a Joint Governing Board that provides the necessary provider network. All patient representatives support the project, and the health insurer CZ is supporting the project financially.

Care as usual differs from the integrated model in many aspects. First, care as usual is reactive. Frail elderly patients consult with their GP on their own initiative. The integrated model is proactive as frail elderly are preventively detected and assessed by their GP. Second, care as usual is fragmented. In the Dutch health care system, the GP has a gate keeper's role (Boot & Knapen, 2005). Frail elderly patients need a referral from their GP to obtain care from primary, secondary or tertiary health professionals (Ex et al., 2003). The referral letter and sporadic telephone calls are the means of communication between the GP and the health professionals. In the same vein, the health professionals, to whom the elder is referred, only confer with each other bilaterally. In the integrated model, the communication is multilateral and care is coordinated in conference with each other in multidisciplinary meetings, with multidisciplinary protocols, case management and shared web-based files. During the study period, the GPs in the control group were not able to implement elements of the integrated model, because they were not supported financially by the health insurer to perform the integrated activities.

Measures

The following health and care outcomes were studied, mostly with validated instruments.

Experienced health is assessed with an item from the RAND-36 that allows the frail elderly to evaluate their own health (van der Zee & Sanderman, 1993). Mental health was measured using a five-item RAND-36 scale with items that question how often the respondent feels certain emotions, such as happiness or nervousness (van der Zee & Sanderman, 1993). This scale has a Cronbach's alpha (α) of 0.79. Social functioning was measured with a RAND-36 item that asked whether social activities were hampered by physical health or emotional problems (van der Zee & Sanderman, 1993). The Katz-15 was used to measure the ability to cope with activities of daily living, such as getting dressed, shopping and taking medication (Weinberger et al., 1992). To assess quality of life, various instruments were used. First, a general measure of quality of life was used, which was based on the RAND-36 (van der Zee & Sanderman, 1993). The second measure was the EQ-6D, which focuses on quality of life related to physical and mental health and includes six dimensions: mobility, self-care, daily activities, pain/discomfort, mood and cognitive functioning (Krabbe, Stouthard, Essink-Bot, & Bonsel, 1999). The third measure was the ICECAP, which was specifically developed to assess the quality of life related to well-being of the elderly. The ICECAP measures five dimensions of quality of life: attachment, security, role, enjoyment and control (Coast et al., 2008). The instrument was based on Sen's capability approach which focuses on whether the elderly are able to function within these domains (Grewal et al., 2006)

Health care use was measured with a questionnaire. Respondents were asked whether they used the following types of care: hospital care, visits to the GP practice after office/open hours, day care, temporary admission to homes for the aged or nursing homes, alarm system, home care, paramedical care and psychosocial care. Satisfaction with the provision of care was examined with a self-developed questionnaire based on the consumer quality index (CQI) (Wiegers, Stubbe, & Triemstra, 2007). In the CQI the following subscales are distinguished: client-oriented ($\alpha = 0.80$), knowledge of care needs ($\alpha = 0.71$), information ($\alpha = 0.77$), joint decision making ($\alpha = 0.77$), attention to social-emotional aspects ($\alpha = 0.72$) and approach ($\alpha = 0.77$).

The explanatory variable in the study was the introduction of the Walcheren Integrated Care Model. The control variables considered were gender, age, marital status (having a partner or not) and living arrangement (living independently at home or in residential care).

Data collection

The data were collected by trained interviewers who visited the frail elderly at home. All frail elderly participants were interviewed face-to-face twice by the same interviewer who took a before measurement (T0) and an after measurement three months later (T1). All interviewers had a background in elderly care. All elderly completed the questionnaire on health outcomes and health care use. If a frail elderly patient received care from at least two care providers, they completed an additional questionnaire on their satisfaction with the provision of care.

Methods of analysis

For each outcome measure, bivariate and multivariate analyses were performed. The bivariate analyses were applied to study whether the change between T0 and T1 differed significantly between the experimental and control group. For nominal variables, a chi-square test was performed to explore whether the proportion of change between T0 and T1 differed between the two groups. For the continuous variables, the difference between the T0 and T1 scores were calculated for each group after which an independent *t*-test was carried out to test whether the change over time differed between the two groups.

Multiple linear regression analysis was used to determine the effect of the Walcheren Integrated Care Model while taking the control variables into account. For the dichotomous variables for use of care, logistic regression was performed. The regression analysis consisted of three models to distinguish the effect of each group of variables on the specific outcome variable at T1. In model 1, the score at T0 of the specific outcome variable was included. For model 2, the control variables (gender, age, marital status and living arrangement) were added. In model 3, the Walcheren Integrated Care Model was incorporated. If the regression models were significant, then the effects of the separate variables were studied. The significance level used was $p < 0.05$.

Results

In the experimental group, 892 elderly patients were approached to assess their level of frailty and to ask if they wanted to participate in this study. In the control group, 953 elderly patients were approached (table 3.1). The response rate in both groups was approximately 80%, and 33% of the patients were considered frail. Ultimately, 222 frail elderly were included in the experimental group, and 224 were included in the control group. The loss to follow-up after three months was 17 frail elderly in the experimental group and 12 frail elderly in the control group. Therefore, the final study population included 205 frail elderly in the experimental group and 212 frail elderly in the control group.

Table 3.1: Response

	Experimental group	Control group
Approached	892	953
Response	83%	78%
Frail Groningen Frailty Indicator =>4	254 (34%)	248 (33%)
T0	222	224
T1 (after 3 months)	205	212

The study population consisted of frail elderly with a mean age of 82 years and a mean Groningen Frailty Indicator score of 6 (table 3.2). Women were overrepresented in both groups; 70% of the experimental group and 59% of the control group were women. The majority of the frail elderly did not have a partner, and most of the elderly were widows. Most of the frail elderly lived independently in their own homes (77% in the experimental group and 89% in the control group). The experimental group included significantly more women and more elderly in assisted living than the control group.

Table 3.2: Descriptive statistics background variables

	Experimental group		Control group		p-value
	%		%		
Sex– female	70		59		0.02*
Partner					
Married or living together	38		42		0.38
Widow or single	62		58		
Living arrangement					
Independently	77		89		0.00**
Assisted living	23		11		
	Mean	S.D.	Mean	S.D.	
Age	82.02	4.61	82.46	5.52	0.38
Groningen Frailty Indicator	6.07	1.96	5.88	1.90	0.30
N	205		212		

*p<0.05; **p<0.005

Health and quality of life outcomes

The differences in health between the experimental and control groups were small (table 3.3). In both groups, the health experience scores were low. On average, the frail elderly required help in the four domains of daily functioning. Their reported mental health, social functioning and general quality of life scores were good. The scores on the EQ-6D revealed that the study population experienced more problems with physical health (e.g., mobility and pain) than with mental health (e.g., cognitive functioning, anxiety and depression). They had the least problems with self-care.

The changes in health over three months were small. The only significant difference was observed for one dimension of the ICECAP. The frail elderly in the control group experienced a decrease in receiving the amount of love and friendship they desired, whereas this area was stable in the experimental group.

Care usage

The types of care used most frequently were home care, an alarm system and meals on wheels (table 3.4).The use of care did not change significantly over three months for either the experimental group or the control group.

Table 3.3: T-tests for health-related outcomes

Health related outcomes	**Experimental group**		**Control group**		**p-value**
	T1	ΔT0	T1	ΔT0	
Experienced health (0-100)	32.48	-0.74	33.25	-0.12	0.73
Mental health (0-100)	67.72	-2.80	69.54	-1.45	0.36
Social functioning (0-100)	62.68	-4.68	63.45	1.07	0.12
Ability to cope (0-15)	4.35	0.28	4.19	0.22	0.74
Quality of life – (0-100)	40.56	-1.10	40.95	-3.9	0.14
EQ-6D - Mobility (1-3)	1.73	0.02	1.71	-0.01	0.44
EQ-6D – Self-care (1-3)	1.48	0.06	1.39	0.01	0.30
EQ-6D – Daily activities (1-3)	1.73	0.05	1.71	-0.01	0.29
EQ-6D - Pain/discomfort (1-3)	1.81	-0.05	1.79	-0.03	0.78
EQ-6D - Anxiety/depression (1-3)	1.46	-0.02	1.46	0.03	0.38
EQ-6D - Cognitive functioning (1-3)	1.49	0.07	1.51	0.05	0.75
ICECAP – Role (1-4)	2.56	-0.09	2.68	-0.06	0.69
ICECAP – Enjoyment (1-4)	2.81	-0.16	2.68	-0.11	0.61
ICECAP - Security	3.25	0.07	3.18	-0.06	0.12
ICECAP – Control (1-4)	2.53	-0.08	2.68	-0.10	0.83
ICECAP – Attachment (1-4)	3.08	0.01	2.86	-0.15	0.03*

*p<0.05

Table 3.4: Care usage

Use of care - %	**Experimental group**		**Control group**		**p-value**
	T1	**T0**	**T1**	**T0**	
Hospital admission	9%	-	9.5%	-	-
GP outside office/open hours	5.9%	-	9.7%	-	-
Temporary admission to home for the aged/nursing home	1%	-	1.9%	-	-
Day care	2.9%	4.9%	2.9%	4.3%	0.68
Alarm system	46.8%	45.8%	38.9%	38.9%	0.78
Meals on wheels	26.7%	29.7%	18.7%	23.6%	0.55
Home care	59.9%	61.4%	61.5%	62%	0.37
Paramedical care	17.2%	17.2%	19.1%	19.1%	0.96
Psychosocial care	38.3%	37.8%	30.7%	30.7%	0.89

The results for satisfaction with the provision of care were based on a smaller sample of frail elderly who received more than one type of care (66 frail elderly in the experimental group and 51 frail elderly in the control group). The frail elderly in both groups reported high levels of satisfaction with the provision of care (table 3.5). Satisfaction did not change significantly over three months.

Table 3.5: T-tests for satisfaction with provision of care

Satisfaction with provision care	Experimental group		Control group		p-value
	T1	ΔT0	T1	ΔT0	
Client-oriented (1-4)	3.65	0.05	3.57	0.07	0.81
Knowledge of care needs (1-4)	3.56	0.02	3.60	0.09	0.46
Information (1-4)	3.12	0.04	3.03	0.09	0.74
Joint decision making (1-4)	2.93	-0.01	2.93	0.03	0.82
Attention to social-emotional aspects (1-4)	3.43	0.04	3.35	0.05	0.93
Approach (1-4)	3.85	0.04	3.80	0.09	0.38
Report mark (0-10)	7.94	-0.11	8.23	-0.07	0.81

Regression analysis

The results of the regression analysis showed that the Walcheren Integrated Care Model had little effect on health (table 3.6), care usage (table 3.7) and satisfaction with care (table 3.8) in the frail elderly. The only significant effect was found for one dimension of the ICECAP. The frail elderly in the experimental group felt that they were better able to receive the love and friendship they desired than the frail elderly in the control group. No effect on care usage was found. The Walcheren Integrated Care Model did not influence the use of alarm systems, meals on wheels, home care and paramedical and psychosocial care. The main determinant for the outcomes after three months appeared to be the situation at baseline, which was significant for all outcome variables and may account for the high explained variance.

Moreover, the characteristics of the elderly affect many outcomes. Women are more negative about their health and are less mobile than men. The frail elderly in assisted living experience more pain and are less able to receive the love and friendship they desire. Having a partner has two negative effects: it leads to a decrease in social functioning and a decrease in doing things that make the elderly individual feel valued. Frail elderly with a partner were less likely to use meals on wheels than those without a partner. Age was an essential variable that had significant effects on both health and care outcomes. With age, the frail elderly showed decreases in health and social functioning, and they experienced more problems with coping, self-care, activities, cognitive functioning and control. Furthermore, there was a greater likelihood that these individuals used alarm systems, meals on wheels and home care.

Table 3.6: Linear regression of health-related outcomes

Health-related outcomes	R2	T0	Gender	Age	Living arrangement	Partner	Intervention
		β	β	β	β	β	β
Experienced health	29%	0.52***	-0.09*	-0.13**	0.02	-0.02	-0.02
Mental health	41%	0.64***	0.04	0.02	0.02	-0.02	-0.05
Social functioning	25%	0.45***	-0.05	-0.16**	0.04	-0.10*	-0.05
Ability to cope	76%	0.83***	0.03	0.07*	0.02	0.05	0.01
Quality of life	26%	0.52***	0.02	-0.01	0.04	0.02	0.03
EQ-6D - Mobility	46%	0.66***	0.09*	0.05	0.00	0.02	0.00
EQ-6D – Self-care	57%	0.69***	0.01	0.15***	0.04	0.06	0.05
EQ-6D – Daily activities	42%	0.59***	0.03	0.16***	0.03	0.07	0.03
EQ-6D - Pain/discomfort	30%	0.53***	0.04	-0.02	0.11*	0.01	-0.02
EQ-6D - Anxiety/depression	20%	0.46***	-0.02	0.02	-0.04	-0.07	-0.01
EQ-6D - Cognitive functioning	37%	0.59***	-0.02	0.12*	0.06	0.01	-0.00
ICECAP – Role	40%	0.61***	-0.05	-0.03	-0.06	-0.11*	-0.03
ICECAP – Enjoyment	34%	0.59***	0.01	-0.01	-0.08	-0.04	0.02
ICECAP - Security	39%	0.63***	0.04	-0.02	0.07	0.04	0.05
ICECAP – Control	61%	0.72***	-0.06	-0.11**	-0.07	-0.05	-0.00
ICECAP – Attachment	45%	0.67***	0.02	0.04	-0.15**	-0.05	0.13**

*p<0.05; **p<0.005; ***p<0.001

Table 3.7: Logistic regression of care-related outcomes

Care related outcomes	Nagelkerke R2	T0	Gender	Age	Living arrangement	Partner	Intervention
		Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)
Alarm system	86%	287.420***	0.919	1.172**	2.294	0.495	1.978
Meals on wheels	80%	390.496***	0.531	1.194***	2.064	0.298*	0.890
Home care	70%	59.264***	1.296	1.096*	1.960	0.900	1.005
Paramedical care	46%	34.814***	0.812	0.971	1.025	0.655	0.868
Psychosocial care	49%	19.884*	1.821	0.958	1.406	0.612	0.974

*p<0.05; **p<0.005; ***p<0.001

Table 3.8: Linear regression of satisfaction with provision of care

Satisfaction provision with care	R2	T0	Gender	Age	Living arrangement	Intervention
		β	β	β	β	β
Client-oriented	26%	0.50***	0.14	-0.05	-0.03	0.03
Knowledge of care needs	19%	0.44***	-0.02	-0.12	0.07	-0.08
Information	24%	0.49***	0.02	-0.09	-0.09	0.01
Joint decision making	29%	0.52***	0.02	-0.02	-0.11	0.01
Attention to social-emotional aspects	18%	0.42***	0.10	-0.07	-0.14	0.04
Approach	14%	0.40***	0.05	-0.04	-0.13	0.05

***p<0.001

Discussion

This study explored the short-term effects of a comprehensive integrated care intervention, the Walcheren Integrated Care Model, on the health, quality of life, health care use and satisfaction with care of frail elderly who were living independently. The main conclusion is that the Walcheren Integrated Care Model had only a small overall effect after three months. This study had two main findings. First, the model had a positive effect on attachment, a dimension of quality of life, which is the capability of the frail elderly to receive love and friendship. Second, health care use was not affected by the integrated care intervention. This result was deemed positive as it could be expected that the preventive element and the geriatric assessments followed up with case management would increase care consumption in the integrated care model. Besides these results, no other effects of the integrated care model were found. The effects were predominantly related to reported health, quality of life, care usage and satisfaction with care at the beginning of the experiment, followed by the age, marital status, sex, and living arrangements of the frail elderly.

Despite the lack of effects on most outcomes, the results of this study are relevant for several reasons. First, the positive effect on attachment shows that integrated models have the potential to influence the quality of life of the frail elderly. Affecting quality of life is important because it is a personal evaluation of both physical and psychosocial aspects of life made by the frail elderly (van Campen, 2011). The ability to stabilise quality of life implies that the frail elderly could live independently for a longer time period. This goal is not only the focus of national policy to reduce costs (de Klerk, 2004) but also the wish of the frail elderly themselves (Lloyd & Wait, 2005).

Second, the lack of impact on health care use is relevant for future choices in integrated care models. A possible concern may be that a proactive approach could lead to an increase in care usage. In the care as usual model, the elderly enter the health care system by visiting a GP on their own initiative. In the Walcheren Integrated Care Model, all patients that were 75 years or older were proactively detected of frailty, and their needs were assessed to prevent future problems. Previous research shows that geriatric assessment could result in an increase in care usage (Hébert et al., 2008; Melis et al., 2008). This study shows that this is not necessarily true because no increase in care usage can be observed in the short term. However, the limited changes in care usage could be a consequence of waiting lists and the care assignment routines in the Dutch health care system. Assigning care takes time because each patient has to be assessed individually by the Centre for Needs Assessment. So for some elderly patients the length of time from geriatric assessment by the case manager to the actual receipt of care might have taken longer than three months. Because of this type of delay, the results regarding care usage may be slightly distorted.

Furthermore, the results may help health professionals to have more realistic expectations of integrated care. Currently, the expectations of integrated care and its value are very high (Minkman, 2012). This expectation also concerns health professionals who must stay involved to organize care according to the Walcheren Integrated Care Model on a daily basis. Expectations strongly affect performance (Baron & Kreps, 1999) so it is crucial that professionals have realistic expectations of integrated care. This study shows that the expectations of professionals should be tempered to avoid disappointment in the short term.

Finally, this study shows that effects on health outcomes cannot be realized in the short term; however, this might not be surprising. Frailty is a gradual, progressive process of deterioration (Gobbens et al., 2010). The Walcheren Integrated Model aims at an early detection of frailty. Thus, more time might be required to observe actual changes in health. No effects on satisfaction with care were found, even though improvement in consumer satisfaction is an important aim of integrated care (Kodner & Spreeuwenberg, 2002; Kodner, 2009). A possible explanation may be that the frail elderly in the Walcheren region were already highly satisfied with care at the start of the study; hence, there is little room for improvement.

An implication for future research is to explore whether the proposed effects of integrated care emerge in a particular sequence. The conditions of the frail elderly in the physical, psychological and social domains influence each other (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010; van Campen, 2011). By preserving quality of life, health outcomes could be improved in the future. To explore this suggestion as well as the full potential of the Walcheren Integrated Care Model, a more longitudinal approach should be adopted.

References

Baron, J. N., & Kreps, D. M. (1999). *Strategic human resources. Frameworks for general managers*. Hoboken: John Wiley & Sons.

Bernabei, R., Landi, F., Gambassi, G., Sgadari, A., Zuccala, G., Mor, V., . . . Carbonin, P. (1998). Randomised trial of impact of model of integrated care and case management for older people living in the community. *Br Med J, 316*, 1348-1351.

Boot, J. M., & Knapen, M. H. J. M. (2005). *Handboek Nederlandse gezondheidszorg [Handbook Dutch healthcare]*. Utrecht: Het Spectrum.

Challis, D., Chessum, R., Chesterman, J., Luckett, R., & Woods, B. (1987). Community care for the frail elderly: An urban experiment. *British Journal of Social Work, 18*(supp), 13-42.

Coast, J., Flynn, T. N., Natarajan, L., Sproston, K., Lewis, J., Louviere, J. J., & Peters, T. J. (2008). Valuing the ICECAP capability index for older people. *Social Science & Medicine, 67*(5), 874-882.

de Klerk, M. (2004). *Zorg en wonen voor kwetsbare ouderen [Care and housing for frail elderly]*. The Hague: The Netherlands Institute for Social Research.

Eklund, K., & Wilhelmson, K. (2009). Outcomes of coordinated and integrated interventions targeting frail elderly people: A systematic review of randomised controlled trials. *Health Soc Care Community, 17*, 447-458.

Ex, C., Gorter, K., & Janssen, U. (2003). *Providing integrated health and social care for older persons in the Netherlands*. Utrecht: Verwey Jonker Institute.

Fabbricotti, I. N. (2007). *Zorgen voor zorgketens [Taking care of integrated care]*. PhD Thesis, Erasmus University Rotterdam.

Fabbricotti, I. N., Janse, B., Looman, W. M., de Kuijper, R., van Wijngaarden, J. D., & Reiffers, A. (2013). Integrated care for frail elderly compared to usual care: A study protocol of a quasi-experiment on the effects on the frail elderly, their caregivers, health professionals and health care costs. *BMC Geriatr, 13*, 31.

Gobbens, R. J., van Assen, M. A., Luijkx, K. G., Wijnen-Sponselee, M. T., & Schols, J. M. (2010). The Tilburg frailty indicator: Psychometric properties. *Journal of the American Medical Directors Association, 11*(5), 344-355.

Gobbens, R. J. J., Luijkx, K. G., Wijnen-Sponselee, M. T., & Schols, J. M. G. A. (2010). Towards an integral conceptual model of frailty. *The Journal of Nutrition, Health & Aging, 14*(3), 175-181.

Grewal, I., Lewis, J., Flynn, T., Brown, J., Bond, J., & Coast, J. (2006). Developing attributes for a generic quality of life measure for older people: Preferences or capabilities? *Social Science & Medicine, 62*(8), 1891-1901.

Gröne, O., & Garcia-Barbero, M. (2001). Integrated care. *Int J Integr Care, 1*(1)

Hébert, R., Dubois, M. F., Raiche, M., Dubuc, N., & Group, P. R. E. (2008). The effectiveness of the PRISMA integrated service delivery network: Preliminary report on methods and baseline data. *Int J Integr Care, 8*, e03.

Hebert, R., Durand, P. J., Dubuc, N., Tourigny, A., & Group, P. (2003). PRISMA: A new model of integrated service delivery for the frail older people in Canada. *Int J Integr Care, 3*, e08.

Johri, M., Beland, F., & Bergman, H. (2003). International experiments in integrated care for the elderly: A synthesis of the evidence. *International Journal of Geriatric Psychiatry, 18*, 222-235.

Kodner, D. L. (2009). All together now: A conceptual exploration of integrated care. *Healthcare Quarterly (Toronto, Ont.), 13 Spec No*, 6-15.

Kodner, D. L., & Kyriacou, C. K. (2000). Fully integrated care for frail elderly: Two American models. *Int J Integr Care, 1*, e08.

Kodner, D. L., & Spreeuwenberg, C. (2002). Integrated care: Meaning, logic, applications, and implications - a discussion paper. *Int J Integr Care, 14*(2)

Krabbe, P. F., Stouthard, M. E., Essink-Bot, M., & Bonsel, G. J. (1999). The effect of adding a cognitive dimension to the EuroQol multiattribute health-status classification system. *Journal of Clinical Epidemiology, 52*(4), 293-301.

Lloyd, J., & Wait, S. (2005). *Integrated care: A guide for policymakers.* Alliance for Health and the Future.

Melis, R. J. F., van Eijken, M. I. J., Teerenstra, S., van Achterberg, T., Parker, S. G., Borm, G. F., . . . Rikkert, M. (2008). A randomized study of a multidisciplinary program to intervene on geriatric syndromes in vulnerable older people who live at home (Dutch EASYcare study). *J.Gerontol.Ser.A-Biol.Sci.Med.Sci., 63*, 283-290.

Minkman, M. M. (2012). Developing integrated care. Towards a development model for integrated care. *Int J Integr Care, 12*

Montgomery, P. R., & Fallis, W. M. (2003). South Winnipeg integrated geriatric program (SWING): A rapid community-response program for the frail elderly. *Can J Aging, 22*, 275-281.

Newcomer, R., Maravilla, V., Faculjak, P., & Graves, M. T. (2004). Outcomes of preventive case management among high-risk elderly in three medical groups: A randomized clinical trial. *Eval Health Prof, 27*, 323-348.

Nies, H. (2004). Integrated care: Concepts and background. In H. Nies, & P. C. Berman (Eds.), *Integrating services for older people: A resource book for managers* (pp. 17-32). Dublin: Ehma.

Ouwens, M., Wollersheim, H., Hermens, R., Hulscher, M., & Grol, R. (2005). Integrated care programmes for chronically ill patients: A review of systematic reviews. *International Journal for Quality in Health Care : Journal of the International Society for Quality in Health Care, 17*(2), 141-146.

Peters, L. L., Boter, H., Slaets, J. P. J., & Buskens, E. (2013). Development and measurement properties of the self assessment version of the INTERMED for the elderly to assess case complexity. *J.Psychosomat.Res., 74*, 518-522.

Rockwood, K., Stadnyk, K., Carver, D., MacPherson, K. M., Beanlands, H. E., Powell, C., . . . Tonks, R. S. (2000). A clinimetric evaluation of specialized geriatric care for rural dwelling, frail older people. *J Am Geriatr Soc, 48*, 1080-1085.

Ross, S., Goodwin, N., & Curry, N. (2011). *Case management: What is it and how it can best be implemented.* London: King’s Fund.

Schuurmans, H., Steverink, N., Lindenberg, S., Frieswijk, N., & Slaets, J. P. (2004). Old or frail: What tells us more? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 59*(9), M962-M965.

Slaets, J. P. J. (2006). Vulnerability in the elderly: Frailty. *Medical Clinics of North America, 90*, 593-601.

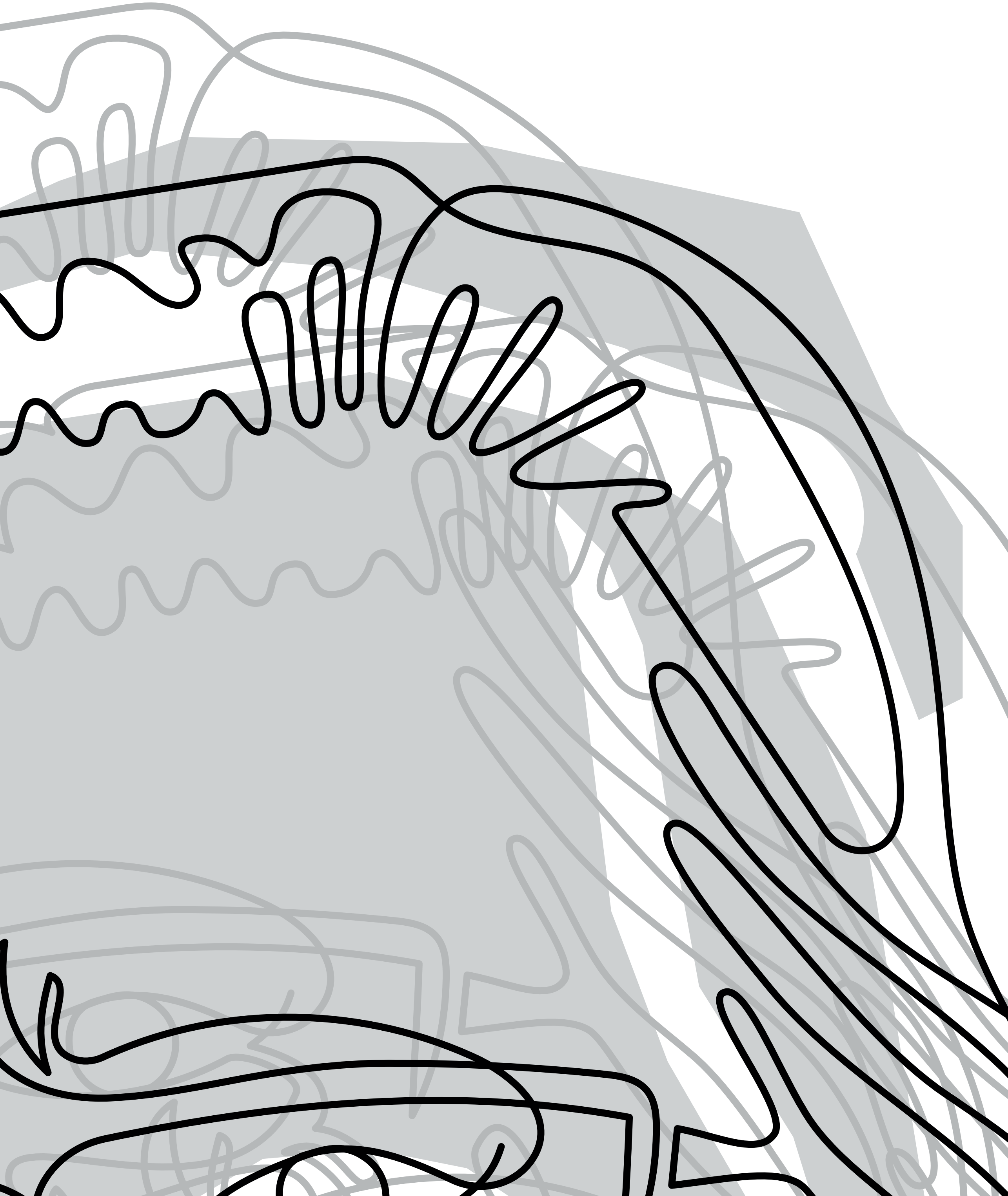
Smelt, A. F., van der Weele, G. M., Blom, J. W., Gussekloo, J., & Assendelft, W. J. (2010). How usual is usual care in pragmatic intervention studies in primary care? an overview of recent trials. *The British Journal of General Practice, 60*(576), e305-e318.

van Campen, C. (2011). *Kwetsbare ouderen [Frail elderly].* The Hague: The Netherlands Institute for Social Research.

van der Zee, K., & Sanderman, R. (1993). Rand-36. *Groningen: Northern Centre for Health Care Research, University of Groningen, the Netherlands, 28*

Weinberger, M., Samsa, G. P., Schmader, K., Greenberg, S. M., Carr, D. B., & Wildman, D. S. (1992). Comparing proxy and patients' perceptions of patients' functional status: Results from an outpatient geriatric clinic. *Journal of the American Geriatrics Society, 40*(6), 585-588.

Wiegers, T. A., Stubbe, J. H., & Triemstra, A. H. M. (2007). *Ontwikkeling van een CQ-index voor verpleeg-en verzorgingshuizen en thuiszorg [Development of a CQ-index for nursing home, home of the aged and home care].* Utrecht: NIVEL.



CHAPTER 4

Effectiveness of the Walcheren Integrated Care Model

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Abstract

Background

This study explored the effectiveness of a pro-active, integrated care model for community-dwelling frail older people compared to care as usual by evaluating the effects on a comprehensive set of outcomes: health outcomes (experienced health, mental health and social functioning); functional abilities; and quality of life (general, health-related and well-being).

Methods

The design of this study was quasi-experimental. In this study, 184 frail older patients of three GP practices that implemented the Walcheren Integrated Care Model were compared with 193 frail older patients of five GP practices that provided care as usual. In the Walcheren Integrated Care Model, community-dwelling elderly were pro-actively screened for frailty from the GP practice using the Groningen Frailty Indicator, and care needs were assessed with the EASYcare instrument. The GP practice functioned as single entry point from which case management was provided, and the GP was the coordinator of care. The entire process was supported by multidisciplinary meetings, multidisciplinary protocols and web-based patient files. The outcomes of this study were obtained at baseline, after three months and after twelve months and analyzed with linear mixed models of repeated measures.

Results

The Walcheren Integrated Care Model had a positive effect on love and friendship and a moderately positive effect on general quality of life. The ability to receive love and friendship and general quality of life decreased in the control group but was preserved in the experimental group. No significant differences were found on health outcomes such as experienced health, mental health, social functioning and functional abilities.

Conclusions

The results indicated that pro-active, integrated care can be beneficial for frail older people in terms of quality of life and love and friendship but not in terms of health outcomes and functional abilities. Recommendations for future research are to gain greater insight into what specific outcomes can be achieved with proactive and integrated care, considering the specific content of this care, and to allow for the heterogeneity of frail older people in evaluation research.

Background

The care for community-dwelling frail older people poses a real challenge for health care systems. Due to population ageing, the number of frail older people is increasing rapidly (World Health Organization, 2015). Furthermore, national health policies are aimed at preventing admission to nursing homes because institutionalization is costly. Frail older people themselves prefer to grow old in the community (Friedman, Steinwachs, Rathouz, Burton, & Mukamel, 2005) and want to live independently at home as long as possible; also referred to as 'ageing in place' (Wiles, Leibing, Guberman, Reeve, & Allen, 2012). This could become problematic because frail older people suffer from problems in the physical, psychological and social domains of daily functioning (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010). The quality of care for these frail older people living in the community needs improvement (Schers, Koopmans, & Rikkert, 2009). Currently, care is reactive and the needs of frail older people are not addressed in a timely manner, leading to crisis situations (Vedel et al., 2009). Care is also fragmented and lacks continuity and coordination (Kodner, 2009). As a way to mitigate these challenges, care for frail older patients in the community should become more pro-active and integrated (Boeckxstaens & De Graaf, 2011).

Pro-active care for frail older people starts with the identification of this group within the community. Research has shown that frailty is related to negative health outcomes, disability (Fried et al., 2001), and poor quality of life (Gobbens & van Assen, 2014). To postpone or prevent these outcomes, frailty should be identified quickly and correctly (Challis, Chessum, Chesterman, Luckett, & Woods, 1987; Strandberg & Pitkala, 2007). After the pro-active identification, care should be integrated and delivered coherently according to the needs of the frail individuals related to the areas of prevention, care, cure, housing and welfare (Ex, Gorter, & Janssen, 2003), meaning that professionals from different disciplines and sectors should collaborate (Gröne & Garcia-Barbero, 2001; Kodner & Kyriacou, 2000). In the present study, we evaluated the Walcheren Integrated Care Model (WICM), a specific pro-active *and* integrated care intervention aimed at community-dwelling frail older people and implemented in primary care with the GP practice as single entry point and the GP as coordinator of care. This study contributes to the growing body of evidence due to the specific features of the intervention and its extensive evaluation.

WICM is primarily characterized by the combination of a pro-active *and* integrated approach to care for frail community-dwelling patients. Many care interventions for community-dwelling frail older people have a strong focus on integration, but the importance of pro-activeness is not widely acknowledged. In the WICM, frailty is detected from the GP practice by screening the GP's entire patient population aged 75 years and older. Research has shown that such a pro-active approach, in combination with integrated care elements, is more effective than a pro-active approach alone (Drubbel et al., 2014). Moreover, all integrated care elements that have been recognized to be effective in prior research are included in the WICM instead of considering only a selection of these elements. These elements include the following: geriatric assessments, case management, multidisciplinary teams, a single entry point (Johri, Beland, & Bergman, 2003), multidisciplinary protocols and discussions, web-based patient files, and a network structure (Fabbricotti, 2007; Hebert, Durand, Dubuc, Tourigny, & Group, 2003; Kodner & Spreeuwenberg, 2002). This network structure, in which the WICM is embedded, consists of GP practices, home care organizations, nursing homes and patient organizations. The representatives of these involved organizations form the WICM's Steering Committee, which is an example of organizational integration at the meso-level. This organizational integration is also a specific feature of the WICM because most integrated care interventions are characterized by case management and the relationship between the GP and case manager (Ross, Goodwin, & Curry, 2011), and integration is restricted to the micro level. The assumption for our approach is that adopting more strategies at different levels is essential to achieve effectiveness (Kodner & Spreeuwenberg, 2002).

The effectiveness of the pro-active and integrated WICM is evaluated comprehensively by considering an extensive combination of patient outcome measures. Previous evaluation studies have primarily focused on three categories of outcomes corresponding to the three problem areas of frailty: health outcomes, functional abilities and quality of life (Beland et al., 2006; Bernabei et al., 1998; Chatterji, Burstein, Kidder, & White, 1998; Drubbel, 2014; Eklund & Wilhelmson, 2009; Eklund, Wilhelmson, Gustafsson, Landahl, & Dahlin-Ivanoff, 2013; Gagnon, Schein, McVey, & Bergman, 1999; Leveille et al., 1998; Markle-Reid et al., 2006; Melis, Eijken, & Teerenstra, 2008; Metzelthin et al., 2013; Montgomery & Fallis, 2003; Rockwood et al., 2000; Tourigny, Durand, Bonin, Hebert, & Rochette, 2004; van Hout et al., 2010). However, these studies have shown inconsistent results and there is an urgent need for more in-depth evaluation research, in particular for research reporting these three domains simultaneously (Eklund & Wilhelmson, 2009). Even though no intervention established effects in terms of health outcomes, functional abilities *and* quality of life yet (Chatterji et al., 1998; Drubbel, 2014), we intended to explore whether the pro-active, comprehensive and highly integrated WICM can achieve effectiveness in all three categories. Hence, this study aimed to answer the following research question: *What is the effect of the WICM on health outcomes (experienced* *health, mental health, social functioning), functional abilities and quality of life (general, health-related, and well-being) of community-dwelling frail older people?*

Methods

Design

The design of this study was quasi-experimental and included before and after measurements with a control group (see also (Fabbricotti et al., 2013). The measurements were obtained at baseline, after three months and after twelve months. The experimental group consisted of older patients of eight GPs from three GP practices located in eastern Walcheren who provided care according to the WICM. The control group consisted of the patients of six GPs from five GP practices who provided care as usual in the northern, southern and western parts of Walcheren.

The study design was reviewed by the medical ethics committee of the Erasmus Medical Center, Rotterdam, the Netherlands, under protocol number MEC-2013-058. This committee waived further examination because the rules established in the Medical Research Involving Human Subjects Act did not apply.

Participants

All GP patients aged 75 and older of the 3 GP practices in the experimental (n=892) and 6 GP practices in the control group (n=953) were sent a GFI questionnaire and an informed consent (see figure 4.1). The GFI is a 15-item questionnaire screening for frailty that measures decreases in physical, cognitive, social and psychological functioning. GFI scores range from 0 to 15; patients with a score of 4 or higher were considered frail (Peters, Boter, Slaets, & Buskens, 2013; Schuurmans, Steverink, Lindenberg, Frieswijk, & Slaets, 2004). In the experimental region 83% of the patients returned the GFI questionnaire; in the control region 78%. Patients were included in the study when they did not fulfil the exclusion criteria of not being frail (GFI score lower than 4); living in a nursing home; being on waiting list for a nursing home; and being terminally ill with a life expectancy under six months. At baseline, 254 frail older patients were included in the experimental group, and 249 frail older patients were included in the control group. After 12 months, the final study population included 184 frail older people in the experimental group and 193 frail older people in the control group. Loss to follow-up was mostly caused by frail older people refusing to participate (n=54) or passing away (n=23).

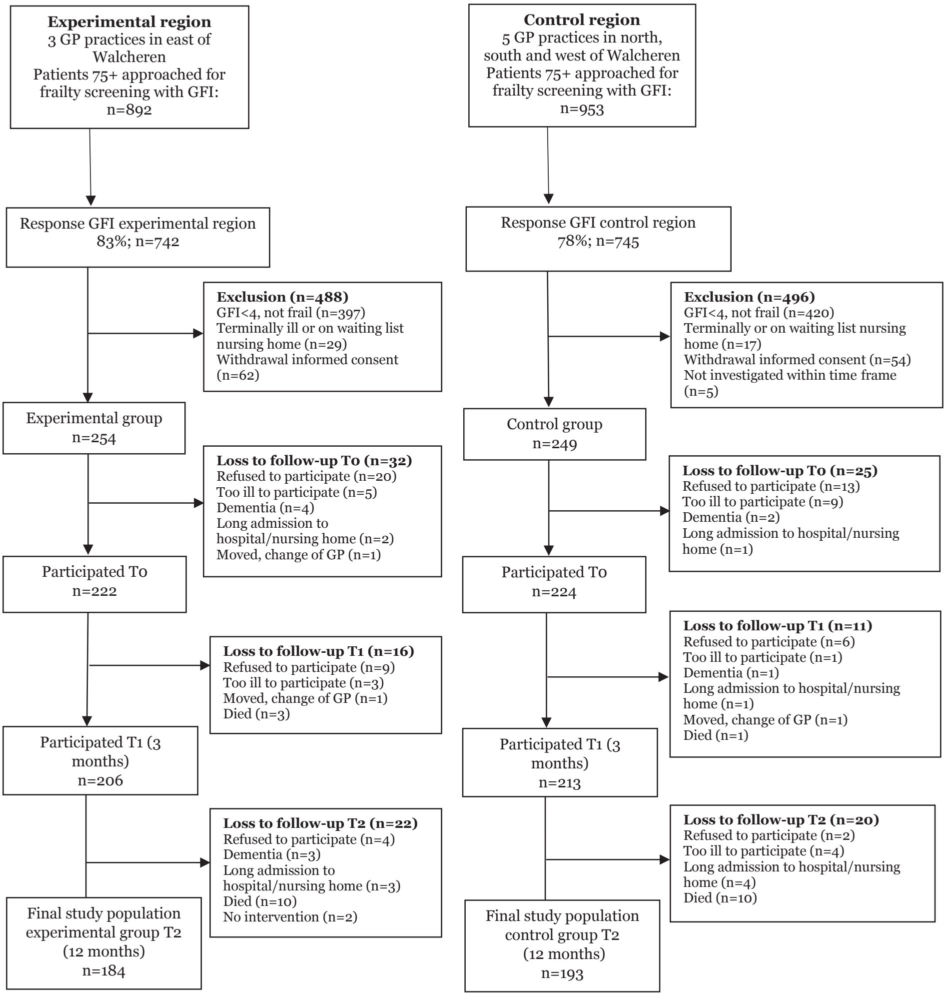

Figure 4.1: Flow chart of participants

Intervention

After screening the patient population of each GP with the GFI, frail older patients in the experimental group were visited by a nurse practitioner who assessed their functional, cognitive, mental and psychological functioning using EASYcare. EASYcare is an evidence-based, comprehensive instrument used to assess care needs (Melis et al., 2008) and has a separate model to translate care needs into specific treatments goals. The GP and nurse practitioner decided on treatment goals in consultation with the older people and their informal caregivers, which were translated into a preliminary multidisciplinary treatment plan. This plan was determined in a multidisciplinary meeting attended by at least the GP, the nurse practitioner, and a secondary-line geriatric nurse practitioner. Depending on frail elderly's problems discussed, the meeting was also attended by other health professionals such as geriatric physiotherapists, geriatricians, pharmacists, district nurse, nursing home doctors and mental health workers. The concrete actions, activities and responsibilities of these health professionals were discussed during this meeting.

Case management was provided from the GP-practice by the nurse practitioner or by a secondary-line geriatric nursing practitioner, depending on the complexity of the older people person's problems. The case manager coordinated care within the multidisciplinary team which implies monitoring the frail older person's condition, arranging the admittance to the required services, being the contact person for the involved professionals to coordinate their care and periodically evaluating the multidisciplinary treatment plan. The evaluation occurred in multidisciplinary meetings. The entire process was supported by web-based patient files and multidisciplinary protocols describing the responsibilities and activities of the involved professionals, in particular the nurse practitioner and secondary-line geriatric nursing practitioner who provided case management. Protocols were also designed for common themes such as incontinence, polypharmacy, and falling. In the WICM, the GP has the final responsibility and functions as a coordinator of care and partner in prevention. The GP practice was a single entry point for the older frail patients, their informal caregivers and health professionals where they can gain access to information and services of all involved professionals and organizations.

The model required task reassignment and delegation between nurses and doctors and among GPs, nursing home doctors and geriatricians. Consultations among primary, secondary, and tertiary care providers occurred. Regarding integration at the organizational level, a Steering Committee serves as an umbrella organization under which the WICM is developed and disseminated. The Steering Committee consists of representatives from all involved organizations, such as GP practices, home care organizations and nursing homes, and provides the necessary provider network. Patient representatives support the project, and the health insurer CZ provides financial support for the project.

Care as usual

Compared with the WICM, care as usual in the Netherlands is reactive and fragmented (table 4.1). Every Dutch citizen is registered at a particular GP practice (or family doctor) near their home. Dutch patients first consult their GP for all health problems. GPs play the role of gate keeper (Boot & Knapen, 2005), patients must have a referral from their GP to obtain care from the primary, secondary and tertiary

Table 4.1: Differences between WICM and care as usual

	WICM	**Care as usual**
Role GP	Single entry point, coordinator of care	Gatekeeper
Pro-activeness versus reactiveness	Entire patient population of 75+ is screened for frailty	Patients receive care on their own initiative
	Comprehensive assessment of care needs with EASYcare	Patients receive care for specific health problems
Treatment plan	Multidisciplinary treatment plan	No or monodisciplinary treatment plan
Care coordination	Case management: monitoring, admittance to services, contact person for professionals, evaluating treatment plan	No case management
Communication	Multidisciplinary meetings and web-based files	Bilateral communication by phone calls and letters
Protocols	Multidisciplinary protocols	Monodisciplinary protocols
Network	Network structure	No participation in provider network

echelons (Ex et al., 2003). However, patients solely receive care for specific (health) problems on their own initiative.

Care as usual is fragmented and has a monodisciplinary focus. Even though the GP is a generalist and has the role of gatekeeper, communication between professionals from the different disciplines and sectors is bilateral through referral letters and sporadic telephone calls. The GPs in the control group were unable to implement elements of the integrated model during the study period because they did not receive financial support from the health insurer to implement the integrated care activities of the WICM. Furthermore, the GPs in the control group could not treat frail older patients differently, as these GPs were not given information on who participated in the study. Therefore, the probability of bias was minimized (Smelt, van der Weele, Blom, Gussekloo, & Assendelft, 2010).

Data collection and measures

Data was collected with questionnaires at three points in time: at baseline, after three months and after twelve months. All older people were visited at home by trained interviewers recruited from the region of Walcheren to ensure a cultural fit with the frail older people. Interviewers had a background in healthcare to ensure a high-quality interview.

Health, functional abilities and quality of life were studied, primarily with validated instruments. All health outcomes (experienced health, mental health and social functioning) were assessed by means of questions from the RAND-36 questionnaire (van der Zee & Sanderman, 1993). Experienced health was assessed with one item from the RAND-36 that allows frail older people to evaluate their own health. Mental health was measured using a five-item RAND-36 scale with items that question how often the respondent feels certain emotions, such as happiness or nervousness; the Cronbach's alpha for this scale was 0.74. Social functioning was measured with one item that asked how often social activities were hampered by physical health or emotional problems.

Functional abilities were measured with the Katz-15 instrument that assesses the ability to perform 15 activities of daily living, such as getting dressed, shopping and taking medication (Laan et al., 2014); the Cronbach's alpha of this instrument was 0.86.

To assess quality of life, various instruments were used. First, a general measure of quality of life was used, which was based on the RAND-36 (van der Zee & Sanderman, 1993). The second measure was the EQ-5D, which focuses on health-related quality of life and includes five dimensions: mobility, self-care, daily activities, pain/ discomfort and mood (Krabbe, Stouthard, Essink-Bot, & Bonsel, 1999; Lamers, McDonnell, Stalmeier, Krabbe, & Busschbach, 2006). The third measure was the ICECAP, which was specifically developed to assess the quality of life related to older people's well-being. The ICECAP measures five dimensions of quality of life: attachment, security, role, enjoyment and control (Coast et al., 2008). This instrument is based on Sen's capability approach, which focuses on whether older people are able to function within these domains (Grewal et al., 2006). All outcomes variable are continuous and measured at the interval level.

The covariates included are age, gender, marital status (0: married and living together; 1: single and widowed), living arrangement (0: independently; 1: assisted living facility) and educational level (0: low; 1: high). Age is a continuous variable measured at the ratio level and all other covariates are categorical variables measured at the nominal level.

Statistical analysis

The study population was described, and baseline differences between the experimental and control groups were tested using chi square tests for categorical variables and independent t-tests for continuous variables. Each outcome variable after three and twelve months of follow-up was analyzed with linear mixed models of repeated measures. In all models, time and intervention (experimental and control group) were included and we adjusted for the baseline score of the specific outcome variable and for the covariates sex, age, marital status, educational level, and living arrangement. The significance level was set at $p<0.05$ and p-values of <0.10 were also reported (Cohen, 1988). All analyses were performed with SPSS 22.

Results

The study population consisted of frail older patients with an average age of 82 years and an average score of 6 on the GFI (see table 4.2). Women were overrepresented in both groups: 70% of the experimental group and 60% of the control group were female. Sixty-three percent of the frail older people in the experimental group and 47% in the control group had a lower level of education. The majority of the frail older people did not have a partner and lived independently. Frail older people reported on average four morbidities; most common were joint damage, hearing problems, vision disorders and heart failure.

Compared with the control group, the experimental group consisted of significantly more women, more less-educated individuals and more individuals residing in assisted living facilities.

The results at baseline showed that frail older people find their mental health and social functioning to be less problematic than their health. The average score on functional abilities was approximately 4, meaning that frail older people need help with 4 (instrumental) activities of daily life. The score for health-related quality of life was approximately 0.6, and the scores on the domains of well-being ranged from 2.6 to 3.2. At baseline, health outcomes, functional abilities and quality of life were equal in both groups, except for general quality of life. General quality of life was significantly lower at baseline in the experimental group than in the control group (42.3 vs. 47.0, $p<0.05$).

Table 4.3 shows that the WICM had limited effects on health outcomes, functional abilities and quality of life. The WICM had a moderate significant effect on quality of life after twelve months (CI: -0.15 to 5.63; $p<0.10$). Whereas the general quality of life of the frail older people in the control group decreased over twelve months, the quality of life of the frail older people in the experimental group was preserved. With regards to health-related quality of life and well-being, no effects were found. However, WICM impacted one dimension of well-being: the ability to receive love and friendship (CI: 0.14 to 0.36; $p<0.001$). In the control group, the ability to receive love

Table 4.2: Baseline characteristics of the study population

	Experimental group (n=184) Mean (SD) or %	**Control group (n=193) Mean (SD) or %**	**p-value**
Background variables			
GFI (0-15)	6.0 (2.0)	5.8 (1.8)	0.19
Age	81.8 (4.7)	82.3 (5.3)	0.38
Sex – women	69.6%	59.6%	0.04
Educational level			
Low	63.0%	46.6%	0.00
High	37.0%	53.4%	
Marital status			
Married and living together	37.0%	41.7%	0.35
Single and widowed	63.0%	58.3%	
Living situation			
Independently	71.7%	82.4%	0.01
Assisted living facility	28.3%	17.6%	
Multimorbidity	3.8 (1.9)	3.9 (1.9)	0.66
Outcomes			
Health			
Experienced health (0-100)	33.8 (17.1)	35.1 (20.5)	0.51
Mental health (0-100)	71.3 (17.6)	72.0 (16.5)	0.69
Social functioning (0-100)	69.1 (33.7)	65.7 (39.0)	0.36
Functional abilities			
Functional abilities (0-15)	3.9 (3.1)	3.7 (3.2)	0.48
Quality of life			
General quality of life (0-100)	42.3 (18.0)	47.0 (19.4)	0.01
Health-related quality of life (0-1)	0.6 (0.2)	0.7 (0.3)	0.60
Well-being – love & friendship (1-4)	3.1 (0.8)	3.0 (0.8)	0.20
Well-being – security (1-4)	3.2 (0.9)	3.3 (0.8)	0.32
Well-being – role (1-4)	2.7 (0.8)	2.8 (0.8)	0.12
Well-being – enjoyment (1-4)	3.0 (0.8)	2.8 (0.8)	0.08
Well-being – control (1-4)	2.6 (0.9)	2.8 (0.9)	0.08

and friendship decreased, but this ability did not change in the experimental group. No significant differences were found between the groups in terms of experienced health, mental health and social functioning. Moreover, functional abilities of frail older people were not affected by the WICM.

All baseline scores were strongly significant and were the main determinant for all outcomes after twelve months. Of the covariates, age was the most important and had a negative effect on social functioning, functional abilities, and health-related quality of life. Marital status had a negative effect on two outcomes, as frail older people with a partner showed lower scores for social functioning and functional abilities. In addition, two significant trends over time could be observed: functional abilities and health-related quality of life both decreased over time.

Table 4.3: Linear mixed models – adjusted overall effects[1]

	Mean (SE) experimental	Mean (SE) control	Mean diff (95% CI)	p-value
Outcomes				
Health				
Experienced health (0-100)	34.31 (1.01)	34.99 (1.04)	-0.68 (-3.18 to 1.82)	0.59
Mental health (0-100)	68.86 (0.94)	69.44 (0.91)	-0.42 (-2.69 to 1.85)	0.72
Social functioning (0-100)	65.06 (2.29)	66.42 (2.36)	-1.36 (-7.04 to 4.33)	0.64
Functional abilities				
Functional abilities (0-15)	4.41 (0.14)	4.19 (0.14)	0.22 (-0.13 to 0.56)	0.21
Quality of life				
General quality of life (0-100)	42.66 (1.15)	39.92 (1.19)	2.74 (-0.15 to 5.63)	0.06
Health-related quality of life (0-1)	0.66 (0.01)	0.65 (0.02)	0.01 (-0.03 to 0.04)	0.73
Well-being – love & friendship (1-4)	3.00 (0.04)	2.75 (0.05)	0.25 (0.14 to 0.36)	0.00
Well-being – security (1-4)	3.32 (0.05)	3.28 (0.06)	0.05 (-0.08 to 0.18)	0.45
Well-being – role (1-4)	2.57 (0.05)	2.54 (0.05)	0.03 (-0.10 to 0.15)	0.66
Well-being – enjoyment (1-4)	2.73 (0.05)	2.66 (0.06)	0.07 (-0.06 to 0.19)	0.30
Well-being – control (1-4)	2.55 (0.05)	2.61 (0.05)	-0.07 (-0.19 to 0.06)	0.27

[1] Adjusted for the baseline score of the specific outcome variable, sex, age, marital status, educational level, and living arrangement.

Discussion

In this study, we explored the effectiveness of the WICM in terms of health outcomes, functional abilities and quality of life. The WICM is an intervention that combines a pro-active and integrated care approach organized from the GP practice; the model contains diverse effective integrated care elements, and integration is achieved at the organizational level. Our study shows that the WICM has a positive effect on the ability to receive love and friendship, and the WICM moderately preserves the general quality of life of frail older people. The WICM was not effective in terms of health outcomes and functional abilities.

The effect of the WICM on quality of life could possibly be explained by the pro-active approach of the WICM and its target group. Previous research has shown that a pro-active attitude has positive results on quality of life (Gobbens & van Assen, 2014) and that timely identification of frailty prevents further deterioration (Challis et al., 1987; Strandberg & Pitkala, 2007). Moreover, in the WICM, older people are pro-actively screened for frailty from the GP practice with the GFI questionnaire, which strongly determined the target group for the intervention. The GFI questionnaire was sent to *all* GP patients aged 75 years or older and focuses on physical, cognitive, social and psychological functioning (Peters et al., 2013; Schuurmans et al., 2004). Compared to other interventions, in which quality of life was considered an outcome variable, our study had a broader approach to frailty and therefore a different target group. In other interventions, older people were included in the interventions if they reported having problems (Markle-Reid et al., 2006; Melis et al., 2008), visited the emergency department (Gagnon et al., 1999), were referred by family practitioners (Rockwood et al., 2000) or were screened by routine care data (Drubbel, 2014). Accordingly, the differences in target groups between the interventions could possibly explain the difference in outcomes.

The WICM also had an effect on love and friendship, which are two important attributes of the quality of life of elderly (Grewal et al., 2006). Previous evaluation research on the short-term effects of the WICM also showed this effect (Looman, Fabbricotti, & Huijsman, 2014), which indicates the consistency of this relevant finding. This consistent effect may be explained by the improved relationship between frail older people and their informal caregivers. In the WICM, the situation of frail older people is comprehensively assessed and monitored in consultations with the informal caregiver, possibly leading to tranquility and relief. This notion is underscored by the finding that the WICM had a positive effect on the subjective burden of the informal caregivers (Nies, 2004). The informal caregivers indicated that their caregiver situation improved in terms of, for example, mental health and relationships, which could have affected the feelings of love and friendship experienced by frail older people.

Furthermore, the WICM did not show effects on health outcomes and functional abilities. Integrated care interventions such as the WICM, encompass the reorganization of care processes targeting at multidimensional needs of persons with similar problems (Nies, 2004). However, this does not provide insight in the specific content of these care processes. Reorganization of care for frail older people might not be sufficient to achieve effectiveness in terms of health outcomes and functional abilities. The content of care might also be important; research has shown that integrated care containing specific medical and paramedical interventions has resulted in positive outcomes for frail older people (Gill, Baker, & Gottschalk, 2002; Leveille et al., 1998).

With respect to medical and paramedical care, the differences between WICM and care as usual were limited, given that the Netherlands has a strong primary care system. An important distinction between WICM and care as usual is the multidisciplinary focus. The care in WICM is not purely medical but also entails prevention, residence and wellbeing. WICM's primary outcome measure was, therefore, quality of life (Fabbricotti et al., 2013).

Strengths

The strength of our study was its consideration of many different outcomes, which were measured with innovative instruments such as the ICECAP. The ICECAP instrument has been developed to measure older people well-being, even when personal functioning is not improving (Makai, Brouwer, Koopmanschap, & Nieboer, 2012). This instrument covers the five most important attributes of older adults' well-being, including love and friendship (Coast et al., 2008). The effectiveness of integrated care has not been examined previously with this specific instrument. However, the ICECAP has been used in economic evaluations, in which it was shown that this instrument is more sensitive at detecting the effectiveness of interventions for frail older people than the EQ-5D-instrument, a more traditional instrument to measure health-related quality of life (Makai et al., 2015).

Limitations

The primary limitation of our research is that the design of the study was quasi-experimental. To ensure that frail older people could receive care from their own GP, randomization of the frail older people population was not desirable. Our quasi-experimental design, however, means that the study population in the experimental and control groups could have differed non-randomly at baseline. In our study, the experimental group consisted of more women, more individuals living in assisted living facilities and more individuals with a lower level of education. However, these differences may not have impacted our results for two reasons. First, we accounted for these differences by including the background characteristics as covariates in our analyses. In these analyses, no significant effects were found for sex, living situation and educational level. Second, previous research has not shown consistent effects of these variables on factors such as quality of life (Grayson, Lubin, & Van Whitlock, 1995; Lee, Ko, & Lee, 2006).

A second limitation is our focus on patient outcomes. Even though a comprehensive set of outcome measures was used in terms of health, functional abilities and quality of life, the effects of WICM on health care utilization remain to be determined. Integrated care has been shown to result in a decline in hospitalization and institutionalization (Eklund & Wilhelmson, 2009). Therefore, it would be useful to explore whether our integrated and pro-active intervention would affect health care utilization and associated costs. These costs could be compared with the effects of our intervention, such as health-related quality of life, to allow for statements regarding the cost-effectiveness of the WICM.

Recommendations

Recommendations for practice are that more in-depth insights into the effectiveness of preventive and integrated care approaches for frail older patients are required. Integrated care interventions such as the WICM should be further optimized in practice; it still remains unclear what specific combinations of pro-active *and* integrated care elements are most effective. The comprehensive WICM pursuing integration at the micro- and meso-level with a preventive focus showed moderate positive results in terms of quality of life but this intervention was not able to improve health outcomes and functional abilities. Furthermore, our study revealed that the specific content of care within these integrated care interventions for community-dwelling elderly should be carefully considered in the future development of these interventions including the WICM.

Regarding the outcomes for frail older people, future research is recommended to explore what specific outcomes could be expected for frail older people and how these outcomes could be accurately detected in evaluation research. Frailty is a gradual process of deterioration (Gobbens & van Assen, 2014), and it might not be realistic to expect improvement or even preservation in all three domains (i.e., health, functional abilities and quality of life). However, our study shows that a slightly different emphasis, for example, by examining specific domains of well-being, is encouraging. In particular, the ICECAP instrument is recommended for inclusion in future evaluation research.

The final implication of this study for future research is enhancement of our understanding of the participants of integrated care interventions. Although all participating older people in the various studies have been described as frail, inclusion criteria or screening instruments to detect frailty in these studies were different (see also (Eklund & Wilhelmson, 2009). In addition, thus far, frail older people have been perceived as a single group in classical evaluation studies; no distinction of any kind has been made among frail older people, even though research has shown that they are a heterogeneous group of people with diverse problems in physical, psychological and social domains (Gobbens & van Assen, 2014). This heterogeneity should also be considered in the evaluation of integrated care and may possibly yield insight into its effectiveness.

Conclusions

The conclusion is that WICM, a pro-active and integrated care intervention with the GP-practice as single entry point, is moderately effective for community-dwelling frail older people. WICM had a positive effect on the ability to receive love and friendship and moderately preserves general quality of life; two relevant findings because they comprise the personal evaluation of the frail older people themselves. However, WICM was not effective in terms of health outcomes and functional abilities.

References

Beland, F., Bergman, H., Lebel, P., Clarfield, A. M., Tousignant, P., Contandriopoulos, A. P., & Dallaire, L. (2006). A system of integrated care for older persons with disabilities in Canada: Results from a randomized controlled trial. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 61*(4), 367-373.

Bernabei, R., Landi, F., Gambassi, G., Sgadari, A., Zuccala, G., Mor, V., . . . Carbonin, P. (1998). Randomised trial of impact of model of integrated care and case management for older people living in the community. *Br Med J, 316*, 1348-1351.

Boeckxstaens, P., & De Graaf, P. (2011). Primary care and care for older persons: Position paper of the European forum for primary care. *Qual Prim Care, 19*, 369-389.

Boot, J. M., & Knapen, M. H. J. M. (2005). *Handboek Nederlandse gezondheidszorg. [Handbook Dutch healthcare]*. Utrecht: Het Spectrum.

Challis, D., Chessum, R., Chesterman, J., Luckett, R., & Woods, B. (1987). Community care for the frail elderly: An urban experiment. *British Journal of Social Work, 18*(supp), 13-42.

Chatterji, P., Burstein, N. R., Kidder, D., & White, A. (1998). *Evaluation of the program of all-inclusive care for the elderly (PACE) demonstration. The impact of PACE on participant outcomes*. Cambridge: Abt Associates Inc.

Coast, J., Flynn, T. N., Natarajan, L., Sproston, K., Lewis, J., Louviere, J. J., & Peters, T. J. (2008). Valuing the ICECAP capability index for older people. *Social Science & Medicine, 67*(5), 874-882.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. (2nd edition ed.). Hillsdale: Lawrence Erlbaum Associates.

Drubbel, I. (2014). *Frailty screening in older patients in primary care using routine care data*. PhD Thesis, Utrecht University.

Drubbel, I., Numans, M. E., Kranenburg, G., Bleijenberg, N., de Wit, N. J., & Schuurmans, M. J. (2014). Screening for frailty in primary care: A systematic review of the psychometric properties of the frailty index in community-dwelling older people. *BMC Geriatrics, 14*(1), 27.

Eklund, K., & Wilhelmson, K. (2009). Outcomes of coordinated and integrated interventions targeting frail elderly people: A systematic review of randomised controlled trials. *Health Soc Care Community, 17*, 447-458.

Eklund, K., Wilhelmson, K., Gustafsson, H., Landahl, S., & Dahlin-Ivanoff, S. (2013). One-year outcome of frailty indicators and activities of daily living following the randomised controlled trial: “Continuum of care for frail older people”. *BMC Geriatr., 13*, 76.

Ex, C., Gorter, K., & Janssen, U. (2003). *Providing integrated health and social care for older persons in the Netherlands*. Utrecht: Verwey Jonker Institute.

Fabbricotti, I. N. (2007). *Zorgen voor zorgketens [Taking care of integrated care]*. PhD Thesis, Erasmus University Rotterdam.

Fabbricotti, I. N., Janse, B., Looman, W. M., de Kuijper, R., van Wijngaarden, J. D., & Reiffers, A. (2013). Integrated care for frail elderly compared to usual care: A study protocol of a quasi-experiment on the effects on the frail elderly, their caregivers, health professionals and health care costs. *BMC Geriatr, 13*, 31.

Fried, L. P., Tangen, C. M., Walston, J., Newman, A. B., Hirsch, C., Gottdiener, J., . . . Cardiovascular Health Study Collaborative Research Group. (2001). Frailty in older adults: Evidence for a phenotype. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 56*(3), M146-56.

Friedman, S. M., Steinwachs, D. M., Rathouz, P. J., Burton, L. C., & Mukamel, D. B. (2005). Characteristics predicting nursing home admission in the program of all-inclusive care for elderly people. *The Gerontologist, 45*(2), 157-166.

Gagnon, A. J., Schein, C., McVey, L., & Bergman, H. (1999). Randomized controlled trial of nurse case management of frail older people. *J Am Geriatr Soc, 47*, 1118-1124.

Gill, T. M., Baker, D. I., & Gottschalk, M. (2002). A program to prevent functional decline in physically frail, elderly persons who live at home. *N Engl J Med,* Oct 3;347(14):1068-1074.

Gobbens, R. J. J., & van Assen, M. A. L. M. (2014). The prediction of quality of life by physical, psychological and social components of frailty in community-dwelling older people. *Quality of Life Research, 23*(8), 2289-2300.

Gobbens, R. J. J., Luijkx, K. G., Wijnen-Sponselee, M. T., & Schols, J. M. G. A. (2010). Towards an integral conceptual model of frailty. *The Journal of Nutrition, Health & Aging, 14*(3), 175-181.

Grayson, P., Lubin, B., & Van Whitlock, R. (1995). Comparison of depression in the community-dwelling and assisted-living elderly. *Journal of Clinical Psychology, 51*(1), 18-21.

Grewal, I., Lewis, J., Flynn, T., Brown, J., Bond, J., & Coast, J. (2006). Developing attributes for a generic quality of life measure for older people: Preferences or capabilities? *Social Science & Medicine, 62*(8), 1891-1901.

Gröne, O., & Garcia-Barbero, M. (2001). Integrated care. *Int J Integr Care, 1*(1)

Hebert, R., Durand, P. J., Dubuc, N., Tourigny, A., & Group, P. (2003). PRISMA: A new model of integrated service delivery for the frail older people in Canada. *Int J Integr Care, 3*, e08.

Johri, M., Beland, F., & Bergman, H. (2003). International experiments in integrated care for the elderly: A synthesis of the evidence. *International Journal of Geriatric Psychiatry, 18*, 222-235.

Kodner, D. L. (2009). All together now: A conceptual exploration of integrated care. *Healthcare Quarterly (Toronto, Ont.), 13 Spec No*, 6-15.

Kodner, D. L., & Kyriacou, C. K. (2000). Fully integrated care for frail elderly: Two American models. *Int J Integr Care, 1*, e08.

Kodner, D. L., & Spreeuwenberg, C. (2002). Integrated care: Meaning, logic, applications, and implications - a discussion paper. *Int J Integr Care, 14*(2)

Krabbe, P. F., Stouthard, M. E., Essink-Bot, M., & Bonsel, G. J. (1999). The effect of adding a cognitive dimension to the EuroQol multiattribute health-status classification system. *Journal of Clinical Epidemiology, 52*(4), 293-301.

Laan, W., Zuithoff, A., Drubbel, I., Bleijenberg, N., Numans, M., De Wit, N., & Schuurmans, M. (2014). Validity and reliability of the Katz-15 scale to measure unfavorable health outcomes in community-dwelling older people. *The Journal of Nutrition, Health & Aging, 18*(9), 848.

Lamers, L. M., McDonnell, J., Stalmeier, P. F., Krabbe, P. F., & Busschbach, J. J. (2006). The dutch tariff: Results and arguments for an effective design for national EQ-5D valuation studies. *Health Economics, 15*(10), 1121-1132.

Lee, T. W., Ko, I. S., & Lee, K. J. (2006). Health promotion behaviors and quality of life among community-dwelling elderly in Korea: A cross-sectional survey. *International Journal of Nursing Studies, 43*(3), 293-300.

Leveille, S. G., Wagner, E. H., Davis, C., Grothaus, L., Wallace, J., LoGerfo, M., & Kent, D. (1998). Preventing disability and managing chronic illness in frail older adults: A randomized trial of a community-based partnership with primary care. *J Am Geriatr Soc, 46*, 1191-1198.

Looman, W. M., Fabbricotti, I. N., & Huijsman, R. (2014). The short-term effects of an integrated care model for the frail elderly on health, quality of life, health care use and satisfaction with care. *Int J Integr Care, 14*, e034.

Makai, P., Brouwer, W. B., Koopmanschap, M. A., & Nieboer, A. P. (2012). Capabilities and quality of life in Dutch psycho-geriatric nursing homes: An exploratory study using a proxy version of the ICECAP-O. *Quality of Life Research, 21*(5), 801-812.

Makai, P., Looman, W., Adang, E., Melis, R., Stolk, E., & Fabbricotti, I. (2015). Cost-effectiveness of integrated care in frail elderly using the ICECAP-O and EQ-5D: Does choice of instrument matter? *Eur J Health Econ, 16*, 437-450.

Markle-Reid, M., Weir, R., Browne, G., Roberts, J., Gafni, A., & Henderson, S. (2006). Health promotion for frail older home care clients. *J.Adv.Nurs., 54*, 381-395.

Melis, R. J. F., van Eijken, M. I. J., Teerenstra, S., van Achterberg, T., Parker, S. G., Borm, G. F., . . . Rikkert, M. (2008). A randomized study of a multidisciplinary program to intervene on geriatric syndromes in vulnerable older people who live at home (Dutch EASYcare study). *J.Gerontol.Ser.A-Biol.Sci.Med.Sci., 63*, 283-290.

Metzelthin, S. F., Daniëls, R., van Rossum, E., Cox, K., Habets, H., de Witte, L. P., & Kempen, G. I. J. M. (2013). A nurse-led interdisciplinary primary care approach to prevent disability among community-dwelling frail older people: A large-scale process evaluation. *Int J Nurs Stud, 50*, 1184-1196.

Montgomery, P. R., & Fallis, W. M. (2003). South Winnipeg integrated geriatric program (SWING): A rapid community-response program for the frail elderly. *Can J Aging, 22*, 275-281.

Nies, H. (2004). Integrated care: Concepts and background. In H. Nies, & P. C. Berman (Eds.), *Integrating services for older people: A resource book for managers* (pp. 17-32). Dublin: Ehma.

Peters, L. L., Boter, H., Slaets, J. P. J., & Buskens, E. (2013). Development and measurement properties of the self assessment version of the INTERMED for the elderly to assess case complexity. *J.Psychosomat.Res., 74*, 518-522.

Rockwood, K., Stadnyk, K., Carver, D., MacPherson, K. M., Beanlands, H. E., Powell, C., . . . Tonks, R. S. (2000). A clinimetric evaluation of specialized geriatric care for rural dwelling, frail older people. *J Am Geriatr Soc, 48*, 1080-1085.

Ross, S., Goodwin, N., & Curry, N. (2011). *Case management: What is it and how it can best be implemented.* (). London: King's Fund.

Schers, H., Koopmans, R., & Rikkert, M. O. (2009). De rol van de huisarts bij kwetsbare ouderen (the role of the GP for frail elderly. an internet survey among GPs). *Huisarts En Wetenschap, 52*(13), 626-630.

Schuurmans, H., Steverink, N., Lindenberg, S., Frieswijk, N., & Slaets, J. P. (2004). Old or frail: What tells us more? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 59*(9), M962-M965.

Smelt, A. F., van der Weele, G. M., Blom, J. W., Gussekloo, J., & Assendelft, W. J. (2010). How usual is usual care in pragmatic intervention studies in primary care? An overview of recent trials. *The British Journal of General Practice, 60*(576), e305-e318.

Strandberg, T. E., & Pitkala, K. H. (2007). Frailty in elderly people. *Lancet, 369*(9570), 1328-1329.

Tourigny, A., Durand, P., Bonin, L., Hebert, R., & Rochette, L. (2004). Quasi-experimental study of the effectiveness of an integrated service delivery network for the frail elderly. *Can J Aging, 23*, 231-246.

van der Zee, K., & Sanderman, R. (1993). Rand-36. *Groningen: Northern Centre for Health Care Research, University of Groningen, the Netherlands, 28* van Hout, H. P., Jansen, A. P., van Marwijk, H. W., Pronk, M., Frijters, D. F., & Nijpels, G. (2010). Prevention of adverse health trajectories in a vulnerable elderly population through nurse home visits: A randomized controlled trial [ISRCTN05358495. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences, 65*(7), 734-742.

Vedel, I., De Stampa, M., Bergman, H., Ankri, J., Cassou, B., Blanchard, F., & Lapointe, L. (2009). Healthcare professionals and managers' participation in developing an intervention: A pre-intervention study in the elderly care context. *Implementation Science, 4*(1), 1.

Wiles, J. L., Leibing, A., Guberman, N., Reeve, J., & Allen, R. E. (2012). The meaning of "aging in place" to older people. *The Gerontologist, 52*(3), 357-366.

World Health Organization. (2015). *World report on ageing and health*. Geneva: World Health Organization.

CHAPTER 5

Cost-effectiveness of the Walcheren Integrated Care Model

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Abstract

Background

An important aim of integrated care for frail elderly is to generate more cost-effective health care. However, empirical research on the cost-effectiveness of integrated care for community-dwelling frail elderly is limited. This study reports on the cost-effectiveness of the Walcheren Integrated Care Model (WICM) after 12 months from a societal perspective.

Methods

The design of this study was quasi-experimental. In total, 184 frail elderly patients from three GP practices that implemented the WICM were compared with 193 frail elderly patients of five GP practices that provided care as usual. Effects were determined by health-related quality of life (EQ-5D questionnaire). Costs were assessed based on questionnaires, GP files, time registrations and reports from multidisciplinary meetings. Average costs and effects were compared using *t*-tests. The incremental cost-effectiveness ratio (ICER) was calculated, and bootstrap methods were used to determine its reliability.

Results

Neither the WICM, nor care as usual resulted in a change in health-related quality of life. The average total costs of the WICM were higher than care as usual (17,089 euros versus 15,189 euros). The incremental effects were 0.00, whereas the incremental costs were 1,970 euros; indicating an ICER of 412,450 euros.

Conclusions

The WICM is not cost-effective, and the costs per quality-adjusted life year are high. The costs of the integrated care intervention do not outweigh the limited effects on health-related quality of life after twelve months. More analyses of the cost-effectiveness of integrated care for community-dwelling frail elderly are recommended as well as consideration of the specific costs and effects.

Background

Due to population ageing, primary care systems throughout the world are encountering great challenges urging innovation in the organization of elderly care. Elderly individuals will gradually experience complex age-related problems in the physical, psychological, cognitive and social domains of daily functioning. This condition is known as frailty and is found to increase the risk of negative health and social outcomes. Frailty is related to poor quality of life and becoming more care dependent, with an increased likelihood of hospitalization and institutionalization (Gobbens & van Assen, 2014). While budget cuts reduce health and social care expenditures, there is, thus, a strong need for providing high-quality care in order to maintain elderly's quality of life. It is frequently questioned whether the current approach to care delivery provides good value for money, given its fragmentation and its lack of responsiveness to the needs of frail elderly (Gröne & Garcia-Barbero, 2001). Therefore, it is essential to consider alternatives.

Integrated care has been increasingly advocated as a means to deliver value for money. Integrated care is defined as "a well-planned and well-organised set of services and care processes, targeted at multi-dimensional needs/problems of an individual client, or a category of persons with similar needs/problems" (Nies, 2004). The two main features of integrated care are client-centeredness and continuity. First, integrated care is demand-oriented, addressing client's needs by professionals from different disciplines and sectors (Gröne & Garcia-Barbero, 2001). Second, integrated care aims to promote continuity: the set of services is delivered coherently, seamlessly and in accordance with clients' changing needs over time (Nies, 2004). Common elements of integrated care models proven to be effective for community-dwelling frail elderly are a single entry point, geriatric assessments, case management, multidisciplinary teams (Johri, Beland, & Bergman, 2003), multidisciplinary protocols and discussions, web-based patient files and a network structure (Kodner & Kyriacou, 2000).

Even though integrated care largely aims at cost-effectiveness, research comparing the associated costs *and* effects of interventions is scarce, limiting conclusions on the cost-effectiveness of integrated care interventions (Melis et al., 2008). Thus far, studies on cost-effectiveness have also shown mixed results. Some interventions for community-dwelling frail elderly have shown to be cost-effective compared with care as usual (Drubbel, 2014; Fairhall et al., 2015; Melis et al., 2008; Stuck, Aronow, & Steiner, 1995), whereas other studies have shown that integrated care is not cost-effective (Kehusmaa, Autti-Rämö, Valaste, Hinkka, & Rissanen, 2010; Metzelthin et al., 2015). The wide variation in the interventions, costs and effects considered in these studies, limits the possibility to draw conclusions regarding what promotes cost-effectiveness in integrated care for community-dwelling frail elderly.

This study adds knowledge by exploring the cost-effectiveness of a specific integrated care intervention: the Walcheren Integrated Care Model (WICM). Our study is relevant for two reasons. In contrast to earlier studies that used a narrow health care perspective (Fairhall et al., 2015; Melis et al., 2008; Stuck et al., 1995), we adopted a societal perspective, which is strongly recommended given its policy relevance at the macro level (Drummond, Sculpher, Claxton, Stoddart, & Torrance, 2005). Second, our intervention comprises *all* integrated care elements that have been identified as effective in prior research rather than a selection of elements. Therefore, we provide valuable insights regarding the cost-effectiveness of a comprehensive integrated care model for community-dwelling frail elderly. This study aimed to answer the following research question: Is the WICM cost-effective from a societal perspective after twelve months?

Methods

Design

The design of this study was quasi-experimental and included before and after measurements with a control group providing care as usual (for a more detailed description of the methods, see (Fabbricotti et al., 2013)). The cost-effectiveness analysis was conducted from a societal perspective and thus considered all costs related to the intervention, irrespective of who pays for these expenses (Drummond et al., 2005).

Intervention

In the WICM, the GP functions as care coordinator and as a partner in prevention. The GP practice is a single entry point for the elderly, their informal caregivers and health professionals. GPs detect frailty in their patient population using the Groningen Frailty Indicator, a validated 15-item instrument that measures decreases in physical, cognitive, social and psychological functioning. Elderly patients with a score of 4 or higher are visited by a nurse practitioner who assesses their functional, cognitive, mental and psychological functioning using EASYcare, an evidence-based instrument used to assess care needs. A multidisciplinary treatment plan is then formulated in consultation with the elderly and their informal caregiver(s). Case management is provided by the nurse practitioner. Multidisciplinary meetings are attended by the GP, the nurse practitioner and other professionals, depending on the care required by the frail elderly. The entire process is supported by web-based patient files and multidisciplinary protocols. The WICM requires task reassignment and delegation between nurses and doctors, and among GPs, nursing home doctors and geriatricians. Consultations occur among primary, secondary, and tertiary care providers. At the organizational level, a steering group serves as an umbrella organization under which the WICM is developed and disseminated. The steering group, which consists of representatives from all involved organizations, forms a Joint Governing Board that provides the necessary provider network. All patient representatives support the project, and the health insurer CZ provides financial support for the project.

Compared with the WICM, care as usual in the Netherlands is fragmented and reactive. In the Dutch health care systems, patients need a referral from their GP to obtain care from the primary, secondary and tertiary echelons. GPs thus play the role of gate keepers. Care as usual is fragmented, as professionals merely communicate bilaterally through referral letters and sporadic telephone calls. Moreover, care as usual is reactive; patients solely receive care for specific (health) problems on their own initiative. The GPs in the control group were unable to implement elements of the integrated model during the study period because they did not receive financial support from the health insurer to implement the integrated care activities of the WICM. Accordingly, participants in the control group were not systematically screened for frailty, their care needs were not assessed, multidisciplinary treatment plan were not formulated and case management was not provided. The GPs in the control group had a monodisciplinary focus; they did not organize multidisciplinary meetings or implement multidisciplinary protocols and web-based files. Furthermore, the GPs in the control group could not treat the frail elderly patients differently, as these GPs were not given information on who participated in the study. Therefore, the probability of bias was minimized.

Participants

The study population consisted of the entire elderly patient population of the GPs in both the experimental and control groups (see figure 5.1). At baseline, 254 frail elderly from three GP practices were included in the experimental group, and 249 frail elderly from six GP practices in the control group. The frail elderly were asked whether they received informal care, including care from non-professionals and unpaid care provided by partners, family, close friends or neighbours. At baseline, 144 frail elderly in the experimental group reported receiving informal care compared with 118 frail elderly in the control group. After 12 months, the final study population included 184 frail elderly and 83 informal caregivers in the experimental group and 193 frail elderly and 76 informal caregivers in the control group.

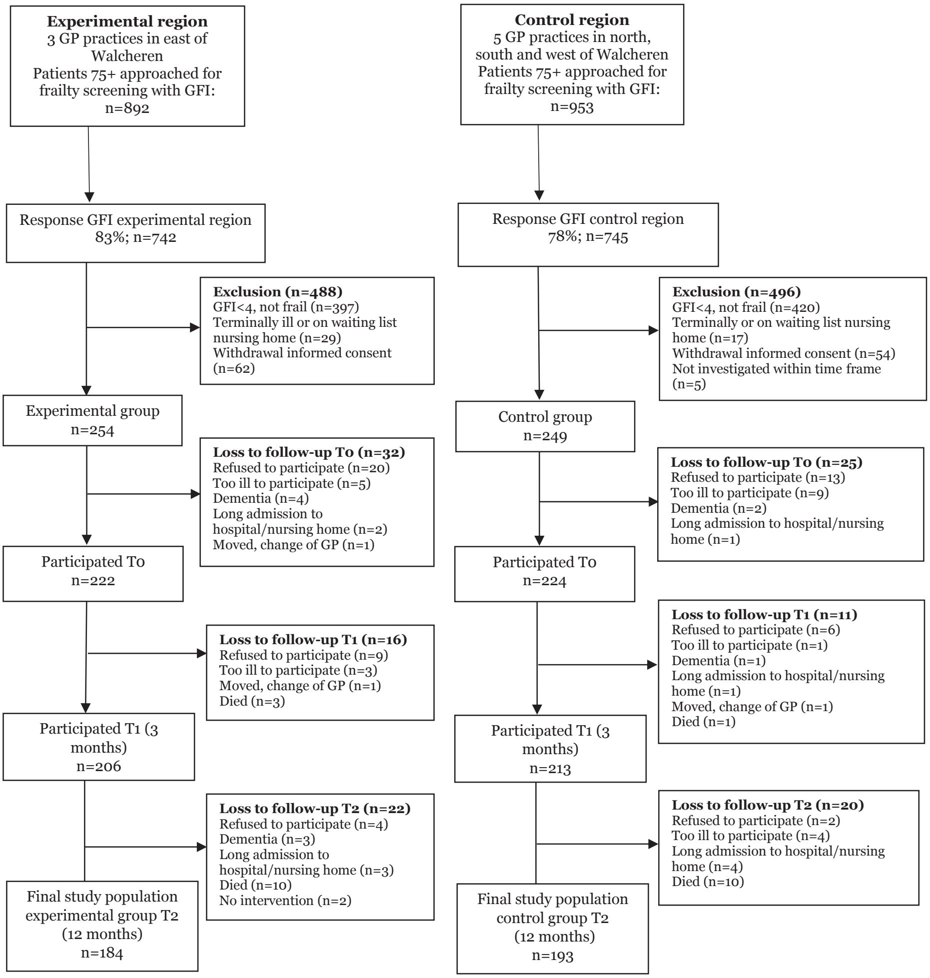


Figure 5.1: Flow chart of selection and loss to follow-up of study participants in experimental and control group

Measures

Effects

The primary outcome of the intervention was quality of life, which was operationalized with health-related quality of life measured with the EQ-5D instrument. The EQ-5D has five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension has three answering categories: (i) no problems; (ii) some problems and (iii) extreme problems. The answer to each of these five dimensions leads to a combination of five numbers and 243 possible health states (e.g. health state 21232 means: having some problems in walking about, having no problems with self-care; having some problems with performing usual activities; having extreme pain or discomfort; being moderately anxious or depressed). The health states unconscious and dead were added, which makes a total of 245 health states that were valued by the Dutch audience on their desirability. In previous research a general sample of the Dutch audience was asked to indicate what period of time in perfect health (11111) was equal to 10 years in a specific health state (e.g 21232) (Lamers, McDonnell, Stalmeier, Krabbe, & Busschbach, 2006). The weights obtained in this research were used to calculate the utility scores of the frail elderly of our study population. Measurements of these utility scores were obtained at baseline, three and twelve months and were used to calculate quality-adjusted life years (QALYs) for each respondent. QALYs combine both quantity and quality of life in one single measure; 1 QALY means one year in perfect health (Lamers et al., 2006)

Costs

Healthcare costs, intervention costs and informal care costs were calculated by multiplying the volume of care by its corresponding cost price.

Health care volumes were collected through questionnaires and GP file research (see table 5.1). In the questionnaires, the frail elderly were asked to indicate the volume of care in assisted living facilities and nursing homes, in day care centres and in home care. Information on the volume of care in assisted living facilities and nursing homes was sought retrospectively after three and twelve months. The volumes of day care and home care were measured in the questionnaire at baseline, three and twelve months. These volumes were extrapolated with a calculation rule to obtain the volume of care over twelve months. The volume at baseline was considered to be the volume for the first month, the volume at three months was considered the volume for the second and third months, and the volume at twelve months was considered to be the volume for the last nine months. The GP file research led to data regarding the volume of care within GP practices, hospitals, and paramedical and psychological care. Data were not extrapolated, as the files provided the exact date of care consumption.

Information on intervention costs was obtained from time registrations of the case managers and notes from the multidisciplinary meetings. The exact intervention time and therefore intervention costs could be calculated for each individual frail elderly person. The education costs of the GPs and case managers were not considered.

Table 5.1: Costs of care and data collection

Type of care		Source data				Cost price
		Question-naire	GP file	Time registrations	Notes from multi-disciplinary meeting	€
Health care costs						
GP practice						
GP	Telephone consultation		number			14.51
	Consultation		number			29.02
	Consultation long		number			58.04
	Visit at home		number			44.57
	Visit at home long		number			89.13
Practice assistant	Telephone consultation		number			5.48
	Consultation		number			10.97
	Consultation long		number			21.93
	Visit at home		number			16.84
	Visit at home long		number			33.68
Emergency GP	Telephone consultation		number			21.29
	Consultation		number			42.58
	Visit at home		number			63.88
Hospital	Admission – general		days			450.85
	Admission - academic		days			595.95
	Outpatient clinic – general		number			66.33
	Outpatient clinic - academic		number			133.70
	Day surgery		number			260.15
	Emergency ward		number			156.50
	Ambulance		number			271.55
Assisted living facility	Temporary stay assisted living facility	days				93.28
Nursing home	Temporary stay nursing home	days				246.67
	Permanent stay nursing home	days				246.67
	Day treatment in nursing home	days				146.66
Home care	Home care – household activities	hours				24.87
	Home care – personal care	hours				45.60
	Home care – nursing care	hours				67.37
Day care center	Day care	days				26.00
Paramedical	Physiotherapy		sessions			37.31
	Occupational therapy		hours			22.80
	Dietitian		hours			27.98
Psychosocial	Psychological care		sessions			89.83

Table 5.1: (continued)

Type of care		Source data				Cost price
		Question-naire	GP file	Time registrations	Notes from multi-disciplinary meeting	€
	Social care		sessions			67.37
Intervention costs						
	Preparation multidisciplinary meeting			minutes	minutes	variable*
	Multidisciplinary meeting			minutes	minutes	variable*
	Time spent per patient by case manager			minutes		variable*
Informal care costs						
	Household activities	hours				24.87
	Personal care	hours				45.60
	Instrumental tasks	hours				13.00

*The cost price differs per group health care professionals and is calculated for each group separately.

Informal care volumes were assessed by questionnaires completed by informal caregivers of the frail elderly at baseline, three and twelve months. The volume of informal care was measured using the Objective Burden of Informal Care Instrument (Van den Berg & Spauwen, 2006) that distinguishes time spent on household, personal care and instrumental tasks. The same calculation rule was applied as for the health care costs assessed in the questionnaire of the frail elderly.

Cost prices were determined using the Dutch guidelines of costing studies (Hakkaart-van Roijen, Tan, & Bouwmans, 2011). Cost prices were determined in euros for the year 2011 and were corrected for inflation.

Statistical analysis

The costs and the effects were compared by conducting a cost-effectiveness analysis. First, the background characteristics of the experimental and control participants at baseline were compared by chi-square tests for the categorical variables and t-tests for the continuous variables. Second, the average volume of care and corresponding costs during the twelve months period were compared between the experimental and control groups with t-tests (Thompson & Barber, 2000). The cost-effectiveness of the WICM was determined by calculating the incremental cost-effectiveness ratio (ICER). The ICER is calculated by dividing the difference between costs of the experimental group and control group (incremental costs) by the difference in effects between the experimental and control group (incremental effects). Missing values were imputed with the fully conditional specification method. We determined the reliability of the ICER with the bootstrap method, which is a statistical method with repetitive computation to determine the confidence interval of the ICER. By sampling from both the distribution of costs and effects concurrently, multiple estimates from ICER were obtained (n=10,000) (Drummond et al., 2005).

Results

The study population consisted of frail elderly patients with an average age of 82 years and an average score of 6 on the Groningen Frailty Indicator (table 5.2). Women were overrepresented in both groups and the majority of the frail elderly lived alone and independently. Nearly half of the frail elderly patients had an informal caregiver. At baseline, the health-related quality of life was equal in both groups. Compared with the control group, the experimental group consisted of significantly more women and frail elderly who lived in assisted living facilities.

Table 5.2: Characteristics of the study participants in experimental and control group at baseline

	Experimental group (n=184)	**Control group (n=193)**	***T-statistic* or chi square**
Groningen Frailty Indicator (0-15)	6.0 (2.0)	5.8 (1.8)	*-1.3*
Age	81.8 (4.7)	82.3 (5.3)	*0.8*
Sex – women	70%	60%	4.1*
Marital status			
Married and living together	37%	42%	0.9
Single and widowed	63%	58%	
Living situation			
Independently	72%	82%	6.1*
Assisted living facility	28%	18%	
Informal caregiver	45%	39%	1.5
Health-related quality of life (0-1)	0.65 (0.2)	0.67 (0.3)	*0.5*

*p<0.05

Frail elderly patients most commonly used care from the GP, hospital and home care (table 5.3). All experimental participants used GP care, as it was the single entry point of care for the intervention. In the control group, 4% of the frail elderly did not use any GP care over the one-year period. Three-quarters of the frail elderly visited the hospital within one year. The highest expenses in both groups were for home care and informal care. Only limited differences were observed in the health care utilization of the experimental and control group. For two types of care, the cost differences were significant. The first type was GP care: the costs were significantly higher in the experimental group than in the control group. Furthermore, because the intervention costs were 0 in the control group, these costs were significantly higher in the experimental group.

Table 5.3: Volume and mean costs of care after 12 months

Costs of care	Experimental group (n=184)			Control group (n=193)			95% CI	p-value
	% frail elderly using care	Mean €	SD €	% frail elderly using care	Mean €	SD €		
Health care costs								
GP	100	315	229	96.4	245	191	-133, -27	0.001***
Emergency GP	25.5	20	50	16.6	12	37	-16, 1	0.104
Hospital care	76.6	1096	3304	77.7	709	1628	-918, 146	0.154
Nursing home & assisted living	5.4	1244	8389	3.1	820	6987	-1985, 1136	0.593
Home care	69.0	7084	9573	71.0	6410	10902	-2756, 1408	0.525
Day care	5.4	205	1157	8.3	239	1216	-207, 274	0.786
Paramedical care	42.4	166	361	35.8	136	295	-96, 37	0.380
Psychosocial care	8.2	10	56	4.1	78	535	-8, 144	0.087
Intervention costs	100	340	188	0	0	0	-368, -313	0.000***
Informal care costs	41.8	6608	15269	35.2	6469	14778	-3182, 2904	0.929

***p<0.001

The average total costs in the experimental group were 17,089 euros for each frail elderly person over a one-year period (table 5.4). The costs were lower in the control group, with an average of 15,189 euros for each frail elderly person. The dispersion of costs was high: 21,000 euros in both groups. The total costs did not significantly differ between the two groups. The effects were explored in terms of health-related quality of life. The average effect in the experimental group was 0.00 compared with -0.01 in the control group; this difference was not significant.

Table 5.4: Effects and total costs of care after twelve months

	Experimental group	**Control group**	95% Confidence interval	p-value
Effects – EQ-5D	0.00 (0,19)	-0.01 (0,17)	-0.04, 0.03	0.80
Total costs	17089 (21.468)	15189 (21.709)	-6344, 2405	0.38

The WICM was not found to be cost-effective after twelve months. The intervention does not achieve incremental effects, meaning that no additional effects were gained.

The incremental costs of the intervention are 1,970 euros so the WICM is more expensive than care as usual. The costs do not outweigh the effects of the intervention after one year. The results indicate an ICER of 412,450 euros, implying that on average 412,450 should be spent to gain 1 additional QALY (one year in perfect health). The 95% confidence interval of the ICER is -4,131,743 to 4,210,593. The results of the bootstrap analysis are presented in the cost-effectiveness plane (figure 5.2). Very few of the bootstrap results, 0,21%, appear in the southeast quadrant, meaning that the intervention is more effective and generates lower costs than care as usual.

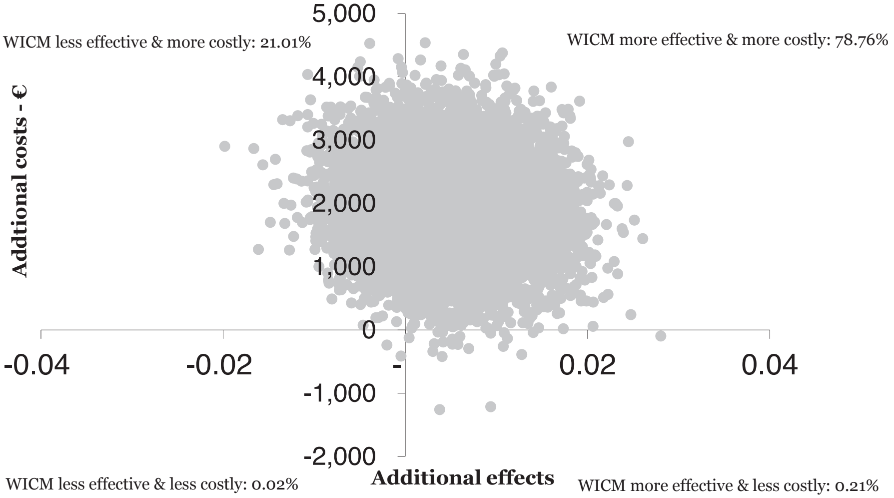


Figure 5.2: Cost-effectiveness plane - costs (euros) vs effects (QALY) of WICM vs care as usual

Discussion

In this study, we performed an economic evaluation of the WICM, a comprehensive integrated care intervention for community-dwelling frail elderly including several effective integrated care elements and differing considerably from standard care (in the Netherlands). The main conclusion is that the WICM is not cost-effective from a societal perspective over a twelve-month period, as the costs do not outweigh the effects and the costs per QALY are high.

Because studies of the cost-effectiveness of integrated care show mixed results, our study both confirms and contradicts current evidence. With regard to the effects, our study corroborates the limited effects of integrated care interventions (Drubbel, 2014; Fairhall et al., 2015; Kehusmaa et al., 2010). These limited effects do not depend on the effect measures, as studies have adopted different effect measures, e.g. functional performance, mental health (Melis et al., 2008), frailty state (Fairhall et al., 2015) and health-related quality of life (Drubbel, 2014; Fairhall et al., 2015; Kehusmaa et al., 2010; Metzelthin et al., 2015). In our cost-effectiveness analysis, we also chose to explore effects on quality of life because this refers to the subjective appraisal of the frail elderly themselves (Gobbens & van Assen, 2014). Moreover, we focused on health-related quality of life because this measure is primarily used for interventions that expect effects on patient health (Drummond et al., 2005). However, comparability between the studies is limited; it is uncertain what results would have been observed if all studies had chosen the same effect measures.

The main difference between our study and earlier research concerns the costs included (i.e., health care costs, intervention costs and informal care costs). With regard to the health care costs, the types of care that were considered clearly differed among studies. Our study included a wide range of costs because the intervention focused on physical, psychological and social functioning of the elderly. Accordingly, we included costs of both paramedical and psychological care, which were not or partially considered in other studies from a societal perspective (Drubbel, 2014; Metzelthin et al., 2015). Furthermore, intervention costs were calculated differently in our study than in other studies. In these studies, the total intervention costs were calculated and divided by the number of intervention participants (Drubbel, 2014; Fairhall et al., 2015; Kehusmaa et al., 2010; Metzelthin et al., 2015). The WICM involved specific investments, such as case management and time spent on multidisciplinary meetings by all professionals. These costs were studied in detail and calculated for each frail elderly person individually. This approach enhanced the validity of our study. Finally, informal care costs were considered only in studies adopting a societal perspective (Drubbel, 2014; Metzelthin et al., 2015). Three of the interventions that were considered to be cost-effective (Fairhall et al., 2015; Melis et al., 2008; Stuck et al., 1995) adopted a health care perspective that did not include the assessment of informal care costs.

This study has several limitations. Our quasi-experimental design was chosen to ensure that the frail elderly patients could stay with their own GP. As randomization of the frail elderly made this impossible, a quasi-experimental design was the second best choice. However, quasi-experimental designs may risk baseline differences between the experimental and control group. In our study, the experimental group consisted of more women and more elderly living in assisted living facilities compared with the control group. However, these differences did not influence our results, as previous research has shown no clear association between sex and quality of life (Bowling, 2005) or between living in an assisted living facility and quality of life (Grayson, Lubin, & Van Whitlock, 1995). This also applies to the costs of care, which were not found to be higher for women (Kehusmaa et al., 2012) or for elderly in assisted living (McGrail et al., 2013). Additionally, with the quasi-experimental design, we might have selectively included GPs in the experimental group who initially already had a more proactive attitude toward the delivery of care to frail elderly patients. Because a proactive attitude has an effect on elderly's quality of life (Gobbens & van Assen, 2014), the choice not to randomize the GPs might have led to a smaller effect on the change in quality of life for the experimental group. Although the quality of life at baseline did not significantly differ in the two groups, we have no information regarding changes in the quality of life prior to the beginning of the intervention. The selection of intervention GPs could also mean that these GPs are more likely to participate in care activities for the frail elderly, leading to higher care costs irrespective of the costs associated with the WICM.

The second limitation is related to the calculation of care costs. In this study, precise data on the volume of some types of formal and informal care were lacking, because the elderly patients did not keep records of the care they received; a method which is a commonly used in cost-effectiveness analyses. Instead, we extrapolated the volume based on their health care use at three explicit moments in time (at baseline, after three and after twelve months). This method could have led to an underestimation or overestimation of health care use and informal care and, consequently, of the costs of care. Additional analyses also showed that the volume of care used at the three moments in time rarely differed.

Third, we did not account for all costs in the cost-effectiveness analysis, e.g. costs regarding medication and assistive devices. We selected the seemingly most important types of care because it remains unknown what specific types of health and social care should be considered in cost-effectiveness analyses of integrated care interventions for the frail elderly. Furthermore, the costs of schooling and training were not accounted for because consideration of such costs would lead to unrealistically high costs for the experimental group, as the return on investment for these costs requires more than twelve months.

It remains unclear whether integrated care for the frail elderly can achieve one of its major aims of being cost-effective and thereby providing value for money. In current health care systems, this knowledge is essential in determining whether integrated care can achieve its high expectations. This implies that further research of evaluation studies on integrated care should include a cost-effectiveness analysis from a societal perspective with similar types of care considered. Adopting a societal perspective, i.e. considering the costs of informal care, is strongly recommended (Drummond et al., 2005). This is necessary because informal caregivers have become increasingly important in the care of frail elderly patients. It is crucial to consider similar costs and effects in cost-effectiveness analyses to ensure comparability among studies. More comparable cost-effectiveness analyses may help researchers to draw conclusions regarding what combinations of integrated care elements are cost-effective. However, performing such research requires determination of the types of care and health issues can be influenced by integrated care interventions for the frail elderly and should thus be considered relevant costs and effects in future cost-effectiveness analyses.

Second, future research may explore whether other goals of the WICM are achieved, such as improvements in the quality of care and consumer satisfaction. Because of a possible trade-off between the various goals of integrated care, focusing solely on cost-effectiveness might impede the implementation of a potentially successful integrated care arrangement for frail elderly patients.

References

Bowling, A. (2005). *Measuring health. A review of quality of life measurement scales.* Berkshire: Open University Press.

Drubbel, I. (2014). *Frailty screening in older patients in primary care using routine care data.* PhD Thesis, Utrecht University.

Drummond, M. F., Sculpher, M. J., Claxton, K., Stoddart, G. L., & Torrance, G. W. (2005). *Methods for the economic evaluation of health care programmes* (3rd edition ed.) Oxford: Oxford university press.

Fabbricotti, I. N., Janse, B., Looman, W. M., de Kuijper, R., van Wijngaarden, J. D., & Reiffers, A. (2013). Integrated care for frail elderly compared to usual care: A study protocol of a quasi-experiment on the effects on the frail elderly, their caregivers, health professionals and health care costs. *BMC Geriatr, 13*, 31.

Fairhall, N., Sherrington, C., Kurrle, S. E., Lord, S. R., Lockwood, K., Howard, K., . . . Aggar, C. (2015). Economic evaluation of a multifactorial, interdisciplinary intervention versus usual care to reduce frailty in frail older people. *Journal of the American Medical Directors Association, 16*(1), 41-48.

Gobbens, R. J. J., & van Assen, M. A. L. M. (2014). The prediction of quality of life by physical, psychological and social components of frailty in community-dwelling older people. *Quality of Life Research, 23*(8), 2289-2300.

Grayson, P., Lubin, B., & Van Whitlock, R. (1995). Comparison of depression in the community-dwelling and assisted-living elderly. *Journal of Clinical Psychology, 51*(1), 18-21.

Gröne, O., & Garcia-Barbero, M. (2001). Integrated care. *Int J Integr Care, 1*(1)

Hakkaart-van Roijen, L., Tan, S., & Bouwmans, C. (2011). *Handleiding voor kostenonderzoek, methoden en standaard kostprijzen voor economische evaluaties in de gezondheidszorg. [Dutch manual for costing: Methods and standard costs for economic evaluation in healthcare].* Diemen: College Voor Zorgverzekeringen.

Johri, M., Beland, F., & Bergman, H. (2003). International experiments in integrated care for the elderly: A synthesis of the evidence. *International Journal of Geriatric Psychiatry, 18*, 222-235.

Kehusmaa, S., Autti-Rämö, I., Valaste, M., Hinkka, K., & Rissanen, P. (2010). Economic evaluation of a geriatric rehabilitation programme: A randomized controlled trial. *Journal of Rehabilitation Medicine, 42*(10), 949-955.

Kehusmaa, S., Autti-Ramo, I., Helenius, H., Hinkka, K., Valaste, M., & Rissanen, P. (2012). Factors associated with the utilization and costs of health and social services in frail elderly patients. *BMC Health Serv.Res., 12*

Kodner, D. L., & Kyriacou, C. K. (2000). Fully integrated care for frail elderly: Two American models. *Int J Integr Care, 1*, e08.

Lamers, L. M., McDonnell, J., Stalmeier, P. F., Krabbe, P. F., & Busschbach, J. J. (2006). The Dutch tariff: Results and arguments for an effective design for national EQ-5D valuation studies. *Health Economics, 15*(10), 1121-1132.

McGrail, K. M., Lilly, M. B., McGregor, M. J., Broemeling, A., Salomons, K., Peterson, S., . . . Barer, M. L. (2013). Health care services use in assisted living: A time series analysis. *Canadian Journal on Aging/La Revue Canadienne Du Vieillissement, 32*(2), 173-183.

Melis, R. J., Adang, E., Teerenstra, S., van Eijken, M. I., Wimo, A., van Achterberg, T., . . . Rikkert, M. G. (2008). Cost-effectiveness of a multidisciplinary intervention model for community-dwelling frail older people. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 63*(3), 275-282.

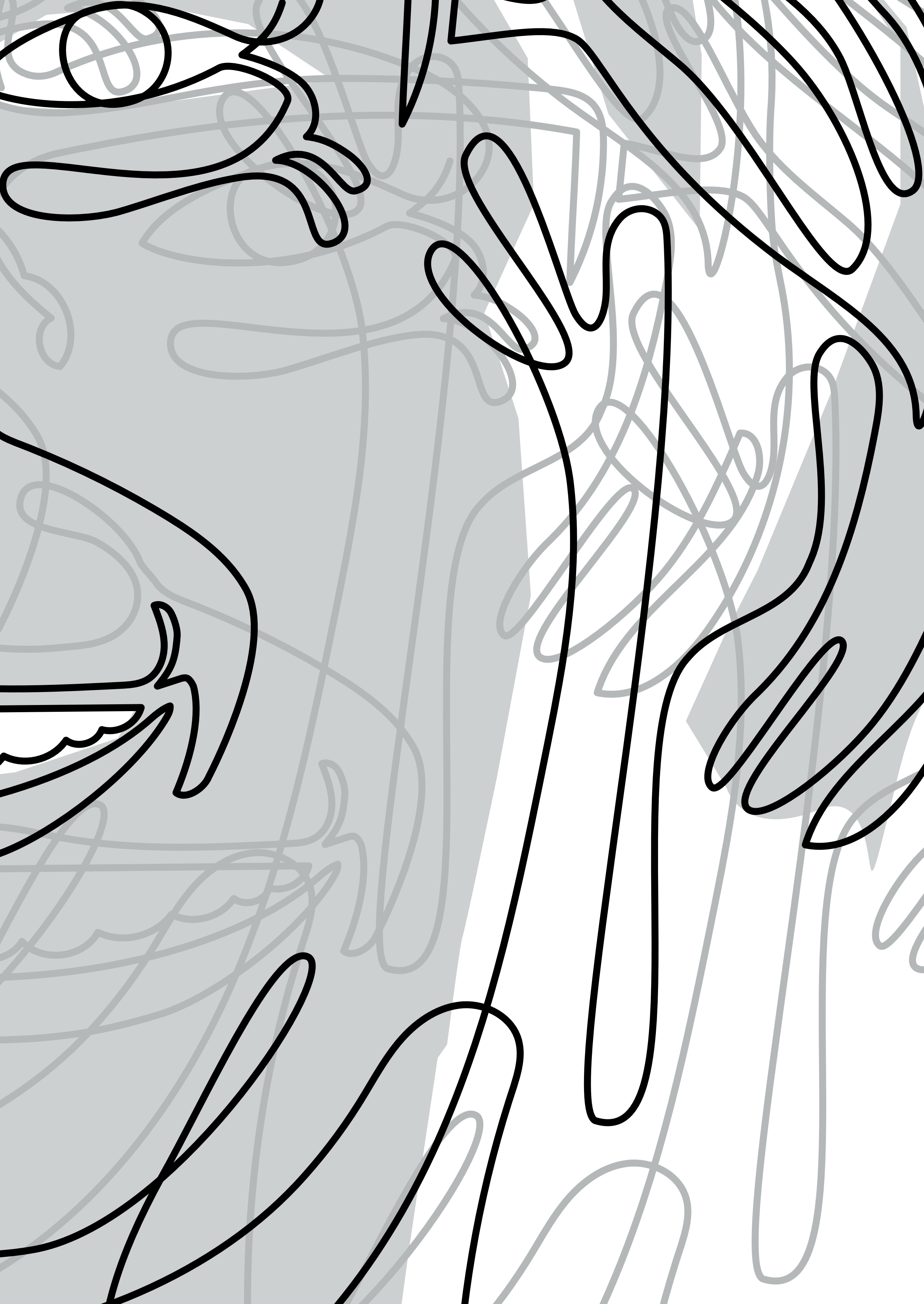
Metzelthin, S. F., van Rossum, E., Hendriks, M. R., De Witte, L. P., Hobma, S. O., Sipers, W., & Kempen, G. I. (2015). Reducing disability in community-dwelling frail older people: Cost-effectiveness study alongside a cluster randomised controlled trial. *Age and Ageing, 44*(3), 390-396.

Nies, H. (2004). Integrated care: Concepts and background. In H. Nies, & P. C. Berman (Eds.), *Integrating services for older people: A resource book for managers* (pp. 17-32). Dublin: Ehma.

Stuck, A. E., Aronow, H. U., Steiner, A., Alessi, C. A., Büla, C. J., Gold, M. N., . . . Beck, J. C. (1995). A trial of annual in-home comprehensive geriatric assessments for elderly people living in the community. *N Engl Med, 333:* 1184-1189

Thompson, S. G., & Barber, J. A. (2000). How should cost data in pragmatic randomised trials be analysed? *BMJ (Clinical Research Ed.), 320*(7243), 1197-1200.

Van den Berg, B., & Spauwen, P. (2006). Measurement of informal care: An empirical study into the valid measurement of time spent on informal caregiving. *Health Economics, 15*(5), 447-460.



CHAPTER 6

Systematic review on the (cost-)effectiveness of preventive, integrated care for community-dwelling frail older people

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Abstract

Background

Integrated care is increasingly promoted as an effective and cost-effective way to organize care for community-dwelling frail older people with complex problems but the question remains whether high expectations are justified. Our study aims to systematically review the empirical evidence for the effectiveness and cost-effectiveness of preventive, integrated care for community-dwelling frail older people and close attention is paid to the elements and levels of integration of the interventions.

Methods

We searched nine databases for eligible studies until May 2016 with a comparison group and reporting at least one outcome regarding effectiveness or cost-effectiveness. We identified 2998 unique records and, after exclusions, selected 46 studies on 29 interventions. We assessed the quality of the included studies with the EPOC risk-of-bias tool. The interventions were described following Rainbow Model of Integrated Care framework by Valentijn.

Results

Our systematic review reveals that the majority of the reported outcomes in the studies on preventive, integrated care show no effects. In terms of health outcomes, effectiveness is demonstrated most often for seldom reported outcomes such as well-being. Outcomes regarding informal caregivers and professionals are rarely considered and negligible. Most promising are the care process outcomes that did improve for preventive, integrated care interventions as compared to usual care. Health care utilization was the most reported outcome but we found mixed results. Evidence for cost-effectiveness is limited.

Conclusions

High expectations should be tempered given this limited and fragmented evidence for the effectiveness and cost-effectiveness of preventive, integrated care for frail older people. Future research should focus on unravelling the heterogeneity of frailty and on exploring what outcomes among frail older people may realistically be expected.

Background

Integrated care is increasingly promoted as an effective way to organize care for community-dwelling frail older people. Societal developments such as population ageing and rising care costs have led to more frail older people with complex problems to 'age in place' (Wiles, Leibing, Guberman, Reeve, & Allen, 2012). Their complex problems in the physical, psychological or social domain cannot be adequately addressed by a single primary care professional and require coordination and multidisciplinary collaboration. A solution is found in integrated care which is defined as an organizational process of coordination that seeks to achieve seamless and continuous care, tailored to the patient's needs and based on a holistic view of the patient (Mur-Veeman, Hardy, Steenbergen, & Wistow, 2003). Integrated care is proclaimed to pursue a wide range of aims such as improving the quality of care and consumer satisfaction, enhancing clinical results, quality of life, system efficiency and cost-effectiveness (Kodner & Spreeuwenberg, 2002). Professionals, policymakers and researchers consider integrated care as a complex phenomenon and promising solution. As a result, several integrated care interventions for frail older people have been developed (Oliver, Foot, & Humphries, 2014). In literature, conceptual frameworks have been developed to enhance the understanding of integrated care (Valentijn, Schepman, Opheij, & Bruijnzeels, 2013) and much effort has put into evaluating the effectiveness of these interventions (Evers & Paulus, 2015).

Despite the widespread interest in integrated care, a systematic review of integrated care interventions for community-dwelling frail older people is lacking. Previous reviews have concentrated on specific interventions such as home-visiting programmes (Elkan et al., 2001; Stuck, Egger, Hammer, Minder, & Beck, 2002) and case management (Stokes et al., 2015; You, Dunt, Doyle, & Hsueh, 2012) or have focused on other target groups such as older patients with chronic diseases (Ouwens, Wollersheim, Hermens, Hulscher, & Grol, 2005) and older people in general (Johri, Beland, & Bergman, 2003). Our aim is to systematically review the empirical evidence on the effectiveness and cost-effectiveness of preventive, integrated care for frail older people in the community. Hence, our study makes five main contributions.

First, we focus explicitly on integrated care for community-dwelling frail older people. Frailty is a specific condition that differs from chronic diseases (Fried et al., 2001) and chronological age (Slaets, 2006). Frailty refers to a dynamic state affecting an individual who experiences loss in one or more domains of human functioning (physical, psychological, social). This loss is influenced by a range of variables that increase the risk of adverse outcomes (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010; Lacas &

Rockwood, 2012). Other reviews focused on frail older people but their eligibility criteria were based on chronological age (Eklund & Wilhelmson, 2009; Johri et al., 2003). Focusing on community-dwelling frail older people implies that the integrated care interventions are based in primary care which provides integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and community (Vanselow, Donaldson, & Yordy, 1995).

Second, our review provides insight into the value of prevention in integrated care interventions for frail older people whereas previous systematic reviews have not paid explicit attention to the preventive component in integrated care (Eklund & Wilhelmson, 2009). Frailty should be prevented in order to reduce the risk of adverse outcomes such as health problems and disability (Fried et al., 2001), poor quality of life (Gobbens & van Assen, 2014), and crisis situations (Vedel et al., 2009). Prevention of frailty is also important to avoid or delay institutionalization, thereby fulfilling an essential aim of national health policies. Therefore, it is important to incorporate prevention into integrated care interventions (Oliver et al., 2014).

Third, our systematic review includes all quantitative designs with a control group and is not limited to randomized controlled trials. Although randomized controlled trials are known to provide strong evidence, their use is questioned for complex interventions (Clark, 2001). Integrated care interventions in primary care particularly illustrate the difficulties with randomized controlled trials because randomization of participants to a general practitioner (GP) is almost impossible.

Fourth, our review incorporates economic evaluations of integrated care interventions for frail older people. Cost-effectiveness is an important aim of integrated care (Kodner & Spreeuwenberg, 2002) and economic evaluations of integrated care for frail older people have recently generated considerable research interest (Evers & Paulus, 2015). Due to budget constraints and population ageing, health and social care expenditures are under pressure. Therefore, it is relevant to explore whether integrated care with a preventive component can put the available resources to optimal use.

Finally, we relate the effectiveness and cost-effectiveness with the specific content of the preventive, integrated care interventions. In the current fragmented health care systems, achieving seamless and continuous care tailored to the needs of frail older people is complex. Integration could be pursued at different levels and with different strategies such as assessments, multidisciplinary teams or organizational integration (Kodner & Spreeuwenberg, 2002; Valentijn et al., 2013). The assumption is that a higher level of integration leads to better outcomes (Kodner & Spreeuwenberg 2002); however, it still remains unclear what specific bundles of integrated care lead to specific outcomes (Eklund & Wilhelmson, 2009; Kodner, 2009). Therefore, the preventive integrated care interventions will be analysed following the taxonomy of the Rainbow Model of Integrated Care; a conceptual framework for integrated care from a primary care perspective (Valentijn et al., 2013).

Methods

The methods and results of this systematic review are reported according to PRISMA guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009).

Search strategy

We searched nine databases, including Embase, Medline (Ovid), Web-of-Science, CINAHL (EBSCO), PsycINFO (Ovid), Cochrane, PubMed publisher, ProQuest (ABI Inform, Dissertations), and Google Scholar. The search terms were discussed with a medical librarian who is a specialist in conducting and designing searches for systematic reviews (Bramer, Giustini, Kramer, & Anderson, 2013). The main search terms were 'integrated health care system', 'frail older people' and 'primary care'. The complete Embase search strategy is presented in the appendix. Besides Boolean operators AND and OR, we used the proximity operators NEAR and NEXT so that terms within a certain reach were also detected in the search. The search was done in August 2015 and updated in May 2016.

Eligibility criteria

Box 6.1 presents the eligibility criteria of our systematic review.

Box 6.1 Eligibility criteria

Inclusion criteria:

- **Population**: community-dwelling frail older people. Excluded: selecting participants on age, having a chronic condition, or hospitalized or institutionalized older people.
- **Intervention**: integrated care intervention with preventive component based in primary care.
- **Comparison group**: community-dwelling frail older people receiving care as usual.
- **Outcome**: > 1 outcome regarding the effectiveness for frail older people or the cost-effectiveness of the intervention.
- **Study designs:** quantitative empirical studies with a control group.

Exclusion criteria:

- policy intervention (at regional or national level)
- non-English studies
- non-peer reviewed studies.

Study selection

After removing duplicates, one reviewer screened the titles of all articles. Then two reviewers independently screened the remaining abstracts according to the inclusion and exclusion criteria. Any disagreements over abstracts were discussed until the reviewers reached a consensus. The remaining full texts were assessed for eligibility by one reviewer. All full texts that met the inclusion criteria or where doubts arose were discussed with the second reviewer. A reference check was performed on all included full texts.

Data extraction

All included full texts were summarized, focusing on the study methods, the intervention and its outcomes. The methods of each study were described according to inclusion criteria (definition of frailty), study design, types of outcomes, sample size, and country. The interventions are presented following the taxonomy of the Rainbow Model of Integrated Care. (Valentijn et al., 2013). The elements of each intervention are distinguished according to the micro, meso and macro levels of integration described by Valentijn. The micro level consists of service integration in which the following elements are distinguished: assessment; care plan; follow-up; and single entry point). The meso level includes professional integration (with four elements: the focal organisation of the intervention; the role of the GP, team composition and education professionals) and organizational integration. The macro level consists financial integration. These three levels are connected by normative integration and functional integration (with two elements: coordination and information system). Additional information is provided about the role of the informal caregiver and prevention in the interventions.

Five outcome categories are presented in subsequent tables: health outcomes, outcomes regarding informal caregivers and professionals, process outcomes, health care utilization and cost-effectiveness. The results for the outcomes are presented as follows: (+: significant outcome in favour of the intervention, 0: no significant outcome; -: significant outcome in favour of the control group; +/- significant outcome both in favour of the intervention and the control group within one category; NS: outcome not tested for significance). Outcomes are presented at the level of the intervention, so the results of studies reporting on the same intervention are combined. The number of statistically significant results has been counted.

Quality assessment

The quality of the included studies was assessed with the Effective Practice and Organization of Care (EPOC) risk-of-bias tool for studies with a separate control group (Effective Practice and Organisation of Care (EPOC), 2015). This quality assessment tool is the most suitable to assess the included studies because our systematic review was not restricted to randomized controlled trials. The EPOC comprises nine standard criteria, including generation and concealment of allocation, similarity of outcome and baseline measures, adequacy of addressing missing outcome date, prevention of knowledge of allocated intervention, protection against contamination, selective outcome reporting and other risks of bias. The nine criteria are assessed in three categories: low risk (1 point), high risk (0 point) and unclear risk (0 point) and the total quality score ranges from 0-9. Two reviewers separately assessed the risk of bias; any disagreements over criteria were discussed until the two reviewers reached a consensus.

Results

Figure 6.1 presents the PRISMA flow chart. Our review included 46 studies regarding a total of 29 separate interventions. The 29 interventions were carried out in ten countries (see table 6.1): Canada (n=8), United States (n=7), the Netherlands (n=6), Sweden (n=2), and Australia, Finland, France, Hong Kong, Japan, New Zealand (n=1 each).

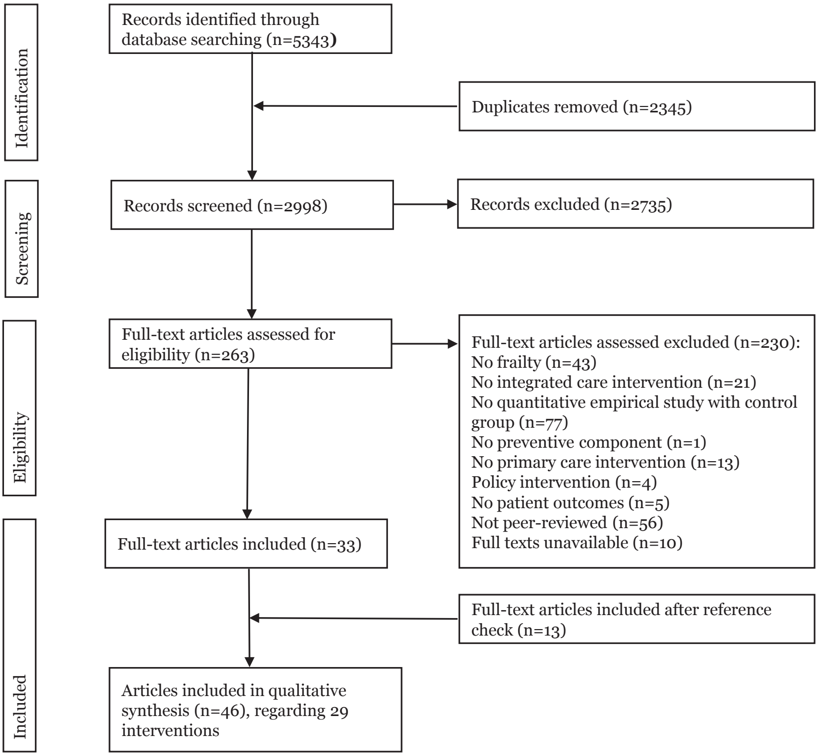

Figure 6.1: PRISMA flow chart

Table 6.1: Study characteristics

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
Béland et al. 2006 (Béland et al., 2006)	65+, recruited from community programmes, screened with Functional Autonomy Measurement System (ADL, IADL, communication and cognition), included: score ≤ -10	physical, psychological	Randomized controlled trial	Health, caregiver, process, utilization	Experimental group n=656; control group n=653	22 months	Canada	6
Bleijenberg et al. 2014 (Drubbel, 2014)	60+ GP patients, screened by GPs routine care electronic medical record on multimorbidity (frailty index 50) potential health deficits, polypharmacy (chronic use of medication) and consultation gap (no general practice consultation), included: frailty index > 0,20 or ≥ 5 different medications or consultation gap > 3 years	physical, psychological, social	Cluster-randomized controlled trial	Health, process, utilization	Experimental group U-PRIM n=790; experimental group U-PRIM+U-CARE n=1446; control group n=856	12 months	the Netherlands	5
Drubbel et al. 2014 (Drubbel, 2014)				Cost-effectiveness	Experimental group U-PRIM n=790; experimental group U-PRIM+U-CARE n=1446; control group n=856	12 months		3
Burns et al. 1995 (Burns, Nichols, Graney, & Cloar, 1995)	65+ admitted to medical, surgical, or neurology services at the Veteran Affairs Medical Centre, medical records were screened for following criteria: ≥ 1 ADL, two or more medical conditions (e.g. congestive heart failure, COPD, diabetes), ≥2 acute care hospitalizations in the previous year, or ≥6 scheduled prescription drugs, included: ≥ 2 criteria	physical	Randomized controlled trial	Health, utilization	Experimental group n=60; control group n=68	12 months	United States	8

Table 6.1: Study characteristics (continued)

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
Burns et al. 2000 (Burns, Nichols, Martindale□ Adams, & Graney, 2000)				Health, utilization	Experimental group n=60; control group n=68	24 months		5
Dalby et al. 2000 (Dalby et al., 2000)	70+ patients of primary care practice, screened by questionnaire, included: functional impairment or admission to hospital or bereavement in the previous 6 months	physical, psychological, social	Randomized controlled trial	Health, utilization	Experimental group n=73; control group n=69	14 months	Canada	7
de Stampa et al. 2014 (De Stampa et al., 2014)	65+, recruited from hospitals or community-based health services centres, assessed with Contact Assessment Tool (ADL, cognitive deficiency, perceived health, shortness of breath and two social items), included: being very frail with complex health and social needs	physical, psychological, social	Controlled before-and-after study	Health, utilization	Experimental group n=105; control group n=323	12 months	France	4
Ekdahl et al. 2016 (Ekdahl et al., 2016)	75+, identified through administrative health care registry, included: ≥ 3 inpatient hospital care in previous 12 months and ≥ 3 concomitant medical diagnoses	physical	Randomized controlled trial	Health, utilization	Experimental group n=208; control group n=174	36 months	Sweden	5
Engelhardt et al. 1996 (Engelhardt, Toseland, & O'Donnell, 1996)	55+, patients from Veteran Affairs Medical Centre outpatient clinic with ≥10 clinic visits in previous 12 months, screened for functional disability using a standard protocol that assesses level of dependence in the performance of ADL and IADL	physical	Randomized controlled trial	Health, process, utilization	Experimental group n=80; control group n=80	16 months	United States	6
Toseland et al. 1996 (Toseland, Jc, & Engelhardt, 1996 Jun)				Health, process, utilization	Experimental group n=80; control group n=80	8 months		4

Table 6.1: Study characteristics (continued)

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
O'Donnell, Toseland 1997 (O'Donnell & Toseland, 1997)				Utilization	Experimental group n=80; control group n=80	48 months		5
Fairhall et al. 2015 (Fairhall et al., 2015)	70+ patients discharged from Rehabilitation and Aged Services, met Cardiovascular Health Study criteria: weak grip, slow gait, exhaustion, low energy expenditure, and weight loss, inclusion: ≥ 3 criteria	physical	Randomized controlled trial	Cost-effectiveness	Experimental group n=120; control group n=121	12 months	Australia	6
Gagnon et al. 1999 (Gagnon, Schein, McVey, & Bergman, 1999)	70+, patients discharged from Emergency Department in previous 12 months, screened with OARS-ADL, OARS-IADL and Boult Assessment tool (probability admission to hospital measuring self-rated health, admission to hospital in previous 12 months, physician or clinic visit in previous 12 months, every history of cardiac disease, and current availability of caregiver), included: ≥1 OARS-ADL or ≥2 OARS-IADL and Boult ≥ 40%	physical	Randomized controlled trial	Health, process, utilization	Experimental group n=212; control group n=215	10 months	Canada	7

Table 6.1: Study characteristics (continued)

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
Gray et al. 2010 (Gray, Armstrong, Dahrouge, Hogg, & Zhang, 2010)	50+, screened from family practice Electronic Medical Records for: ≥1 ED visit in previous year, multiple health conditions (including ≥2 chronic conditions for which ≥2 visits were recorded in previous year or 4 conditions with ≥2 visits in previous year), frequent visits (≥5 visits to practice previous 6 months or 10 in previous year), polypharmacy (≥4 currently active or chronic medications), physicians codified the screened patients in 4 risk levels, included: high or medium risk	physical	Randomized controlled trial	Cost-effectiveness	Experimental group n=74; control group n=78	12-18 months	Canada	3
Hébert et al. 2008 (Hébert, Dubois, Raiche, Dubuc, & Group, 2008)	75+, screened for being at risk for functional decline by Sherbrooke Postal Questionnaire (e.g. ≥ 3 medications and mobility), included: score ≥ 3	physical	Controlled before-and-after study	Health, caregiver, process, utilization	Experimental group n=501; control group n=419	12 months	Canada	2
Hébert et al. 2010 (Hébert et al., 2010)				Health, caregiver, process, utilization	Experimental group n=501; control group n=419	48 months		2
Hinkka et al. 2007 (Hinkka et al., 2007)	65+ meeting the criteria of entitlement for Pensioners' Care Allowance - a benefit granted by the SII to compensate for the costs for the person's care at home and is granted to people with a medical disability verified by a physician, and a need of assistance	physical	Randomized controlled trial	Health, process	Experimental group n=343; control group n=365	12 months	Finland	7

Table 6.1: Study characteristics (continued)

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
Kehusmaa et al. 2010 (Kehusmaa, Autti-Rämö, Valaste, Hinkka, & Rissanen, 2010)				Cost-effectiveness	Experimental group n=376; control group n=365	12 months	Finland	7
Kerse et al. 2014 (Kerse et al., 2014)	75+ patients primary care practice, screened with Brief Risk Identification Tool on health (physical, psychological, cognitive) and disability, included: ≥3	physical, psychological	Cluster-randomized controlled trial	Health, process, utilization	Experimental group n=1,942; control group n=1,747	36 months	New Zealand	6
Kono et al. 2012 (Kono et al., 2012)	65+, identified from list of Long-Term Care Insurance certified residents at the local government office, included: support level 1 or 2 (able to walk, without serious cognitive problems, dependency IADL)	physical, psychological	Randomized controlled trial	Health, utilization	Experimental group n=161; control group n=162	24 months	Japan	5
Kono et al. 2013 (Kono, Kanaya, Tsumura, & Rubenstein, 2013)				Utilization	Experimental group n=161; control group n=162	24 months		3
Kono et al. 2016 (Kono, Izumi, Yoshiyuki, Kanaya, & Rubenstein, 2016)				Health, utilization	Experimental group n=179; control group n=181	36 months		6
Kristenson et al. 2010 (Kristensson, Ekwall, Jakobsson, Midlöv, & Hallberg, 2010)	65+, recruited from clinics at university hospital, primary care centres, home care organizations or contact with research group, included: dependent in ≥ 2 ADL and ≥2 admissions hospital > or ≥4 visits outpatient or primary care	physical	Randomized controlled trial	Health	Experimental group n=23; control group n=23	3 months		5

Table 6.1: Study characteristics (continued)

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
Möller et al. 2014 (Möller, Kristensson, Midlöv, Ekdahl, & Jakobsson, 2014)				Health	Experimental group n=80; control group n=73	12 months	Sweden	7
Sandberg et al. 2015a (Sandberg, Kristensson, Midlöv, & Jakobsson, 2015)				Utilization	Experimental group n=80; control group n=73	12 months		8
Sandberg et al. 2015b (Sandberg, Jakobsson, Midlöv, & Kristensson, 2015)				Cost-effectiveness	Experimental group n=80; control group n=73	12 months		6
Leung et al. 2010 (Leung, Lou, Chan, Yung, & Chi, 2010)	Elders with moderate to severe functional impairment measured by Minimum Data Set-Home Care (multiple domains of function, health, social support and service use)	physical, social	Case-control study	Health	Experimental group n=78; control group n=312	24 months	Hong Kong	5
Looman et al. 2014 (Looman, Fabbricotti, & Huijsman, 2014)	75+ GP patients, screened by Groningen Frailty Indicator questionnaire (decrease in physical, cognitive, social and psychological functioning), included: score ≥ 4	physical, psychological, social	Controlled before-and-after study	Health, process, utilization	Experimental group n=205; control group n=212	3 months	the Netherlands	4
Makai et al. 2015 (Makai et al., 2015)				Cost-effectiveness	Experimental group n=205; control group n=212	3 months		3

Table 6.1: Study characteristics (continued)

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
Looman et al. 2016a (Looman, Fabbricotti, de Kuyper, & Huijsman, 2016)				Health	Experimental group n=184; control group n=193	12 months		4
Looman et al. 2016b (Looman, Huijsman, Bouwmans-Frijters, Stolk, & Fabbricotti, 2016)				Cost-effectiveness	Experimental group n=184; control group n=193	12 months		4
Melis et al. 2008a (R. J. F. Melis et al., 2008)	70+. GP patients, patient has a health problem that was recently presented to the physician by the patient or informal caregiver, request for help is related to the following fields: cognitive disorders, behavioural and psychological symptoms of dementia, mood disorders, mobility disorders and falling, or malnutrition, patients/informal caregiver have determined a goal to achieve, fulfil one or more of these criteria: MMSE ≤ 26, GARS ≥ 25, or MOS mental health ≤ 75	physical, psychological, social	Randomized controlled trial	Health	Experimental group n=85; control group n=66	6 months	the Netherlands	8
Melis et al. 2008b (R. J. Melis et al., 2008)				Cost-effectiveness	Experimental group n=85; control group n=66	6 months		6
Metzelthin et al. 2013 (Metzelthin et al., 2013)	70+ GP patients, screened by Groningen Frailty Indicator questionnaire, score ≥ 5	physical, psychological, social	Cluster-randomized controlled trial	Health	Experimental group n=193; control group n=153	24 months	the Netherlands	8

Table 6.1: Study characteristics (continued)

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
Metzelthin et al. 2015 (Metzelthin et al., 2015)				Cost-effectiveness	Experimental group n=193; control group n=153	24 months		5
Montgomery, Fallis 2003 (Montgomery & Fallis, 2003)	65+, referred to home care programme. Included: multiple problems requiring coordinated follow-up home care	unclear	Randomized controlled trial	Health, caregiver, process, utilization	Experimental group n=82; control group n=82	3 months	Canada	3
Morishita et al. 1998 (Morishita, Boult, Boult, Smith, & Pacala, 1998)	70+, Medicare beneficiaries, screened with survey on high probability of repeated admissions to hospitals during the following four years (e.g. poor self-related health, previous admission, and morbidity), included: probability ≥ 40	physical	Randomized controlled trial	Process	Experimental group n=248; control group n=274	18 months	United States	3
Boult et al. 2001 (Boult et al., 2001)				Health, utilization	Experimental group n=274; control group n=294	18 months		9
Reuben et al. 1999 (Reuben, Frank, Hirsch, McGuigan, & Maly, 1999)	65+ recruited from community-based sites where older persons congregate, screened with a medical and functional questionnaire (functional status, urinary continence, falls and depression), included: ≥1 warning zones of functional status scale, 2 affirmative answers to both incontinence questions, affirmative answer to the falls screening question and ≥1 supplemental fall question, affirmative answer to the depression question and core Geriatric Depression Scale ≥ 11	physical, psychological	Randomized controlled trial	Health, process	Experimental group n=180; control group n=183	15 months	United States	9

Table 6.1: Study characteristics (continued)

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
Rockwood et al. 2000 (Rockwood et al., 2000)	Patients from rural family practitioners, included: concern about community living, recent bereavement, hospitalization, or acute illness, frequent physician contact, multiple medical problems, polypharmacy, adverse drug events, functional impairment or functional decline, and diagnostic uncertainty	physical, social	Randomized controlled trial	Health, utilization	Experimental group n=95; control group n=87	12 months	Canada	5
Rubenstein et al. 2007 (Rubenstein et al., 2007)	65+ patients from practice groups with ≥ 1 visit to ambulatory care centre in previous 18 months, screened by Geriatric Postal Screening Survey (five common geriatric conditions and health-related symptoms/problems), included: score ≥ 4	physical	Randomized controlled trial	Health, utilization	Experimental group n=380; control group n=412	36 months	United States	8
Ruikes et al. 2015 (Ruikes et al., 2016)	70+ GP patients, identified with EASYcare TOS, a two-step screening, GP reviewed medical records and answered 14 questions about functioning in somatic, psychological and social domains, structured assessment with EASYcare by practice nurse, included: defined as frail based on clinical reasoning d using all explicit and tacit knowledge	physical, psychological, social	Controlled before-and-after study	Health, utilization	Experimental group n=287; control group n=249	12 months	the Netherlands	3
Schreader et al. 2008 (Schraeder, Fraser, Clark, & Long, 2008 Nov)	65+, recruited from primary care practices and hospitals, screened for high risk for mortality, functional decline or health service use with Community Assessment Risk Screen, included: high risk	physical	Controlled before-and-after study	Utilization	Experimental group n=400; control group n=277	36 months	United States	3

Table 6.1: Study characteristics (continued)

Authors	Inclusion criteria participants	Dimension(s) of frailty	Study design	Types of outcomes	N baseline	Follow-up period	Country	EPOC-score
Shapiro Taylor 2002 (Shapiro & Taylor, 2002)	Older adults referred to waiting list to receive social services by hospitals, rehabilitation centres, physicians, risk score calculated based on uniform state-wide assessment device based on chronic health conditions, activities of daily living limitations, and other measures of physical and psychological impairment, included: characterized as moderate risk	physical, psychological	Randomized controlled trial	Health, utilization	Experimental group n=40; control group n=65	18 months	United States	6
Tourigny et al. 2004 (Tourigny, Durand, Bonin, Hebert, & Rochette, 2004)	75+, recruited from review of files, included: had used home care, day care, or rehabilitation or geriatric ambulatory services previous 12 months AND needed help ≥ 2 ADL OR needed help ≥ 1 ADL and one of the following diagnoses: Parkinson's disease, stroke or dementia	physical	Controlled before-and-after study	Health, caregiver, process, utilization	Experimental group n=272; control group n=210	36 months	Canada	5
van Leeuwen et al. 2015 (Van Leeuwen et al., 2015)	65+ patients of primary care physician, identified as being frail by physician based on multidimensional definition (experiencing one or more limitations in physical, psychological, or social areas) and screened with Program on Research for Integrating Services for the Maintenance of Autonomy Case finding tool (PRISMA-7), included: score ≥ 3	physical, psychological, social	Stepped-wedge cluster-randomized controlled trial	Cost-effectiveness	Group 1 n=456; group 2 n=227; group 3 n=338; group 4 n=226	24 months	the Netherlands	3

Most studies were randomized controlled trials (n =18). Other types were controlled before-and-after studies (n=6), cluster-randomized controlled trials (n=3), case-control study and stepped-wedge cluster-randomized controlled trial (n=1 for both). Of the 46 included studies, 36 reported the effectiveness and ten the cost-effectiveness of an integrated care intervention. The total number of participants ranged from 36 participants to 3,689 participants. The follow-up period varied from three to 48 months. Overall, the quality of the evidence was moderate ranging from 2 to 9 on the EPOC risk-of-bias-scale with an average score of 5.3 (see also supplementary table 6.1 in the appendix).

Our results revealed that each intervention defined frailty differently. All interventions used different tools and inclusion criteria and the dimensions of frailty differed considerably between the interventions. Of the 29 interventions, 13 incorporated the physical dimension of frailty in their inclusion criteria. Five interventions combined the physical and psychological dimensions of frailty and two focused on the physical and social dimension. Eight interventions adopted a broader approach to frailty, including the physical, psychological and social domains of functioning. Additionally, researchers used different age criteria, ranging from 50 years and older to 75 years and older and most interventions adopted the criterion of 65 years and older.

Interventions

The 29 interventions, arranged according to the Valentijn framework (Valentijn et al., 2013) (see table 6.2). The level of integration of the interventions is high at the micro level but generally low at the meso and macro levels of integration.

Service integration was substantially high in all 29 interventions. All interventions used assessment tools, mostly a comprehensive geriatric assessment, which the majority of interventions used to develop a care plan. Occasionally, the frail older person and their informal caregiver were also involved in the development of the care plan. The assessments and care plans revealed the preventive character of the integrated interventions. The assessment demonstrated that it could detect a wide range of problems that might not have been recognized in usual care. The care plan addressed a selection of these problems, however, the articles provided limited insight into how the assessments resulted in a care plan.

Table 6.2: Intervention characteristics – components and levels of integration
Table 6.2a Short description and focus of intervention

Authors	Name intervention	Short description intervention	Focus intervention/ primary outcome
Béland et al. 2006	System of Integrated Care for Older Persons (SIPA)	Community-based care with local agencies responsible for the full range and coordination of community and institutional (acute and long-term) health and social services.	Meet the needs of the frail elderly, to assure comprehensive care, integration by all professionals and institutions involved
Bleijenberg et al. 2014, Drubbel et al. 2014	U-PRIM & U-CARE	U-PRIM, a frailty screening intervention based on routine care data, and of U-PRIM followed by U-CARE, a nurse-led personalised care intervention.	Preserving daily functioning
Burns et al. 1995, Burns et al. 2000	Interdisciplinary outpatient primary care Geriatric Evaluation and Management	After an initial comprehensive assessment, older veterans received long-term management in the geriatric clinic.	Focus on evaluation and long-term management, or primary care.
Dalby et al. 2000	Preventive home visits by a nurse	A screening questionnaire identified eligible participants (those aged 70 years or more at risk of sudden deterioration in health). During preventive home visits by a nurse, patients were assessed and followed in their home for 14 months.	Minimize negative effects of age-related changes and risk factors and promote positive functional consequences
de Stampa et al. 2014	Coordination Personnes Agées	Integrated primary care with intensive case management for community-dwelling, very frail elderly patients.	Better fit services and needs elderly, reduce excess healthcare use, improve continuity of care
Ekdahl et al. 2016	Ambulatory Geriatric Assessment – a Frailty Intervention Trial (AGe-FIT)	Comprehensive Geriatrics Assessment-based care intervention characterized by home visits, participants visits to the ambulatory geriatric unit, and/or telephone calls, according to each participant's needs and preferences.	Prevent functional decline and managing main symptoms and diseases to improve health and quality of life.
Engelhardt et al. 1996, Toseland et al. 1996, O'Donnell, Toseland 1997	Outpatient Geriatric Evaluation and Management in VAMC	Included an initial comprehensive assessment, the development and implementation of a care plan, periodic reassessment, monitoring and updating the care plan and referral to and coordination with other health and social service providers within and outside the VAMC.	Improve care and reduce utilization
Fairhall et al. 2015	FIT intervention	A 12-month multifactorial, interdisciplinary intervention was individualized to each participant based on the frailty criteria present and incorporated the principles of geriatric evaluation and management.	Targeting identified frailty characteristics

Table 6.2a (continued)

Authors	Name intervention	Short description intervention	Focus intervention/ primary outcome
Gagnon et al. 1999	Nurse case management	Coordination and provision of healthcare services by nurses, both in and out the hospital, for a 10-month period.	Integrate care from a health maintenance and promotion perspective
Gray et al. 2010	Anticipatory and Preventive Team Care (APTcare)	The central thrust of the intervention was to ensure evidence-based disease management and strong social supports to patients.	Ensure evidence-based disease management and strong social supports to patients
Hébert et al. 2008, Hébert et al. 2010	Program of Research to Integrate the Services for the Maintenance of Autonomy (PRISMA)	Innovative coordination-type integrated service delivery system to improve continuity and increase the effectiveness and efficiency of services. PRIMA composes six components: coordination between decision makers and managers at the regional and local level, singe entry point, single assessment instrument coupled with case-mix management system, case management, individualized service plan and computerized clinical chart.	Increase the effectiveness and efficiency of services
Hinkka et al. 2007; Kehusmaa et al. 2010	Network-based geriatric rehabilitation intervention	3 in-patient periods at rehabilitation centres and a home visit by a professional.	Enabling living in community independently
Kerse et al. 2014	Brief Risk Identification Geriatric Health Tool (BRIGHT)	The BRIGHT screening tool was sent to older adults every birthday; those with a score of 3 or higher were referred to regional geriatric services for assessment and, if needed, service provision.	Disability
Kono et al. 2012, Kono et al. 2013, Kono et al. 2016	Preventive home visit model	Nurses and care managers provided structured preventive home visits every 6 months over 2 years, with a systematic assessment of care to prevent functional decline.	Locomotion, daily activities, social contacts or relationships with other people, health conditions, sign of abuse
Kristenson et al. 2010, Möller et al. 2014, Sandberg et al. 2015, Sandberg et al. 2015	Case management programme	Case management programme with the focus on functional status and an important role of physiotherapist. Intervention was carried out by nurses and physiotherapists working as case managers who undertook home visits at least once a months and employed a multifactorial preventive approach.	Functional status
Leung et al. 2010	Community-based Care Management Service (CMS)	Intervention provided by a care management team that comprised both professionals and paraprofessionals.	Fall prevention

Table 6.2a (continued)

Authors	**Name intervention**	**Short description intervention**	**Focus intervention/ primary outcome**
Looman et al. 2014, Makai et al. 2015, Looman et al. 2016a, Looman et al. 2016b	Walcheren Integrated Care model (WICM)	Pro-active screening for frailty, assessment of care needs, GP practice as single entry point from which case management was provided, GP as coordinator of care, and the process was supported by multidisciplinary meetings, protocols and web-based files.	Improve quality of life
Melis et al. 2008a, Melis et al. 2008b	Dutch EASYcare Study Geriatric Intervention Programme (DGIP)	Starting off from a wide multidimensional assessment, the intervention team developed an individualized, integrated treatment plan for each patient.	Five problems: cognition, nutrition, behaviour, mood, mobility.
Metzelthin et al. 2013, Metzelthin et al. 2015	Prevention of Care Approach	Multidimensional assessment and interdisciplinary care based on a tailor made treatment plan and regular evaluation and follow-up.	Participation in social and productive activities
Montgomery, Fallis 2003	South Winnipeg Integrated Geriatric (SWING)	Multidimensional assessment, enhanced access to geriatric medical and day-hospital services and case management for 3 months period.	Impact on health care service utilization
Morishita et al. 1998, Boult et al. 2001	Outpatient Geriatric Evaluation and Management	Comprehensive assessment followed by interdisciplinary primary care in a clinic from a team consisting of a geriatrician, a nurse, social worker and a gerontological nurse practitioner.	Functional ability, use of health service, satisfaction
Reuben et al. 1999	Outpatient Comprehensive Geriatric Assessment consultation	A single outpatient Comprehensive Geriatric Assessment consultation coupled with an intervention to improve primary care physician and patient adherence with Comprehensive Geriatric Assessment recommendations.	Improve primary care physician and patient adherence with Comprehensive Geriatric Assessment recommendations.
Rockwood et al. 2000	Mobile Geriatric Assessment Team	Three-month implementation of Comprehensive Geriatric Assessment recommendations by a Mobile Geriatric Assessment Team.	Goal attainment
Rubenstein et al. 2007	Screening, Case Finding and Referral System for Older Veterans in Primary Care	The intervention combined a structured telephone geriatric assessment by a physician assistant, individualized referrals and recommendations, selected referral to outpatient geriatric assessment, and ongoing telephone case management.	Five geriatric target conditions: depression, cognitive impairment, urinary continence, falls, functional impairment
Ruikes et al. 2015	CareWell	General practitioner-led extensive, multicomponent program integrating cure, care and welfare for the prevention of functional decline.	Prevention functional decline
Schreader et al. 2008	Collaborative primary care nurse management intervention	Emphasising collaboration between physicians, nurses and patients, risk identification, comprehensive assessment, collaborative planning, health monitoring, patient education and transitional care.	Chronic illnesses/health care utilization and costs

Table 6.2a (continued)

Authors	**Name intervention**	**Short description intervention**	**Focus intervention/ primary outcome**
Shapiro Taylor 2002	Community-Based Early Intervention Program	An early interventive social service program designed to provide case-managed services earlier than clients would normally receive them to allow older adults to remain independent.	High quality of life and a lower risk of institutionalization and mortality
Tourigny et al. 2004	Bois-Francs ISD network	Coordinated model where every organization keeps its own structure while adapting its operation to the agreed requirements and processes, and integrates all the gerento-geriatric services in the area, from promotion and prevention to diagnosis, treatment, rehabilitation, long-term care and palliative care.	Better planning and coordination for meeting individual needs
van Leeuwen et al. 2015	Geriatric Care Model	Consisted of the following components: a regularly scheduled in-home comprehensive geriatric assessment by a practice nurse, followed by a customized care plan, management and training of practice nurse by a geriatric expert team, and coordination of care through community care network meetings and multidisciplinary team consultations of individuals with complex care needs.	Target health risks and care needs at an early stage, stimulate active involvement of older adults in the care process, improve coordination between professionals

Table 6.2b Service integration of interventions

Authors	Service integration (micro-level)			
	Assessment	**Care plan**	**Follow-up**	**Single entry point**
Béland et al. 2006	Yes, comprehensive		Case management by nurse or social worker: follow and intervene with patients & caregivers, liaise with family physicians, assure continuity, ease transitions, 24 hour on-call services	Yes
Bleijenberg et al. 2014, Drubbel et al. 2014	Yes, two-stage: Frailty & bio-psychosocial needs; comprehensive (falls & mobility, physical functioning, nutrition and malnutrition, cognitive decline, polypharmacy, mood & depression, loneliness, vision problems & hearing loss, urinary incontinence, caregiver burden)	Yes, developed by practice nurse and GP	Interventions from evidence-based care plan for all ten health problems (e.g. polypharmacy: multifactorial interventions; tailored patient education, instruction, support, feedback and follow-up; tools and reminders for adherence)	
Burns et al. 1995, Burns et al. 2000	Yes, functional limitations, gait impairment, incontinence, polypharmacy, depression, and cognitive impairment, resources	Yes, developed by team	Follow-up in GEM clinic by most appropriate team member, who functions as liaison between participant and team	
Dalby et al. 2000	Yes, review of chart & additional comprehensive assessment (physical, cognitive, emotional & social function, medication use, the safety & suitability of home environment)	Yes, developed with primary care physician, the patient, the family, caregivers and other health professionals	Case management by nurse: integrate services and agencies into care plan, follow-up, monitor, promote health, provide psychosocial support	
de Stampa et al. 2014	Yes, comprehensive: health and social needs, preventive strategies	Yes, developed by case manager, approved with multidisciplinary team	Case management by nurse: implement care plan, care coordination, follow-up, re-assess needs every 3 months, contact with professionals, patient and family	Yes
Ekdahl et al. 2016	Yes, comprehensive: medical, functioning, psychological, cognitive, social; for each discipline separately		Follow-up by home visits, telephone calls or visits to clinic according to participant's needs and preferences, at least 2 visits, obtain overall picture of life situation, team decides on further action (treatment within unit or referrals), available during office hours	

Table 6.2b (continued)

Authors	Service integration (micro-level)			
	Assessment	**Care plan**	**Follow-up**	**Single entry point**
Engelhardt et al. 1996, Toseland et al. 1996, O'Donnell, Toseland 1997	Yes, comprehensive	Yes	Follow-up by GEM team: periodic assessment, monitoring and updating care plan, referral to and coordination with other health and social service providers, educate patient and informal caregiver, help with psychosocial and financial problems	
Fairhall et al. 2015	Yes, frailty characteristics (weight loss; exhaustion and Geriatric Depression Scale; social isolation; grip weakness, four metre walk time or physical activity level; self-efficacy, motivational readiness for change and goal appraisement; general health status, caregiver distress)		Specific follow-up and interventions for each frailty condition separately (e.g. referrals, home exercise program, medication review, supportive intervention care giver)	
Gagnon et al. 1999	Yes, current health status (physical, functional, social, & environmental aspects), review of the perceived needs of older person and caregiver	Yes	Case management by nurse: monitoring, follow-up every month, integrate care, support older people & caregiver, coordination work of all professionals, available at beepers	
Gray et al. 2010	Yes, review of record and additional assessment	Yes, developed by nurse practitioner and pharmacist, reviewed with family physician	Follow-up by nurse practitioner and pharmacist, education sessions with health-related information, home telehealth monitoring system for selection participants	
Hébert et al. 2008, Hébert et al. 2010	Yes, functional ability in ADL, mobility, communication, mental functions & IADL and resources	Yes, developed by case manager, approved in multidisciplinary meeting	Case management by nurse, social worker or other professional: planning of and admission to services, coordinate support & multidisciplinary team, advocate, monitor, reassess patient every 6 months	Yes

Table 6.2b (continued)

Authors	Service integration (micro-level)			
	Assessment	**Care plan**	**Follow-up**	**Single entry point**
Hinkka et al. 2007; Kehusmaa et al. 2010	Yes, comprehensive	Yes	Multidisciplinary group intervention on physical psychological and social activation, motivate to adopt an active lifestyle, classes on disease management and coping strategies, and recreational activities	
Kerse et al. 2014	Yes, comprehensive		Coordination of support rehabilitation services & geriatrical medical expertise	
Kono et al. 2012, Kono et al. 2013, Kono et al. 2016	Yes, assessment of locomotion, daily activities, social contacts or relationships with other people, health conditions, signs of abuse	Yes	Home visits by community care nurses, care managers or social workers every 6 months, evaluate care plan	
Kristenson et al. 2010, Möller et al. 2014, Sandberg et al. 2015, Sandberg et al. 2015	Yes, comprehensive: Functional status, physical function, vibration sensations.	Yes	Case management by nurse or physiotherapist: care coordination, follow-up visits every month, advocacy, providing general and specific information, safety, available during working hours	
Leung et al. 2010	Yes, comprehensive	Yes	Providing falls prevention interventions, providing/linking elders and caregivers for services, review care plan & progress by professionals such as social workers, nurses, and physiotherapists	
Looman et al. 2014, Makai et al. 2015, Looman et al. 2016a, Looman et al. 2016b	Yes, comprehensive: Activities daily life, cognition, mood, support care givers	Yes, formulated consultation with frail older people and informal caregiver, developed by case manager, approved in multidisciplinary meeting	Case management by practice nurse: coordinate care, monitoring, admittance to services, contact person for professionals, evaluating treatment plan, follow-up at least every 6 months	Yes
Melis et al. 2008a, Melis et al. 2008b	Yes, multidimensional		Follow-up visits by geriatric specialist nurse for additionals geriatric evaluation and management	

Table 6.2b (continued)

Authors	Service integration (micro-level)			
	Assessment	**Care plan**	**Follow-up**	**Single entry point**
Metzelthin et al. 2013, Metzelthin et al. 2015	Yes, multidimensional: Problems daily activities, risk factors daily activities	Yes, formulated with frail older person	Case management by practice nurse: executing treatment plan with intervention protocol and toolbox of interventions, evaluation of achievement of goals, implementation of strategies in daily life, need of support in the following period, update other professionals	
Montgomery, Fallis 2003	Yes, comprehensive: History, functional, social and environmental	Yes, formulated by coordinator, reviewed by geriatrician & day-hospital team	Case management for 3 months: provide resources, resolve problems, preventive measures, referrals to home and community-based services	
Morishita et al. 1998, Boult et al. 2001	Yes, comprehensive: medical conditions, psychosocial status, functional ability, cognitive status, nutritional risk, use of alcohol, social network, gait and balance, environmental safety, medications, advance directives, hearing and vision	Yes, developed by EM nurse, social worker, and geriatrician	Case management by team of geriatrician, a nurse, social worker and a gerontological nurse practitioner: diagnose and treat problems, adjust medication regime, provide counselling and health education, referrals to other services, assistance with directives, monthly visits to clinic, 24-hour on-call services	
Reuben et al. 1999	Yes, comprehensive, for each discipline separately		Adherence intervention of assessment for patients and their physicians, ensure understanding of recommendations, assess level of agreement, empower patient to interact proactively with physician to implement and adhere recommendations	
Rockwood et al. 2000	Yes, comprehensive: mental status, emotional health, communication, mobility, balance, bowels, bladders, nutrition, daily activities, social situation	Yes, developed by geriatric nurse assessor and geriatrician		

Table 6.2b (continued)

Authors	Service integration (micro-level)			
	Assessment	**Care plan**	**Follow-up**	**Single entry point**
Rubenstein et al. 2007	Yes, two stage: Assessment of specific risk and unmet needs; evaluation of physical health, functional status, mental health, and social and environmental status	Yes	Case management by physician assistant with supervision geriatrician: coordinate follow-up, follow-up every three months, refer to services, health promotion recommendations & health education, monitor	
Ruikes et al. 2015	Yes	Yes, revised during team meetings	Case management by nurse or social worker: coordinate and monitor care, plan team meetings, acknowledge participants of care plan, involve participants in settings goals, maintain contact with participants and informal caregiver, hold a medication review (by ≥5 chronically prescribed drugs)	
Schreader et al. 2008	Yes, comprehensive	Yes, developed by nurse case manager and primary care physician	Case management by nurse and care assistant: review and update care plan, monitor health status, identify adherence to treatment regime, provide ongoing health education on managing health, coordination and arrange health-related services, follow-up every month	
Shapiro Taylor 2002	Yes, geriatric		Case management: care planning, monitoring, prescribe and coordinate services, follow-up every 3 months	
Tourigny et al. 2004	Yes, physical and psychological health, social aspects, and functional autonomy.	Yes	Case management by professionals trained in social services for most complex cases	Yes
van Leeuwen et al. 2015	Yes comprehensive	Yes, developed by nurse with primary care physician	Guideline-concordant management and treatment options, involve older adults in decision-making process, evaluate of care plan	

Table 6.2c Professional, organizational and system integration of interventions

Authors	**Professional integration (meso-level)**				**Organizational integration (meso-level)**	**System integration (macro-level)**
	Focal organisation	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
Béland et al. 2006	Network of organizations with one single entry point	Continues usual care, liaises with case manager, develops and applies protocols, working agreement between primary care professionals & interdisciplinary team	Multidisciplinary team: case managers, community nurses, social workers, occupational therapists, psychotherapists, homemakers, staff family physician, consultant pharmacists, community organizers		New organization - consortium of public institutions, agreements about service provision with other providers, e.g. hospital and long-term care institutions	Yes - Integration of all public financing for health and social services, teams controlled own budget
Bleijenberg et al. 2014, Drubbel et al. 2014	GP practice		GP, practice nurse	Practice nurses: intervention training program 5 weeks of 4 hours on frailty assessment, content assessment, evidence-based care plans. GP and practice nurse: intervention training session 4 hours on content intervention		
Burns et al. 1995, Burns et al. 2000	GEM outpatient clinic		Interdisciplinary team: including physicians, nurse practitioner, social worker, psychologists, clinical pharmacists	All professionals: extensive training and development		
Dalby et al. 2000						

Table 6.2c (continued)

Authors	Professional integration (meso-level)				Organizational integration (meso-level)	System integration (macro-level)
	Focal organisation	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
de Stampa et al. 2014	Primary care practice	Part of core team: care management, responsible for medical decision making	Two persons team - case manager and primary care physician, collaboration with geriatrician		Non-profit consortium: managers from community-based services and hospital setting	
Ekdahl et al. 2016	Ambulatory geriatric unit		Interdisciplinary team: doctors, nurses, psychotherapists, occupational therapist, dietician, social worker, pharmacist			No - Intervention was financed by Swedish government
Engelhardt et al. 1996, Toseland et al. 1996, O'Donnell, Toseland 1997	Veterans Affair Medical Centre		GEM team: geriatrician, nurse practitioner, social worker			
Fairhall et al. 2015		Sub-optimal medication is discussed with GP	Interdisciplinary team: physiotherapists, geriatrician, rehabilitation physician, dietician, nurse. Referrals to psychiatrist, psychologist, day activity group, volunteer, and contact with GP about medication.			

Table 6.2c (continued)

Authors	Professional integration (meso-level)				Organizational integration (meso-level)	System integration (macro-level)
	Focal organisation	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
Gagnon et al. 1999		Part of interdisciplinary team	Interdisciplinary team: case managers, community-based family physicians, psycho-geriatricians or psychologists, social workers, occupational therapists, psychotherapists, dieticians. Consultation from geriatricians, family physicians, staff physicians			
Gray et al. 2010	Community practice	Part of team	Physicians, nurses, support staff, nurse practitioners, pharmacists, family physicians			
Hébert et al. 2008, Hébert et al. 2010	Network of organizations with one single entry point	Main medical practitioner, primary collaborators of case manager, access to and coordination of specialised medical services	Multidisciplinary team	Case managers: special training	Network with Joint Governing Board of all health and social organisations and community agencies (public, private, and voluntary), coordination between decision makers and managers at the regional and local level	Limited - System funding as part of agreement between organizations

Table 6.2c (continued)

Authors	**Professional integration (meso-level)**				**Organizational integration (meso-level)**	**System integration (macro-level)**
	Focal organisation	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
Hinkka et al. 2007; Kehusmaa et al. 2010	Rehabilitation centre		Key members: rehabilitation team: physician, physiotherapist, social worker, occupational therapist		Network of organizations: rehabilitation institutes, local social and health providers, SII, non-governmental organizations	
Kerse et al. 2014	Primary care practice	Maintains responsibility for overall medical care	Multidisciplinary team: physiotherapists, occupational therapists, gerontology nurse, geriatrician, and social worker	Primary care practices: intervention processes, feedback about health and support services decision		Limited - Practices were funded for 1 day per month of a practice nurse's salary to complete BRIGHT recall process, and regional geriatrics services were bulk funded to provide assessment services to trial participants
Kono et al. 2012, Kono et al. 2013, Kono et al. 2016	Community-based comprehensive care centres		Community health nurses, care managers, social workers			
Kristenson et al. 2010, Möller et al. 2014, Sandberg et al. 2015, Sandberg et al. 2015	Physio-therapists	Supports case manager	Nurse, physiotherapist, primary care physicians, hospital-based geriatric specialist			

Table 6.2c (continued)

Authors	**Professional integration (meso-level)**				**Organizational integration (meso-level)**	**System integration (macro-level)**
	Focal organisation	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
Leung et al. 2010			Social workers, nurses, physiotherapists			
Looman et al. 2014, Makai et al. 2015, Looman et al. 2016a, Looman et al. 2016b	Network of organizations with one single entry point	Coordinator of care, partner in prevention, single entry point	GP, nurse practitioner, second-line geriatric nurse practitioner, geriatric physiotherapists, geriatricians, pharmacists, district nurse, nursing home doctors, mental health workers	GP: training in geriatric care, assessment tool, GP consults. Case manager: training assessment tool, course case management	Network with Joint Governing Board of all involved organizations (GP practices, home care organizations, and nursing homes)	
Melis et al. 2008a, Melis et al. 2008b		Continues usual care - primarly responible, referrals, medication changes and other interventions	Geriatric specialist nurse, primary care physician, geriatrician. Consultation of other involved health care workers, eg home care or physical therapist			
Metzelthin et al. 2013, Metzelthin et al. 2015	GP practice	Member core team	Core team: General practitioner and practice nurse. Close cooperation: occupational therapists and physical therapists, other professionals (pharmacists, geriatrician)	All professionals: training sessions and meetings on intervention protocol (e.g. screening, assessment), possibility to gain experience with protocol in practice		
Montgomery, Fallis 2003	Home care organization		Coordinator, geriatrician, day-hospital team			

Table 6.2c (continued)

Authors	Professional integration (meso-level)				Organizational integration (meso-level)	System integration (macro-level)
	Focal organisation	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
Morishita et al. 1998, Boult et al. 2001	GEM-clinic	Continues usual care - GEM clinic coexists alongside regular primary care	Core team: geriatrician, nurse, social worker, gerontological nurse practitioner	All clinical staff: weekly seminars on topics as dementia, urinary incontinence		
Reuben et al. 1999		Adherence intervention for primary care physician	Board-certified geriatricians, nurse practitioner, social worker, physical therapist, health educator	Physicians: focus groups, one at a fee-for-service hospital and one at the a health maintenance organization hospital to develop the intervention		
Rockwood et al. 2000			Geriatric nurse assessors, geriatricians, physiotherapists, occupational therapists, social worker, dietitian, audiologist, speech-language pathologist			
Rubenstein et al. 2007	Geriatric assessment clinic	Continues care as usual -results assessment and recommendations are reported to primary care provider	Case manager, geriatrician, geriatric medicine faculty, physician assistant, internal medicine house staff, geriatric psychiatrist, geriatrician with expertise in incontinence, physical therapist	Geriatric assessment clinic is an assessment and teaching clinic		

Table 6.2c (continued)

Authors	Professional integration (meso-level)				Organizational integration (meso-level)	System integration (macro-level)
	Focal organisation	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
Ruikes et al. 2015	GP practice		Core multidisciplinary team: GP, practice nurse or community nurse, elderly care physician, social worker	Persuasive communication and social influencing for participation, provision of additional information through a website, newsletters and written instructions, providing feedback and advice to the participating professionals		No - Financial reimbursement for all health care professionals and organizations to cover the extra efforts required by the program, to facilitate participation in the intervention
Schreader et al. 2008	Primary care practice	Addition of registered nurse to the primary care practice		Primary care practices, nurses, administrators: measuring and reporting major study outcomes		
Shapiro Taylor 2002			Geriatric nurse			
Tourigny et al. 2004	Network of organizations with one single entry point		No multidisciplinary team but integration of all the geronto-geriatric services in the area, from promotion and prevention to diagnosis, treatment, rehabilitation, long-term care, palliative care		Network with Joint Governing Board of managers of public institutions and community agencies	Limited - Pooling resources from four institutions for case management

Table 6.2c (continued)

Authors	Professional integration (meso-level)				Organizational integration (meso-level)	System integration (macro-level)
	Focal organisation	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
van Leeuwen et al. 2015	Primary care practice	Part of team	Practice nurse, GP, geriatric expert team (experienced geriatric nurse and an elderly care physician), pharmacists, other health care professionals could be consulted	Practice nurse: motivational interviewing course, workshop on assessment tool, management and training by expert team. Geriatrician: workshop on assessment tool	Regional network of organizations: providers of care services for older adults, primary care professionals, community-based organizations	

Table 6.2d Functional and normative integration of interventions and role informal caregiver and prevention in interventions

Authors	Functional integration		Normative integration		
	Coordination	Information system	Normative integration	Role informal caregiver	Prevention
Béland et al. 2006	Series of evidence-based interdisciplinary protocols (nutrition, falls, congestive heart failure, dementia, depression, medication, vaccination)			Encourage family participation in care and decision making, follow-up and intervene with patients & caregivers	Assessment; follow-up; SIPA is responsible for prevention (among other services)
Bleijenberg et al. 2014, Drubbel et al. 2014	Flowchart with suggested interventions		Workshop about collaboration between GP's and practice nurses	Assessment of caregiver burden	Screening, assessment; care plan; follow-up; screening intervention on falls/mobility, exercise programs that consist of muscle strengthening, balance retraining, endurance and flexibility, motivation, feedback, patient education on physical functioning; screening on nutritional status, patient education on loneliness
Burns et al. 1995, Burns et al. 2000			Members of this team had worked together on an outpatient GEM clinic for approximately 3 years		Assessment; care plan; follow-up
Dalby et al. 2000					Screening; assessment; care plan; follow-up; health promotion by case manager

Table 6.2d (continued)

Authors	Functional integration		Normative integration		
	Coordination	**Information system**	**Normative integration**	**Role informal caregiver**	**Prevention**
de Stampa et al. 2014	Interdisciplinary evidence-based protocols			Case managers can be reached by family members, support available from psychologists	Assessment (including preventive strategies); care plan; follow-up
Ekdahl et al. 2016	Team conferences twice a week	Medical record		Next of kin are welcome as part of care team, services directed to informal caregiver, holistic appraisal of best course of action toward an increased quality of life of the patient	Assessment; follow-up
Engelhardt et al. 1996, Toseland et al. 1996, O'Donnell, Toseland 1997	Weekly meetings GEM team	Customized software program linked to hospital mainframe computer		Social workers help caregivers with psychosocial and financial problems. Nurse practitioner educated informal caregiver	Assessment; care plan; follow-up; educate patient and informal caregiver
Fairhall et al. 2015	Weekly interdisciplinary case-conferences, separate guidelines/ interventions for each frailty characteristic			Supportive intervention when informal caregiver experiences significant distress	Assessment; follow-up
Gagnon et al. 1999	Weekly meetings case manager and investigative team members	Computerized patient record			Assessment; care plan; follow-up

Table 6.2d (continued)

Authors	Functional integration		Normative integration		
	Coordination	**Information system**	**Normative integration**	**Role informal caregiver**	**Prevention**
Gray et al. 2010	Scheduled case conferences	Charting and electronical messaging, home health monitor system			Assessment; care plan; follow-up; education sessions to provide specific health related information. education and self-care as one of the five priorities
Hébert et al. 2008, Hébert et al. 2010	Multidisciplinary meetings	Computerized clinical charts allowing communication between institutions and clinicians for monitoring purposes		Care plan is validated with informal caregivers to empower them in decision-making process	Assessment; care plan; follow-up
Hinkka et al. 2007; Kehusmaa et al. 2010					Assessment; care plan; physical, psychological and social activation and counselling, motivating the participants to adopt an active lifestyle, classes on disease management and coping strategies, and recreational activities
Kerse et al. 2014					Screening; assessment
Kono et al. 2012, Kono et al. 2013, Kono et al. 2016	Rigorous recommendations for each of the five care needs categories				Assessment; care plan; follow-up; focus on preventing functional decline
Kristenson et al. 2010, Möller et al. 2014, Sandberg et al. 2015, Sandberg et al. 2015	Meetings between nurses, physiotherapists and research group				Assessment; care plan; follow-up; physiotherapists had preventive approach

Table 6.2d (continued)

Authors	Functional integration		Normative integration		
	Coordination	**Information system**	**Normative integration**	**Role informal caregiver**	**Prevention**
Leung et al. 2010	Interventions based on a clinical protocol by multidisciplinary action				Assessment; care plan, fall prevention interventions
Looman et al. 2014, Makai et al. 2015, Looman et al. 2016a, Looman et al. 2016b	Multidisciplinary meetings, multidisciplinary protocols, web-based files, task reassignment and delegation between nurses and doctors and among GPs, nursing home doctors and geriatricians. Consultation among primary, secondary and tertiary care providers occurred	Web-based files		Explicit attention for support and guidance and informal caregiver, validate care plan with informal caregiver	Screening; assessment; care plan; follow-up; GP is partner in prevention
Melis et al. 2008a, Melis et al. 2008b	Interdiscplinary consults, separate guidelines for five health problems			Care burden assessment, results implemented in care plan	Assesment; follow-up
Metzelthin et al. 2013, Metzelthin et al. 2015	Bilateral or extended team meetings, toolbox of interventions: enhancing meaningful activities, daily physical activity, social network and social activities, adapting environment, activities or skills, and stimulating health		Training sessions and meetings on client-centeredness, interdisciplinary collaboration	Support of social and physical environment, involvement in decision making and cooperative working relationship	Screening; assessment; care plan; follow-up; stimulating health is one of five topics in toolbox of interventions
Montgomery, Fallis 2003					Assessment; care plan; follow-up with preventive measures

Table 6.2d (continued)

Authors	**Functional integration**		**Normative integration**		
	Coordination	**Information system**	**Normative integration**	**Role informal caregiver**	**Prevention**
Morishita et al. 1998, Boult et al. 2001	Daily meetings GEM team, clinical guidelines, for health maintenance, dementia, depression, urinary continence, constipation, osteoarthritis, and diabetes		All clinical staff attended weekly seminars on health maintenance. All staff attended a 8 hour workshop on team development		Assessment; care plan; follow-up; counselling and health education by team
Reuben et al. 1999	Short interdisciplinary case conferences after evaluation				Screening; assessment; health educator contacted patient; empower patient for interaction physician
Rockwood et al. 2000					Assessment; care plan
Rubenstein et al. 2007	Interdisciplinary team meeting				Screening; assessment; care plan; follow-up; health promotion recommendation and health education by case manager
Ruikes et al. 2015	Team meetings every 4 - 8 weeks, multidisciplinary guidelines on 8 common geriatric syndromes, a guideline on advance care planning, procedure agreement for easy-to-access consultation by geriatric experts, and procedure agreement between primary and specialized providers upon hospitalization and discharge	Web-based health and welfare portal	Tailor-made meetings, coaching on the job, helpdesk, and expert meetings to overcome gaps in knowledge, attitude and skills needed to conduct the program		Assessment; care plan; follow-up

Table 6.2d (continued)

Authors	Functional integration		Normative integration		
	Coordination	**Information system**	**Normative integration**	**Role informal caregiver**	**Prevention**
Schreader et al. 2008	Formal meetings, monthly reports of individual patients and their characteristics		Education series for primary care professionals, nurses and administrators on goals and responsibilities of the collaborative care teams and clinical decision making with older adult patients		Screening; assessment; care plan; follow-up; ongoing education on specific health problems and conditions by case manager
Shapiro Taylor 2002				Care givers participated in care planning.	Assessment; follow-up; early interventive social service program designed to provide case-managed services earlier than clients would normally receive them to allow older adults to remain independent
Tourigny et al. 2004		Geronto-geriatric information system by computerized clinical		Case management for complex cases - also caregivers.	Assessment; care plan; follow-up; integration of all the geronto-geriatric services in the area, including promotion and prevention
van Leeuwen et al. 2015	Guideline-concordant management and treatment options	Digital patient system, tasks geriatric expert team: (quality) management, expert knowledge transfer by team meetings, training sessions and multidisciplinary patient reviews			Assessment; care plan; follow-up

Despite the similarities in assessments and care plans, the follow-up differed between interventions, particularly in the role of prevention. Predominantly, case management was an important part of the follow-up which involved executing the care plan, monitoring the frail older people, advocacy by arranging admission to services and updating other professionals. Follow-up could also include home visits or specific interventions aimed at fall prevention or activation. Follow-up standardization fluctuated: some interventions developed protocols so that follow-up took place each month, whereas other interventions were more flexible, responding to the needs of the frail older people. Remarkably, the role of prevention in the follow-up was generally limited and differed between interventions. A few interventions (n=9) paid explicit attention to health education, health promotion, or adopting an active life style and coping.

Professional integration varied between interventions. Different professionals were responsible for follow-up: (practice) nurses, social workers, physiotherapists, geriatricians, or a multidisciplinary team of professionals. The involved professionals and organizations differed between interventions. Physicians and nurses are involved most frequently but also collaboration with geriatricians in secondary care and social workers commonly occurs (both n=13). Some interventions were situated in a clear focal organization, such as a primary care or community practices, home care organization, Geriatric Evaluation and Management outpatient clinic, physiotherapist or rehabilitation centre, whereas other interventions are situated in a network of organizations. The level of involvement of the GP varied between the interventions; the GP was at the core of some of the interventions, whereas occasionally the GP had no role at all and the integrated care intervention co-existed alongside usual care. Finally, the intervention-specific education of professionals was sparse and concentrated mostly on very specific elements of the interventions such as assessment instruments or protocols.

Organizational integration was modest in the preventive, integrated care interventions. A few cases created a network of organizations: five cases set up a Joint Governing Board and two built a new consortium. *Financial integration* was even less frequent. Two interventions had partial financial integration; one was fully integrated financially and its teams controlled their own budget.

Functional integration was limited; a few interventions (n=9) used a shared information system or developed multidisciplinary protocols (n=6) on specific themes such as urinary incontinence or falls. In addition, the level of *normative integration* was negligible (n=4) according to the intervention descriptions. Workshops and training courses focused on the following topics: collaboration of the practice nurse and GP; goals and responsibilities of collaborative care teams; team development; client-centeredness and interdisciplinary collaboration.

Informal caregivers of the frail older people were not always considered as active participants by the professionals in the interventions. Sporadically (n=2), the caregiver burden was included in the comprehensive assessment and occasionally (n=6) the follow-up was also aimed at the informal caregivers. At times (n=5), the professionals actively involved informal caregivers in the care process, by validating the care plan with them or involving them in the actual decision-making process.

Health outcomes

There was generally limited evidence of integrated care interventions on health outcomes of frail older people. No clear pattern emerged in the elements or level of integration of the interventions that did generate significant effects.

An extensive range of health outcomes were considered (see table 6.3). The outcomes reported most often were activities of daily living (ADL)/instrumental activities of daily living (IADL) (n=18), mortality (n=15) and physical functioning (n=13). Less frequently used outcomes were social support (n=3), vitality (n=3), and desire for institutionalization and frailty (n=1 for both).

In terms of effectiveness, four outcomes were most promising: well-being, life satisfaction, frailty and desire for institutionalization. The majority of the interventions reporting these specific outcomes found a positive effect for the intervention. However, these outcomes were reported less frequently, especially desire for institutionalization and frailty. For other outcomes, positive effects were reported occasionally; for instance, depression (n=4 out of 10) and cognitive functioning (n=3 out of 8). Four outcome measures did not reach significance in any of the interventions: pain, role, social support, and health-related quality of life. We found an effect in favour of the control group only twice: reported morbidities (Burns et al., 1995) and life satisfaction (Kono et al., 2016).

The differences in outcomes could not be explained by the elements and level of integration of the interventions. This, for example, is shown by the 18 interventions that reported ADL and IADL as an outcome. Four interventions that showed positive effects had, for example, a multidisciplinary team, whereas the two other interventions with positive effects had no multidisciplinary team. The same mixed pattern was found in the 12 interventions that reported no effects on ADL and IADL.

Some outcomes tended to show that better outcomes were accompanied by a lower level of integration. The studies that showed an effect on mortality in favour of the intervention were not integrated normatively, organizationally or financially. The interventions that reported a positive effect on mental health were not integrated functionally, normatively or organizationally.

Two remarkable effective interventions showed similar effects for life satisfaction, well-being, depression and social functioning. One intervention (Shapiro & Taylor, 2002) also found significant effects in mortality, whereas the other also reported effects on perceived health, cognitive functioning and IADL (Burns et al., 1995; Burns et al., 2000). These results highlighted the limited effect in the physical domain of functioning. Both these interventions showed a low level of integration at the meso and macro level since both had no functional, organizational and financial integration.

Table 6.3: Health outcomes

Authors	Perceived health	Morbidities	ADL/IADL	Physical functioning	Pain	Vitality	Mental health	Depression	Role	Social functioning	Social support	Cognitive functioning	QoL - general	Qol - health-related	QoL - well-being	Life satisfaction	Fall incident	Mortality	Desire institutionalization	Frailty
Béland et al. 2006	0																	0		
Bleijenberg et al. 2014			+	0		0	0			0			0	0				0		
Drubbel et al. 2014														0						
Burns et al. 1995	+	-	0	0				+		+		0				+		0		
Burns et al. 2000	+		0/+					+		+		+			+	+		0		
Dalby et al. 2000																		0		
de Stampa et al. 2014		+	0		0			+		0		0					0	0		
Ekdahl et al. 2016																		+		
Engelhardt et al. 1996	0			0			0	0			0				0			+		
Toseland et al. 1996	0			0			0	0	0						0			+		
O'Donnell, Toseland 1997																				
Fairhall et al. 2015														0						+
Gagnon et al. 1999	0		0	0	0	0	0		0	0			0							
Gray et al. 2010																				
Hébert et al. 2008			0									+								
Hébert et al. 2010			+																	
Hinkka et al. 2007	+	0		0	0							0								

Table 6.3: Health outcomes (continued)

Authors	Perceived health	Morbidities	ADL/IADL	Physical functioning	Pain	Vitality	Mental health	Depression	Role	Social functioning	Social support	Cognitive functioning	QoL - general	Qol - health-related	QoL - well-being	Life satisfaction	Fall incident	Mortality	Desire institutionalization	Frailty
Kehusmaa et al. 2010				0										0						
Kerse et al. 2014			0	+				0					+							
Kono et al. 2012			0					0			0									
Kono et al. 2013																				
Kono et al. 2016			+/0					0				0				-	0	0		
Kristenson et al. 2010								0						0						
Möller et al. 2014			0/	0													0			
Sandberg et al. 2015a																				
Sandberg et al. 2015b																				
Leung et al. 2010																	+			
Looman et al. 2014	0		0				0			0			0	0	+					
Makai et al. 2015														0	0					
Looman et al. 2016a	0		0				0			0			+	0	+					
Looman et al. 2016b														0						
Melis et al. 2008a			+	0			+		0	0		0	0		+			0		
Melis et al. 2008b			0				0													
Metzelthin et al. 2013			0					0		0	0						0			
Metzelthin et al. 2015			0											0						
Montgomery, Fallis 2003			0	0								+								
Morishita et al. 1998																				
Boult et al. 2001				+				+										0		
Reuben et al. 1999	0			+	0	+	0		0	+					0			0		
Rockwood et al. 2000			0	0								0	0					0		
Rubenstein et al. 2007	0	0	0					0									0			
Ruikes et al. 2015			0				0			0				0				0		
Schreader et al. 2008																				
Shapiro Taylor 2002								+		+					+	+		+		
Tourigny et al. 2004			+															0	+	
van Leeuwen et al. 2015			0	0			0							0						

+: significant outcome in favour of the intervention; 0: no significant outcome; -: significant outcome in favour of the control group

Outcomes for informal caregivers and professionals

Our results show a considerable lack of emphasis on outcomes regarding the informal caregivers and professionals. Subsequently, the effects on these outcomes were negligible.

Nine of the 29 interventions reported on the following outcomes: caregiver's satisfaction with care, caregiver's desire for institutionalization, caregiver's subjective and objective burden, and professional satisfaction with care (table 6.4). The effect on caregiver's satisfaction with care was most convincing, since it was effective in one of the two studies reporting this outcome. Caregiver's satisfaction improved in the SIPA intervention which encouraged family participation in care and decision making and professionals also intervened with caregivers. No effect was found in SWING and no specific attention was paid to the informal caregiver. Caregiver's desire for institutionalization did not show any significant effect.

The effects on caregiver subjective burden were rather inconsistent. Four studies reported this outcome, all using the same measurement instrument, but the results were mixed: an effect in favour of the intervention (Tourigny et al., 2004), the control group (Hébert et al., 2010) or no effect at all (Béland et al., 2006; Montgomery & Fallis, 2003). These results were unrelated to the role of the informal caregiver in the intervention since informal caregivers were the least involved in the care process in the most effective intervention. The objective burden of informal caregivers was not affected by preventive, integrated care interventions. The objective burden – time spent on informal care – was considered from a societal perspective in five cost-effectiveness analyses and one intervention found an effect in favour of the caregivers in the intervention group. Time spent on IADL by the caregivers decreased in this intervention that aimed specially at improving the functional status of frail older people (Sandberg et al., 2015).

Professional satisfaction was the only outcome regarding professionals that was taken into account by a single study (Morishita et al., 1998). However, this study did not apply significance testing. The professionals indicated that the intervention is appropriate, helpful for both their patients and themselves in ongoing care for their patients.

Table 6.4: Outcomes for informal caregivers and professionals

Authors	Caregiver burden - subjective	Caregiver burden - objective	Caregiver desire for institutionalization	Caregiver satisfaction	Professional satisfaction
Béland et al. 2006	0			+	
Bleijenberg et al. 2014					
Drubbel et al. 2014		NS			
Burns et al. 1995					
Burns et al. 2000					
Dalby et al. 2000					
de Stampa et al. 2014					
Ekdahl et al. 2016					
Engelhardt et al. 1996					
Toseland et al. 1996					
O'Donnell, Toseland 1997					
Fairhall et al. 2015					
Gagnon et al. 1999					
Gray et al. 2010					
Hébert et al. 2008	0		0		
Hébert et al. 2010	-		0		
Hinkka et al. 2007					
Kehusmaa et al. 2010					
Kerse et al. 2014					
Kono et al. 2012					
Kono et al. 2013					
Kono et al. 2016					
Kristenson et al. 2010					
Möller et al. 2014					
Sandberg et al. 2015a					
Sandberg et al. 2015b		+			
Leung et al. 2010					
Looman et al. 2014					
Makai et al. 2015		0			
Looman et al. 2016a					
Looman et al. 2016b		0			
Melis et al. 2008a					
Melis et al. 2008b					
Metzelthin et al. 2013					
Metzelthin et al. 2015		0			
Montgomery, Fallis 2003	0			0	
Morishita et al. 1998					NS

Table 6.4: Outcomes for informal caregivers and professionals (continued)

Authors	Caregiver burden - subjective	Caregiver burden - objective	Caregiver desire for institutionalization	Caregiver satisfaction	Professional satisfaction
Boult et al. 2001					
Reuben et al. 1999					
Rockwood et al. 2000					
Ruikes et al. 2015					
Schreader et al. 2008					
Shapiro Taylor 2002					
Tourigny et al. 2004	+				
van Leeuwen et al. 2015		0			

+: significant outcome in favour of the intervention; 0: no significant outcome; -: significant outcome in favour of the control group; NS: outcome not tested for significance

Process outcomes

Process outcomes of integrated care interventions generated little interest but the effects were beneficial, particularly for care process. Five types of outcomes fit into the category of process outcomes: goal attainment, empowerment, satisfaction with care, care process and rate of implementation (table 6.5).

For three types of outcomes, most effects were in favour of the intervention group: goal attainment, empowerment and care process. Goal attainment was reported for only one intervention as the primary outcome measure (Rockwood et al., 2000), in which an effect in favour of the intervention was generated. Empowerment had a positive effect in two of four interventions. The definition of empowerment was aligned with the focus of intervention studies: it was related either to patient involvement in the care process or to empowerment in terms of activities of daily life. Both definitions showed a significant effect once.

The care process improved in all five integrated, preventive care interventions in which it was considered an outcome measure. These five interventions were not integrated normatively, organizationally, or financially. The operationalization of care process differed between studies and was closely aligned to specific interventions. For example, the Rubenstein intervention focused on five geriatric target conditions and referrals. The researchers operationalized the care process by evaluating documentation and assessing the target conditions and referrals (Rubenstein et al., 2007).

Evidence for the most common outcome in this category – satisfaction with care – was not convincing. Of the ten interventions reporting on this outcome, three found an increase in satisfaction with preventive, integrated care. No clear pattern emerged on what could explain the differences in effects. Two Outpatient Geriatric Evaluation Management interventions in the United States reported higher satisfaction with care (Engelhardt et al., 1996; Morishita et al., 1998; Toseland et al., 1996) but a very comparable intervention, also using a similar measurement instrument, did not result in higher satisfaction (Reuben et al., 1999). PRISMA resulted in higher satisfaction with care after four years (Hébert et al., 2010) but this effect was not yet established after one year (Hébert et al., 2008). Comparable interventions to PRISMA with a high level of professional integration (Kerse et al., 2014) and organizational integration (Béland et al., 2006; Gagnon et al., 1999; Looman et al., 2014) found no effect in shorter follow-up periods (3 - 36 months).

Table 6.5: Process outcomes

Authors	Goal attainment	Empowerment	Satisfaction with care	Care process	Implementation
Béland et al. 2006			0		
Bleijenberg et al. 2014			0		
Drubbel et al. 2014					
Burns et al. 1995					
Burns et al. 2000					
Dalby et al. 2000					
de Stampa et al. 2014					
Ekdahl et al. 2016					
Engelhardt et al. 1996			+	+	
Toseland et al. 1996			+	+	
O'Donnell, Toseland 1997					
Fairhall et al. 2015					
Gagnon et al. 1999			0		
Gray et al. 2010				+	
Hébert et al. 2008		0	0		NS
Hébert et al. 2010		+	+		NS
Hinkka et al. 2007			NS		
Kehusmaa et al. 2010					
Kerse et al. 2014			0		
Kono et al. 2012					NS
Kono et al. 2013					
Kono et al. 2016		0		+	
Kristenson et al. 2010					
Möller et al. 2014					
Sandberg et al. 2015a					NS
Sandberg et al. 2015b					

Table 6.5: Process outcomes (continued)

Authors	Goal attainment	Empowerment	Satisfaction with care	Care process	Implementation
Leung et al. 2010					
Looman et al. 2014			0		
Makai et al. 2015					
Looman et al. 2016a					
Looman et al. 2016b					
Melis et al. 2008a					
Melis et al. 2008b					
Metzelthin et al. 2013					NS
Metzelthin et al. 2015					
Montgomery, Fallis 2003				+	
Morishita et al. 1998			+		
Boult et al. 2001					
Reuben et al. 1999		0	0		
Rockwood et al. 2000	+				NS
Rubenstein et al. 2007				+	
Ruikes et al. 2015					
Shapiro Taylor 2002		+			
Tourigny et al. 2004					
van Leeuwen et al. 2015					

+: significant outcome in favour of the intervention; 0: no significant outcome; -: significant outcome in favour of the control group; NS: outcome not tested for significance

Health care utilization

Health care utilization did not differ substantially between frail older people receiving care as usual and preventive, integrated care. Nonetheless, we observed both decreases and increases in utilization.

Health care utilization was the most reported outcome (n=27) (table 6.6). The focus was mainly on secondary care since the most frequently reported outcomes were hospital length of stay (n=19), hospital admission (n=18), nursing home admission (n=18). Far less attention was paid to social care utilization such as psychosocial care (n=4) or meals on wheels (n=5). The least reported outcomes were diagnostics (n=4) and equipment (n=3).

The majority of the interventions reported no significant increase or decrease in health care utilization in any outcome category. Despite the limited effects, some patterns in health care utilization could be revealed. Three types of health care utilization were not affected at all by integrated care: use of equipment, psychosocial care and day surgery. The effects of integrated care interventions on hospital care tend to be positive; slightly more interventions showed a decrease in hospital care utilization by the frail older people than an increase. This accounted for four types of hospital care: admission to the emergency department, length of stay in hospital, admission to the hospital and contact with physicians in outpatient care. On the other hand, more increases than decreases in utilization were reported for other types of care. Primary care increased for almost half of the interventions reporting this outcome. For paramedical care, day care, diagnostics and meals on wheels only increases in utilization were observed, although led by non-significant effects for all types of healthcare utilization. The effect on nursing home admissions was ambiguous since 14 interventions found no effects, two showed a decrease in admissions (Montgomery & Fallis, 2003; Shapiro & Taylor, 2002) and two an increase (Kerse et al., 2014; Kono et al., 2012). In 14 interventions, the health care utilization outcomes were converted into costs. The effects were sparse; 11 interventions find no significant effect, due mostly to the wide variation in costs.

At intervention level, six interventions reported no significant effects at all for health care utilization. Moreover, a substantial number (n=12) of interventions reported more increases in health care utilization than decreases. Remarkably, the PRISMA intervention reported increases in six types of health care utilization in the first year of follow-up (Hébert et al., 2008), but these increases disappeared (i.e. became non-significant) in the four-year follow-up period (Hébert et al., 2010).

The differences in outcomes in health care utilization could not be fully explained by the differences in components or level of integration of the interventions. The results indicated that a higher level of integration did not result in better outcomes. For instance, for hospital length of stay, there was no organizational and financial integration in the interventions that generated a decrease in length of stay, whereas the interventions that had an increase in length of stay were integrated organizationally and financially. The one intervention that resulted in a decrease of primary care had no functional, organizational and financial integration, whereas this was both present and absent for interventions that found no effect or an increase in primary care utilization.

Cost-effectiveness

Our systematic review showed limited evidence for the cost-effectiveness of preventive, integrated care interventions for frail older people. Cost-effectiveness was determined for nine interventions, of which three stated they were cost-effective (table 6.7). Generally we observed no significant differences in total cost between

Table 6.6: Health care utilization

Authors	GP/primary care	Contact physicians outpatient care	Paramedical care	Home Care	Day care	Diagnostics	Equipment	Meals on wheels	Psychosocial care	Hospital admission	Hospital length of stay	Emergency department	Day surgery	Nursing home	Medication	Costs
Béland et al. 2006				-						+		o		o		o
Bleijenberg et al. 2014	-									o		o				
Drubbel et al. 2014	NS			NS	NS						NS	NS		NS		o
Burns et al. 1995										o					+	v
Burns et al. 2000	+									o						
Dalby et al. 2000	o	o								o	o	o			-	
de Stampa et al. 2014										+/-		+				
Ekdahl et al. 2016	-		-	o		o	o			o	+			o	o	o
Engelhardt et al. 1996	-					o				o	o	+	o	o	o	o
Toseland et al. 1996	-	o				o				o	o	o	o	o		o
O’Donnell, Toseland 1997	-					o			o	o		o	o			
Fairhall et al. 2015	o			o				-	o		o			o		
Gagnon et al. 1999										o	o	-				
Gray et al. 2010	o		o			-					o	o	o		o	-
Hébert et al. 2008	-	o	-	-	-			-	o	o	-	-/+	o	o		
Hébert et al. 2010	o	o	o	o	o				o	o	o	-/+	o	o		
Hinkka et al. 2007																
Kehusmaa et al. 2010	o	o		o		o		o			o		o	o	o	-
Kerse et al. 2014		o	o	+						o		o		-		
Kono et al. 2012				-										-		o
Kono et al. 2013																+
Kono et al. 2016				o						o				o		o
Kristenson et al. 2010																
Möller et al. 2014																
Sandberg et al. 2015a		+								o	o	+				
Sandberg et al. 2015b		o		o							o					o
Leung et al. 2010																
Looman et al. 2014			o	o	o			o	o							
Makai et al. 2015	-	o	o	o	o				o		o	o	o	o		o
Looman et al. 2016a																
Looman et al. 2016b	-		o	o	o				o		o			o		o

Table 6.6: (continued)

Authors	GP/primary care	Contact physicians outpatient care	Paramedical care	Home Care	Day care	Diagnostics	Equipment	Meals on wheels	Psychosocial care	Hospital admission	Hospital length of stay	Emergency department	Day surgery	Nursing home	Medication	Costs
Melis et al. 2008a																
Melis et al. 2008b	0	0	0	0	0			0			0			0		0
Metzelthin et al. 2013																
Metzelthin et al. 2015	-	0	-	0			0				0			0		0
Montgomery, Fallis 2003				-	-					0	+			+	-	
Morishita et al. 1998																
Boult et al. 2001		0		-			0				0			0		0
Reuben et al. 1999																
Rockwood et al. 2000														0		
Rubenstein et al. 2007										0	0					
Ruikes et al. 2015										0				0		
Schreader et al. 2008										+	+	0				0
Shapiro Taylor 2002														+		
Tourigny et al. 2004	-/+									0	-	-			0	
van Leeuwen et al. 2015	0		NS	NS					NS	0	NS		NS	NS	0	0

+: significant outcome in favour of the intervention (i.e. decrease in health care utilization); 0: no significant outcome; -: significant outcome in favour of the control group (i.e. increase in health care utilization); +/- significant outcome both in favour of the intervention and the control group within one category (i.e. both decrease and increase in health care utilization within one category); NS: outcome not tested for significance

the preventive, integrated care interventions and care as usual. The total costs of two interventions were higher than care as usual (Gray et al., 2010; Kehusmaa et al., 2010) due mostly to high intervention costs rather than any increase in health care utilization.

Besides the limited cost savings, the effects of the interventions were also modest, particularly in terms of quality-adjusted life years (QALY). Seven studies chose QALY as an effect measure and one study adopted another measure for health-related quality of life. None of these interventions found an effect in favour of the intervention. Two significant effects were established: quality of care for APTcare and frailty for

Table 6.7: Cost-effectiveness

Authors	perspective	costs	effect measure	effects	cost-effective
Drubbel et al. 2014	societal	0	QALY	0	yes - 95% WTP €20,000
Fairhall et al. 2015	health care funder	0	frailty; QALY	+/0	yes - 80% WTP AU $50,000
Gray et al. 2010	provincial Ministry of Health	-	quality of care	+	no
Kehusmaa et al. 2010	societal	-	functional independence; health-related quality of life	0	no
Makai et al. 2015	societal	0	QALY; ICECAP	0	no
Looman et al. 2016b	societal	0	QALY	0	no
Melis et al. 2008b	health care system	0	% successful treatment	0	yes - 75% WTP €34,000
Metzelthin et al. 2015	societal	0	disability; QALY	0	no
Sandberg et al. 2015	societal	0	QALY	0	no
van Leeuwen et al. 2015	societal	0	ADL & IADL; physical health; mental health; QALY	0	no

+: significant outcome in favour of the intervention’ 0: no significant outcome; -: significant outcome in favour of the control group

FIT. These effect measures were more properly aligned to the two interventions. APTcare, for instance, was a disease management programme and quality of care was determined by specific performance measures for each chronic disease. FIT strongly focused on frailty by assessing specific frailty characteristics and implementing specific interventions for each frailty condition.

Due to their modest effects, the majority of interventions were not cost-effective. Three interventions had a high probability of being cost-effective, 75% at a willingness to pay 20,000 euro (Drubbel, 2014), 95% at 34,000 euros (Melis et al., 2008) and 80% at 50,000 dollars (Fairhall et al., 2015). These three interventions had some features in common: the absence of case management, a single entry-point, information system, and organizational and financial integration. These elements were both present and absent in the seven interventions that were not cost-effective.

Discussion

The widespread interest in preventive, integrated care has generated high expectations for improving the organization of care for community-dwelling frail older people. The aim of this study was to systematically review the empirical evidence for its effectiveness and cost-effectiveness to test these expectations. Our results showed that the fragmented evidence is not compelling.

Preventive, integrated care is not likely to be effective since the majority of the reported outcomes show no effect. Less frequently reported outcomes were most promising such as care process, well-being and life satisfaction, even as outcomes closely aligned to the aim of the interventions such as frailty and fall prevention. However, when interventions were specifically aimed at ADL, IADL and physical functioning, effects were less likely to be substantiated. The evidence for health care utilization was mixed but preventive, integrated care did not lead to clear cost reductions or substitution of health care and cost-effectiveness was limited., Our review showed no clear relation between (cost-) effectiveness and specific preventive, integrated elements or levels of integration. The more integrated interventions, in particular in terms of functional, normative, organizational and financial integration, tended not to result in more effectiveness. Differences in outcomes could neither be explained by the quality of the studies, the sample size, nor the follow-up period.

Another important result of our systematic review was that populations, interventions and outcomes differed substantially which made it extremely difficult to compare both interventions and evaluation studies. Firstly, fragmentation was caused by the heterogeneity of the target population of the interventions. No consensus existed on the definition of frailty since the inclusion criteria of the participants were formulated differently in literally all studies. Frailty was mostly related to the physical domain of functioning, but the psychological and social domain were gradually incorporated as well. In the inclusion criteria, the physical domain was very frequently translated to dependency in ADL or IADL, whereas previous research has shown that frailty is a different condition than disability (Fried, Ferrucci, Darer, Williamson, & Anderson, 2004; Lutomski et al., 2014). Secondly, the interventions were built up differently in terms of elements and level of integration. Some common elements could be derived, such as assessments and care plans but their follow-up varied between interventions and was not clearly described in the intervention descriptions. Also the role of prevention differed between interventions. Secondary prevention was part of all interventions due to the comprehensive geriatric assessment and care plans. Nevertheless, screening the older population for frailty was less common. Only few interventions paid explicit attention to self-management, health education and empowerment in the follow-up of frail older people; thus tertiary prevention was limited. Besides the differences in the elements, the level of integration of the interventions also varied. Some were organizationally integrated interventions but were not normatively and functionally integrated and vice versa. Thirdly, the fragmentation of the evaluation research is caused predominantly by the extensive variation in outcome measures. Some main categories that nearly always are considered to determine the (cost-) effectiveness of preventive integrated care can be distinguished: ADL and IADL, hospitalization and nursing home admission. But besides these commonalities, the outcomes were dispersed, ranging from vitality to desire for institutionalization for frail older people and caregivers. Many different measurement instruments were used for these outcomes which fragmented the evidence even more and made comparisons more difficult. Although measurements of health care utilization were consistently by self-report or from registrations, the outcomes typically focused on health care rather than social care and were distinctive for each intervention. These differences also implied that the cost of preventive, integrated care was calculated differently for each intervention.

Interpretation of results in the context of other studies

Our results added nuances to the high expectations for integrated care in the literature. Some theoretical studies on (general) integrated care state that it could pursue a wide range of aims. (Kodner & Spreeuwenberg, 2002). However, our results were in line with other empirical reviews on integrated care interventions for older people. Previous research also emphasized the unconvincing effects on health outcomes (Eklund & Wilhelmson, 2009; Johri et al., 2003; Low, Yap, & Brodaty, 2011; Stokes et al., 2015; You et al., 2012). The positive effect on well-being was confirmed in a systematic review on case management of frail older people and people with dementia (You et al., 2012). Our results confirmed the lack of emphasis on informal caregivers and professionals, in particular (Eklund & Wilhelmson, 2009; Johri et al., 2003; Stokes et al., 2015; You et al., 2012). Previous research showed similar results for the care process but this outcome was considered far less often than health outcomes and health care utilization. Integrated care for patients with chronic diseases also resulted in improvement of the quality of care (Ouwens et al., 2005) and case management for older people resulted in fewer unmet service needs (You et al., 2012). However, our review did not show encouraging effects on care satisfaction, in contrast to case management interventions (Stokes et al., 2015). Our results mitigate the effects of integrated care on health care utilization. Two previous reviews showed a decrease in hospitalization and institutionalization (Eklund & Wilhelmson, 2009; Johri et al., 2003). Our results were less conclusive when more types of health and social care utilization were considered. Indeed, there was an indication that hospital care might decrease because of integrated care intervention but the effect on institutionalization was inconsistent in our review. Our broader range of outcomes also showed increases in health care utilization, mostly for primary care.

Strengths and limitations

The strength of this systematic review is the comprehensive overview it provides in terms of both interventions and outcomes. Analysing the interventions with the Valentijn theoretical framework with an additional focus on prevention provided useful insights into the various components of integrated care and the different levels of integration in relation to the wide range of outcomes Besides the included articles, we also considered corresponding study protocols in order to provide all available information on the interventions. Furthermore, we considered all types of outcomes, divided into five categories, one of which was cost-effectiveness for which systematic evidence is scarce (Ouwens et al., 2005; Stokes et al., 2015).

The first limitation of our systematic review is that we did not perform a meta-analysis. We were not able to do a meta-analysis because of the substantial differences in population, interventions, research designs and the wide range of outcomes measured with different instruments. Our aim was to present the bigger picture rather than limiting ourselves to a selection of more common outcome categories. The most common outcomes were ADL/IADL, physical functioning, mortality, hospital admissions, home care and institutionalization. However, this would have been too restricted to fully explore the potential effectiveness of preventive, integrated care. Our research showed that effects can be observed in other outcomes, such as care process or well-being.

In providing this broad overview, we had to categorize the outcome measures, which is the second limitation of our study. Many different operationalisations of outcomes could be distinguished, especially for ADL/IADL, physical functioning, hospital admissions and well-being. A concrete example is the category of hospitalization that not only includes actual hospitalization, but also the number of multiple, acute, subacute, planned, and total hospitalizations. Another example was physical functioning, for which the following measurements were used in a single intervention: physical functioning, number of restricted activities days, number of bed days, physical performance test, NIA battery score and physical health summary scale (Reuben et al., 1999). In these cases, we adopted an optimistic approach; if one of the outcomes within a category had a positive effect, we reported it as a positive outcome for that category.

The last limitation is the moderate state of empirical evidence, risk of bias and quality of the studies. This was partly due to our inclusion criterion on controlled designs, which implied that non-randomized trials were also included and that increased the risk of bias. Yet, a more important contributor to the moderate risk of bias was the lack of information in the evaluation studies. The number of EPOC criteria we determined as ‘unclear risk’ was approximately equivalent to the number of criteria determined as ‘high risk’.

Implications for research, policy and practice

The first implication is that the heterogeneity of frail older people in the community should be further explored. The population of the interventions differed substantially between and within interventions. Several studies adopted a narrow definition of frailty, focusing on the physical domain, but more recent studies also considered the psychological and social domain. Still, there is no consensus on the definition and measurement of frailty (Dent, Kowal, & Hoogendijk, 2016) and thereby on identifying which community-dwelling older people would benefit most from the preventive, integrated care interventions (Collard, Boter, Schoevers, & Oude Voshaar, 2012). Researchers have become increasingly aware of complexity and heterogeneity (see also (Eklund & Wilhelmson, 2009)) and recently, have distinguished subpopulations of physically frail older people (Lafortune, Béland, Bergman, & Ankri, 2009; Liu, 2014). These subpopulations could further unravel frailty and support professionals in daily practice. However, in evaluations of studies into preventive, integrated care, the population of frail older people is still considered as a single group and no distinction is made between the characteristics of the frail older people. When the population of the intervention is more heterogeneous, it might be harder to achieve effectiveness (Ferrucci et al., 2004; Lette, Baan, van den Berg, & de Bruin, 2015). Accordingly, a possible explanation for the limited effectiveness of integrated care might be that it is more beneficial for certain subpopulations of frail older people; this hypothesis should be explored further.

The second implication is that further research should provide better insight into the term ‘effectiveness’ for community-dwelling frail older people before extensive (expensive) preventive, integrated care interventions are designed, implemented and evaluated. It is crucial to explore what specific outcomes can be influenced for the frail older population in the community – who are deteriorating in multiple domains of functioning – and their informal caregivers. Likewise, it is fundamental to formulate realistic expectations for what preventive, integrated care can achieve. Our systematic review challenges the important role that physical domain of functioning plays in preventive, integrated care for frail older people and its evaluation research. Many professionals involved in integrated care aim specifically at improving ADL/IADL or at preventing functional decline with limited effectiveness. An important question for practice, policy and research is whether we can expect a positive effect for ADL/IADL in preventive, integrated care at all. In fact, a recent systematic review proved that it is very difficult to influence ADL limitations for the older population (van der Vorst et al., 2016). The QALY is another outcome that might be less suitable for determining cost-effectiveness for the community-dwelling frail older population. This outcome is widely used in the curative sector and is known for its comparability across populations and interventions (Drummond, Sculpher, Claxton, Stoddart, & Torrance, 2005). None of the interventions found an effect on health-related quality of life and previous research has also confirmed that it might be less appropriate for frail older people (Comans, Peel, Gray, & Scuffham, 2013; Makai, 2014). Our systematic review provides useful support for a shift from (psychical) functioning to well-being in preventive, integrated care and, correspondingly, its evaluation research. Also well-being of informal caregivers should be considered since the role of informal caregivers has become more prominent in the care for frail older people (Grootegoed & Van Dijk, 2012). Primary care professionals are originally trained to adopt a monodisciplinary, disease-specific approach (Lette et al., 2015) but preventive, integrated care requires a more holistic approach including an important role for well-being (Schuurmans, 2004; Valentijn et al., 2013). Previous research has shown dimensions of well-being for frail older people such as affection and doing things that make you feel valued (Coast et al., 2008; Schuurmans, 2004) but more research is required, also on well-being of informal caregivers.

Our systematic review indicates that we possibly need to shift our focus from effectiveness in terms of clinical outcomes to the *process* of integrated care. Integration implies “bringing together or merging the elements or components that were formerly separate” (Kodner & Spreeuwenberg, 2002) and integrated care is one strategy designed to solve the fragmentation of care, lack of continuity and coordination (Fabbricotti, 2007; Kodner, 2009). However, our review shows that the focus of research is mainly on health and health care utilization outcomes rather than on the care process. The evidence thus far on care process outcomes is rather promising. Consequently, professionals, researchers and policymakers might need to shift their expectations of the influence of integrated care from health outcomes to achieving organizational aims such as maintaining continuity and integrating health, social and informal care. This requires further empirical work on valid measurement instruments for the care process (see also (Bautista, Nurjono, Lim, Dessers, & Vrijhoef, 2016)), as well as on outcomes for the professionals.

Future research should provide recommendations on specific cost drivers of preventive, integrated care for frail older people. Researchers considered various types of costs to determine the cost-effectiveness of preventive, integrated interventions. There seems to be some consensus on the consideration of hospital care, nursing home admissions, home care and primary care but until now other types of care such as paramedical care and different forms of social care (psychosocial care, meals on wheels, day care) have often been neglected.

A final implication is that researchers might want to adopt a less static approach to research since both integration and frailty are dynamic, complex processes. The evaluations are summative; researchers have taken two to four quantitative snapshots in time. However, it might be useful to monitor both the frail older people and the integration process more closely and continuously. Integration is very complex since it involves overcoming several barriers to integration (Kodner, 2009; Valentijn et al., 2013). Close continuous monitoring would also lead to more transparency on the specific contents of the interventions, particularly the follow-up, since the description of the interventions in the current type of evaluation research is limited (see also (Eklund & Wilhelmson, 2009)). Action research, which integrates research and practice in close co-operation could be a future direction of study in order to improve daily care practice (Meyer, 2000).

Conclusion

The diverse and high expectations for preventive, integrated care for community-dwelling frail older people in research, policy and practice should be tempered slightly. Our systematic review does not provide a solid base of evidence, particularly for important policy aims such as preventing functional decline and institutionalization. Effectiveness may be pursued in other outcomes, such as well-being and care processes. The level of integration is not decisive since higher level of integration does not seem to lead to better outcomes. More attention should be devoted to exploring effectiveness for subgroups of frail older people. Researchers in integrated care should be more aware of the underlying principles of the topic of integrated care: they should integrate their research, consider continuity and differentiate between frail older people.

References

Bautista, M. A. C., Nurjono, M., Lim, Y. W., Dessers, E., & Vrijhoef, H. J. (2016). Instruments measuring integrated care: A systematic review of measurement properties. *Milbank Quarterly, Dec;94(4):862-917.*

Béland, F., Bergman, H., Lebel, P., Clarfield, A. M., Tousignant, P., Contandriopoulos, A. P., & Dallaire, L. (2006). A system of integrated care for older persons with disabilities in Canada: Results from a randomized controlled trial. *J Gerontol Ser A Biol Sci Med Sci, 61*, 367-373.

Boult, C., Boult, L. B., Morishita, L., Dowd, B., Kane, R. L., & Urdangarin, C. F. (2001). A randomized clinical trial of outpatient geriatric evaluation and management. *Journal of the American Geriatrics Society, 49*(4), 351-359.

Bramer, W. M., Giustini, D., Kramer, B. M., & Anderson, P. (2013). The comparative recall of google scholar versus PubMed in identical searches for biomedical systematic reviews: A review of searches used in systematic reviews. *Systematic Reviews, 2*(1), 1.

Burns, R., Nichols, L. O., Martindale-Adams, J., & Graney, M. J. (2000). Interdisciplinary geriatric primary care evaluation and management: Two-Year outcomes. *Journal of the American Geriatrics Society, 48*(1), 8-13.

Burns, R., Nichols, L. O., Graney, M. J., & Cloar, F. T. (1995). Impact of continued geriatric outpatient management on health outcomes of older veterans. *Archives of Internal Medicine, 155*(12), 1313-1318.

Clark, J. (2001). Preventive home visits to elderly people. Their effectiveness cannot be judged by randomised controlled trials. *BMJ (Clinical Research Ed.), 323*(7315), 708.

Coast, J., Flynn, T. N., Natarajan, L., Sproston, K., Lewis, J., Louviere, J. J., & Peters, T. J. (2008). Valuing the ICECAP capability index for older people. *Social Science & Medicine, 67*(5), 874-882.

Collard, R. M., Boter, H., Schoevers, R. A., & Oude Voshaar, R. C. (2012). Prevalence of frailty in community-dwelling older persons: A systematic review. *J Am Geriatr Soc, 60*(8), 1487-1492.

Comans, T. A., Peel, N. M., Gray, L. C., & Scuffham, P. A. (2013). Quality of life of older frail persons receiving a post-discharge program. *Health and Quality of Life Outcomes, 11*(1), 1.

Dalby, D. M., Sellors, J. W., Fraser, F. D., Fraser, C., van Ineveld, C., & Howard, M. (2000). Effect of preventive home visits by a nurse on the outcomes of frail elderly people in the community: A randomized controlled trial. *CMAJ, 162*(4), 497-500.

De Stampa, M., Vedel, I., Buyck, J. F., Lapointe, L., Bergman, H., Beland, F., & Ankri, J. (2014). Impact on hospital admissions of an integrated primary care model for very frail elderly patients. *Arch Gerontol Geriatr, 58*, 350-355.

Dent, E., Kowal, P., & Hoogendijk, E. O. (2016). Frailty measurement in research and clinical practice: A review. *European Journal of Internal Medicine, 31*, 3-10.

Drubbel, I. (2014). *Frailty screening in older patients in primary care using routine care data*. PhD Thesis, Utrecht University.

Drummond, M. F., Sculpher, M. J., Claxton, K., Stoddart, G. L., & Torrance, G. W. (2005). *Methods for the economic evaluation of health care programmes* (3rd edition ed.) Oxford: Oxford university press.

Effective Practice and Organisation of Care (EPOC). (2015). Suggested risk of bias criteria for EPOC reviews. EPOC resources for review authors. Oslo: Norwegian knowledge centre for the health services. Retrieved from http://epoc.cochrane.org/epoc-specific-resources-review-authors

Ekdahl, A. W., Alwin, J., Eckerblad, J., Husberg, M., Jaarsma, T., Mazya, A. L., . . . Carlsson, P. (2016). Long-term evaluation of the ambulatory geriatric assessment: A frailty intervention trial (AGe-FIT): Clinical outcomes and total costs after 36 months. *J.Am.Med.Dir.Assoc., 17*, 263-268.

Eklund, K., & Wilhelmson, K. (2009). Outcomes of coordinated and integrated interventions targeting frail elderly people: A systematic review of randomised controlled trials. *Health Soc Care Community, 17*, 447-458.

Elkan, R., Kendrick, D., Dewey, M., Hewitt, M., Robinson, J., Blair, M., . . . Brummell, K. (2001). Effectiveness of home based support for older people: Systematic review and meta-analysis. *BMJ (Clinical Research Ed.), 323*(7315), 719-725.

Engelhardt, J., Toseland, R., & O'Donnell, J. (1996). The effectiveness and efficiency of outpatient geriatric evaluation and management. *J Am Geriatr Soc, 44*, 847-856.

Evers, S., & Paulus, A. (2015). Health economics and integrated care: A growing and challenging relationship. *Int J Integr Care, 15*(2)

Fabbricotti, I. N. (2007). *Zorgen voor zorgketens [Taking care of integrated care].* PhD Thesis, Erasmus University Rotterdam.

Fairhall, N., Sherrington, C., Kurrle, S. E., Lord, S. R., Lockwood, K., Howard, K., . . . Aggar, C. (2015). Economic evaluation of a multifactorial, interdisciplinary intervention versus usual care to reduce frailty in frail older people. *Journal of the American Medical Directors Association, 16*(1), 41-48.

Ferrucci, L., Guralnik, J. M., Studenski, S., Fried, L. P., Cutler, G. B., & Walston, J. D. (2004). Designing randomized, controlled trials aimed at preventing or delaying functional decline and disability in frail, older persons: A consensus report. *Journal of the American Geriatrics Society, 52*(4), 625-634.

Fried, L. P., Ferrucci, L., Darer, J., Williamson, J. D., & Anderson, G. (2004). Untangling the concepts of disability, frailty, and comorbidity: Implications for improved targeting and care. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 59*(3), 255-263.

Fried, L. P., Tangen, C. M., Walston, J., Newman, A. B., Hirsch, C., Gottdiener, J., . . . Cardiovascular Health Study Collaborative Research Group. (2001). Frailty in older adults: Evidence for a phenotype. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 56*(3), M146-56.

Gagnon, A. J., Schein, C., McVey, L., & Bergman, H. (1999). Randomized controlled trial of nurse case management of frail older people. *J Am Geriatr Soc, 47*, 1118-1124.

Gobbens, R. J. J., & van Assen, M. A. L. M. (2014). The prediction of quality of life by physical, psychological and social components of frailty in community-dwelling older people. *Quality of Life Research, 23*(8), 2289-2300.

Gobbens, R. J. J., Luijkx, K. G., Wijnen-Sponselee, M. T., & Schols, J. M. G. A. (2010). Towards an integral conceptual model of frailty. *The Journal of Nutrition, Health & Aging, 14*(3), 175-181.

Gray, D., Armstrong, C. D., Dahrouge, S., Hogg, W., & Zhang, W. (2010). Cost-effectiveness of anticipatory and preventive multidisciplinary team care for complex patients: Evidence from a randomized controlled trial. *Canadian Family Physician Medecin De Famille Canadien, 56*(1), e20-9.

Grootegoed, E., & Van Dijk, D. (2012). The return of the family? Welfare state retrenchment and client autonomy in long-term care. *Journal of Social Policy, 41*(4), 677-694.

Hébert, R., Raîche, M., Dubois, M. F., Gueye, N. R., Dubuc, N., & Tousignant, M. (2010). Impact of PRISMA, a coordination-type integrated service delivery system for frail older people in Quebec (Canada): A quasi-experimental study. *J Gerontol B Psychol Sci Soc Sci, 65 B*, 107-118.

Hébert, R., Dubois, M. F., Raiche, M., Dubuc, N., & Group, P. R. E. (2008). The effectiveness of the PRISMA integrated service delivery network: Preliminary report on methods and baseline data. *Int J Integr Care, 8*, e03.

Hinkka, K., Karppi, S. L., Pohjolainen, T., Rantanen, T., Puukka, P., & Tilvis, R. (2007). Network-based geriatric rehabilitation for frail elderly people: Feasibility and effects on subjective health and pain at one year. *J.Rehabil.Med., 39*, 473-478.

Johri, M., Beland, F., & Bergman, H. (2003). International experiments in integrated care for the elderly: A synthesis of the evidence. *International Journal of Geriatric Psychiatry, 18*, 222-235.

Kehusmaa, S., Autti-Rämö, I., Valaste, M., Hinkka, K., & Rissanen, P. (2010). Economic evaluation of a geriatric rehabilitation programme: A randomized controlled trial. *Journal of Rehabilitation Medicine, 42*(10), 949-955.

Kerse, N., McLean, C., Moyes, S. A., Peri, K., Ng, T., Wilkinson-Meyers, L., . . . Connolly, M. (2014). The cluster-randomized BRIGHT trial: Proactive case finding for community-dwelling older adults. *Ann Fam Med, 12*, 514-524.

Kodner, D. L. (2009). All together now: A conceptual exploration of integrated care. *Healthcare Quarterly (Toronto, Ont.), 13 Spec No*, 6-15.

Kodner, D. L., & Spreeuwenberg, C. (2002). Integrated care: Meaning, logic, applications, and implications - a discussion paper. *Int J Integr Care, 14*(2)

Kono, A., Izumi, K., Yoshiyuki, N., Kanaya, Y., & Rubenstein, L. Z. (2016). Effects of an updated preventive home visit program based on a systematic structured assessment of care needs for ambulatory frail older adults in japan: A randomized controlled trial. *J Gerontol A Biol Sci Med Sci, 71*(12), 1631-1637.

Kono, A., Kanaya, Y., Fujita, T., Tsumura, C., Kondo, T., Kushiyama, K., & Rubenstein, L. Z. (2012). Effects of a preventive home visit program in ambulatory frail older people: A randomized controlled trial. *J Gerontol A Biol Sci Med Sci, 67*, 302-309.

Kono, A., Kanaya, Y., Tsumura, C., & Rubenstein, L. Z. (2013). Effects of preventive home visits on health care costs for ambulatory frail elders: A randomized controlled trial. *Aging Clin Exp Res, 25*, 575-581.

Kristensson, J., Ekwall, A. K., Jakobsson, U., Midlöv, P., & Hallberg, I. R. (2010). Case managers for frail older people: A randomised controlled pilot study. *Scand J Caring Sci, 24*, 755-763.

Lacas, A., & Rockwood, K. (2012). Frailty in primary care: A review of its conceptualization and implications for practice. *BMC Med, Jan 11*(10), 4.

Lafortune, L., Béland, F., Bergman, H., & Ankri, J. (2009). Health status transitions in community-living elderly with complex care needs: A latent class approach. *BMC Geriatrics, 9*(6)

Lette, M., Baan, C. A., van den Berg, M., & de Bruin, S. R. (2015). Initiatives on early detection and intervention to proactively identify health and social problems in older people: Experiences from the Netherlands. *BMC Geriatr., 15*(143).

Leung, A. Y., Lou, V. W., Chan, K. S., Yung, A., & Chi, I. (2010). Care management service and falls prevention: A case-control study in a chinese population. *J Aging Health, 22*, 348-361.

Liu, L. F. (2014). The health heterogeneity of and health care utilization by the elderly in taiwan. *Int J Environ Res Public Health, 11*, 1384-1397.

Looman, W. M., Fabbricotti, I. N., de Kuyper, R., & Huijsman, R. (2016). The effects of a pro-active integrated care intervention for frail community-dwelling older people: A quasi-experimental study with the GP-practice as single entry point. *BMC Geriatr., 16*, 43.

Looman, W. M., Fabbricotti, I. N., & Huijsman, R. (2014). The short-term effects of an integrated care model for the frail elderly on health, quality of life, health care use and satisfaction with care. *Int J Integr Care, 14*, e034.

Looman, W. M., Huijsman, R., Bouwmans-Frijters, C., Stolk, E. A., & Fabbricotti, I. N. (2016). Cost-effectiveness of the 'Walcheren Integrated Care Model' intervention for community-dwelling frail elderly. *Fam Pract, 33*, 154-160.

Low, L. F., Yap, M., & Brodaty, H. (2011). A systematic review of different models of home and community care services for older persons. *BMC Health Serv Res, 11*, 93.

Lutomski, J. E., Baars, M., Boter, H., Buurman, B., Elzen, W. d., Jansen, A., . . . Olde Rikkert, M. (2014). Frailty, disability, and multi-morbidity: The relationship with quality of life and healthcare costs in elderly people. *Nederlands Tijdschrift Geneeskunde, 158*, A7297.

Makai, P. (2014). *Moving beyond the QALY: Economic evaluation in health and social care for elderly populations*. PhD Thesis, Erasmus University Rotterdam.

Makai, P., Looman, W., Adang, E., Melis, R., Stolk, E., & Fabbricotti, I. (2015). Cost-effectiveness of integrated care in frail elderly using the ICECAP-O and EQ-5D: Does choice of instrument matter? *Eur J Health Econ, 16*, 437-450.

Melis, R. J., Adang, E., Teerenstra, S., van Eijken, M. I., Wimo, A., van Achterberg, T., . . . Rikkert, M. G. (2008). Cost-effectiveness of a multidisciplinary intervention model for community-dwelling frail older people. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 63*(3), 275-282.

Melis, R. J. F., van Eijken, M. I. J., Teerenstra, S., van Achterberg, T., Parker, S. G., Borm, G. F., . . . Rikkert, M. (2008). A randomized study of a multidisciplinary program to intervene on geriatric syndromes in vulnerable older people who live at home (Dutch EASYcare study). *J.Gerontol.Ser.A-Biol.Sci.Med.Sci., 63*, 283-290.

Metzelthin, S. F., van Rossum, E., de Witte, L. P., Ambergen, A. W., Hobma, S. O., Sipers, W., & Kempen, G. I. (2013). Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people: Cluster randomised controlled trial. *Bmj, 347*, f5264.

Metzelthin, S. F., van Rossum, E., Hendriks, M. R., De Witte, L. P., Hobma, S. O., Sipers, W., & Kempen, G. I. (2015). Reducing disability in community-dwelling frail older people: Cost-effectiveness study alongside a cluster randomised controlled trial. *Age and Ageing, 44*(3), 390-396.

Meyer, J. (2000). Using qualitative methods in health related action research. *British Medical Journal, 320*(7228), 178.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annals of Internal Medicine, 151*(4), 264-269.

Möller, U. O., Kristensson, J., Midlöv, P., Ekdahl, C., & Jakobsson, U. (2014). Effects of a one-year home-based case management intervention on falls in older people: A randomized controlled trial. *J Aging Phys Act, 22*, 457-464.

Montgomery, P. R., & Fallis, W. M. (2003). South Winnipeg integrated geriatric program (SWING): A rapid community-response program for the frail elderly. *Can J Aging, 22*, 275-281.

Morishita, L., Boult, C., Boult, L., Smith, S., & Pacala, J. T. (1998). Satisfaction with outpatient geriatric evaluation and management (GEM). *Gerontologist, 38*, 303-308.

Mur-Veeman, I., Hardy, B., Steenbergen, M., & Wistow, G. (2003). Development of integrated care in England and the Netherlands: Managing across public–private boundaries. *Health Policy, 65*(3), 227-241.

O'Donnell, J. C., & Toseland, R. W. (1997). Does geriatric evaluation and management improve the health behavior of older veterans in psychological distress? *J Aging Health, 9*, 473-497.

Oliver, D., Foot, C., & Humphries, R. (2014). *Making our health and care systems fit for an ageing population*. London: The King's Fund.

Ouwens, M., Wollersheim, H., Hermens, R., Hulscher, M., & Grol, R. (2005). Integrated care programmes for chronically ill patients: A review of systematic reviews. *International Journal for Quality in Health Care : Journal of the International Society for Quality in Health Care, 17*(2), 141-146.

Reuben, D. B., Frank, J. C., Hirsch, S. H., McGuigan, K. A., & Maly, R. C. (1999). A randomized clinical trial of outpatient comprehensive geriatric assessment coupled with an intervention to increase adherence to recommendations. *Journal of the American Geriatrics Society, 47*(3), 269-276.

Rockwood, K., Stadnyk, K., Carver, D., MacPherson, K. M., Beanlands, H. E., Powell, C., . . . Tonks, R. S. (2000). A clinimetric evaluation of specialized geriatric care for rural dwelling, frail older people. *J Am Geriatr Soc, 48*, 1080-1085.

Rubenstein, L. Z., Alessi, C. A., Josephson, K. R., Trinidad Hoyl, M., Harker, J. O., & Pietruszka, F. M. (2007). A randomized trial of a screening, case finding, and referral system for older veterans in primary care. *J Am Geriatr Soc, 55*, 166-174.

Ruikes, F. G. H., Zuidema, S. U., Akkermans, R. P., Assendelft, W. J. J., Schers, H. J., & Koopmans, R. T. C. M. (2016). Multicomponent program to reduce functional decline in frail elderly people: A cluster controlled trial. *J Am Board Fam Med, 29*, 209-217.

Sandberg, M., Jakobsson, U., Midlöv, P., & Kristensson, J. (2015). Cost-utility analysis of case management for frail older people: Effects of a randomised controlled trial. *Health Econ Rev, 5*(1): 51.

Sandberg, M., Kristensson, J., Midlöv, P., & Jakobsson, U. (2015). Effects on healthcare utilization of case management for frail older people: A randomized controlled trial (RCT). *Arch Gerontol Geriatr, 60*, 71-81.

Schraeder, C., Fraser, C. W., Clark, I., & Long, B. (2008 Nov). Evaluation of a primary care nurse case management intervention for chronically ill community dwelling older people. *Journal of Clinical Nursing, 17*(11c), 407-417.

Schuurmans, J. (2004). *Promoting well-being in frail elderly people. Theory and intervention*. PhD Thesis, University of Groningen.

Shapiro, A., & Taylor, M. (2002). Effects of a community-based early intervention program on the subjective well-being, institutionalization, and mortality of low-income elders. *The Gerontologist, 42(3):* 334-341.

Slaets, J. P. J. (2006). Vulnerability in the elderly: Frailty. *Medical Clinics of North America, 90*, 593-601.

Stokes, J., Panagioti, M., Alam, R., Checkland, K., Cheraghi-Sohi, S., & Bower, P. (2015). Effectiveness of case management for 'at risk' patients in primary care: A systematic review and meta-analysis. *PLoS One, 10*.

Stuck, A. E., Egger, M., Hammer, A., Minder, C. E., & Beck, J. C. (2002). Home visits to prevent nursing home admission and functional decline in elderly people: Systematic review and meta-regression analysis. *Jama, 287*(8), 1022-1028.

Toseland, R. W., O'Donell, J. C., Engelhardt, J. B., Hendler, S. A., Richie, J. T., & Jue, D. (1996). Outpatient geriatric evaluation and management: Results of a randomized trial. *Med Care, 34*(6), 624-640.

Tourigny, A., Durand, P., Bonin, L., Hebert, R., & Rochette, L. (2004). Quasi-experimental study of the effectiveness of an integrated service delivery network for the frail elderly. *Can J Aging, 23*, 231-246.

Valentijn, P. P., Schepman, S. M., Opheij, W., & Bruijnzeels, M. A. (2013). Understanding integrated care: A comprehensive conceptual framework based on the integrative functions of primary care. *Int J Integr Care, 13*(1), 655-679.

van der Vorst, A., Zijlstra, G. R., De Witte, N., Duppen, D., Stuck, A. E., Kempen, G. I., . . . D-SCOPE Consortium. (2016). Limitations in activities of daily living in community-dwelling people aged 75 and over: A systematic literature review of risk and protective factors. *PloS One, 11*(10), e0165127.

Van Leeuwen, K. M., Bosmans, J. E., Jansen, A. P. D., Hoogendijk, E. O., Muntinga, M. E., Van Hout, H. P. J., . . . Van Tulder, M. W. (2015). Cost-effectiveness of a chronic care model for frail older adults in primary care: Economic evaluation alongside a stepped-wedge cluster-randomized trial. *J Am Geriatr Soc, 63*, 2494-2504.

Vanselow, N. A., Donaldson, M. S., & Yordy, K. D. (1995). A new definition of primary care. *Jama, 273*(3), 192-192.

Vedel, I., De Stampa, M., Bergman, H., Ankri, J., Cassou, B., Blanchard, F., & Lapointe, L. (2009). Healthcare professionals and managers' participation in developing an intervention: A pre-intervention study in the elderly care context. *Implementation Science, 4*(1), 1.

Wiles, J. L., Leibing, A., Guberman, N., Reeve, J., & Allen, R. E. (2012). The meaning of "aging in place" to older people. *The Gerontologist, 52*(3), 357-366.

You, E. C., Dunt, D., Doyle, C., & Hsueh, A. (2012). Effects of case management in community aged care on client and carer outcomes: A systematic review of randomized trials and comparative observational studies. *BMC Health Serv Res, 12*, 395.

Appendix Search strategy Embase

(‘integrated health care system’/exp OR ‘managed care’/exp OR ‘case manager’/exp OR ‘case management’/exp OR ‘disease management’/de OR (((integrat* OR managed OR continuit* OR shared OR coordinat* OR chain* OR partnership*) NEAR/6 (care OR healthcare* OR system)) OR ((case* OR care OR discharge* OR comprehensiv* OR disease*) NEAR/3 manage*) OR ((Patient OR person) NEXT/1 (Centered* OR Centred*)) OR ((vertical* OR clinical* OR functional*) NEAR/3 integrat*)):ab,ti) AND (‘frail elderly’/exp OR ‘very elderly’/exp OR (‘vulnerable population’/exp AND aged/exp) OR (frail* OR ((vulnerable OR very OR ‘high risk’) NEAR/3 (elder* OR old*)) OR ‘oldest old’ OR septagenar* OR octagenar* OR nonagenar* OR centenar* OR supercentenar*):ab,ti) AND ((family OR physician* OR practice*:de,it,lnk,ab,ti OR ‘primary care’ OR ‘Primary Health Care’/exp OR primary:de,it,lnk,ab,ti OR (general NEXT/1 pract*) OR gp:ab,ti OR gps:ab,ti) OR ‘primary health care’/exp OR ‘general practitioner’/exp OR ‘general practice’/exp OR ‘family medicine’/exp OR ‘ambulatory care’/exp OR ‘outpatient care’/exp OR ‘outpatient department’/exp OR ‘community care’/exp OR ‘home care’/exp OR population/exp OR home/exp OR ‘rural population’/exp OR ‘urban population’/exp OR ‘visiting nursing service’/exp OR ‘homebound patient’/exp OR ‘independent living’/exp OR (((primary OR ‘first line’) NEAR/3 (care OR healthcare)) OR ((general OR family) NEAR/3 (practitioner* OR practice* OR doctor* OR medicine* OR physician*)) OR gp OR gps OR ambulatory* OR outpatient* OR communit* OR ((living OR care OR healthcare OR management OR visit*) NEAR/6 home) OR (independent* NEAR/3 (living OR live)) OR ‘home nursing’ OR neighbo* OR population* OR ‘nursing service’ OR (visit* NEAR/3 nurs*) OR homebound OR (house NEXT/1 call*) OR ‘Aging in Place’):ab,ti) AND [english]/lim NOT ([Conference Abstract]/lim OR [Letter]/lim OR [Note]/lim OR [Editorial]/lim)

Supplementary table 6.1: Risk of bias

Authors	1. Was the allocation sequence adequately generated?	2. Was the allocation adequately concealed?	3. Were baseline outcome measure-ments similar?	4. Were baseline characteristics similar?	5. Was incomplete outcome data adequately addressed?	6. Was knowledge of the allocated intervention adequately prevented during the study?	7. Was the study adequately protected against contamination?	8. Was the study free from selective outcomes reporting?	9. Was the study free from other risks of bias?	Total EPOC- score
Béland et al. 2006	1	1	?	1	0	1	1	1	0	6
Bleijenberg et al. 2014	1	1	1	?	?	0	1	1	0	5
Drubbel et al. 2014	?	?	?	?	1	?	1	1	0	3
Burns et al. 1995	1	1	1	1	1	0	1	1	1	8
Burns et al. 2000	?	?	1	1	?	0	1	1	1	5
Dalby et al. 2000	1	1	?	1	?	1	1	1	1	7
de Stampa et al. 2014	0	0	1	1	?	?	0	1	1	4
Ekdahl et al. 2016	1	1	?	1	?	1	0	1	0	5
Engelhardt et al. 1996	?	?	1	1	0	1	1	1	1	6
Toseland et al. 1996	?	?	1	1	?	1	?	0	1	4
O'Donnell, Toseland 1997	?	?	?	1	?	1	1	1	1	5
Fairhall et al. 2015	?	?	1	1	1	1	0	1	1	6
Gagnon et al. 1999	1	1	?	1	1	1	0	1	1	7
Gray et al. 2010	?	?	1	1	?	?	0	1	0	3
Hébert et al. 2008	0	0	0	0	?	0	1	1	0	2
Hébert et al. 2010	0	0	0	0	?	?	1	1	0	2
Hinkka et al. 2007	1	1	1	1	1	1	0	0	1	7
Kehusmaa et al. 2010	1	1	?	1	1	1	0	1	1	7
Kerse et al. 2014	1	1	1	1	?	1	0	0	1	6
Kono et al. 2012	1	1	0	?	1	?	0	1	1	5
Kono et al. 2013	1	1	?	?	?	?	0	1	0	3
Kono et al. 2016	1	1	1	?	?	1	0	1	1	6
Kristenson et al. 2010	1	1	1	1	?	?	0	1	0	5
Möller et al. 2014	1	1	1	1	1	0	0	1	1	7
Sandberg et al. 2015a	1	1	1	1	1	1	0	1	1	8

Supplementary table 6.1: (continued)

Authors	1. Was the allocation sequence adequately generated?	2. Was the allocation adequately concealed?	3. Were baseline outcome measure-ments similar?	4. Were baseline characteristics similar?	5. Was incomplete outcome data adequately addressed?	6. Was knowledge of the allocated intervention adequately prevented during the study?	7. Was the study adequately protected against contamination?	8. Was the study free from selective outcomes reporting?	9. Was the study free from other risks of bias?	Total EPOC- score
Sandberg et al. 2015b	?	?	1	1	1	1	0	1	1	6
Leung et al. 2010	0	0	?	1	1	?	1	1	1	5
Looman et al. 2014	0	0	1	0	?	?	1	1	1	4
Makai et al. 2015	0	0	?	0	1	?	1	1	0	3
Looman et al. 2016a	0	0	1	0	?	?	1	1	1	4
Looman et al. 2016b	0	0	?	0	1	?	1	1	1	4
Melis et al. 2008a	1	1	1	1	1	0	1	1	1	8
Melis et al. 2008b	?	?	1	1	1	?	1	1	1	6
Metzelthin et al. 2013	1	1	1	0	1	1	1	1	1	8
Metzelthin et al. 2015	1	?	1	0	?	?	1	1	1	5
Montgomery, Fallis 2003	1	1	0	0	0	1	0	0	0	3
Morishita et al. 1998	?	?	?	1	?	?	0	1	1	3
Boult et al. 2001	1	1	1	1	1	1	1	1	1	9
Reuben et al. 1999	1	1	1	1	1	1	1	1	1	9
Rockwood et al. 2000	?	?	1	1	?	1	1	1	0	5
Rubenstein et al. 2007	1	1	1	1	1	1	1	0	1	8
Ruikes et al. 2015	0	0	1	0	0	0	1	1	0	3
Schreader et al. 2008	0	0	1	0	0	?	1	1	0	3
Shapiro Taylor 2002	1	1	1	1	0	0	0	1	1	6
Tourigny et al. 2004	0	0	1	1	?	?	1	1	1	5
van Leeuwen et al. 2015	?	?	?	0	1	?	1	1	0	3

CHAPTER 7

Frailty subpopulations in integrated care arrangements

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Abstract

Background

A fundamental issue in elderly care is targeting those older people at risk and in need of care interventions. Frailty is widely used to capture variations in health risks than but there is no general consensus on the conceptualization of frailty. Indeed, there is considerable heterogeneity in the group of older people characterized as frail. This research identifies frailty profiles based on the physical, psychological, social and cognitive domains of functioning and the severity of the problems within these domains.

Methods

This research was a secondary data-analysis of older persons derived from the Older Person and Informal Caregiver Minimum Dataset. Selected respondents were 60 years and older (n=43,704; 59.6% female). The following variables were included: self-reported health, cognitive functioning, social functioning, mental health, morbidity status, and functional limitations. Using latent class analysis, the population was divided in subpopulations that were subsequently discussed in a focus group with older people for further validation.

Results

We distinguished six frailty profiles*:* relatively healthy; mild physically frail; psychologically frail; severe physically frail; medically frail and multi-frail. The relatively healthy had limited problems across all domains. In three profiles older people mostly had singular problems in either the physical or psychological domain and the severity of the problems differed. Two remaining profiles were multidimensional with a combination of problems that extended to the social and cognitive domain.

Conclusions

Our research provides an empirical base for meaningful frailty profiles. The profiles showed specific patterns underlying the problems in different domains of functioning. The heterogeneous population of frail older people has differing needs and faces different health issues that should be considered to tailor care interventions. Evaluation research of these interventions should acknowledge the heterogeneity of frailty by profiling.

Background

Population ageing and care for older people pose major challenges for health care systems globally. The number of older persons is increasing rapidly; the number of people aged 60 years or over will increase by 56 percent between 2015 and 2030 and the population over 80 years of age (oldest–old) will increase even faster (United Nations, 2015). There is wide variety within this increasing population; older people experience their health considerably differently (World Health Organization, 2015) and their needs differ as well (Rockwood, Fox, Stolee, Robertson, & Beattie, 1994). Consequently, a fundamental issue in elderly care is targeting those older people at risk and in need of care interventions. The question remains: which intervention works best for whom? Traditionally, chronological age was used as a marker for targeted care. However, age is not specific enough because the ageing process varies substantially between individuals (Slaets, 2006).

Consequently, the notion of frailty was introduced to better target older people in need of care interventions (Schuurmans, Steverink, Lindenberg, Frieswijk, & Slaets, 2004; van Kempen et al., 2013), because frailty better captures variations in health risks than chronological age (Lacas & Rockwood, 2012). Frailty is a complex condition involving the interaction of multiple problems in different domains of functioning (Lacas & Rockwood, 2012). Frail people are at risk for adverse outcomes such as falls, functional decline, hospitalization, institutionalization and mortality (Clegg, Young, Iliffe, Rikkert, & Rockwood, 2013; Fried et al., 2001; Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010). Yet, despite agreeing on the complexity of frailty and its relation to adverse outcomes, health care professionals, policy makers and researchers have not achieved consensus on the conceptualization of frailty (Dent, Kowal, & Hoogendijk, 2016). Frailty has become a buzzword (Manthorpe & Iliffe, 2015) and considerable heterogeneity exists within the group of older people labelled frail.

To elucidate the heterogeneity within the frail population, researchers have explored the physical, psychological and social domains of frailty. Frailty has been related to the physical domain of functioning with characteristics such as unintentional weight loss or exhaustion (Fried et al., 2001). Other researchers have conceptualized frailty from a broader perspective which also includes the psycho-social domains (Gobbens et al., 2010; Markle-Reid & Browne, 2003; Schuurmans et al., 2004). Important in the daily functioning of older people, these domains are characterized by memory loss, and feelings of anxiety or loneliness. Still, the distinction between the separate domains does not demonstrate the full complexity of frailty. The domains might influence or reinforce each other and thus it remains unclear which specific combinations lead to adverse outcomes (Gobbens et al., 2010; Lafortune, Béland, Bergman, & Ankri, 2009). Frailty has been conceptualized as an accumulation of deficits in these domains and a frailty index can be calculated by dividing the number of deficits a person has by the maximum number of deficits (Rockwood & Mitnitski, 2007; Rockwood et al., 2005). Also, to identify older people in need of interventions, frailty measurement instruments are used that sum the number of health problems and do not differentiate between the underlying problems (Metzelthin et al., 2010).

Further specification of frailty by defining *profiles* of frail older people contributes to the ongoing debate on the conceptualization of frailty and could improve interventions. To date, the heterogeneity in the frail population is not fully acknowledged in care interventions and populations substantially differ between and within interventions (Looman, Huijsman, & Fabbricotti, 2018). Profiling, or distinguishing subpopulations, is common in other disciplines such as social sciences, economics and medical sciences (Lafortune et al., 2009). Recently, subpopulations have also been used in studies of the older population. However, this research focused specifically on chronic conditions (Gellert et al., 2017; Newcomer, Steiner, & Bayliss, 2011; Olaya et al., 2017), general health status (Lafortune et al., 2009; Liu, Tian, & Yao, 2014) and physical frailty (Liu et al., 2017). These studies did not include the psychological and social domains (Lafortune et al., 2009; Liu et al., 2014; Newcomer et al., 2011) whereas researchers have emphasized that frailty also involves both these domains of functioning (Gobbens et al., 2010; Markle-Reid & Browne, 2003; Schuurmans et al., 2004).

Therefore, the aim of this study is to identify frailty profiles, constructed on the basis of not only functional limitations, multi-morbidity and self-reported health, but also mental, cognitive and social functioning. Our research expands current knowledge in creating a frailty taxonomy which includes the full range of domains of functioning and the severity of the problems within these domains. These identified profiles could be applied in tailoring interventions such as integrated care interventions and should form part of the evaluation of these interventions.

Methods

Data source

For this study we performed a secondary data-analysis on The Older Person and Informal Caregiver Survey Minimum Dataset (TOPICS-MDS), a large data-sharing initiative in the Netherlands (for more information see (Lutomski et al., 2013b). In 2008, the Dutch Ministry of Health, Welfare and Sports started the National Care for the Elderly Programme (NCEP) which aimed at reorganizing health and social care according to the needs of older people. Between 2008 and 2014 several implementation and research projects were carried out and funded by the NCEP. Within the NCEP, the TOPICS-MDS instrument was developed, a standardized instrument to study the effects of these projects on older people and their informal caregivers. The instrument was based on other validated instruments on morbidity, quality of life, functional limitations, mental health, social functioning and health service utilization. Researchers in all projects collected the data consistent with the TOPICS-MDS so a national, uniform dataset was created. The TOPICS-MDS currently contains pooled data from 54 research projects which differ across study design, sampling framework an inclusion criteria. TOPICS-MDS is a fully anonymized dataset available for public access, and therefore the analysis in this study is exempt from ethical review (Radboud University Medical Centre Ethical Committee review reference number: CMO: 2012/120) (Lutomski et al., 2013b). For our study, we selected the baseline data of the respondents aged 60 years and older (n=43,704).

Measurements

Baseline measurements entailed: *Self-reported health* is assessed with two items from RAND-36. The first item allows older people to evaluate their own current general health in the following answer categories: excellent; very good; good; fair; poor. The second item is self-reported health compared to one year ago with five answer categories: much better; somewhat better; about the same; somewhat worse; much worse (van der Zee & Sanderman, 1993). *Cognitive functioning* is measured by one item from EQ-5D+c focused on problems with memory, attention and thinking, and had three answer categories: no problems; some problems; extreme problems with memory, attention and thinking (Krabbe, Stouthard, Essink-Bot, & Bonsel, 1999). *Social functioning* is measured with one item on how often social activities are hampered by physical health or emotional problems. The possible answers are: none of the time, a little of the time, some of the time, most of the time, all of the time (van der Zee & Sanderman, 1993). *Mental health* is measured on a five-item RAND-36 scale with items that question how often the respondents have felt nervous, calm and peaceful, down-hearted and blue, happy, or so down in the dumps that nothing could cheer them up. The scores range from 0–100 and a higher score implies better mental health (van der Zee & Sanderman, 1993). *Morbidity status* is self-reported: participants could indicate their morbidities on a 17-item list of conditions (no/yes), such as heart failure, joint damage and hearing disorders (Lutomski et al., 2013b). The number of morbidities were summed and the score ranges from 0–17. *Func-*

tional limitations are measured with the modified Katz-15 instrument that assesses the ability to perform 15 activities of daily living (ADL) and instrumental activities of daily living (IADL) (yes/no) such as getting dressed, shopping and taking medication (Laan et al., 2014; Weinberger et al., 1992). The number of activities that respondents cannot do is summed, ranging from 0–15 with a higher score indicating more functional limitations.

Frailty index is calculated from 45 health deficits in the TOPICS-MDS (Lutomski et al., 2013a), including the before mentioned self-reported health, cognitive functioning, social functioning, mental health, functional limitations and the five items of the EQ-5D (Krabbe et al., 1999). The number of health problems of the older person is divided by the total number of 45 health problems; the score ranges from 0 to 1 with a higher score indicating a higher level of frailty (Lutomski et al., 2013a; Searle, Mitnitski, Gahbauer, Gill, & Rockwood, 2008).

Demographic variables: gender, living arrangement (independent; in residential care or nursing home), marital status (married or cohabiting; widowed or single), ethnicity (native Dutch; first/second generation migrant), educational level (primary school or less; practical/secondary vocational training; some college/university degree) and age.

Methods of analysis

The analyses were done in five steps combining quantitative and qualitative methods. First, we described the total sample, giving frequencies and percentages for the categorical variables and mean, standard deviations and range for the continuous variables (table 7.1).

Second, we did latent class analysis (LCA) to identify subpopulations within a larger population of older people. LCA is a person-centred approach to identify unobserved groups of similar individuals (latent classes) based on observed variables. The aim of LCA is to find the best class solution; meaning the smallest number of latent classes describing the associations among a set of observed variables (Muthén & Muthén, 2000). The observed variables we used in the LCA were self-reported health, social functioning and cognitive functioning as categorical variables and morbidity status, mental health, functional limitations as continuous variables. To avoid local likelihood maxima and inaccurate parameter estimates, we used 1,000 multiple start values and 100 iterations (Geiser, 2012). For each class solution, we present the Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC) and adjusted BIC (aBIC) which combine goodness of fit and parsimony (Hagenaars & McCutcheon, 2002). We based the number of classes on the adjusted Lo-Mendell-Rubin likelihood test (bootstrap). The quality of the classification was determined by the entropy measure (Muthen & Muthen, 1998). The various class solutions and model fit are presented in supplementary table 7.1 in the appendix. We used the Mplus 7.4 program. We based the final number of classes on the highest entropy score as it indicates the best quality classification.

Third, we described the final class solution according to the observed variables self-reported health, social functioning, cognitive functioning, morbidity status, mental health and functional limitations to identify the differences between them (see table 7.2 and supplementary table 7.2).

Fourth, we assessed the quality of the LCA classification with a focus group of older people (see the appendix the focus group protocol). In LCA, the value of the classes should also be interpreted qualitatively. The focus group participants were members of the Elderly Forum of the Geriatric Network Rotterdam, one of the eight regional networks in the NCEP. All 15 members of the Elderly Forum were invited to the focus group and eight (five males and three females) were able to attend. The profiles were presented textually for each of the final classes as identified by LCA: Older people in this profile experience their health as *[excellent/very good/good/fair/poor]* and state that their health is *[much better/somewhat better/about the same/somewhat worse/much worse]* compared to a year ago. They experience *[no/some/serious]* problems with their cognitive functioning. They experience problems with social activities *[a little/some/a good bit/most/all]* of the time. Their mean score on mental health is *[0–100]*. They have *[0–17]* morbidities and need help with *[0–15]* daily activities. Besides the textual presentation, the final profiles were also presented together to provide a clear, visual overview. To validate the profiles, we asked the participants whether they recognized the profiles and if (how much) they could relate to them. In addition, we asked them to state which specific domain contributed the most to frailty in each of the profiles and invited them to rank the profiles from least to most frail. The focus group discussions were recorded and transcribed verbatim. We began the analysis by carefully rereading the transcript of the focus group several times and subsequently applied a data-driven approach to our thematic analysis per profile. We were looking for the interpretation of each of the profiles to understand the similarities and differences between the perceptions of the eight participants. Focus group quotes are presented with reference to respondents 1–8.

Fifth, we used the input of the focus group participants for additional (quantitative) analysis and further explored the class division quantitatively by looking into the distribution of demographic background variables (gender, living arrangement, marital status, ethnicity, educational level and age). We tested the relation between profiles and demographic variables and between the profiles and the frailty index with multinomial regression analysis (see table 7.3). And we determined the scores of the frailty index, distribution of morbidities and functional limitations across the six subpopulations (see tables 7.2, 7.4 and 7.5).

The Results section presents the first and second steps of the analysis separately. The results of the third, fourth and fifth steps are combined and reported by profile.

Results

Table 7.1 presents the sample characteristics. The total study population consisted of 43,704 older people, mostly female (59.6%) and with a mean (SD) age of 78.7 (7.1) years. Of the older people, 90% lived independently and half (49.8%) were married or cohabiting. The majority of the study population (60.2%) had a middle educational level (practical or secondary vocational training) and 90% was native Dutch. Health was perceived mostly as good or fair and 12% stated that their health was very good or excellent. Half of the population (54.1%) stated that their health was stable and a quarter indicated that it was somewhat worse compared to a year ago. Most of the study population (66.4%) had no problems with cognitive functioning, 27.8% had some problems and 2% had serious problems. Social activities were never hampered for 46%, whereas they were always hampered for 7.5%. On a scale from 0 to 100, the mean (SD) score on mental health was 73.7 (18.2). The older population had on average 2.9 morbidities (theoretical range: 0–17) and 2.9 functional limitations in terms of ADL and IADL (theoretical range: 0–15). The mean (SD) score on frailty index is 0.23 (0.14).

Six profiles of frail older people

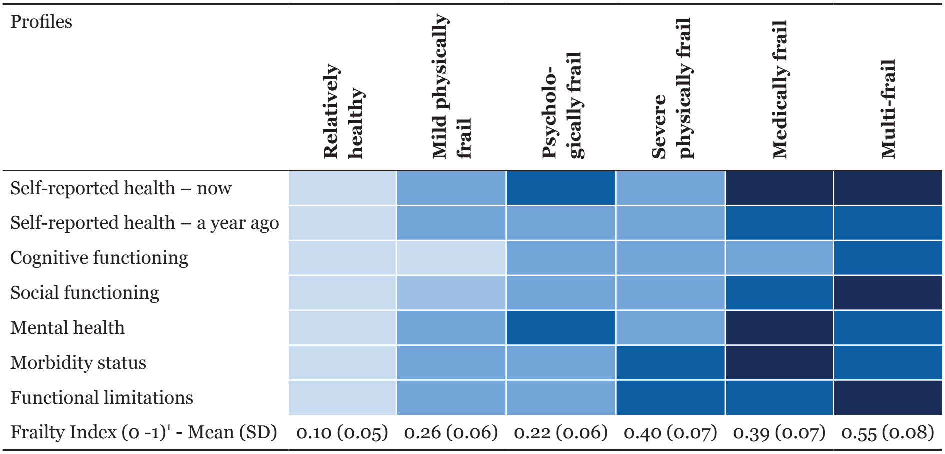
Latent class analysis with various class solutions identified six subpopulations within the population of older people. The supplementary table 7.1 (see the appendix) presents the model fit statistics of the various class solutions. In these different class solutions, two to three relatively big classes remained stable and the other classes became increasingly dispersed. In the eight-class solution, for example, two classes accounted for 50% of the study population and the remaining six classes were relatively small. We chose the six-class solution, based on the highest entropy score (0.81) which indicated the best quality classification.

Table 7.1: Sample characteristics

	N (43,704)	*%*
Gender: Female	26,009	59.6
Living situation Independently	38,321	89.6
Residential care setting or nursing home	4,430	10.4
Marital status Married/Cohabiting	21,368	49.8
Educational level Primary school or less	8,639	22.7
Practical/secondary vocational training	22,913	60.2
Some college/university degree	6,495	17.1
Ethnicity – Native Dutch	39,168	90.4
Self-reported health: Excellent	1,533	3.8
Very good	3,329	8.3
Good	17,150	42.7
Fair	15,379	38.3
Poor	2,772	6.9
Self-reported health compared to one year ago: Much better	1,030	2.6
Somewhat better	2,488	6.2
About the same	21,639	54.1
Somewhat worse	11,487	28.7
Much worse	3,370	8.4
Cognitive functioning		
No problems with memory, attention & thinking	25784	66.4
Some problems	12187	31.4
Severe problems	856	2.2
Social functioning have problems with social activities: None of the time	18804	46.4
A little of the time	7581	18.7
Some of the time	7668	18.9
Mostly	3414	8.4
All of the time	3043	7.5
	Mean (SD)	*Range*
Age	78.74 (7.12)	60.0 – 102.80
Mental health (0–100)[1]	73.69 (18.24)	0 – 100
Morbidity status (0–17 morbidities)[2]	2.89 (2.02)	0 – 17
Functional limitations (0–15 limitations) [3]	2.89 (3.30)	0 – 15
Frailty Index (0-1)[4]	0.23 (0.14)	0.00 - 0.85

[1] RAND Mental Health Subscale, higher scores represent better mental health;
[2] Self-reported number of morbidities, higher scores represent more morbidities;
[3] Modified Katz scale, higher scores represent more functional limitations;
[4] Frailty index, higher scores represent higher level of frailty.

Table 7.2: Six profiles of frail older people



Profiles	Relatively healthy	Mild physically frail	Psycholo-gically frail	Severe physically frail	Medically frail	Multi-frail
Self-reported health – now	░	▓	█	▓	■	■
Self-reported health – a year ago	░	▓	▓	▓	█	█
Cognitive functioning	░	░	▓	▓	▓	█
Social functioning	░	▒	▓	▓	█	■
Mental health	░	▓	█	▓	■	█
Morbidity status	░	▓	▓	█	■	█
Functional limitations	░	▓	▓	█	█	■
Frailty Index (0 -1)[1] - Mean (SD)	0.10 (0.05)	0.26 (0.06)	0.22 (0.06)	0.40 (0.07)	0.39 (0.07)	0.55 (0.08)

NB: The darker the colour, the more severe the problems in the domain.
[1]Frailty index, higher scores represent higher level of frailty.

Profile A (*'relatively healthy'*) fundamentally differs from the other five profiles. Older people in this profile were relatively healthy; they indicated having good (mental) health and had very few problems across all the domains. They were not co-morbid; on average, they generally reported fewer than two morbidities and almost no functional limitations. When a functional limitation was reported, this was mostly related to household activities. The clear distinction between the *relatively healthy* and the other profiles is also demonstrated by differences in the background characteristics. The relatively healthy respondents are more likely to be male, younger, live independently and be married than the respondents in the other five profiles. Older people in the focus group clearly identified them as the least frail of the six profiles, "They are not frail compared to the rest, of course" (respondent 8). This is also confirmed by their mean score on the frailty index (0.10).

Profile B (*'mild physically frail'*) features suffering from mild problems in the physical domain, and the focus group reinforced this characterization: "They need a lot of help. Needing help with four to five activities is quite a lot" (respondent 5). This profile reflected an initial loss of independence, particularly with regard to IADL activities. Almost all individuals required help in the household, and the vast majority needed help with travelling and shopping. Most still lived independently at home, but typically had no partner to help them with these activities. Moreover, *mild physically frail* people had multi-morbidity; joint damage and hearing problems were reported most frequently in this profile. Despite their functional limitations, their self-reported health and mental health were considerably good, underscoring

Table 7.3: Distribution (%) of demographic characteristics and the frailty index across the six frailty profiles

	Total (n=43,704)	**Relatively healthy (n=17,580)**	**Mild physically frail (n=6,336)**	**Psycholo-gically frail (n=10,411)**	**Severe physically frail (n=4,522)**	**Medically frail (n=3,339)**	**Multi-frail (n=1,516)**	Nagelkerke's R square[1]
Gender: Female - %	59.6	50.6	68.9	59.8	70.3	71.4	63.9	0.03
Living situation: Independently - %	89.6	97.6	82.9	96.1	66.7	84.6	52.8	0.12
Marital status: Married/cohabiting - %	49.8	60.9	37.2	49.5	34.8	39.6	41.2	0.04
Educational level: - %								0.03
Primary school or less	22.7	15.8	27.4	21.7	32.0	31.1	34.0	
Practical/secondary vocational training	60.2	62.3	58.5	61.6	56.0	57.9	55.4	
Some college/university degree	17.1	21.9	14.1	16.7	11.9	11.1	10.7	
Ethnicity: Dutch native - %	90.4	91.2	90.6	89.4	90.6	88.7	89.4	0.00
Age: Mean (SD)	78.74 (7.13)	76.90 (6.19)	81.40 (7.14)	77.83 (6.61)	82.24 (7.97)	80.28 (6.99)	81.51 (9.24)	0.09

[1] explained variance of the multinomial regressions of the specific background characteristic on the division into six subpopulations.

the definition as "mild problems". One focus group participant described the older people in this profile as follows: "The limitations are simply because of their age. But they're not bothered by them and just go their own way" (respondent 4).

The types of problems in profile C ('*psychologically frail*') were rather different from the *mild physically frail* profile. Their reported health and mental health were relatively poor and social functioning was worse than in the *relative healthy, mild and severe physically frail* profiles. However, this profile reported only sporadic functional limitations; mostly related to problems in the household. Participants in the focus group still agreed that, despite their independence, the *psychologically frail* profile was rather frail. Their problems could partly be explained by their psychological condition, a relatively high percentage of people reported anxiety disorders and depression. However, the focus group also attributed the problems of this profile to their coping behaviour: "They treat every (minor) inconvenience as a major limitation or severe disease" (respondent 4). The participants of the focus group perceived the *psychologically frail* profile more frail than the *mild physically frail* profile. "People in this group are sensitive and will interpret things negatively which could lead to a self-fulfilling prophecy" (respondent 5). However, the mean score on the frailty index of this profile was lower than of the *mild physically frail* (0.22 respectively 0.26).

Table 7.4: Distribution (%) of morbidities across six frailty profiles

Morbidities - % of respondents indicating having a specific morbidity	**Total (n=43,704)**	**Relatively healthy (n=17,580)**	**Mild physically frail (n=6,336)**	**Psycholo-gically frail (n=10,411)**	**Severe physically frail (n=4,522)**	**Medically frail (n=3,339)**	**Multi-frail (n=1,516)**
Joint damage (osteoarthritis, rheumatoid wear) of hips or knees	44.1	29.8	45.4	53.4	49.5	70.2	48.9
Hearing problems	38.7	29.4	40.3	42.4	44.8	53.9	49.9
Vision disorders	32.0	18.5	35.0	35.7	42.3	56.5	46.8
Involuntary urinary loss	25.4	10.5	30.6	23.1	44.3	46.9	64.1
Diabetes	21.9	16.7	22.9	24.4	24.7	31.9	25.0
Heart failure	21.2	10.9	22.7	26.5	26.4	40.7	27.3
Osteoporosis	19.9	9.7	20.5	23.8	26.3	41.8	25.9
Asthma, chronic bronchitis, pulmonary emphysema or CARA/COPD	19.2	11.1	18.3	25.1	20.8	36.3	23.6
Dizziness with falling	16.1	6.2	15.1	18.9	22.4	41.0	28.9
A form of cancer (malignant disease)	11.2	7.6	10.8	14.1	12.7	18.5	11.6
Prostatism due to benign prostatic hyperplasia[1]	11.0	10.4	7.3	13.9	9.6	13.7	10.4
Stroke, brain haemorrhage, cerebral infarction or transient ischaemic attack	9.3	4.2	10.8	8.4	16.0	16.7	24.1
Depression	9.0	1.9	4.5	13.3	10.7	30.8	20.2
Fractures other than hip	6.7	3.3	8.0	6.1	11.8	11.9	12.8
Anxiety/panic disorder	6.0	1.3	2.6	8.2	7.0	21.8	14.8
Dementia	4.7	1.9	4.5	3.1	9.4	7.7	23.3
Hip fracture	3.8	1.3	5.0	2.8	9.2	5.8	10.2

[1] % of male respondents

Profile D ('*severe physically frail*') was comparable to *mild physically frail* profile but here the physical problems were more severe and problems also expanded across other domains. On average, they had eight functional limitations, twice as many as found in the *mild physically frail* profile. Almost all people in the *severe physically frail* profile were hampered in IADL, such as taking care of the home, shopping and travelling. They needed considerably less help with the less physical IADL activities such as taking medication and handling finances. Older people in this profile also began encountering problems with ADL activities. For example, 80% said they needed help with showering. In this oldest profile, initial problems with cognitive and social functioning were prevalent. Despite their advanced age and severe limitations, they regarded their health as quite good. The mean score on the frailty index within was fairly high with 0.40. One focus group participant stated that the situation was

Table 7.5: Distribution (%) of functional limitations based on a modified 15-item Katz Index across six frailty subpopulations

Functional limitations - % of respondents needing help with an activity	**Total (n=43,704)**	**Relatively healthy (n=17,580)**	**Mild physically frail (n=6,336)**	**Psycholo-gically frail (n=10,411)**	**Severe physically frail (n=4,522)**	**Medically frail (n=3,339)**	**Multi-frail (n=1,516)**
Do you need help taking care of your house?	54.6	19.1	91.4	49.3	98.4	93.6	99.3
Do you need help travelling?	36.2	5.2	67.9	17.7	91.7	75.1	99.0
Do you need help shopping?	32.3	3.3	61.7	14.9	91.0	70.6	98.9
Do you need help walking about?	29.9	4.4	55.9	13.3	81.0	57.0	88.1
Do you use incontinence products?	29.7	11.9	41.4	22.1	59.7	48.9	83.8
Do you need help preparing a meal?	24.7	3.9	38.7	6.8	81.0	41.7	98.3
Do you need help with taking a bath or shower?	21.8	1.0	32.1	3.5	84.4	35.4	99.4
Do you need help handling your finances?	19.2	7.8	28.6	6.0	49.6	23.2	83.3
Do you need help getting dressed?	15.4	0.6	18.2	1.7	67.2	20.6	97.2
Do you need help taking your medications?	12.6	1.0	14.6	2.8	42.8	14.7	83.4
Do you need help sitting down and getting up from a chair?	9.8	0.6	10.2	2.0	35.2	13.9	71.8
Do you need help toileting?	7.2	0.3	6.3	0.4	29.4	4.2	76.2
Do you need help using the telephone?	6.5	0.6	5.9	1.2	20.1	7.3	61.5
Do you need help brushing your hair or shaving?	5.3	0.1	1.9	0.1	17.2	2.4	71.4
Do you need help with eating?	2.6	0.1	1.0	0.1	6.0	1.6	43.6

delicate, “The moment anything goes wrong, they are in deep trouble but they’re not experiencing this yet” (respondent 7). The focus group agreed that people in the *severe physically frail* profile might be in denial of their frailty: “Their perception is positive even though the situation is serious” (respondent 5).

In the preceding four profiles, problems were mostly limited to one domain. However, in profile E (‘*medically frail*’) people accumulated problems in three domains –the physical, psychological and social – that seemed to be the origin of their morbidities. People in this group mostly experienced fair or poor health in combination with a deterioration in their health compared to a year ago. Their social activities were frequently hampered by their physical condition and/or emotional problems. They experienced the worst mental health and the most morbidities of all profiles. These morbidities were psychological conditions such as depression and anxiety disorders but also physical conditions such as joint damage, dizziness with falling and heart failure. The score on the frailty index was similar to the *severe physically frail* profile. The older people in the focus group agreed that the older people in the medically frail profile were more frail. One of the focus group participants imagined that people with these kinds of morbidities “have physical problems that hamper them, for example in social activities, in particular compared to before” (respondent 4).

As for profile F (‘*multi-frail*’), in addition to problems in the physical, psychological and social domains, here people also had cognitive problems. They had the highest score on the frailty index (0.55) and also the focus group also characterized the *multi-frail* profile as the most frail, especially because of the cognitive problems combined with severe functional limitations. In the *multi-frail* profile, people had moderate to extreme cognitive problems and reported the highest percentage of dementia. On average, people in this profile needed help with 12 activities. The focus group described this state as “totally dependent” (respondent 1) and “needing help from morning to night” (respondent 8). They need help with almost all IADL and most ADL activities and almost half needed help with eating. Focus group participants felt that these older people should be institutionalized. Still, half of *multi-frail* profile lived independently, most often without a partner. Social functioning was hampered most frequently in this profile: “When you have these kinds of cognitive problems, I can image that you won’t undertake things yourself. I have 21 years of experience of dealing with my wife’s dementia. They don’t take the initiative, they become withdrawn” (respondent 6). The reported mental health in this profile was remarkable. As one respondent observed: “They still feel relatively good” (respondent 3). Another explained: “They’re not hampered by a sense of reality because of their cognitive problems” (respondent 5).

Discussion

Frailty is widely acknowledged to explain variations in health risks and is frequently used to select older people for care interventions. Yet, clearly, frailty is not binary but rather a heterogeneous identity. While the distinctions between the physical, psychological and social domain begin to distinguish the complexity of frail, they do not fully capture the multifaceted concept of frailty. This research demonstrates that in fact six frailty profiles can be distinguished.

Our results show that ‘the’ frail older person does not exist. Frail older people are indeed a heterogeneous population, as is shown by our relatively high number of six profiles. Previous research on profiles on chronic conditions, general health status or physical frailty distinguished at most four profiles (Gellert et al., 2017; Lafortune et al., 2009; Liu et al., 2014; Liu et al., 2017; Ng, Luo, & Heng, 2014). The *relatively* *healthy* profile remained a constant group in the different class solutions of our latent class analysis. Correspondingly, this relatively healthy group also emerged in previous research on subpopulations of older people (Lafortune et al., 2009; Liu et al., 2014; Ng et al., 2014) and it could be discussed whether the older people in this profile could be labelled as being frail. However, the remaining ‘relatively unhealthy’ (or frail) older people were divided into several smaller classes for which the six-class solution ultimately fitted the data best. The differences between the six profiles are substantial. Older people in the *relative healthy* profile have less than one functional limitation compared to the average of 12 functional limitations in the *multi-frail* profile. By including this full range of domains of functioning and the severity of the problems, our results enhance previous findings on frailty profiles. Our results showed that the physical domain is important (Lafortune et al., 2009; Liu et al., 2014; Liu et al., 2017) with two profiles of whom the severity of their problems clearly differed. Moreover, a separate profile for psychological frailty was not found in contrast to other studies (Ng et al., 2014).

Our results show specific patterns of underlying the problems in different domains which confirm the complexity of frailty. The conventional distinction between the physical, psychological and social domains of frailty or determining the degree of frailty with frailty indexes barely do justice to this constellation of problems. Despite their comparable frailty index scores, older people in the *mild physically frail* and *psychologically frail* profiles experience rather contrasting problems. Also the *severe physically* and *medically* frail profiles had similar scores on the frailty index but the underlying problems clearly differed. In the severe physically frail the problems mostly originated in the physical domain whereas people in the medically frail profile suffer from a combination of problems in the physical, psychological and social domains. In the multi-frail profile the constellation also extended to the cognitive domain of functioning. Unlike problems in the physical and psychological domain, problems in the social domain did not emerge in a separate subpopulation. Social frailty seems related to problems in the other domains, for example to morbidities or functional limitations but the direction of the relation between health and social functioning remains unclear (George, 1996). Our study provides valuable insights in the complex interaction of problems of frail older people.

Underlying problems in the different domains may not contribute equally to the degree of frailty. Focus group participants carefully weighed the problems in all domains and were well able to rank the six profiles from least to most frail. This ranking did not correspond with the scores on the frailty index. For the focus group, frailty was synonymous with losing independence and respondents clearly perceived multi-frail profile as the most frail because of the cognitive problems and functional limitations which made people in this group extremely dependent. While considering the frailty profile rankings, the focus group weighed off the assets and deficits. Not all domains were deficits according to them; they could also be assets that help people cope with their problems. The (mis)balance between assets and deficits resulted in frailty (see also (Rockwood et al., 1994; van Campen, 2011)). The focus group clearly mentioned this in relation to the difference between the mild *physically frail* and *psychologically profiles*. Although the *mild physically frail* profile had four times more functional limitations than the *psychologically frail*, the latter was still perceived as more frail because people in this group had a limited capacity to cope with ageing and deterioration of their health.

Finally, our study challenges the relevance of demographic variables in the conceptualization of frailty. Age is too restricted a factor to predict health status, as previous research has confirmed (Lacas & Rockwood, 2012; Schuurmans et al., 2004; Slaets, 2006). Also, the relation of frailty to other demographic variables such as gender, marital status, ethnicity and educational level is limited. Only living arrangement related moderately to the frailty subpopulations but it could be considered an outcome of frailty rather than an antecedent.

Strengths and limitations

The main strength of this study is its strong empirical base for frailty profiles. We were able to use data from TOPICS-MDS, a large data-sharing initiative that contains data on older people from all around the Netherlands. The large sample, combined with considerations of several domains of functioning makes the current research valuable. The quantitative results were complemented with a qualitative approach, which also adds value. The focus group enabled us to further validate the profiles and to understand the older person's perspective on frailty.

The first limitation is that even though the 54 TOPICS-MDS projects generally focused on older people at risk or frail older people, their sampling frame and inclusion criteria substantially differed. Older people were included based on functional limitations or were screened frailty instruments questionnaires such as Groningen Frailty Indicator, whereas other projects adopted an age criterion. Our study included all 54 projects and our only selection criterion was age; people 60 years and older were included. As the focus group also indicated, there is still disagreement on what is regarded as 'old' and 60 years might be relatively young. The literature recommends including people of 70 years and older for frailty interventions (Ferrucci et al., 2004) but a systematic search of the literature revealed that different age criteria are adopted (Looman et al., 2018). We decided to include everyone 60 years and older in order to also include older people with a migrant background in whom ageing begins at a younger age and who often experience worse physical and emotional health than people born in the Netherlands (Den Draak & De Klerk, 2011). We expect that the relatively young sample may not have influenced our results since the effect of age on the frailty profiles was negligible. Including all people of 60 years and older might have also resulted in the rather large group of older people in the *relatively healthy* profile and it remains unclear whether these older people could actually be considered as being frail. They were not perceived as frail according to the participants of the focus group and their score on the frailty index was also below the general cut-off point of 0.20 (Searle et al., 2008). Nevertheless, some older people in this *relatively healthy* profile were identified as being frail by the Groningen Frailty Indicator.

The second limitation was the formulation of the social functioning item that might possible have affected our results. The item was phrased as: “During the past four weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups (like visiting friends or close relatives)?” This phrasing related social functioning directly to both physical and psychological functioning and might have contributed to the absence of a separate social frailty profile.

Recommendations

The most important implication of our study is that we should take the heterogeneity of frailty into consideration in research, policy and practice. Future research should endeavour to further validate our six profiles. The focus group with older people was a good starting point but the profiles could also be validated by professionals and policy makers. Our identification effort should also be replicated on other databases of frail older people and with other measurement instruments, for example for social functioning. Testing the validity of these profiles would also involve examining frailty trajectories. In other words, our cross-sectional latent class analysis could be complemented with a latent transition analysis (Muthen & Muthen, 1998) which could account for the dynamic and progressive character of frailty (Gobbens et al., 2010). In this regard, it would be beneficial to explore whether *mild physically frail* profile eventually transfer to the *severe physically frail* profile or how the trajectory of relatively healthy people progresses.

Our research also has implications for selecting the appropriate target groups for care interventions. The psychosocial domain of frailty is deemed important and focusing on the physical domain of frailty and functional limitations by professionals, researchers and policy makers could be too restricted. Our research showed that a relatively large group suffers from problems in the psychological domain without having problems in the physical domains in terms of functional limitations. It is important to target this profile for care interventions. Instruments with a broad perspective including the psychosocial domains such as frailty indexes (Rockwood et al., 2005; Searle et al., 2008) and the Groningen Frailty Indicator (Peters, Boter, Slaets, & Buskens, 2013) sum the total numbers of health problems which implies that they do not differentiate between the types of underlying problems or weigh different domains. Older people with the same score on the frailty index or Groningen Frailty Indicator could have different underlying problems and frailty profiles (Metzelthin et al., 2010). The *severe physically frail* had a similar frailty index as the *medically frail* but their psychological and social functioning was not hampered. The medically frail profile showed that their problems related to morbidities extended to severe problems in the psychological and social domains. These problems should be also be acknowledged by health care professionals who are originally trained to have a disease-specific approach (Lette et al., 2015). In other words, the balance between deficits *and* assets in relation to frailty should be further explored in practice, policy and research. Assets could be coping style, resilience (Wiles, Wild, Kerse, & Allen, 2012) or resources such as older people's social network (Rockwood et al., 1994), which should be considered in the conceptualization and measurement of frailty.

Lastly, the six frailty profiles could be used to develop tailor-made care interventions for each profile rather than producing one-size-fits-all care. The heterogeneity of frailty should be incorporated in the evaluation of these interventions. Currently, traditional evaluation research is not acknowledging this heterogeneity in, for example, integrated care, which is misaligned with its goal to provide person-centred care with a holistic view of the individual (Mur-Veeman, Hardy, Steenbergen, & Wistow, 2003). So far, the effects of integrated care on health outcomes is limited (Looman et al., 2018). Concurrently, the more heterogeneous a population is, the harder it is to achieve effectiveness (Ferrucci et al., 2004; Lette, Baan, van den Berg, & de Bruin, 2015). A possible explanation for the limited effectiveness of integrated care could be that the care professionals involved – and particularly researchers conducting the evaluation research – generally perceive frail older people as a homogeneous group. Evaluation research on integrated care could be replicated by incorporating the frailty profiles to gain deeper insight into the effectiveness of integrated care interventions. It would be beneficial to explore whether integrated is (more) effective on specific outcomes for each of the six profiles separately. Future research should explore, for example, whether integrated care is effective in terms of mental health for the psychological frail than for the mild physical profile.

Conclusions

Frail older people are a heterogeneous population and ‘the’ frail older person does not exist. Six frailty profiles were developed on the full range of domains of functioning and the severity of these domains. Specific patterns of underlying problems in different domains emerged. Acknowledging the heterogeneity by frailty profiles is crucial for tailoring and evaluating interventions and developing policy for frail older people.

References

Clegg, A., Young, J., Iliffe, S., Rikkert, M. O., & Rockwood, K. (2013). Frailty in elderly people. *The Lancet, 381*(9868), 752-762.

Den Draak, M., & De Klerk, M. (2011). *Oudere migranten* [*Elderly migrants]*. Den Haag: Sociaal en Cultureel Planbureau.

Dent, E., Kowal, P., & Hoogendijk, E. O. (2016). Frailty measurement in research and clinical practice: A review. *European Journal of Internal Medicine, 31*, 3-10.

Ferrucci, L., Guralnik, J. M., Studenski, S., Fried, L. P., Cutler, G. B., & Walston, J. D. (2004). Designing randomized, controlled trials aimed at preventing or delaying functional decline and disability in frail, older persons: A consensus report. *Journal of the American Geriatrics Society, 52*(4), 625-634.

Fried, L. P., Tangen, C. M., Walston, J., Newman, A. B., Hirsch, C., Gottdiener, J., . . . Cardiovascular Health Study Collaborative Research Group. (2001). Frailty in older adults: Evidence for a phenotype. *The Journals of Gerontology.Series A, Biological Sciences and Medical Sciences, 56*(3), M146-56.

Geiser, C. (2012). *Data analysis with Mplus*. New York: Guilford Press.

Gellert, P., von Berenberg, P., Zahn, T., Neuwirth, J., Kuhlmey, A., & Dräger, D. (2017). Multimorbidity profiles in German centenarians: A latent class analysis of health insurance data. *J Aging Health*. Oct.

George, L. K. (1996). Social factors and illness. In R. H. Binstock, L. K. George, V. W. Marshall, G. C. Myers & J. H. Schulz (Eds.), *Handbook of aging and the social sciences* (4th ed., pp. 229-252). San Diego: Academic Press.

Gobbens, R. J. J., Luijkx, K. G., Wijnen-Sponselee, M. T., & Schols, J. M. G. A. (2010). Towards an integral conceptual model of frailty. *The Journal of Nutrition, Health & Aging, 14*(3), 175-181.

Hagenaars, J. A., & McCutcheon, A. L. (2002). *Applied latent class analysis*. Cambridge: Cambridge University Press.

Krabbe, P. F., Stouthard, M. E., Essink-Bot, M., & Bonsel, G. J. (1999). The effect of adding a cognitive dimension to the EuroQol multiattribute health-status classification system. *Journal of Clinical Epidemiology, 52*(4), 293-301.

Laan, W., Zuithoff, A., Drubbel, I., Bleijenberg, N., Numans, M., De Wit, N., & Schuurmans, M. (2014). Validity and reliability of the katz-15 scale to measure unfavorable health outcomes in community-dwelling older people. *The Journal of Nutrition, Health & Aging, 18*(9), 848.

Lacas, A., & Rockwood, K. (2012). Frailty in primary care: A review of its conceptualization and implications for practice. *BMC Med, Jan 11*(10), 4.

Lafortune, L., Béland, F., Bergman, H., & Ankri, J. (2009). Health status transitions in community-living elderly with complex care needs: A latent class approach. *BMC Geriatrics, 9*(6).

Lette, M., Baan, C. A., van den Berg, M., & de Bruin, S. R. (2015). Initiatives on early detection and intervention to proactively identify health and social problems in older people: Experiences from the Netherlands. *BMC Geriatr., 15*(143)

Liu, L. F., Tian, W. H., & Yao, H. P. (2014). The heterogeneous health latent classes of elderly people and their socio-demographic characteristics in Taiwan. *Arch Gerontol Geriatr, 58*, 205-213.

Liu, L. K., Guo, C., Lee, W., Chen, L., Hwang, A., Lin, M., . . . Liang, K. (2017). Subtypes of physical frailty: Latent class analysis and associations with clinical characteristics and outcomes. *Scientific Reports, 7*, 46417.

Looman, W. M., Huijsman, R., & Fabbricotti, I. N. (2018). The (cost-)effectiveness of preventive, integrated primary care for community-dwelling frail older people: A systematic review. *Health & Social Care in the Community, April*, 1-30.

Lutomski, J. E., Baars, M. A., Kempen, J. A., Buurman, B. M., Elzen, W. P., Jansen, A. P., . . . Steyerberg, E. W. (2013a). Validation of a frailty index from the older persons and informal caregivers survey minimum data set. *Journal of the American Geriatrics Society, 61*(9), 1625-1627.

Lutomski, J. E., Baars, M. A. E., Schalk, B. W. M., Boter, H., Buurman, B. M., den Elzen, W. P. J., . . . Melis, R. J. F. (2013b). The development of the older persons and informal caregivers survey minimum DataSet (TOPICS-MDS): A large-scale data sharing initiative. *PLoS One, 8*(12), e81673.

Manthorpe, J., & Iliffe, S. (2015). Frailty – from bedside to buzzword? *Journal of Integrated Care, 23*(3), 120-128.

Markle-Reid, M., & Browne, G. (2003). Conceptualizations of frailty in relation to older adults. *J.Adv.Nurs., 44*, 58-68.

Metzelthin, S. F., Daniëls, R., van Rossum, E., de Witte, L., van den Heuvel, Wim JA, & Kempen, G. I. (2010). The psychometric properties of three self-report screening instruments for identifying frail older people in the community. *BMC Public Health, 10*(1), 176.

Mur-Veeman, I., Hardy, B., Steenbergen, M., & Wistow, G. (2003). Development of integrated care in England and the Netherlands: Managing across public–private boundaries. *Health Policy, 65*(3), 227-241.

Muthén, B., & Muthén, L. K. (2000). Integrating person-centered and variable-centered analyses: Growth mixture modeling with latent trajectory classes. *Alcoholism: Clinical and Experimental Research, 24*(6), 882-891.

Muthen, L. K., & Muthen, B. O. (1998). Mplus [computer software]. *Los Angeles, CA: Muthén & Muthén.*

Newcomer, S. R., Steiner, J. F., & Bayliss, E. A. (2011). Identifying subgroups of complex patients with cluster analysis. *Am J Manag Care, 17*(8), e324-e332.

Ng, C. W., Luo, N., & Heng, B. H. (2014). Health status profiles in community-dwelling elderly using self-reported health indicators: A latent class analysis. *Quality of Life Research, 23*(10), 2889-2898.

Olaya, B., Moneta, M. V., Caballero, F. F., Tyrovolas, S., Bayes, I., Ayuso-Mateos, J. L., & Haro, J. M. (2017). Latent class analysis of multimorbidity patterns and associated outcomes in Spanish older adults: A prospective cohort study. *BMC Geriatrics, 17*(1), 186.

Peters, L. L., Boter, H., Slaets, J. P. J., & Buskens, E. (2013). Development and measurement properties of the self assessment version of the INTERMED for the elderly to assess case complexity. *J.Psychosomat.Res., 74*, 518-522.

Rockwood, K., & Mitnitski, A. (2007). Frailty in relation to the accumulation of deficits. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 62*(7), 722-727.

Rockwood, K., Fox, R. A., Stolee, P., Robertson, D., & Beattie, L. (1994). Frailty in elderly people: An evolving concept. *Cmaj, 150*(4), 489-495.

Rockwood, K., Song, X., MacKnight, C., Bergman, H., Hogan, D. B., McDowell, I., & Mitnitski, A. (2005). A global clinical measure of fitness and frailty in elderly people. *CMAJ : Canadian Medical Association Journal = Journal De L'Association Medicale Canadienne, 173*(5), 489-495.

Schuurmans, H., Steverink, N., Lindenberg, S., Frieswijk, N., & Slaets, J. P. (2004). Old or frail: What tells us more? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 59*(9), M962-M965.

Searle, S. D., Mitnitski, A., Gahbauer, E. A., Gill, T. M., & Rockwood, K. (2008). A standard procedure for creating a frailty index. *BMC Geriatrics, 8*(1), 24.

Slaets, J. P. J. (2006). Vulnerability in the elderly: Frailty. *Medical Clinics of North America, 90*, 593-601.

United Nations, Department of Economic and Social Affairs, Populations Division. (2015). *World population ageing 2015.* (No. (ST/ESA/SER.A/390)).

van Campen, C. (2011). *Kwetsbare ouderen [Frail elderly].* The Hague: The Netherlands Institute for Social Research.

van der Zee, K., & Sanderman, R. (1993). Rand-36. *Groningen: Northern Centre for Health Care Research, University of Groningen, the Netherlands.*

van Kempen, J. A. L., Schers, H. J., Jacobs, A., Zuidema, S. U., Ruikes, F., Robben, S. H. M., . . . Olde Rikkert, M. G. M. (2013). Development of an instrument for the identification of frail older people as a target population for integrated care. *Br J Gen Pract, 63,* e225-e231.

Weinberger, M., Samsa, G. P., Schmader, K., Greenberg, S. M., Carr, D. B., & Wildman, D. S. (1992). Comparing proxy and patients' perceptions of patients' functional status: Results from an outpatient geriatric clinic. *Journal of the American Geriatrics Society, 40*(6), 585-588.

Wiles, J. L., Wild, K., Kerse, N., & Allen, R. E. (2012). Resilience from the point of view of older people:'There's still life beyond a funny knee'. *Social Science & Medicine, 74*(3), 416-424.

World Health Organization. (2015). *World report on ageing and health*. Geneva: World Health Organization.

Appendix Focus group protocol

Before the focus group

All participants of the focus group get a paper form with 4 general questions. The participants were asked to fill in this form before the focus group had started.

1) How do you define frailty?
2) When would you consider an older person as being frail?
3) What do you think of the idea to divide frail older people in different profiles?
4) In what profiles would you personally divide the population of frail older people?

During the focus group

The main researcher of the project (WL) introduced herself and gave a presentation on the research project and the aim of the focus group.

Objective of the project:

Age explains health differences between older people insufficiently
Therefore: frailty
But: also big differences between frail older people

Research project:

TOPICS-MDS data of more than 40,000 older people
Looking for profiles of frail older people…
… to include in future research on integrated care

Discuss the answer to 4 questions on the paper form:

1) How do you define frailty?
2) When would you consider an older person as being frail?
3) What do you think of the idea to divide frail older people in different profiles?
4) In what profiles would you personally divide the population of frail older people?

Explanation of the profiles:

On what features do we characterize the profiles?

Perceived health

- Now
- Compared to one year ago

Problems with memory

- Problems with memory, attention and thinking

Problems with social activities

- Hampered with social activities by physical health or emotional problems

Mental health

- How often do you feel nervous or down

Diseases

- List of 17 diseases, for example diabetes or hearing problems

Needing help with daily activities

- Number of activities that people need help with, for example dressing or household activities

6 profiles

The data-analysis shows:

- 40,000 older people could be divided into 6 profiles

This means:

Older people within each profile have more in common with each other than with older people from the other profiles.

Important aims of today

Interpreting the profiles

Questions:

- Do you recognize the profiles?
- Do you know examples from your own environment of older people within the profiles?
- What terminology would you use to describe the profiles?
- What specific domain contributed most to frailty in each profile?
- Could you rank the profiles from least to most frail?

- By what profiles would you recommend the following interventions:

o Exercise programme
o Social activities
o Early detection
o Case management
o Integrated care model

The six profiles were presented in text and in one table to provide a clear overview:

Profile 1

Older people in profile 1 report **good health** and state that their health is **about the same** compared to a year ago.
They experience **no** problems with cognitive functioning. They have problems with social activities **none of the time**.
Their mean score on mental health is **83.**
They have **1.7** morbidities and need help with **0.6** activities.

Profile 2

Older people in profile 2 report **good to fair health** and state that their health is **about the same to somewhat worse** compared to a year ago.
They experience **no** problems with cognitive functioning.
They have problems with social activities **none to little of the time**.
Their mean score on mental health is **78**.
They have **3** morbidities and need help with **4.6** activities.

Profile 3

Older people in profile 3 report **fair health** and state that their health is **somewhat worse to about the same** compared to a year ago.
They experience **no to some** problems with cognitive functioning.
They have problems with social activities **little to some of the time**.
Their mean score on mental health is **65**.
They have **3.2** morbidities and need help with **1.3** activities.

Profile 4

Older people in profile 4 report **fair to good health** and state that their health is **somewhat worse to about the same** compared to a year ago.
They experience **no to some** problems with cognitive functioning.
They have problems with social activities **none, little to some of the time**.
Their mean score on mental health is **70**.
They have **3.8** morbidities and need help with **8.3** activities.

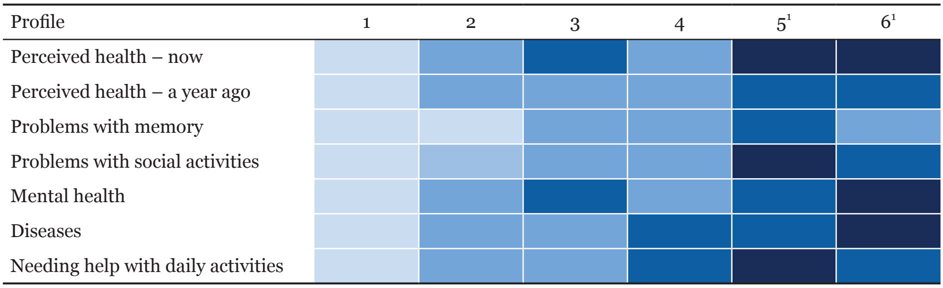
Profile 5[1]

Older people in profile 5 report **fair to poor health** and state that their health is **somewhat to much worse** compared to a year ago.
They experience **some to severe** problems with cognitive functioning.
They have problems with social activities **most to all the time**.
Their mean score on mental health is **60**.
They have **4.5** morbidities and need help with **12.2** activities.

Profile 6[1]

Older people in profile 6 report **fair to poor health** and state that their health is **somewhat to much worse** compared to a year ago.
They experience **no to some** problems with cognitive functioning.
They have problems with social activities **some, most to all the time**.
Their mean score on mental health is **51**.
They have **5.2** morbidities and need help with **4.9** activities.

Six profiles of frail older people



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[1] In the focus group the order of the profiles was different than in the article. The participants of the focus group strongly agreed that profile 5 was more more frail than profile 6. Therefore, we changed the order in the article: profile 5 was changed into profile F (multi-frail) and profile 6 was changed into profile E (medically frail).

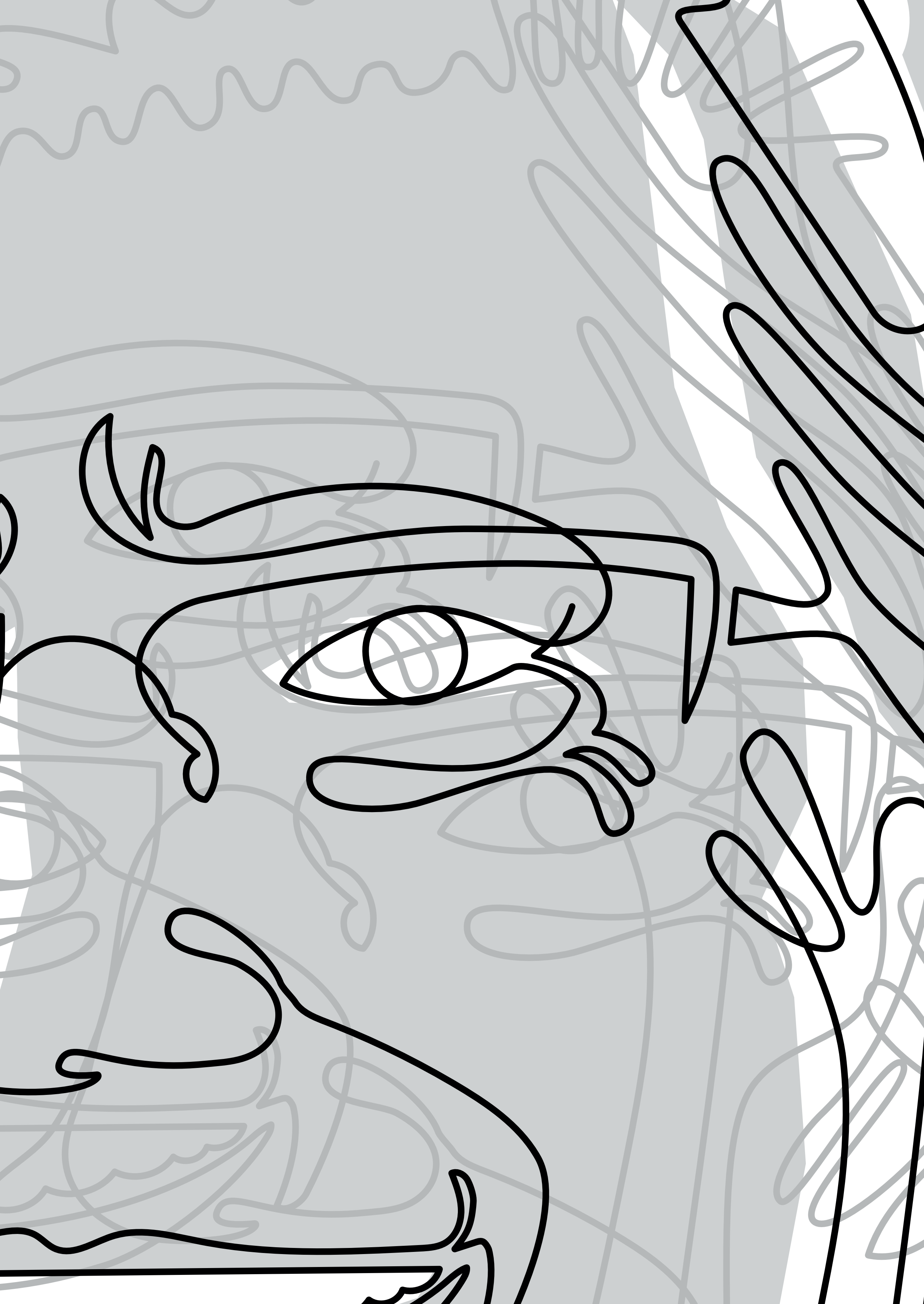
Supplementary Table 7.1: Model fit – latent class analysis

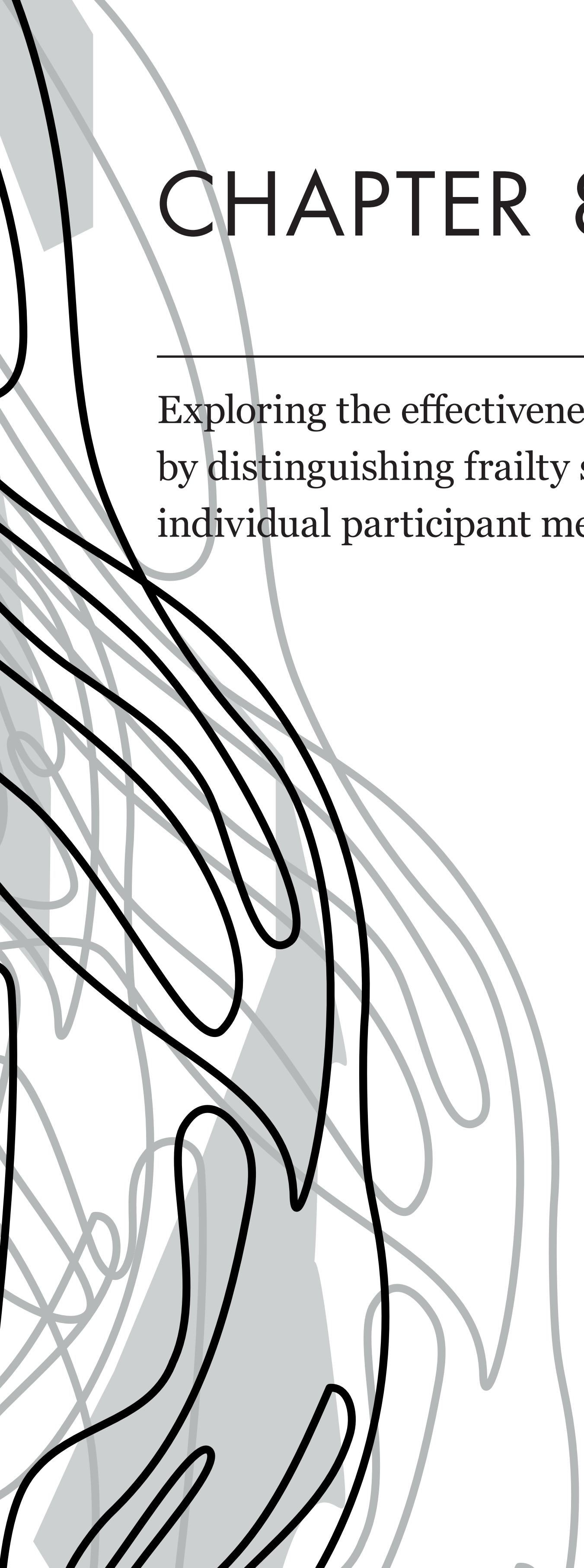
	2 classes	3 classes	4 classes	5 classes	6 classes	7 classes	8 classes	9 classes	10 classes
Information criterion									
AIC	1057575.878	1044960.251	1038571.226	1031816.004	1028366.429	1025009.292	1022780.354	1020685.911	1019009.583
BIC	1057905.916	1045446.622	1039213.931	1032615.042	1029321.801	1026120.997	1024048.392	1022110.283	1020590.288
Adjusted BIC	1057785.151	1045268.653	1038978.758	1032322.665	1028972.220	1025714.212	1023584.403	1021589.089	1020011.891
LMT LRT									
Log likelihood value	-550688.022	-528749.939	-522424.125	-519211.613	-515816.002	-514073.215	-512376.646	-511244.177	-510178.955
-2 difference in log likelihood	43876.165	12651.627	6425.025	6791.223	3485.574	3393.137	2264.939	2130.443	1712.328
p value	<0.0001	<0.0001	<0.0001	<0.0001	0.0206	0.0007	<0.0001	<0.00001	<0.00001
Adjusted LMR LRT	43649.220	12586.188	6391.792	6756.096	3467.546	3375.586	2253.224	2119.423	1703.471
p value	<0.0001	<0.0001	<0.0001	<0.0001	0.0213	0.0007	<0.0001	<0.0001	<0.0001
Entropy	0.737	0.766	0.770	0.789	0.810	0.797	0.776	0.782	0.783
Condition no.	0.513E-04	0.280E-04	0.168E-03	0.137E-03	0.140E-03	0.497E-04	0.125E-03	0.111E-03	0.583E-04

Supplementary Table 7.2: Conditional probabilities per profile

	Total	A Relatively healthy	B Mild physically frail	C Psycholo-gically frail	D Severe physically frail	E Medically frail	F Multi-frail
Self-reported health: 1 excellent	*3.8*	8.1	2.6	0.2	1.9	0.1	1.4
2 very good	*8.3*	17.4	5.2	1.0	3.5	0.4	2.1
3 good	*42.7*	61.8	47.2	28.1	34.6	4.7	21.9
4 fair	*38.3*	12.6	40.9	64.8	47.6	62.6	45.5
5 poor	*6.9*	0.1	4.1	5.9	12.3	32.2	29.1
Self-reported health: compared to year ago: 1 much better	*2.6*	3.8	2.8	1.6	1.8	0.3	1.7
2 somewhat better	*6.2*	5.9	7.4	6.6	6.8	4.1	5.4
3 about the same	*54.1*	80.8	48.5	39.5	35.5	14.4	24.5
4 somewhat worse	*28.7*	9.1	34.6	44.4	39.3	48.2	36.8
5 much worse	*8.4*	0.4	6.8	7.8	16.5	33.0	31.6
Cognitive functioning: 1 no problems	*66.4*	82.0	66.5	57.7	55.2	45.0	36.2
2 some	*31.4*	17.8	31.8	41.1	39.6	49.6	45.1
3 severe	*2.2*	0.1	1.7	1.2	5.2	5.5	18.7
Social functioning: problems with social activities: 1 none of the time	*46.4*	76.3	44.8	21.4	27.2	8.7	13.8
2 a little of the time	*18.7*	17.7	19.0	25.8	14.8	9.3	9.4
3 some of the time	*18.9*	5.1	21.1	36.2	23.3	28.4	15.6
4 most of the time	*8.4*	0.5	8.7	10.9	15.9	27.3	21.6
5 all of the time	*7.5*	0.5	6.5	5.6	18.8	26.4	39.6
Mental health: (0–100) mean (SD)	*73.69*	83.75 (0.22)	78.21 (0.54)	64.86 (1.19)	70.21 (2.27)	50.60 (1.65)	59.75 (1.73)
Morbidity status: (0–17 diseases) mean (SD)	*2.88*	1.68 (0.03)	2.97 (0.07)	3.18 (0.08)	3.77 (0.20)	5.15 (0.16)	4.45 (0.14)
Functional limitations: (0–15 limitations) mean (SD)	*2.89*	0.56 (0.02)	4.58 (0.10)	1.27 (0.06)	8.33 (0.07)	4.88 (0.41)	12.25 (0.16)
%	*100*	40	14	24	10	8	3
N	43,704	17,580	6,336	10,411	4,522	3,339	1,516

[1] RAND Mental Health Subscale, higher scores represent better mental health; [2] Self-reported number of morbidities, higher scores represent more morbidities; [3] Modified Katz scale, higher scores represent more functional limitations.





CHAPTER 8

Exploring the effectiveness of integrated care by distinguishing frailty subpopulations: an individual participant meta-analysis

Abstract

Background

Evaluation research thus far has shown limited effectiveness of preventive, integrated care interventions for frail older people. A possible explanation could be that frail older people have been perceived as a homogeneous group by both care professionals involved in the interventions and researchers conducting the evaluation research. The aim of the current study is to explore to what extent the effectiveness of eight integrated care interventions in Dutch primary care differ between six profiles of frail older people.

Methods

Eight studies evaluating preventive, integrated care interventions in primary care for community-dwelling frail older people between 2008 and 2012 were included for an IPD-meta analysis. All eight interventions contained identification or screening of frail older people from the GP practice, comprehensive geriatric assessments, care plans and an integrated, multidisciplinary follow-up according to the needs of the older people. The following outcomes were studied in a two-stage IPD-analysis: functional limitations, mental health, social functioning, health-related quality of life and general quality of life.

Results

In total, 8,678 participants were included in the eight studies, the mean age ranged from 74.2 to 83.9 years and the majority of the participants was female. The division of the six frailty subpopulations (relatively healthy; mild physically frail; psychologically frail; severe physically frail; medically frail and multi-frail) strongly differed between the eight interventions. For none of these six frailty profiles significant effects were found of the integrated care interventions on health outcomes.

Conclusions

Acknowledging the heterogeneity of the frail older population by means of frailty profiles did not provide a solid explanation yet why evaluation research thus far could not prove the effectiveness of preventive, integrated care in terms of (traditional) health outcomes. This study points out that the target population of frail older people, integrated care interventions and outcomes in evaluation research should be further aligned.

Background

Despite the high expectations of integrated care, evaluation research thus far showed limited effectiveness of preventive, integrated care interventions for frail older people. Integrated care seeks to achieve seamless and continuous care, tailored to the frail older patient's needs and based on a holistic view of the patient (Kodner & Spreeuwenberg, 2002; Mur-Veeman, Hardy, Steenbergen, & Wistow, 2003; Nies, 2004). The expectations of integrated care are high and an extensive list of potential aims are presented in the literature such as improving the quality of care and consumer satisfaction, enhancing clinical results, quality of life, system efficiency and cost-effectiveness (Kodner & Spreeuwenberg, 2002; Kodner, 2009). The number of evaluation studies is increasing rapidly in order to explore whether integrated care is able to achieve these aims, Yet, these evaluation studies of integrated care interventions have not shown convincing effects, in particular in terms of health outcomes (Blom et al., 2018; Eklund & Wilhelmson, 2009; Looman, Huijsman, & Fabbricotti, 2018)

Besides the limited effectiveness, research has also revealed that substantial differences exist between the populations of integrated care interventions aiming at frail older people. Populations were all framed as being frail but further examination showed that the populations considerably differed between and within the interventions (Looman et al., 2018). This is caused by the ambiguity of the conceptualization of frailty (Dent, Kowal, & Hoogendijk, 2016). Researchers have distinguished different domains of frailty, (i.e. the physical, psychological and social domain) (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010; Markle-Reid & Browne, 2003) but this distinction does not fully acknowledge the complexity of frailty yet. Research showed that the more heterogeneous a population is, the more difficult it is to achieve effectiveness (Ferrucci et al., 2004; Lette, Baan, van den Berg, & de Bruin, 2015). Thus, a possible explanation for the limited effects of integrated care interventions could be that frail older people have been perceived as a homogeneous group by both care professionals involved in the interventions and researchers conducting the evaluation research.

In previous research on the evaluation of integrated care interventions sub*groups* of frail older people have been distinguished. However, these subgroups were solely based on dichotomies such as male versus female, low versus high educational level (Drubbel, 2014) or worse versus better baseline situation (Blom et al., 2018; Metzelthin et al., 2013; Stuck, Egger, Hammer, Minder, & Beck, 2002). We argue that by acknowledging the heterogeneity of frailty with subpopulations of frail older people

- based on problems in different domains and the severity of these problems -, more insights can be provided in the potential effectiveness of integrated care interventions. Subpopulations within this heterogeneous population of frail older people could reveal constellation of problems - not only of physical but also of psychosocial problems - and go beyond these dichotomous subgroups. Frailty subpopulations were distinguished with latent-class analysis based on physical, psychological, social and cognitive domain of functioning (Looman et al., 2018). The results showed that frail older people cannot be perceived as a homogeneous population. Six profiles were distinguished (see box 1) ranging from relatively health to extremely frail. In four profiles the problems were mostly limited to one specific domain (either physical or psychological) and in two profiles were multidimensional with a combination of problems that extended to the social and cognitive domain.

The aim of this study is to explore to what extent the effectiveness of integrated care interventions differ between the profiles of frail older people. In other words: is integrated care (more) effective for specific frail older people? As part of the National Care for the Elderly Programme in the Netherlands, eight preventive, integrated primary care interventions were evaluated. However, an IPD-analysis of these interventions did not show convincing effects (Blom et al., 2018). In the current study the IPD-analysis of Blom and colleagues will be replicated for each of the frailty profiles separately (see figure 8.1).

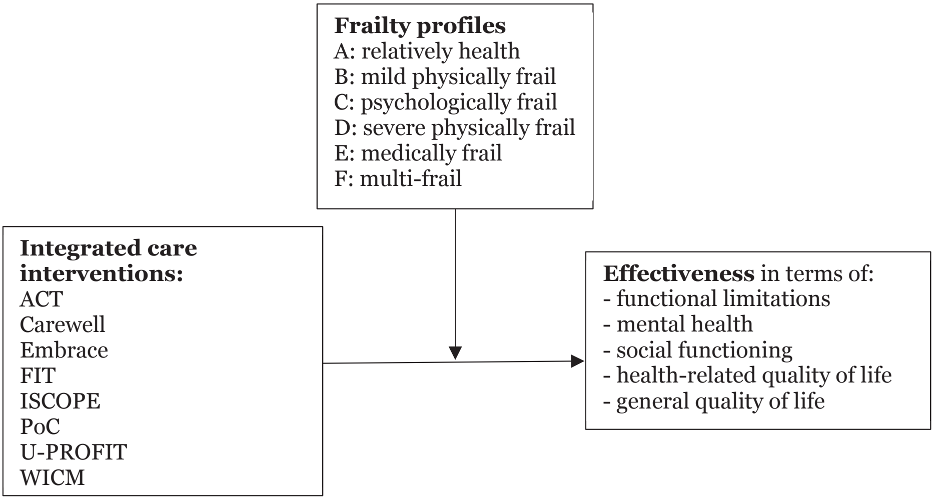


Figure 8.1: Conceptual model

Box 8.1: Descriptions of profiles of frailty

Profile A: '*Relatively healthy'*
Older people in profile A report **good health** and state that their health is **about the same** compared to a year ago. They experience **no** problems with cognitive functioning. They have problems with social activities **none of the time**. Their mean score on mental health is **83**[1]**.** They have **1.7**[2] morbidities and **0.6**[3] functional limitations.

Profile B: '*Mild physically frail'*
Older people in profile B report **good to fair health** and state that their health is **about the same to somewhat worse** compared to a year ago. They experience **no** problems with cognitive functioning. They have problems with social activities **none to little of the time**. Their mean score on mental health is **78**[1]. They have **3**[2] morbidities and **4.6**[3] functional limitations.

Profile C: '*Psychologically frail'*
Older people in profile C report **fair health** and state that their health is **somewhat worse to about the same** compared to a year ago. They experience **no to some** problems with cognitive functioning. They have problems with social activities **little to some of the time**. Their mean score on mental health is **65**[1]. They have **3.2**[2] morbidities and **1.3**[3] functional limitations.

Profile D: *'Severe physically frail'*
Older people in profile D report **fair to good health** and state that their health is **somewhat worse to about the same** compared to a year ago. They experience **no to some** problems with cognitive functioning. They have problems with social activities **none, little to some of the time**. Their mean score on mental health is **70**[1]. They have **3.8**[2] morbidities and **8.3**[3] functional limitations.

Profile E: *'Medically frail'*
Older people in profile E report **fair to poor health** and state that their health is **somewhat to much worse** compared to a year ago. They experience **no to some** problems with cognitive functioning. They have problems with social activities **some, most to all the time**. Their mean score on mental health is **51**[1]. They have **5.2**[2] morbidities and **4.9**[3] functional limitations.

Profile F: *'Multi-frail'*
Older people in profile F report **fair to poor health** and state that their health is **somewhat to much worse** compared to a year ago. They experience **some to severe** problems with cognitive functioning. They have problems with social activities **most to all the time**. Their mean score on mental health is **60**[1]. They have **4.5**[2] morbidities and **12.2**[3] functional limitations.

[1] Mental health: 0 – 100, higher scores represent better mental health.
[2] Morbidities: 0 – 17 self-reported morbidities.
[3] Functional limitations: 0 – 15 limitations in (instrumental) activities of daily living

Methods

Design

In 2008, the Dutch Ministry of Health, Welfare and Sports started the National Care for the Elderly Programme (NCEP) which aimed at reorganizing health and social care according to the needs of older people. Between 2008 and 2014 several implementation and research projects were carried out and funded by the NCEP. Eight studies evaluating preventive, integrated care interventions in primary care for community-dwelling frail older people between 2008 and 2012 were included for an IPD-meta analysis (for a detailed description of the IPD-analysis, see (Blom et al., 2018)). These eight included studies were Care in Transition study (ACT) (Muntinga et al., 2012), the CareWell-primary care program (Ruikes et al., 2012), the Embrace-study (Spoorenberg et al., 2013), the Function In Transition study (FIT) (Suijker et al., 2012), the Integrated Systematic Care for Older PEople study (ISCOPE) (Blom et al., 2016), the Prevention of Care study (PoC) (Metzelthin, van Rossum, de Witte, Hendriks, & Kempen, 2010), the Utrecht primary care PROactive frailty intervention trial (U-PROFIT) (Bleijenberg et al., 2012) and the Walcheren Integrated Care Model study (WICM) (Fabbricotti et al., 2013). The eight interventions studies had controlled designs with before and after measurements, including randomized cluster, individually or stepped wedge, or quasi-experimental designs. The number of respondents in the studies ranged from 346 (PoC) to 2283 (FiT). The follow-up period for the IPD-analysis was 12 months. Researchers in all eight projects collected the data consistent with The Older Person and Informal Caregiver Survey Minimum Dataset (TOPICS-MDS), a national, uniform dataset was created (see (Lutomski et al., 2013). TOPICS-MDS is a fully anonymized dataset available for public access, and therefore the analysis in this study is exempt from ethical review (Radboud University Medical Centre Ethical Committee review reference number: CMO: 2012/120) (Lutomski et al., 2013).

Interventions vs care as usual

The eight interventions were described according to Valentijn's Rainbow model (Valentijn, Schepman, Opheij, & Bruijnzeels, 2013), consistent with the intervention descriptions in the systematic review in chapter 6. All eight interventions contained the following elements: identification or screening of frail older people from the GP practice, comprehensive geriatric assessments, care plans and an integrated, multidisciplinary follow-up according to the needs of the older people (see the supplementary table 8.1 in the appendix). However, the specific content of these elements differed between the interventions. All interventions had a preventive approach and screened frail older people from the GP patient population with a broad approach to frailty, including the physical, psychological and social domains of functioning. However, the screening methods differed between the interventions. Half of the interventions used two-steps screening (Bleijenberg et al., 2012; Muntinga et al., 2012; Ruikes et al., 2012; Spoorenberg et al., 2013), whereas in the other half of the intervention one instrument was used. In two interventions, frailty was identified by the GP (Muntinga et al., 2012; Ruikes et al., 2012) and in one intervention information from the Electronic Medical Record was analyzed (Bleijenberg et al., 2012). Questionnaires were used in most interventions, including PRISMA (Muntinga et al., 2012), Intermed (Spoorenberg et al., 2013), ISAR-PAR (Suijker et al., 2012), EASYCARE-TOS (Ruikes et al., 2012), ISCOPE questionnaire (Blom et al., 2016) and the Groningen Frailty Indicator (Bleijenberg et al., 2012; Fabbricotti et al., 2013; Metzelthin et al., 2010; Spoorenberg et al., 2013). Comprehensive geriatric assessment in all interventions addressed a wide range of topics such as physical functioning, mood and depression, social participation, and cognitive decline. The assessment was translated into a care plan. The priorities in the care plan were sometimes determined by the older people and their informal caregivers (Blom et al., 2016; Fabbricotti et al., 2013; Metzelthin et al., 2010; Suijker et al., 2012).

The follow-up to the care plan differed between the interventions, with multiple follow-up visits (Suijker et al., 2012), evidence-based interventions (Bleijenberg et al., 2012) or case management (Fabbricotti et al., 2013; Metzelthin et al., 2010; Ruikes et al., 2012; Spoorenberg et al., 2013). The teams responsible for the follow-up in the interventions consisted at least of the GP and practice nurse but in some interventions other professionals were involved such as elderly care physician, social worker, occupational therapist and physiotherapists. All interventions educated the professionals for the interventions on specific elements such as using the assessment, developing the care plan or stimulating patient empowerment. Organizational integration was limited; two networks were set up (Fabbricotti et al., 2013; Muntinga et al., 2012), and financial integration was absent.

Functional integration was applied more extensively. In half of the interventions, multidisciplinary meetings were organized (Fabbricotti et al., 2013; Muntinga et al., 2012; Ruikes et al., 2012; Spoorenberg et al., 2013) and protocols were developed for specific geriatric problems, either evidence-based (Bleijenberg et al., 2012; Metzelthin et al., 2010; Muntinga et al., 2012; Suijker et al., 2012) or focused on multidisciplinary collaboration (Fabbricotti et al., 2013). Moreover, in half of the interventions, professionals used an information system (Fabbricotti et al., 2013; Muntinga et al., 2012; Ruikes, Meys, & Wetering, 2012; Spoorenberg et al., 2013) and normative integration occurred in half of the interventions, mostly by training sessions or workshops (Bleijenberg et al., 2012; Metzelthin et al., 2010; Ruikes et al., 2012; Spoorenberg et al., 2013).

Compared to these eight interventions, care as usual in the Netherlands is reactive, fragmented and has a monodisciplinary focus. Frail older people consult their GP at their own initiative and for specific health problems. In the Dutch health care system, the GP is gate keeper and refers patients to primary, secondary and tertiary echelons (Boot & Knapen, 2005). Moreover, care as usual is fragmented because care is delivered monodisciplinary and communication between professionals from different disciplines is scarce and bilateral through referral letters or telephonic consultations.

Outcome measures

Five outcome measures from the TOPICS-MDS were considered. *Functional limitations* were measured with the Katz-15 instrument that assesses the ability to perform 15 basic and instrumental activities of daily living (yes/no) such as getting dressed, shopping and taking medication (Laan et al., 2014; Weinberger et al., 1992). The number of activities that respondents were unable to perform were summed, ranging from 0 – 15 with a higher score indicating more functional limitations. *Health-related quality of life* was measured with the EQ-5D, which focuses on health-related quality of life and includes five dimensions: mobility, self-care, daily activities, pain/ discomfort and mood (Krabbe, Stouthard, Essink-Bot, & Bonsel, 1999; Lamers, McDonnell, Stalmeier, Krabbe, & Busschbach, 2006). For the general measure of *quality of life* the Cantril's Self Anchoring Ladder was used (Cantril, 1965). *Mental health* was measured using a five-item RAND-36 scale with items that question how often the respondents have felt nervous, calm and peaceful, down-hearted and blue, happy, and so down in the dumps nothing could cheer them up. The score of this scale ranges from 0 – 100 and a higher score implies a better mental health (van der Zee & Sanderman, 1993). *Social functioning* was measured with one item with which was asked how often social activities were hampered by physical health or emotional problems. The possible answers were: none of the time, a little of the time, some of the time, most of the time, all of the time (van der Zee & Sanderman, 1993).

Methods of analysis

The study population of each of the eight evaluation studies was described in terms of background variables (gender, age, marital status, living arrangement, educational level and frailty subpopulations) and outcome measures at baseline. Frequencies and percentages were presented for the categorical variables; means and standard deviations were presented for the continuous variables.

A two-stage IPD analysis was performed. The first step was the analysis of each of the eight interventions and for each of the six profiles separately. The four continuous outcome variables (functional limitations, health-related quality of life, general quality of life, mental health) were analysed with Linear Mixed Models of repeated measures and the categorical variable (social functioning) with Generalized Estimated Equations. In all models time, intervention (experimental or control group) and the interaction time x intervention were included and we adjusted for age, sex and clustering of GP practices. The second step was presenting the pooled outcome for each of the six profiles separately with a random-effect model, weighting with the individual standard errors. The significance level was set at $p<0.05$. The analyses were performed with SPSS and STATA.

Results

In table 8.1 the characteristics of the total 8,678 participants are presented per study. The mean age ranged from 74.2 to 83.9 years and the majority of the participants was female. Most of the older people lived independently and alone, either being widowed or single.

The mean functional limitations varied between 1.52 and 5.08 (theoretical range 0-15). On a scale from 0 to 100, the mean score on mental health ranged from 59.5 to 71.0. Social functioning was frequently hampered by 16.8 to 31.5 percent of the frail older people in the eight interventions. The mean health-related quality of life ranged from 0.57 to 0.68 (theoretical range 0-1). General quality of life was rather stable with a mean of approximately 7 in all interventions.

The division in frailty subpopulations strongly differed between the interventions. For example, the percentage of *'relative healthy'* participants in profile A ranged from 9.2% (PoC) to 62.5% (FIT). The percentage of '*psychologically frail'* older people differed between the interventions, with a relative high percentage in PoC, U-PROFIT and Embrace. The percentage of participants belonging to the multi-frail subpopulation F was low in all eight interventions so we were unable to perform the IPD-analysis for this subpopulation. For none of the six profiles the effect of integrated care on functional limitations, mental health, social functioning, health-related quality of life and general quality of life was significant (see table 8.2). Also for the WICM, the main intervention in this thesis, no significant effects were found.

Table 8.1: Characteristics of the participants

	ACT n=1147	Carewell n=536	Embrace n=602	FIT n=2283	ISCOPE n=1,104	PoC n=346	U-PROFIT n=2214	WICM n=446
N experimental & control group	groups 1:456; 2:227; 3:238; 4:226	E:287; C:249	E:309; C:293	E:1209; C:1074	E:866; C:238	E:193; C:153	E:1,384; C:830	E:221; C:225
Age in years (mean, SD)	80.49 (7.53)	81.88 (5.93)	81.89 (5.00)	82.17 (6.41)	83.86 (5.43)	77.89 (5.11)	74.24 (8.42)	82.82 (5.08)
Female - %	66.5	65.7	66.1	64.0	73.6	57.5	57.4	64.4
Educational level								
low	33.6	45.5	59.0	34.2	38.6	35.3	34.9	55.5
high	66.4	54.5	41.0	65.8	61.4	64.7	65.1	44.5
Marital status - %								
married/living together	37.6	38.8	47.4	46.4	28.3	47.4	58.1	41.0
widowed/not married/divorced	62.4	61.2	52.4	53.6	71.7	52.6	41.9	59.0
Living situation - %								
independently	92.1	100	79.2	87.1	84.5	93.4	99.9	83.0
residential care/nursing home	7.0		20.8	12.9	15.5	6.6	0.1	17.0
Subpopulations:								
A: relatively health - %	15.8	13.8	17.8	62.5	11.8	9.2	38.8	23.3
B: mild physically frail - %	22.5	37.5	17.0	7.0	21.7	12.4	8.9	19.9
C: psychologically frail - %	27.1	15.1	38.9	20.9	25.9	40.2	39.3	23.5
D: severe physically frail - %	12.7	20.3	10.5	3.3	18.5	10.4	3.1	13.2
E: medically frail - %	19.3	9.5	13.8	4.8	15.8	25.1	9.3	15.7
F: multi-frail - %	2.6	3.7	2.0	1.4	6.3	2.6	0.7	4.5
Functional limitations (0-15) (mean, SD)	3.92 (2.78)	5.08 (2.84)	3.29 (2.85)	3.21 (3.00)	4.65 (3.34)	3.12 (3.01)	1.52 (2.05)	4.02 (3.30)
Mental health (0-100) (mean, SD)	67.70 (20.59)	71.00 (19.52)	67.22 (0.16)	70.79 (17.49)	66.48 (18.40)	59.50 (17.53)	70.36 (18.62)	70.69 (17.65)
Social function hampered a little of none of the time - %	45.7	61.3	50.1	54.8	78.3	39.3	56.0	59.0
Health-related quality of life (0-1) (mean, SD)	0.60 (0.28)	0.60 (0.30)	0.68 (0.16)	0.74 (0.22)	0.57 (0.30)	0.64 (0.27)	0.74 (0.23)	0.63 (0.27)
Quality of life (0-10) (mean, SD)	6.98 (1.30)	7.04 (1.23)	6.60 (1.32)	7.17 (1.24)	6.79 (1.38)	6.57 (1.28)	7.17 (1.28)	6.99 (1.15)

Table 8.2 Outcomes of the IPD-analysi:s for each of the six frailty profiles

Outcome measures - *Patient outcomes (mean change over 12 months)*	Adjusted mean difference between intervention and usual care (95% CI)				
Frailty profiles	Functional limitations[1]	Mental health[2]	Social functioning[3] - OR	Quality of life[4] – health related	Quality of life[5] – general
A: relatively health	-0.02 (-0.12; 0.10)	-0.05 (-1.16; 1.07)	1.00 (0.79; 1.27)	-0.01 (-0.03; 0.01)	-0.02 (-0.10; 0.06)
B: mild physically frail	-0.08 (-0.34; 0.18)	-0.13 (-1.85; 1.58)	0.88 (0.65; 1.19)	-0.02 (-0.05; 0.01)	0.07 (-0.14; 0.28)
C: psychologically frail	0.01 (-0.14; 0.16)	-0.64 (-1.89; 0.60)	1.07 (0.87; 1.32)	0.00 (-0.02; 0.02)	0.02 (-0.10; 0.13)
D: severe physically frail	-0.02 (-0.46; 0.45)	0.59 (-2.38; 3.56)	0.82 (0.43; 1.55)	0.02 (-0.03; 0.06)	-0.03 (-0.25; 0.19)
E: medically frail	0.24 (-0.07; 0.54)	0.02 (-2.31; 2.34)	1.33 (0.90; 1.96)	0.00 (-0.03; 0.04)	-0.06 (-0.27; 0.16)
F: multi-frail	-	-	-	-	-

[1] Modified Katz scale, higher scores represent more functional limitations;
[2] RAND Mental Health Subscale, higher scores represent better mental health;
[3] RAND item social functioning; hampered a little or none of the time vs hampered some of the time; mostly and all of the time.
[4] EQ-5D, higher scores represent better health-related quality of life
[5] Cantril's Self Anchoring Ladder, higher score represents better quality of life

Discussion

Despite the high expectations of integrated care, evaluation research thus far has shown limited effectiveness of preventive, integrated care interventions in primary care for community-dwelling frail older people. A possible explanation for the limited effects could have been that frail older people are a heterogeneous group which is not fully acknowledged in the evaluation research on integrated care. Therefore, in the current study, insights of two previous studies were combined in order to explore whether integrated care is effective for specific subpopulations of frail older people. An IPD-analysis of eight integrated care interventions from the NCEP was replicated (see also (Blom et al., 2018)) for six frailty profiles as distinguished in previous research (Looman et al., 2018). The results showed that the subpopulations of frail older people do not moderate the effectiveness of eight integrated, primary care interventions or the WICM. For none of the subpopulations, integrated care was effective in terms of five health functional limitations, mental health, social functioning, general quality of life and health-related quality of life.

The results confirmed that frail older people are indeed a heterogeneous population. Heterogeneity of the population of frail older people exists within and between primary integrated interventions. The distribution of subpopulations strongly differed between the study populations of the eight preventive, integrated care interventions in our study. This is related to the screening methods as is shown by the differences in distributions of the subpopulation FIT intervention (using the ISAR-PAR which is a short instrument with three questions on IADL activities, memory loss and age (Suijker et al., 2012)) and the PoC, using the Groningen Frailty Indicator (a 15 item questionnaire on The GFI is a 15-item questionnaire that measures decreases in physical, cognitive, social, and psychological functioning (Metzelthin et al., 2010)). However, the screenings instruments do not fully explain the differences between the populations since both PoC (Metzelthin et al., 2010) and the WICM (Fabbricotti et al., 2013) used the Groningen Frailty Indicator to screen for frailty – but with different cut-off points – and the division in frailty subpopulations is still rather different.

Furthermore, our results show that acknowledging this heterogeneity by frailty profiles does not provide a solid explanation for the limited effectiveness of preventive, integrated care on health outcomes of frail older people. This is line with evidence from previous systematic review on integrated care (Eklund & Wilhelmson, 2009; Looman et al., 2018) and the IPD-analysis on the entire population of frail older people and on dichotomous subgroups (Blom et al., 2018). Even though no significant effects were found, still, some tendencies between specific frail older people and the effectiveness of integrated care could be observed. Firstly, when the type and severity of the problems of the frail older people, and thereby the complexity, increased, the effects of integrated care on health outcomes also varied increasingly. The effects of the integrated care interventions were most similar for *relative healthy* older people (profile A) compared to the other five frailty profiles. Secondly, also negative tendencies could be observed for the effects of integrated care within the profiles. This is quite remarkable since in a systematic review no negative effects of integrated care on health outcomes were found for frail older people in general (Looman et al., 2018). However, in the current study distinguishing frailty profiles, a negative tendency was shown of integrated care on mental health for *psychological frail* of profile C. Also for profile E, the *medically frail*, there wa a negative tendency of integrated care on functional limitations. Within this profile E the frail older people have relatively many chronic conditions and this negative effect might point towards medicalisation (Pereira et al., 2015). Thirdly, the severity of frailty also seemed relevant in the effects of integrated care. The results showed differences in the effect of integrated care on health-related quality of life between the two physically frail profiles. Profile B, the *mild physically frail*, tended towards a negative effect, whereas for profile D, the *severe physically frail*, tended towards a positive effect of integrated care on health-related quality.

Strengths and limitations

The main strength of this study is the innovative approach of exploring the effectiveness of integrated care by acknowledging the heterogeneity of the population of frail older people. Our frailty profiles exceed the dichotomy frail – non-frail or the divisions in subgroups, for example worse versus better baseline situation. The six subpopulations show constellations of problems in multiple domains of functioning. The effectiveness of eight Dutch interventions from the NCEP could be explored in an IPD-analysis because the eight interventions were quite comparable, even as the care as usual in the control group. Moreover, all evaluation studies measured the exact same outcomes with the same instruments as prescribed in the TOPICS-MDS. This was a unique opportunity to explore the Dutch context.

The first limitation of our research is that the IPD-analysis was a non-systematic selection of eight interventions in the Dutch context and that the external validity is limited. We can therefore not generalize our conclusions to other countries or make general statements on the effectiveness of integrated care. The second limitation is that some of the subpopulations were rather small. This means that the statistical power was sometimes limited and for profile F – the *multi-frail* - the number were too small to perform the IPD analysis. In the original analysis of the frailty profiles, the profiles were dinstinguished with latent-class analysis based on the entire TOPICS-MDS dataset including hospitalized and institutionalized frail older people (Looman et al., 2018; Lutomski et al., 2013) whereas our IPD-analysis focused integrated primary care interventions in which community-dwelling frail older were preventively screened. The last limitation is that the outcome measures of the IPD-analysis were rather traditional health outcomes such as functional limitations and health-related quality of life. Previous research also showed that the effects of preventive, integrated care on these outcomes is generally limited (Blom et al., 2018; Eklund & Wilhelmson, 2009; Looman et al., 2018). These (traditional) outcomes were agreed upon for the TOPICS-MDS within the NCEP; however, since the development of the TOPICS-MDS (Lutomski et al., 2013), research has gradually shifted towards other outcomes related to well-being and positive health (Huber et al., 2011; Huber et al., 2016; Linton, Dieppe, & Medina-Lara, 2016). Two outcomes in this study were quality of life outcomes but these were health-related quality of life (Krabbe et al., 1999; Lamers et al., 2006) and general quality of life measured with a single item (Cantril, 1965). Research showed that health-related quality of life seems less appropriate for frail older people (Comans, Peel, Gray, & Scuffham, 2013) and well-being is more nuanced and related to specific domains, such as love and friendship and doing things that make you valued (Coast et al., 2008; Grewal et al., 2006; Nieboer, Lindenberg, Boomsma, & Bruggen, 2005).

Recommendations

The first implication of our research is that heterogeneity of frailty should be further explored in order to gain better insights in improving the effectiveness of integrated care aimed at frail older people. Heterogeneity enables to identify specific needs of frail older people by acknowledging both their deficits *and* assets. Also in evaluation research of integrated care, the heterogeneity of frail older population should become more prominent. Our research shows that overall effects of integrated care might be absent because both positive and negative effects emerge that might level each other out. Moreover, when complexity of the problems of frail older people increases, the effects of the intervention became more mixed. Further specification of frailty could provide better understanding in the potential effects of integrated care on frail older people. Even though our six frailty profiles were a promising starting point, future research might apply more narrow segmentation. The second implication is that the integrated care interventions itself should be properly aligned to the needs of frail older people. The integrated care interventions in these studies were complex interventions consisting of many different components such as screening, geriatric assessments, follow-up, case management, multidisciplinary meetings and protocols. However, these elements might not be necessary for all (profiles of) frail older people, since also negative tendencies emerged in our study. Also the specific content of the integrated care interventions should be aligned to the needs of frail older people. The eight interventions had a strong medical approach since all were situated in Dutch primary care practices with an important role for the GP and practice nurse. A third and last implication is that the effects of subpopulations on the effectiveness of integrated care should also be studied for other types of outcomes, including well-being and outcomes related to positive health.

Conclusions

The heterogeneity and complexity of the frail older population should be further acknowledged, both between and within integrated care interventions. Yet, acknowledging this heterogeneity by means of frailty profiles did not provide a solid explanation yet why evaluation research thus far could not prove the effectiveness of preventive, integrated care in terms of (traditional) health outcomes. This study points out that the alignment between the target population of frail older people, integrated care interventions and outcomes in evaluation research should improve.

References

Bleijenberg, N., Drubbel, I., Ten Dam, V. H., Numans, M. E., Schuurmans, M. J., & de Wit, N. J. (2012). Proactive and integrated primary care for frail older people: Design and methodological challenges of the utrecht primary care PROactive frailty intervention trial (U-PROFIT). *BMC Geriatr, 12*, 16.

Blom, J., Den Elzen, W., Van Houwelingen, A. H., Heijmans, M., Stijnen, T., Van den Hout, W., & Gussekloo, J. (2016). Effectiveness and cost-effectiveness of a proactive, goal-oriented, integrated care model in general practice for older people. A cluster randomised controlled trial: Integrated systematic care for older people—the ISCOPE study. *Age and Ageing, 45*(1), 30-41.

Blom, J. W., Van den Hout, W. B., Den Elzen, W. P. J., Drewes, Y. M., Bleijenberg, N., Fabbricotti, I. N., . . . on behalf of the TOPICS-MDS research consortium. (2018). Effectiveness and cost-effectiveness of proactive and multidisciplinary integrated care for older people with complex problems in general practice: An individual participant data meta-analysis. *Age & Ageing, 47: 705-714*.

Boot, J. M., & Knapen, M. H. J. M. (2005). *Handboek Nederlandse gezondheidszorg. [Handbook Dutch healthcare].* Utrecht: Het Spectrum.

Cantril, H. (1965). *Pattern of human concerns*. New Brunswick: Rutgers University Press.

Coast, J., Flynn, T. N., Natarajan, L., Sproston, K., Lewis, J., Louviere, J. J., & Peters, T. J. (2008). Valuing the ICECAP capability index for older people. *Social Science & Medicine, 67*(5), 874-882.

Comans, T. A., Peel, N. M., Gray, L. C., & Scuffham, P. A. (2013). Quality of life of older frail persons receiving a post-discharge program. *Health and Quality of Life Outcomes, 11*(1), 1.

Dent, E., Kowal, P., & Hoogendijk, E. O. (2016). Frailty measurement in research and clinical practice: A review. *European Journal of Internal Medicine, 31*, 3-10.

Drubbel, I. (2014). *Frailty screening in older patients in primary care using routine care data*. PhD Thesis, Utrecht University.

Eklund, K., & Wilhelmson, K. (2009). Outcomes of coordinated and integrated interventions targeting frail elderly people: A systematic review of randomised controlled trials. *Health Soc Care Community, 17*, 447-458.

Fabbricotti, I. N., Janse, B., Looman, W. M., de Kuijper, R., van Wijngaarden, J. D., & Reiffers, A. (2013). Integrated care for frail elderly compared to usual care: A study protocol of a quasi-experiment on the effects on the frail elderly, their caregivers, health professionals and health care costs. *BMC Geriatr, 13*, 31.

Ferrucci, L., Guralnik, J. M., Studenski, S., Fried, L. P., Cutler, G. B., & Walston, J. D. (2004). Designing randomized, controlled trials aimed at preventing or delaying functional decline and disability in frail, older persons: A consensus report. *Journal of the American Geriatrics Society, 52*(4), 625-634.

Gobbens, R. J. J., Luijkx, K. G., Wijnen-Sponselee, M. T., & Schols, J. M. G. A. (2010). Towards an integral conceptual model of frailty. *The Journal of Nutrition, Health & Aging, 14*(3), 175-181.

Grewal, I., Lewis, J., Flynn, T., Brown, J., Bond, J., & Coast, J. (2006). Developing attributes for a generic quality of life measure for older people: Preferences or capabilities? *Social Science & Medicine, 62*(8), 1891-1901.

Huber, M., Knottnerus, J. A., Green, L., van der Horst, H., Jadad, A. R., Kromhout, D., . . . van der Meer, Jos WM. (2011). How should we define health? *BMJ: British Medical Journal (Online), 343*

Huber, M., van Vliet, M., Giezenberg, M., Winkens, B., Heerkens, Y., Dagnelie, P. C., & Knottnerus, J. A. (2016). Towards a 'patient-centred' operationalisation of the new dynamic concept of health: A mixed methods study. *BMJ Open, 6*(1), e010091-2015-010091.

Kodner, D. L. (2009). All together now: A conceptual exploration of integrated care. *Healthcare Quarterly (Toronto, Ont.),* 13 Spec No, 6-15.

Kodner, D. L., & Spreeuwenberg, C. (2002). Integrated care: Meaning, logic, applications, and implications - a discussion paper. *Int J Integr Care, 14*(2).

Krabbe, P. F., Stouthard, M. E., Essink-Bot, M., & Bonsel, G. J. (1999). The effect of adding a cognitive dimension to the EuroQol multiattribute health-status classification system. *Journal of Clinical Epidemiology, 52*(4), 293-301.

Laan, W., Zuithoff, A., Drubbel, I., Bleijenberg, N., Numans, M., De Wit, N., & Schuurmans, M. (2014). Validity and reliability of the katz-15 scale to measure unfavorable health outcomes in community-dwelling older people. *The Journal of Nutrition, Health & Aging, 18*(9), 848.

Lamers, L. M., McDonnell, J., Stalmeier, P. F., Krabbe, P. F., & Busschbach, J. J. (2006). The dutch tariff: Results and arguments for an effective design for national EQ-5D valuation studies. *Health Economics, 15*(10), 1121-1132.

Lette, M., Baan, C. A., van den Berg, M., & de Bruin, S. R. (2015). Initiatives on early detection and intervention to proactively identify health and social problems in older people: Experiences from the netherlands. *BMC Geriatr., 15*(143)

Linton, M. J., Dieppe, P., & Medina-Lara, A. (2016). Review of 99 self-report measures for assessing well-being in adults: Exploring dimensions of well-being and developments over time. *BMJ Open, 6*(7), e010641-2015-010641.

Looman, W. M., Fabbricotti, I. N., Blom, J. W., Jansen, A. P. D., Lutomski, J. E., Metzelthin, S. F., . . . on behalf of the TOPICS-MDS research consortium. (2018). The frail older person does not exist: Development of frailty profiles with latent class analysis. *BMC Geriatrics, 18*(1), 84.

Looman, W. M., Huijsman, R., & Fabbricotti, I. N. (2018). The (cost-)effectiveness of preventive, integrated primary care for community-dwelling frail older people: A systematic review. *Health & Social Care in the Community, April,* 1-30.

Lutomski, J. E., Baars, M. A. E., Schalk, B. W. M., Boter, H., Buurman, B. M., den Elzen, W. P. J., . . . Melis, R. J. F. (2013). The development of the older persons and informal caregivers survey minimum DataSet (TOPICS-MDS): A large-scale data sharing initiative. *PLoS One, 8*(12), e81673.

Markle-Reid, M., & Browne, G. (2003). Conceptualizations of frailty in relation to older adults. *J.Adv.Nurs., 44,* 58-68.

Metzelthin, S. F., van Rossum, E., de Witte, L. P., Ambergen, A. W., Hobma, S. O., Sipers, W., & Kempen, G. I. (2013). Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people: Cluster randomised controlled trial. *Bmj, 347,* f5264.

Metzelthin, S. F., van Rossum, E., de Witte, L. P., Hendriks, M. R. C., & Kempen, G. I. J. M. (2010). The reduction of disability in community-dwelling frail older people: Design of a two-arm cluster randomized controlled trial. *BMC Public Health, 10*(1), 511.

Muntinga, M. E., Hoogendijk, E. O., van Leeuwen, K. M., van Hout, H. P., Twisk, J. W., van, d. H., . . . Jansen, A. P. (2012). Implementing the chronic care model for frail older adults in the netherlands: Study protocol of ACT (frail older adults: Care in transition). *BMC Geriatr, 12*, 19.

Mur-Veeman, I., Hardy, B., Steenbergen, M., & Wistow, G. (2003). Development of integrated care in england and the Netherlands: Managing across public–private boundaries. *Health Policy, 65*(3), 227-241.

Nieboer, A., Lindenberg, S., Boomsma, A., & Bruggen, A. C. V. (2005). Dimensions of well-being and their measurement: The SPF-IL scale. *Social Indicators Research, 73*(3), 313-353.

Nies, H. (2004). Integrated care: Concepts and background. In H. Nies, & P. C. Berman (Eds.), *Integrating services for older people: A resource book for managers* (pp. 17-32). Dublin: Ehma.

Ruikes, F. G., Meys, A. R., van de Wetering, G., Akkermans, R. P., van Gaal, B. G., Zuidema, S. U., . . . Koopmans, R. T. (2012). The CareWell-primary care program: Design of a cluster controlled trial and process evaluation of a complex intervention targeting community-dwelling frail elderly. *BMC Fam Pract, 13*, 115.

Spoorenberg, S. L., Uittenbroek, R. J., Middel, B., Kremer, B. P., Reijneveld, S. A., & Wynia, K. (2013). Embrace, a model for integrated elderly care: Study protocol of a randomized controlled trial on the effectiveness regarding patient outcomes, service use, costs, and quality of care. *BMC Geriatr, 13*, 62.

Stuck, A. E., Egger, M., Hammer, A., Minder, C. E., & Beck, J. C. (2002). Home visits to prevent nursing home admission and functional decline in elderly people: Systematic review and meta-regression analysis. *Jama, 287*(8), 1022-1028.

Suijker, J. J., Buurman, B. M., ter Riet, G., van Rijn, M., de Haan, R. J., de Rooij, S. E., & van Charante, Eric P Moll. (2012). Comprehensive geriatric assessment, multifactorial interventions and nurse-led care coordination to prevent functional decline in community-dwelling older persons: Protocol of a cluster randomized trial. *BMC Health Services Research, 12*(1), 85.

Valentijn, P. P., Schepman, S. M., Opheij, W., & Bruijnzeels, M. A. (2013). Understanding integrated care: A comprehensive conceptual framework based on the integrative functions of primary care. *Int J Integr Care, 13*(1), 655-679.

van der Zee, K., & Sanderman, R. (1993). Rand-36. *Groningen: Northern Centre for Health Care Research, University of Groningen, the Netherlands, 28*

Weinberger, M., Samsa, G. P., Schmader, K., Greenberg, S. M., Carr, D. B., & Wildman, D. S. (1992). Comparing proxy and patients' perceptions of patients' functional status: Results from an outpatient geriatric clinic. *Journal of the American Geriatrics Society, 40*(6), 585-588.

Supplementary table 8.1

Name intervention	Short description intervention	Focus intervention/ primary outcome
ACT	Consisted of the following components: a regularly scheduled in-home comprehensive geriatric assessment by a practice nurse, followed by a customized care plan, management and training of practice nurse by a geriatric expert team, and coordination of care through community care network meetings and multidisciplinary team consultations of individuals with complex care needs.	Target health risks and care needs at an early stage, stimulate active involvement of older adults in the care process, improve coordination between professionals
CareWell	General practitioner-led extensive, multicomponent program integrating cure, care and welfare for the prevention of functional decline.	Prevention functional decline
Embrace	Embrace encompasses an Elderly Care Team per general practitioner practice, an Electronic Elderly Record System, decision support instruments, and a self-management support and prevention program – combined with care and support intensity levels.	Primary patient outcomes: complexity of care needs, frailty, health status, and self-management ability. Primary caregiver outcome: caregiver burden.
FIT	Comprehensive geriatric assessment and individually tailored care treatment plan consisting of multifactorial interventions based on standardized evidence-based protocols, and nurse-led care coordination with multiple follow-up visits	Primary outcome: physical functioning.
ISCOPE	Multidisciplinary integrated care plan using a functional approach delivered by the GP and PN. Training in functional approach and care plan, 3 sessions of 2 hours each.	Quality of life, activities of daily living
PoC	Multidimensional assessment and interdisciplinary care based on a tailor made treatment plan and regular evaluation and follow-up.	Participation in social and productive activities
UPROFIT	U-PRIM, a frailty screening intervention based on routine care data, and of U-PRIM followed by U-CARE, a nurse-led personalised care intervention.	Preserving daily functioning
WICM	Pro-active screening for frailty, assessment of care needs, GP practice as single entry point from which case management was provided, GP as coordinator of care, and the process was supported by multidisciplinary meetings, protocols and web-based files.	Improve quality of life

	Service integration (micro-level)				
Name intervention	**Identification/screening of frail older people**	**Assessment**	**Care plan**	**Follow-up**	**Single entry point**
ACT	2 consecutive steps:1) Identification of frail persons by the GP (frail=experiencing one or more limitation in either physical, psychological and/or social areas); 2) PRISMA-7 questionnaire score > 3 (a score of > 3 was considered as frail)	Yes comprehensive	Yes, developed by nurse with primary care physician	Guideline-concordant management and treatment options, involve older adults in decision-making process, evaluate of care plan	
CareWell	EasyCare-TOS instrument	Yes	Yes, revised during team meetings	Case management by nurse or social worker: coordinate and monitor care, plan team meetings, acknowledge participants of care plan, involve participants in settings goals, maintain contact with participants and informal caregiver, hold a medication review (by ≥5 chronically prescribed drugs)	
Embrace	Identification based on complexity of care needs [INTERMED Elderly Self-assessment (IM-E-SA)], and level of frailty measured with the Groningen Frailty Indicator (GFI) into risk profiles: A) robust, B) frail, C) complex care needs. B and C included in this study.	Yes, history questionnaire to identify problems on physical functioning, performance of activities, social participation and living environment	Yes, care and support plan with information about goal setting, actions performed and evaluations	Case management by practice nurse or social worker, navigating through complex care process, monitor changes in the medical, psychosocial, or living situation and navigates the plan's delivery. Close contact with professionals and volunteers. Care plan is discussed every month.	
FIT	ISAR-PC: Identification of Seniors at Risk-Primary Care	Yes, comprehensive geriatric assessment to systematically identify geriatric conditions, problems and needs. CGA focuses on physical, psychological, functional and social domains with validated instrument and physical examination.	Individually tailored care and treatment plan (CTP), priorities in consultation with the older people and informal caregivers.	Multiple follow-up visits, nurse-led coordination. Evaluation of CTP and interventions; prioritizing geriatric conditions, social functioning and participation, burden and needs of caregiver, participants needs and expectations. Nr of home visits is flexible range between 3 and 8. Nurse maintains contact with other health care professionals (occupational therapists, physiotherapists, welfare consultants) and caregiver.	

	Service integration (micro-level)				
Name intervention	**Identification/screening of frail older people**	**Assessment**	**Care plan**	**Follow-up**	**Single entry point**
ISCOPE	ISCOPE-screening questionnaire with 4 domains of health: functional, somatic, psychological, social: >2 domains of health positive included.	Inventory of existing health problems in problem areas: somatic, activities daily living, social, mental and communicative problems. Wishes and expectations of older person about goals to be achieved were explored with participant and informal caregiver.	Multidisciplinary integrated care plan using a functional approach, priorities and goals of the older person as starting point.	The GP/practice nurse, together with the older person, formulated actions to be taken and evaluation plans for follow-up. Other care professionals were involved where needed (multidisciplinary consultation)	
PoC	Screening Groningen Frailty Indicator >4	Yes, multidimensional: Problems daily activities, risk factors daily activities	Yes, formulated with frail older person	Case management by practice nurse: executing treatment plan with intervention protocol and toolbox of interventions, evaluation of achievement of goals, implementation of strategies in daily life, need of support in the following period, update other professionals	
UPROFIT	Screening with automated analysis of electronic medical record (EMR) data: Multimorbidity (frailty index score of ≥ 0.20); AND/OR; Polypharmacy (chronic use of ≥ 5 medications) AND/OR; Consultation gap in primary care of ≥3 years	Yes, two-stage: Frailty & bio-psychosocial needs; comprehensive (falls & mobility, physical functioning, nutrition and malnutrition, cognitive decline, polypharmacy, mood & depression, loneliness, vision problems & hearing loss, urinary incontinence, caregiver burden)	Yes, developed by practice nurse and GP	Interventions from evidence-based care plan for all ten health problems (e.g. polypharmacy: multifactorial interventions; tailored patient education, instruction, support, feedback and follow-up; tools and reminders for adherence)	
WICM	Screening Groningen Frailty Indicator>3	Yes, comprehensive: Activities daily life, cognition, mood, support care givers	Yes, formulated in consultation with frail older people and informal caregiver, developed by case manager, approved in multidisciplinary meeting	Case management by practice nurse: coordinate care, monitoring, admittance to services, contact person for professionals, evaluating treatment plan, follow-up at least every 6 months	Yes

	Professional integration (meso-level)				**Organizational integration (meso-level)**	**System integration (macro-level)**
Name intervention	**Focal organisation**	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
ACT	Primary care practice	Part of team	Practice nurse, GP, geriatric expert team (experienced geriatric nurse and an elderly care physician), pharmacists, other health care professionals could be consulted	Practice nurse: motivational interviewing course, workshop on assessment tool, management and training by expert team. Geriatrician: workshop on assessment tool	Regional network of organizations: providers of care services for older adults, primary care professionals, community-based organizations	
CareWell	GP practice		Core multidisciplinary team: GP, practice nurse or community nurse, elderly care physician, social worker	Persuasive communication and social influencing for participation, provision of additional information through a website, newsletters and written instructions, providing feedback and advice to the participating professionals		No - Financial reimbursement for all health care professionals and organizations to cover the extra efforts required by the program, to facilitate participation in the intervention
Embrace	GP practice		Elderly Care Team: GP, elderly care physician, case managers (district nurse and social worker)	Intensive training program on working according to the intervention (pro-active team work, prevention, and working with the information system. Casemanagers: training on individual and group self-management interventions. GP: manage their team and on providing care and support on problems as multimorbidity,. Project leader: training and support on the job.		
FIT	GP practice	Registered nurse works in close collaboration with GP. GP is formally responsible.	GP and registered nurse	10-day training program on content and use of study protocol, CGA, design and apply individually tailored CTP. Focus on care coordination, patient empowerment and motivational interviewing. Group refresher course every 6 weeks on study protocol and to discuss complex cases.		

	Professional integration (meso-level)				Organizational integration (meso-level)	System integration (macro-level)
Name intervention	**Focal organisation**	**Role GP**	**Team composition**	**Education professionals**	**Organizational integration**	**Financial integration**
ISCOPE	GP practice		GP and PN	GPs and practice nurses were trained (2 sessions of 3 hours) by a GP specialised in geriatric care to deliver proactive integrated care, including designing, conducting and adjusting a care plan. GPs could consult the specialised GP and received extra training on resources and organisation of care.		
PoC	GP practice	Member core team	Core team: General practitioner and practice nurse. Close cooperation: occupational therapists and physical therapists, other professionals (pharmacists, geriatrician)	All professionals: training sessions and meetings on intervention protocol (e.g. screening, assessment), possibility to gain experience with protocol in practice		
UPROFIT	GP practice		GP, practice nurse	Practice nurses: intervention training program 5 weeks of 4 hours on frailty assessment, content assessment, evidence-based care plans. GP and practice nurse: intervention training session 4 hours on content intervention		
WICM	Network of organizations with one single entry point	Coordinator of care, partner in prevention, single entry point	GP, nurse practitioner, second-line geriatric nurse practitioner, geriatric physiotherapists, geriatricians, pharmacists, district nurse, nursing home doctors, mental health workers	GP: training in geriatric care, assessment tool, GP consults. Case manager: training assessment tool, course case management	Network with Joint Governing Board of all involved organizations (GP practices, home care organizations, and nursing homes)	

	Functional integration		Normative integration		
Name intervention	**Coordination**	**Information system**	**Normative integration**	**Role informal caregiver**	**Prevention**
ACT	Guideline-concordant management and treatment options	Digital patient system, tasks geriatric expert team: (quality) management, expert knowledge transfer by team meetings, training sessions and multidisciplinary patient reviews			Identification of frail older people by GP & PRISMA questionnaire; assessment; care plan; follow-up
CareWell	Team meetings every 4 - 8 weeks, multidisciplinary guidelines on 8 common geriatric syndromes, a guideline on advance care planning, procedure agreement for easy-to-access consultation by geriatric experts, and procedure agreement between primary and specialized providers upon hospitalization and discharge	Web-based health and welfare portal	Tailor-made meetings, coaching on the job, helpdesk, and expert meetings to overcome gaps in knowledge, attitude and skills needed to conduct the program		Screening with EasyCare-TOS, assessment; care plan; follow-up
Embrace	Monthly meetings in which the Elderly Care Team evaluates the participants' (health) problems and treatment options. Decision support: triage instrument for stratification and history questionnaires.	Clinical information system with personal health records (individual triage data, history questionnaire, care plan), panel overview and team agenda.	Regular meetings between ECT professionals and project leaders. GP trainings on team management.	(Health) problems and treatment options of caregivers are discussed and evaluated in meetings.	Screening with INTERMED Elderly Self-assessment and GFI into risk profiles, assessment, care plan. Focus on the elderly people central role in their health management and their perspective on care and support needs. Systematic application of effective self-management support strategies such as shared decision making, motivational interviewing, goal attainment, and action planning. Organization of community meetings on need for prevention. endorsing a healthy lifestyle and maintaining self-management abilities.

	Functional integration		Normative integration		
Name intervention	**Coordination**	**Information system**	**Normative integration**	**Role informal caregiver**	**Prevention**
FIT	Multifactorial interventions based on standardized evidence-based protocols for geriatric conditions (goal, step-wise action plan, background information, screening for conditions, diagnostic work-up, evidence-based interventions, financing of care, advice participants, aim of patient empowerment), nurse-led coordination.			Care and treatment plan is discussed with informal caregiver. Burden and needs of caregivers are addressed during home visits.	Identification ISAR-PC, assessment, CTP. Registered nurse enhances empowerment of the participants and caregivers by providing or facilitation psychoeducation on identified geriatric conditions.
ISCOPE				Goals to be achieved were discussed with informal caregiver.	Screening with ISCOPE, inventory health problem, care plan.
PoC	Bilateral or extended team meetings, toolbox of interventions: enhancing meaningful activities, daily physical activity, social network and social activities, adapting environment, activities or skills, and stimulating health		Training sessions and meetings on client-centeredness, interdisciplinary collaboration	Support of social and physical environment, involvement in decision making and cooperative working relationship	Screening Groningen Frailty Indicator; assessment; care plan; follow-up; stimulating health is one of five topics in toolbox of interventions
UPROFIT	Flowchart with suggested evidence-based interventions,		Workshop about collaboration between GP's and practice nurses	Assessment of caregiver burden	Screening of electronic medical record, assessment; care plan; follow-up; screening intervention on falls/mobility, exercise programs that consist of muscle strengthening, balance retraining, endurance and flexibility, motivation, feedback, patient education on physical functioning; screening on nutritional status, patient education on loneliness
WICM	Multidisciplinary meetings, multidisciplinary protocols, web-based files, task reassignment and delegation between nurses and doctors and among GPs, nursing home doctors and geriatricians. Consultation among primary, secondary and tertiary care providers occurred	Web-based files		Explicit attention for support and guidance and informal caregiver, validate care plan with informal caregiver	Screening Groningen Frailty Indicator; assessment; care plan; follow-up; GP is partner in prevention

CHAPTER 9

General discussion

Frail older people with complex and diverse needs, like my grandmother, have to age in place in the community rather than being admitted to residential care or nursing homes. Their number keeps rising due to population ageing and national health policies are increasingly aiming at ageing in place. Health care systems are under pressure and (primary) care professionals keep struggling with the increasing complexity of the frail patient population. Care for frail older people originally is reactive, fragmented and lacks coordination and integrated, preventive care is perceived as a promising solution. The overall aim of this thesis was therefore to gain more insight into the effectiveness and cost-effectiveness of preventive, integrated care for community-dwelling frail older people. This insight is firstly provided by focusing on the (cost-) effectiveness of the Walcheren Integrated Care Model (WICM). Secondly, this WICM evaluation was incorporated in a systematic review to synthesize the current evidence of 46 studies on 29 interventions were studied. In this review, the heterogeneity of the population, community-dwelling frail older people, was highly remarkable and may have possibly influenced the results of evaluation studies. Thirdly, this heterogeneity of frailty was therefore further explored in this thesis by developing frailty profiles with latent-class analysis. These frailty profiles were used to re-determine the effectiveness of the WICM and seven comparable interventions for each of profile separately to explore where integrated care is more effective for certain types of frail older people.

In the discussion of this thesis, the main findings are presented and the theory and research methodology are reflected upon. In order to explore the future directions of the triangle practice, policy and research, we reflect upon the relation of these three domains and one general integrated agenda was formulated.

Main findings

The effectiveness and cost-effectiveness of the Walcheren Integrated Care Model

As stated above, the first sub-question of this thesis was: is the WICM (cost-)effective? The WICM intervention is a comprehensive model with a broad frailty screening, comprehensive geriatric assessment, follow-up with case management and a multidisciplinary team (chapter 2). Different elements were implemented to realize integration such as multidisciplinary meetings, web-based files and network structure. All elements were combined into the WICM to provide coherent, continuous care according to the needs of frail older people. The effectiveness was studied three and twelve months after implementation of the WICM and the cost-effectiveness was determined after twelve months. From this thesis can we concluded that the effect of the WICM appears to be limited but increases over time.

After three months, the effectiveness of the WICM was limited to a small effect on the quality of life of the frail older people (chapter 3). The intervention resulted in frail older people being able to receive more love and friendship. No other quick wins of the intervention were found in terms of health outcomes, functional abilities, health care utilization or satisfaction with care.

After twelve months, more effects were substantiated. The WICM still had a positive effect on love and friendship but also on general quality of life (chapter 4). Moreover, frail older people who received care according to the WICM were more satisfied with the care and information given to them, and the patient-centeredness of and the coherence in their care than frail older receiving usual care[2]. However, still no effects were found on health outcomes, functional abilities and health care utilization. The absence of effects on the health care utilization, and hence the costs, combined with the intervention costs (case management, multidisciplinary meetings), and a very small effect on health-related quality of life resulted in the WICM not being cost-effective (chapter 5).

The (cost-) effectiveness of the WICM compared to similar interventions

From a systematic review conducted in this thesis can be concluded that the results of the WICM are in line with the outcomes of other preventive, integrated care interventions (chapter 6). As in the WICM, the effect on health outcomes and functional abilities were limited in most studies, whilst well-being appeared to be positively affected. With respect to health care utilization, similar patterns also emerged between the WICM and the other interventions. Most types of health care utilization of frail older people as well as health-related quality of life were not affected by the integrated care interventions. Also, no effects on the health care costs were found which resulted in limited evidence on the cost-effectiveness. In contrast to most other models, the WICM increased the satisfaction of care.

Impact of distinguishing frailty subpopulations on the effectiveness of integrated care

The last sub-questions of this thesis were: To what extent can frailty subpopulations in integrated care arrangements be distinguished and is preventive, integrated

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[2] Not published in this thesis, see Report Walcheren 2013.

care more effective for certain subpopulations of frail older people? For this thesis, latent-class analysis was performed resulting in six frailty profiles that differed in the level of physical, psychological, social and cognitive functioning of the frail older person (chapter 7). In this thesis it is concluded that distinguishing these subpopulations of frail older people does not change the effects of both the WICM and similar preventive, integrated care interventions. This conclusion can be drawn for all six subpopulations and all types of health outcomes, functional abilities and outcomes regarding quality of life (chapter 8).

Theoretical considerations

In the literature it is assumed that integrated care is beneficial for vulnerable groups with complex and multiple problems (Kodner, 2009). The conclusion of this thesis challenges this assumption since the effects of preventive, integrated care for frail older people are limited and do not meet up to the high expectations of integrated care (Kodner, 2009; Kodner & Spreeuwenberg 2002). However this does not mean that the general assumption about the benefits of integrated care should be rejected.

The alignment between subpopulations and interventions

A first reason is that integrated care interventions may not be customized to the heterogeneity of frail older people. The diversity within the population of older people labelled as being frail is enormous. The concept of frailty has also been broadened over time and now includes the physical, psychological and social domains of functioning (Gobbens, Luijkx, Wijnen-Sponselee, & Schols, 2010; Markle-Reid & Browne, 2003; Rockwood & Mitnitski, 2007a; Schuurmans, Steverink, Lindenberg, Frieswijk, & Slaets, 2004). In addition, this thesis shows that the frail older person does not exist and that a wide variety of subpopulations can be distinguished. This heterogeneity of frail older people is increasingly acknowledged (Manthorpe & Iliffe, 2015) and a tendency to distinguish subpopulations of (frail) older people can be observed in the literature (Gellert et al., 2017; Lafortune, Béland, Bergman, & Ankri, 2009; Liu, Tian, & Yao, 2014; Liu et al., 2017; Newcomer, Steiner, & Bayliss, 2011). Heterogeneity is also a possible explanation for the limited effectiveness of integrated care (Eklund & Wilhelmson, 2009; Ferrucci et al., 2004; Hoogendijk, 2016; Spoorenberg, 2017), as the approach to frailty has changed time, but the beliefs in effective components of integrated care have not.

Currently, these beliefs are that highly integrated care interventions are most effective (Kodner & Spreeuwenberg, 2002; Valentijn, Schepman, Opheij, & Bruijnzeels, 2013). Moreover, there is still a general consensus that effective interventions contain specific elements such as comprehensive geriatric assessments, case management and multidisciplinary teams (Fabbricotti, 2007; Hebert, Durand, Dubuc, Tourigny, & Group, 2003; Johri, Beland, & Bergman, 2003; Kodner & Kyriacou, 2000). However, not all elements might be necessary or beneficial for the entire and heterogeneous population of frail older people. Case management with care coordination might not be necessary for less complex frail older patients (van Eissens, van Offenbeek, Broekhuis, & Slaets, 2014), for example for mild physically or psychologically frail older people. And comprehensive geriatric assessment, for example, is proven to be effective for more specific patients groups, for example for older people with chronic conditions or in acute care settings, rather than for all subtypes of frail older people (Hoogendijk, 2016; Stuck, Egger, Hammer, Minder, & Beck, 2002). Furthermore, there is still a debate who would benefit most from (integrated) care interventions and when intervening is most appropriate: in an early phase of frailty or when the condition is more severe (Elkan et al., 2001; Metzelthin, 2014; Stuck et al., 2002). Thus, aligning integrated care interventions to specific subpopulations of frail older people seems necessary (Vuik, Mayer, & Darzi, 2016). The misalignment might be the reason why the effectiveness of integrated care interventions, discussed in this thesis, with multiple components in terms of health outcomes could not be demonstrated for the six frailty subpopulations separately. It is possible that the diversity of frail older people has not been taken into account sufficiently within integrated care interventions by professionals and researchers. In sum, further acknowledging the heterogeneity of frail older people and aligning integrated interventions to the specific needs of frail older people might enhance the (cost-) effectiveness of integrated care.

The medical dominance

Another consideration that has to be taken into account before rejecting the beneficial effects of integrated care, is that more attention should be devoted to the care and support that frail older people actually receive, in addition to the emphasis on how to integrate medical components of care. Integrated interventions still have a strong medical focus whereas a holistic, person-centered approach also includes the psychological and social domains (Kodner & Spreeuwenberg, 2002; World Health Organization, 2015). The medical dominance in the integrative solutions of care is seen throughout this thesis. The investigated integrated care interventions for community-dwelling frail older people were mostly situated in the medical spheres in primary care in which GPs were important integrators in the interventions. The systematic review in this thesis also showed that structures are indeed created to improve collaboration and coordination between medical health care professionals and organizations, mostly with case management and sometimes with multidisciplinary meetings, protocols, teams and information systems. Even the follow-up is mostly GP-oriented and disease-specific and medically orientated according to how primary care professionals were originally trained (De Lepeleire, Iliffe, Mann, & Degryse, 2009; Lette, Baan, van den Berg, & de Bruin, 2015). For instance, within the WICM, the case managers also worked from the GP practice and were originally trained as practice nurses or district nurses. Process evaluation of comparable integrated care interventions also showed that practice nurses and GPs tend to mainly focus on existing diseases and disability rather than psychosocial problems (Metzelthin et al., 2013) and that mostly physical problems appeared in care plans (Stijnen, Jansen, Duimel-Peeters, & Vrijhoef, 2014). Recent research showed that even though practice nurses agree about the importance of collobaration with professionals outside the GP practice, they still experience barriers in this collobaration, such as ambiguity about responsibilities and time constraints (de Groot, de Veer, Versteeg & Francke, 2018). Our systematic review also confirmed that the role of social care and welfare organizations in integrated care interventions is generally limited (see also (Hoogendijk, 2016)), just like the role of informal caregivers. A holistic approach requires attention for psychological and social domains and most of all for the well-being of frail older people (Nicholson, Meyer, Flatley, & Holman, 2013). This requires additional knowledge and skills of professionals (Leichsenring, 2004; Lloyd & Wait, 2005; van Dijk, Cramm, & Nieboer, 2016). Hence, the benefits of integrated care for frail older people may improve by a more holistic approach that goes beyond the medical domain encompassing all domains of functioning.

The 'limited' vision on prevention

The third theoretical consideration on the benefits is that the preventive elements might not be well integrated yet in integrated care arrangements. Prevention is often not part of integrated care arrangements for frail older people (Oliver et al. 2014) or the vision on prevention for frail older people is limited. It appears that a focus on secondary prevention prevails. Our systematic review showed that prevention mainly encompasses a comprehensive geriatric assessment. In a few studies the population of older people were systematically screened for frailty. However, tertiary prevention - in terms of health education, self-management and empowerment - is often lacking in integrated care interventions for community-dwelling frail older people (Harrison, Clegg, Conroy, & Young, 2015). The role of prevention is particularly limited compared to disease management programmes for chronic conditions (Ouwens, Wollersheim, Hermens, Hulscher, & Grol, 2005; Rijken et al., 2018; Wagner, Davis, Schaefer, & Von Korff, 1999), although the positive effects have been proven. Research shows, for example, that frail older people could benefit from physical activities and nutrition (Puts et al., 2007) and older people from self-managament support programmes (van het Bolscher-Niehuis, den Ouden, de Vocht & Francke, 2016). Also self-management is important for maintaining well-being (Cramm et al., 2012; Steverink, Lindenberg, & Slaets, 2005) and is not necessary related to specific chronic conditions (van het Bolscher-Niehuis et al., 2016; Rijken et al., 2018). Hence, integrated care interventions for community-dwelling frail older people should adopt a broader vision on prevention which might result in more (cost-) effective integrated care interventions.

Methodological considerations

Besides the questions with whom and how we intervene, a crucial question is how do we research these preventive, integrated interventions. In this thesis, different – mostly quantitative - methods were used to study preventive, integrated care for frail older people. An evaluation study of the transition experiment WICM investigated the short and long-term effects and also included a cost-effectiveness study with a quasi-experimental design. A systematic review provided a comprehensive overview of the current literature. Based on this systematic review, subpopulations of frail older people were developed with a latent-class analysis and a qualitative focus group. These subpopulations were incorporated in an IPD-analysis of comparable interventions. With this combination of methodologies, we were able to provide further insights into the potential of integrated care for frail older people. However, this thesis also has some methodological limitations.

Design

As randomized controlled designs are perceived as the golden standard providing the highest quality of evidence, one could argue that using a quasi-experimental design for the evaluation of the WICM is a limitation. A first reason is the non-random assignment of the frail older people to the experimental and control group. This could lead to selection bias and non-random imbalance of observed and unobserved factors between the experimental and control group (Black, 1996; Craig et al., 2008). Regarding the background covariates, the experimental group in the WICM consisted of more women, more individuals in assisted living facilities and more individuals with a lower level of education than the control group. However, we were able to correct for these variables in the analyses and no effects were found of these variables on the outcomes of the evaluation study. Concerning the outcome variables, the experimental group had a lower general quality of life at baseline than the control group but we also adjusted for the baseline differences in the linear mixed models of repeated measures. Therefore, the differences in observed factors may have only limited effects on our results.

Second, randomizing patients in integrated care interventions with a key role of the GP practice such as the WICM is impossible and undesirable (Berkhout, 2000). In the Dutch healthcare system, frail older people have their own GP with whom they have a longstanding relation. A change in GP leads to discontinuity of patientcentered care and a breakdown in the trusting relations between the elders and their GP. Also, randomizing patients increases the chance of contamination between caregiving according to the experimental way of working and usual caregiving, which could lead to biased estimates of the effects of the intervention (Craig et al., 2008). When randomizing frail older people, GPs would have to provide integrated care and usual care at the same time. It is likely that the care given to the patients in the control group will then be influenced by (parts) of the intervention (Black, 1996). However, contamination can also occur in a quasi-experimental design, if the experimental way of working is occurring in the proximity of the region in which usual care is given. To avoid this type of contamination and to ensure that frail older people could keep receiving care from their own GP, three GP practices in the south-east Walcheren formed the experimental group, whilst the control group consisted of five GPs in other parts of the Walcheren region.

A popular and valid alternative for RCTs would have been a cluster-randomized controlled trial in which the GP practices are randomized rather than the patients. Because this requires a certain number of GP practices (Eldridge, Ashby, Feder, Rudnicka, & Ukoumunne, 2004), this design was not applicable for the WICM. Moreover, since other organizations and professionals outside the GP practices were involved, such as district nurses and physiotherapists, even a cluster-randomized controlled trial might have led to contamination and spill-over effects as mentioned above. In sum, a quasi-experimental design was the most optimal design for the main intervention in this thesis.

Furthermore, the use of rigid designs such as randomized controlled trials and quasi-experimental designs is increasingly questioned for the evaluation of complex interventions (Campbell et al., 2000; Craig et al., 2008). The main reason is that due to the complexity, the level of control on the conditions is limited. This level of control is crucial in rigid designs to estimate the effect of the intervention and diminish confounding factors. Integrated care is a complex intervention since integration occurs at various levels with different interacting components that involve many actors and involves changing behaviour of both professionals delivering the intervention and the frail older people receiving the intervention (Craig et al., 2008; Raine et al., 2016). Consequently, researchers have limited control in how the various professionals actually deliver the intervention. The same holds for the frail older people in experimental and control group who are exposed to external factors in the long time frame of the evaluation study that may also influence the outcomes of the intervention (see also (Blom et al., 2016)), like fall incidents or bereavement. Another drawback of rigid designs is that they imply standardization and should preferably not be adjusted during the study. This standardization also means inflexibility to adapt to the local context (Craig et al., 2008; RVS, 2017), which is crucial for the intervention in our study and for many other complex interventions in health care (Craig et al., 2008; RVS, 2017). Interventions should be constantly adjusted, as integrated care is demand-driven care, and as there is no blueprint for integrated care (Leijten et al., 2018; Tsiachristas, Stein, Evers, & Rutten-van Mölken, 2016; Valentijn et al., 2013; Wehrens, Oldenhof, Verweij, Francke, & Bal, 2017). Moreover, the effectiveness of integrated care is expected to increase when it is adapted to the local context (Eyre, Farrelly, & Marshall, 2017). Thus, for evaluating integrated care interventions the drawbacks of rigid design should be considered carefully.

Process evaluation

The absence of a process evaluation in this thesis might have led to a lack of insights in the benefits of integrated care for frail older people. Process evaluations are strongly encouraged for complex interventions to improve understanding of the implementation process and to explain the (lack of) outcomes of an intervention (Craig et al., 2008; Moore et al., 2015). In the WICM, we assumed that the implementation of structures would enhance integration processes that would result in certain outcomes. However, previous research shows that the implementation of structures does not lead automatically to integration processes (Fabbricotti, 2007; Kirst et al., 2017; Valentijn et al., 2013; van Dijk et al., 2016). Besides structural integration, also other types of integration are important to realize integrated care such as mutual goals, shared values and an integrative culture (Fabbricotti, 2007; Valentijn et al., 2013). In this thesis, the insights in these types of integration processes were generally limited, not only in WICM but also in the systematic review of comparable interventions and might have related to the limited effects. In addition, process evaluations would also have provided useful insights in the implementation fidelity of the integrated care interventions. It remains unclear what specific structures of the interventions were actually implemented and what care the frail older people actually received. Also, the medical dominance and the limited vision on prevention that were described above could have been verified in a process evaluation. Previous process evaluations have confirmed that professionals tend to focus on specific problems of frail older people

(Metzelthin et al., 2013). Therefore, it could be possible that in the assessments, care plans and follow-up within the integrated care interventions, mostly medical problems were addressed. Moreover, processes and outcomes were not modelled and the mechanisms leading to specific outcomes were not explored. For complex interventions, a process evaluation enables to clarify causal mechanisms (Craig et al., 2008). For the WICM, we were not able to prove what mechanisms within the WICM have led to the effect on love and friendship and quality of life. Our possible explanation is the improved relation with the informal caregivers whose subjective burden decreased because of the intervention (Janse, Huijsman, de Kuyper, & Fabbricotti, 2014). Yet, this explanation could not be confirmed within the process evaluation. At last, a process evaluation could also have provided insights in unexpected outcomes (Craig et al., 2008) which could be important benefits established by the intervention. We know from project meetings that the GPs involved in WICM experienced feelings of control and grip on their (increasing) frail patient population and to more tranquillity in the GP practice. These types of findings are also found in other studies and deemed important (Glasby, 2016). However, they were not considered in rigid designs (Wehrens et al., 2017). Hence, better insights in the process of integration and implementation in relation to the outcomes would have provided better understanding of integrated care for frail older people.

Outcomes for frail older people in evaluation research

Another limitation is related to the outcomes used. In the evaluation study of the WICM mostly traditional outcomes were adopted focusing on health outcomes and functional abilities. The traditional outcome measures might not be suitable to assess the benefits of integrated care for frail older people. Frailty can be perceived as a progressive condition (Gill, Gahbauer, Allore, & Han, 2006; Harrison et al., 2015) and frail older people mostly experience deterioration of their health and functioning (Clegg, Young, Iliffe, Rikkert, & Rockwood, 2013; D'Avanzo et al., 2017). Improvement of their health and functioning is therefore not expected. Moreover, research shows it is extremely difficult to influence these outcomes such as ADL at an older age at all (Beswick et al., 2008; van der Vorst et al., 2016). The evaluation of the WICM and the systematic review also confirm that the effects of preventive, integrated care on traditional outcomes are limited. For example, the choice of health-related quality of life in cost-effectiveness analysis might lead to the absence of effects (Comans, Peel, & Gray, 2013; Makai et al., 2015) because of the natural deterioration in health of frail older people.

The outcomes were part of The Older Person and Informal Caregiver Survey Minimum Dataset (TOPICS-MDS), which had to be used in our research. TOPICS-MDS is a standardized instrument developed within the NCEP (Lutomski et al., 2013) and is a large data-sharing initiative in the Netherlands. Researchers within all NCEP projects had to collect data consistent with the TOPICS-MDS. Researchers were allowed to complement the TOPCS-MDS with other questionnaires (and hence outcomes). However, given the length of the TOPICS-MDS, trade-offs between time and the concentration span of the elderly, and the validity of the data on the added outcomes had to be taken into account. Thus, the ability to add new questions was limited.

Another reason for the use of tradition outcome measures lies in the time-frame of the study. The TOPICS-MDS was composed before the start of the NCEP projects by a working group and was extensively discussed with an expert panel (Lutomski et al., 2013). The TOPICS-MDS provided unique research opportunities such as the development of frailty profiles in this thesis. However, in the period after the development of the TOPICS-MDS and the use of the instruments in the empirical evaluations, new insights appeared in the literature. For example, the concept of well-being became increasingly important in practice, policy and research (Linton, Dieppe, & Medina-Lara, 2016). There is also a growing awareness that well-being for older people differs from well-being in the general population and consists of other dimensions (Coast et al., 2008). Moreover, the traditional definition of health of the WHO (a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity) was complemented with Huber's positive health defined as the ability to self-manage and adapt (Huber et al., 2011). This change in perspective involves a shift in focus from weaknesses to strengths and adopts a broader perception of health including well-being, social and societal participation and spiritual/existential dimension (Huber et al., 2016). This change in perspective should also be considered in evaluation research of integrated care so outcomes are more properly aligned to the population of frail older people.

Bridging practice, policy and research

In this thesis, the effectiveness of preventive, integrated care for frail older people was unravelled by switching three buttons: the population of frail older people (with whom do we intervene?), the integrated care interventions (how do we intervene?) and the research on these topics (how do we research this?). The limited effectiveness of preventive, integrated care for frail older people could not fully be explained by answering these questions. Nor a comprehensive integrated care intervention, nor discriminating between subpopulations of frail older people were able to yield effectiveness with the current research designs and outcomes related to functioning.

Therefore, a future agenda is crucial; now more than ever. A transition in research is required to integrate the information (or evidence) on frailty, integrated care and outcomes. Bridges should be built between practice, policy and research and therefore an agenda is proposed for the three together. This triangle should be balanced with close attention for the older people facing frailty.

Frailty

A first task is that researchers should work more closely together to reach consensus on the conceptualization of frailty for practice and policy to actually answer the question: with whom should we intervene? Frailty has become a buzzword and many different conceptualizations have emerged in the literature (Dent, Kowal, & Hoogendijk, 2016; Manthorpe & Iliffe, 2015). This disagreement in conceptualization also resulted in the development of an impressive range of screenings instruments such as frailty phenotype, frailty indexes, Groningen Frailty Indicator, Tilburg Frailty Indicator, ISCOPE, U-PRIM, EASY-CARE-TOS and PRISMA-7 (Bleijenberg et al., 2012; Blom et al., 2016; Gobbens, van Assen, Luijkx, Wijnen-Sponselee, & Schols, 2010; Rockwood & Mitnitski, 2007b; Ruikes et al., 2012; Van Leeuwen et al., 2015). These instruments also have several variations, for example Fried's phenotype has 262 modifications (Dent et al., 2016; Theou et al., 2015). This results in more ambiguity whilst the need of consensus is increasing (Dent et al., 2016). If it is remains unclear with whom we intervened in the past, the answer to the question with whom should we intervene in the future becomes more difficult to answer. Also conducting reviews (Carpenter et al., 2015; Clegg, Rogers, & Young, 2014; Dent et al., 2016; Drubbel, 2014; Pialoux, Goyard, & Lesourd, 2012), even resulting in an umbrella review of screening instruments (Apostolo et al., 2017) has not resulted in consensus or a standard instrument of frailty. A good point of departure would be to agree on what specific domains should be included in the conceptualization of frailty.

Besides moving towards consensus in the frailty conceptualization, researchers should also more carefully consider the needs of professionals, policy makers and frail older people themselves. The focus on screenings instruments does not align with their needs. Frail older people, for example, perceive screenings instrument as 'patronizing'. They also indicate that screenings instrument are mostly limited to problems in the physical domains and therefore do not align with the needs of frail older people who experience problems in other domains as well-being and participation (de Bruin, Lette, Baan, & van den Berg, 2016). Professionals increasingly agree that using screenings instruments to screen the GPs elderly population is not useful since the added value is not proven (NHG, 2017; Verlee et al., 2016). According to the professionals, screening is time consuming and not valuable at itself. Also, professionals do not know how to intervene effectively after the screening (de Bruin et al., 2016; Verlee et al., 2016). This means that the focus on the development of screenings instrument or on modifications of existing screenings instrument might not be justified.

Another point on the future agenda is that we need to move beyond the current approach of differentiating frail older people based on the accumulation of their deficits to an approach in which the distinction is made based on (a combination of) domains of functioning. Translating frailty into a cut-off score based on a screenings instrument or frailty index is too restricted and does no justice to the complexity of frailty. This thesis shows that the type and severity of problems strongly differ between frail older people. The frailty profiles demonstrate that problems do not only occur in the physical domain but also the psychological, social and cognitive domains are deemed important. Moreover, frail older people also suffer from (interacting) problems in different domains. Chronic conditions could go together with severe problems in the psychological and social domain. Additionally, including the combinations of domains in conceptualizing frailty also has another implication, which is that frailty should also account for assets rather than only deficits. In the 1990s the transition from singular frailty problems into combination scores was highly innovative (Dent et al., 2016). Currently, in screenings instruments the number of deficits are still added up to calculate the total score and in frailty indexes the number of existing deficits are divided by the total number of possible deficits. However, these 'deficits' – now also including the psychological, social and cognitive domains - could also function as assets. These assets could help frail older people with coping or self-managing their condition (Rockwood, Fox, Stolee, Robertson, & Beattie, 1994; van Campen, 2011). For example, bad mental health is considered as a deficit in screenings instrument, for example by asking whether people have been feeling down or depressed, or nervous or anxious (Schuurmans et al., 2004). However, good mental health could also help frail older people coping with their deficits. Our research shows that older people in the mild and physically frail profiles have a better perceived health than the older people in the psychologically frail profile. Frailty should therefore move towards the ability to adapt to ageing and deterioration, in line with the positive health movement (Huber et al., 2011) rather than on focusing on the number of deficits. The response to the deterioration is "what distinguished people who managed to maintain well-being, from those who did not" (D'Avanzo et al., 2017). The balance between deficits and assets and the adaptation to deterioration should be acknowledged in relation to frailty and could be useful in determining with whom do we intervene and also how we intervene.

Integrated care

Research on integrated care should be increasingly integrated in order to add value for frail older people, to policy and to practice. As Eyre (2017; 5) stated: “Integrated care is a good example of a policy initiative characterized by enthusiastic system leaders, frustrated practitioners and largely unhelpful research evidence”. Research has mostly focused on the question: is this integrated care intervention effective? The answer to this question is rather short and simplistic (no or yes, on these specific outcomes) and applicable to a specific context which makes evidence fragmented (Eyre et al., 2017). This evidence is mostly disseminated among other researchers rather than among professionals (Schrijvers, 2016). And if the evidence reaches professionals, it appears not to be useful for professionals willing to translate this knowledge in providing integrated care in their daily practice (Eyre et al., 2017). The future research agenda on integrated care needs some redirection to explore the full potential of integrated care.

Firstly, future research should provide a better answer to the question: how do we intervene with whom? Integrated care should take the heterogeneity of frail older people into account. This heterogeneity could be captured into frailty subpopulations. Subpopulations emerged of frail older people experiencing singular problems in either the physical or psychological domain or constellation of problems that extended to the social and cognitive domains. This implies that the full range of health care, social care, welfare and prevention should be covered. Health and social care should be increasingly person-centered and integrated according to the needs of specific frail older people. Research should provide insights in what frail older people benefit from what specific elements of integrated care.

Secondly, other research designs such as mixed-methods evaluations or participatory research should be adopted to do justice to the complexity of integrated care (Eyre et al., 2017; Meyer, 2000). Performing mixed-methods process-evaluations is recommended alongside rigid designs to provide better insights in the black box of integrated care interventions (see also (Moore et al., 2015)). It is important to determine what elements of the intervention were actually implemented and how these elements were used within the intervention (de Vos et al., 2013; Hasson, Blomberg, & Dunér, 2012). Interviews with important stakeholders such as frail older people, their informal caregivers, professionals involved in the intervention and project leaders could identify barriers and facilitators of integration which could be useful for the design and implementation of future interventions (Metzelthin et al., 2013; van Dijk et al., 2016). Process evaluations could elucidate the results of the rigid designs so these results could be translated to other contexts. Moreover, interviews might reveal outcomes of preventive, integrated care that were not measured in the quantitative evaluations. These results could be process outcomes such as professional satisfaction with the care delivery according to the intervention (Metzelthin et al., 2013; Poot, Caljouw, de Waard, Wind, & Gussekloo, 2016; Wehrens et al., 2017). Also outcomes for frail older people themselves should be deliberated on, for example feelings of independence (Metzelthin et al., 2013) and control (Spoorenberg et al., 2015).

In action research, professionals and researchers, and frail older people could solve also practical problems by and while optimizing the care for frail older people (Eyre et al., 2017; Wehrens et al., 2017). In the action research process, integrated care could adapted to the local context which is important for complex interventions (Craig et al., 2008) and in line with the current movement in the Netherlands from strict evidence-based to context-based practice in health care (RVS, 2017). By continuously adjusting the care practice for frail older people, the learning curve is high for both professionals and researchers. Involvement of frail older people is crucial (Sunderji, Ion, Lin, Ghavam-Rassoul, & Jansz, 2018), also to be able to take the heterogeneity of frail older people into account. Action research could provide insights in how professionals could adapt a holistic approach to frail older people or how professionals could incorporate prevention within integrated care for frail older people. Thus, research providing deeper understanding of integrated care for frail older people should be integrated between professionals, policy makers and researchers with a central role for the frail older people.

However, it is important to emphasize that integrated care research so far has generated value. The scientific value might have been somewhat limited because research has mostly focused on whether integrated care is effective. Still, research has also resulted in other types of value. In the Netherlands for example, the National Care for the Elderly Programme (NCEP) was set up, a large implementation and research initiative, including the WICM. NCEP resulted in an increased participation of older people: researchers and professionals tend to talk more with older people than about older people. Research also led to collaborations in regional networks, including approximately 650 different organizations. And also practical value was created since professionals have indicated that the care delivery has improved (van Rossum & van Hout, 2016; Wehrens et al., 2017).

Outcomes

Important on the future research agenda is to gain more insights in outcomes for frail older people. An important point of attention is to explore how older people are enabled to live independently in the community since national policies strongly aim at ageing in place and preventing institutionalization (Wiles, Leibing, Guberman, Reeve, & Allen, 2012). Outcomes should be properly aligned with this policy aim and to the adaptation to ageing and deterioration. This is also important for professionals who have to deal with the increasing complexity of older people living in the community longer. Outcomes related to independence are self-management (Cramm, Strating, de Vreede, Steverink, & Nieboer, 2012), goal-setting (Rockwood et al., 2003) but also autonomy and resilience (Wiles, Wild, Kerse, & Allen, 2012). More specifically, this thesis showed that well-being is a promising outcome that deserves further exploration. National policies have increasing interest in the well-being of their citizens (Linton et al., 2016) and maintaining well-being for frail older people is the most important aim of recent guidelines of primary care (NHG, 2017; Verlee et al., 2016). Still, there is no golden standard of well-being and there is an ongoing discussion on the various domains and its measurement (Linton et al. 2016). Domains of well-being are different for frail older people than for the general population. Health seems less important for example (Farquhar, 1995; Puts et al., 2007) which is line with the result that health-related quality of life is not the most suitable outcome measure for frail older people (see also(Comans, Peel, Gray, & Scuffham, 2013). Instruments on well-being of frail older people should be more subtle and focus on things that are important for frail older people and that could still be influenced. Promising instruments aimed at frail older people are the ICECAP-O (Coast et al., 2008) and SPF-IL scale (Nieboer, Lindenberg, Boomsma, & Bruggen, 2005). Other dimensions of well-being are emphasized such as love and friendship (such as attachment in ICECAP-O and affection in SPF-IL) and doing things that make you feel valued (defined as role in ICECAP-O and behavioural confirmation in SPF-IL). Future research should focus on dimensions of well-being and the mechanisms that improve well-being for frail older people, policy and practice.

Concluding remarks

Integrated care is a complex phenomenon even as the target population of frail older people who have complex and diverse needs. The expectations of integrated care are high but evaluation research increasingly showed that integrated care could not fully live up to these expectations. Also, acknowledging the determined heterogeneity of the frail older people or comprehensive integrated care interventions could not solve this puzzle. This thesis did show that no blue print is available for effective integrated care. Research on integrated care for frail older people should move forwards in order to add value to practice and policy. Research could carefully consider the principles of integrated care: we should and could practice what we preach.

Effective integrated care also requires research that is integrated, continuous, and person-centred. Bridges should be built between research, practice and policy and also researchers should work together. Continuity could be improved by exchanging knowledge (or context-based evidence) between practice and research more quickly in order to keep learning. Person-centeredness is deemed extremely important because **the** frail older person does not exist. The outcomes of integrated care should be closely aligned to the differentiated target populations of frail older people. Because most of all, it is about the older people facing frailty. They should be able to say (as my grandmother always said): “I have had a beautiful life”.

References

Apostolo, J., Cooke, R., Bobrowicz-Campos, E., Santana, S., Marcucci, M., Cano, A., . . . Holland, C. (2017). Predicting risk and outcomes for frail older adults: An umbrella review of frailty screening tools. *JBI Database of Systematic Reviews and Implementation Reports, 15*(4), 1154-1208.

Berkhout, A. J. M. D. (2000). *Resident-oriented care in nursing homes: An evaluation study of the model of resident-oriented care, the implementation and the effects*. PhD Thesis, Maastricht University.

Beswick, A. D., Rees, K., Dieppe, P., Ayis, S., Gooberman-Hill, R., Horwood, J., & Ebrahim, S. (2008). Complex interventions to improve physical function and maintain independent living in elderly people: A systematic review and meta-analysis. *Lancet, 371*, 725-735.

Black, N. (1996). Why we need observational studies to evaluate the effectiveness of health care. *BMJ (Clinical Research Ed.), 312*(7040), 1215-1218.

Bleijenberg, N., Drubbel, I., Ten Dam, V. H., Numans, M. E., Schuurmans, M. J., & de Wit, N. J. (2012). Proactive and integrated primary care for frail older people: Design and methodological challenges of the utrecht primary care PROactive frailty intervention trial (U-PROFIT). *BMC Geriatr, 12*, 16.

Blom, J., den Elzen, W., van Houwelingen, A. H., Heijmans, M., Stijnen, T., Van den Hout, W., & Gussekloo, J. (2016). Effectiveness and cost-effectiveness of a proactive, goal-oriented, integrated care model in general practice for older people. A cluster randomised controlled trial: Integrated systematic care for older people—the ISCOPE study. *Age and Ageing, 45*(1), 30-41.

Campbell, M., Fitzpatrick, R., Haines, A., Kinmonth, A. L., Sandercock, P., Spiegelhalter, D., & Tyrer, P. (2000). Framework for design and evaluation of complex interventions to improve health. *Bmj, 321*(7262), 694-696.

Carpenter, C. R., Shelton, E., Fowler, S., Suffoletto, B., Platts-Mills, T. F., Rothman, R. E., & Hogan, T. M. (2015). Risk factors and screening instruments to predict adverse outcomes for undifferentiated older emergency department patients: A systematic review and meta-analysis. *Academic Emergency Medicine, 22*(1), 1-21.

Clegg, A., Rogers, L., & Young, J. (2014). Diagnostic test accuracy of simple instruments for identifying frailty in community-dwelling older people: A systematic review. *Age and Ageing, 44*(1), 148-152.

Clegg, A., Young, J., Iliffe, S., Rikkert, M. O., & Rockwood, K. (2013). Frailty in elderly people. *The Lancet, 381*(9868), 752-762.

Coast, J., Flynn, T. N., Natarajan, L., Sproston, K., Lewis, J., Louviere, J. J., & Peters, T. J. (2008). Valuing the ICECAP capability index for older people. *Social Science & Medicine, 67*(5), 874-882.

Comans, T. A., Peel, N. M., Gray, L. C., & Scuffham, P. A. (2013). Quality of life of older frail persons receiving a post-discharge program. *Health and Quality of Life Outcomes, 11*(1), 1.

Comans, T. A., Peel, N. M., & Gray, L. C. (2013). *Quality of life of older frail persons receiving a post-discharge program* biomedcentral.com.

Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., Petticrew, M., & Medical Research Council Guidance. (2008). Developing and evaluating complex interventions: The new medical research council guidance. *BMJ (Clinical Research Ed.), 337*, a1655.

Cramm, J. M., Hartgerink, J. M., De Vreede, P. L., Bakker, T. J., Steyerberg, E. W., Mackenbach, J. P., & Nieboer, A. P. (2012). The relationship between older adults' self-management abilities, well-being and depression. *European Journal of Ageing, 9*(4), 353-360.

Cramm, J. M., Strating, M. M., de Vreede, P. L., Steverink, N., & Nieboer, A. P. (2012). Validation of the self-management ability scale (SMAS) and development and validation of a shorter scale (SMAS-S) among older patients shortly after hospitalisation. *Health and Quality of Life Outcomes, 10*(1), 9.

D'Avanzo, B., Shaw, R., Riva, S., Apostolo, J., Bobrowicz-Campos, E., Kurpas, D., . . . Holland, C. (2017). Stakeholders' views and experiences of care and interventions for addressing frailty and pre-frailty: A meta-synthesis of qualitative evidence. *PloS One, 12*(7), e0180127.

de Bruin, S., Lette, M., Baan, C., & van den Berg, M. (2016). *Vroegopsporing bij (kwetsbare) ouderen; op weg naar betere aansluiting bij wat ouderen zelf willen en kunnen.* (). Bilthoven: RIVM.

De Lepeleire, J., Iliffe, S., Mann, E., & Degryse, J. M. (2009). Frailty: An emerging concept for general practice. *The British Journal of General Practice : The Journal of the Royal College of General Practitioners, 59*(562), e177-82.

de Groot, K. , Veer, A. de, Versteeg, S., & Francke, A. (2018). Het organiseren van langdurige zorg en ondersteuning voor thuiswonende patiënten: ervaringen van praktijkondersteuners in de huisartsenzorg. Utrecht: Nivel.

de Vos, A. J., Bakker, T. J., de Vreede, P. L., van Wijngaarden, J. D., Steyerberg, E. W., Mackenbach, J. P., & Nieboer, A. P. (2013). The prevention and reactivation care program: Intervention fidelity matters. *BMC Health Services Research, 13*(1), 29.

Dent, E., Kowal, P., & Hoogendijk, E. O. (2016). Frailty measurement in research and clinical practice: A review. *European Journal of Internal Medicine, 31*, 3-10.

Drubbel, I. (2014). *Frailty screening in older patients in primary care using routine care data*. PhD Thesis, Utrecht University.

Eklund, K., & Wilhelmson, K. (2009). Outcomes of coordinated and integrated interventions targeting frail elderly people: A systematic review of randomised controlled trials. *Health Soc Care Community, 17*, 447-458.

Eldridge, S. M., Ashby, D., Feder, G. S., Rudnicka, A. R., & Ukoumunne, O. C. (2004). Lessons for cluster randomized trials in the twenty-first century: A systematic review of trials in primary care. *Clinical Trials, 1*(1), 80-90.

Elkan, R., Kendrick, D., Dewey, M., Hewitt, M., Robinson, J., Blair, M., . . . Brummell, K. (2001). Effectiveness of home based support for older people: Systematic review and meta-analysis. *BMJ (Clinical Research Ed.), 323*(7315), 719-725.

Eyre, L., Farrelly, M., & Marshall, M. (2017). What can a participatory approach to evaluation contribute to the field of integrated care? *BMJ Quality & Safety, 26*(7), 588-594.

Fabbricotti, I. N. (2007). *Zorgen voor zorgketens [taking care of integrated care].* PhD Thesis, Erasmus University Rotterdam.

Farquhar, M. (1995). Elderly people's definitions of quality of life. *Social Science & Medicine, 41*(10), 1439-1446.

Ferrucci, L., Guralnik, J. M., Studenski, S., Fried, L. P., Cutler, G. B., & Walston, J. D. (2004). Designing randomized, controlled trials aimed at preventing or delaying functional decline and disability in frail, older persons: A consensus report. *Journal of the American Geriatrics Society, 52*(4), 625-634.

Gellert, P., von Berenberg, P., Zahn, T., Neuwirth, J., Kuhlmey, A., & Dräger, D. (2017). Multimorbidity profiles in german centenarians: A latent class analysis of health insurance data. *J Aging Health,* Oct.

Gill, T. M., Gahbauer, E. A., Allore, H. G., & Han, L. (2006). Transitions between frailty states among community-living older persons. *Archives of Internal Medicine, 166*(4), 418-423.

Glasby, J. (2016). If integration is the answer, what was the question? what next for english health and social care. *Int J Integr Care, 16*(4)

Gobbens, R. J., van Assen, M. A., Luijkx, K. G., Wijnen-Sponselee, M. T., & Schols, J. M. (2010). The tilburg frailty indicator: Psychometric properties. *Journal of the American Medical Directors Association, 11*(5), 344-355.

Gobbens, R. J. J., Luijkx, K. G., Wijnen-Sponselee, M. T., & Schols, J. M. G. A. (2010). Towards an integral conceptual model of frailty. *The Journal of Nutrition, Health & Aging, 14*(3), 175-181.

Harrison, J. K., Clegg, A., Conroy, S. P., & Young, J. (2015). Managing frailty as a long-term condition. *Age Ageing,*

Hasson, H., Blomberg, S., & Dunér, A. (2012). Fidelity and moderating factors in complex interventions: A case study of a continuum of care program for frail elderly people in health and social care. *Implementation Science, 7*(1), 23.

Hebert, R., Durand, P. J., Dubuc, N., Tourigny, A., & Group, P. (2003). PRISMA: A new model of integrated service delivery for the frail older people in canada. *Int J Integr Care, 3*, e08.

Hoogendijk, E. O. (2016). How effective is integrated care for community-dwelling frail older people? the case of the netherlands.

Huber, M., Knottnerus, J. A., Green, L., van der Horst, H., Jadad, A. R., Kromhout, D., . . . van der Meer, Jos WM. (2011). How should we define health? *BMJ: British Medical Journal (Online), 343*

Huber, M., van Vliet, M., Giezenberg, M., Winkens, B., Heerkens, Y., Dagnelie, P. C., & Knottnerus, J. A. (2016). Towards a 'patient-centred' operationalisation of the new dynamic concept of health: A mixed methods study. *BMJ Open, 6*(1), e010091-2015-010091.

Janse, B., Huijsman, R., de Kuyper, R. D. M., & Fabbricotti, I. N. (2014). The effects of an integrated care intervention for the frail elderly on informal caregivers: A quasi-experimental study. *BMC Geriatr., 14*

Johri, M., Beland, F., & Bergman, H. (2003). International experiments in integrated care for the elderly: A synthesis of the evidence. *International Journal of Geriatric Psychiatry, 18*, 222-235.

Kirst, M., Im, J., Burns, T., Baker, G. R., Goldhar, J., O'campo, P., . . . Wodchis, W. P. (2017). What works in implementation of integrated care programs for older adults with complex needs? A realist review. *International Journal for Quality in Health Care, 29*(5), 612-624.

Kodner, D. L. (2009). All together now: A conceptual exploration of integrated care. *Healthcare Quarterly (Toronto, Ont.), 13 Spec No*, 6-15.

Kodner, D. L., & Kyriacou, C. K. (2000). Fully integrated care for frail elderly: Two american models. *Int J Integr Care, 1*, e08.

Kodner, D. L., & Spreeuwenberg, C. (2002). Integrated care: Meaning, logic, applications, and implications - a discussion paper. *Int J Integr Care, 14*(2)

Lafortune, L., Béland, F., Bergman, H., & Ankri, J. (2009). Health status transitions in community-living elderly with complex care needs: A latent class approach. *BMC Geriatrics, 9*(6).

Leichsenring, K. (2004). Developing integrated health and social care services for older persons in europe. *Int J Integr Care, 4*(3)

Leijten, F. R., Struckmann, V., van Ginneken, E., Czypionka, T., Kraus, M., Reiss, M., . . . Bal, R. (2018). The SELFIE framework for integrated care for multi-morbidity: Development and description. *Health Policy, 122*(1), 12-22.

Lette, M., Baan, C. A., van den Berg, M., & de Bruin, S. R. (2015). Initiatives on early detection and intervention to proactively identify health and social problems in older people: Experiences from the netherlands. *BMC Geriatr., 15*(143)

Linton, M. J., Dieppe, P., & Medina-Lara, A. (2016). Review of 99 self-report measures for assessing well-being in adults: Exploring dimensions of well-being and developments over time. *BMJ Open, 6*(7), e010641-2015-010641.

Liu, L. F., Tian, W. H., & Yao, H. P. (2014). The heterogeneous health latent classes of elderly people and their socio-demographic characteristics in taiwan. *Arch Gerontol Geriatr, 58*, 205-213.

Liu, L. K., Guo, C., Lee, W., Chen, L., Hwang, A., Lin, M., . . . Liang, K. (2017). Subtypes of physical frailty: Latent class analysis and associations with clinical characteristics and outcomes. *Scientific Reports, 7*, 46417.

Lloyd, J., & Wait, S. (2005). *Integrated care: A guide for policymakers* Alliance for Health and the Future.

Lutomski, J. E., Baars, M. A. E., Schalk, B. W. M., Boter, H., Buurman, B. M., den Elzen, W. P. J., . . . Melis, R. J. F. (2013). The development of the older persons and informal caregivers survey minimum DataSet (TOPICS-MDS): A large-scale data sharing initiative. *PLoS One, 8*(12), e81673.

Makai, P., Looman, W., Adang, E., Melis, R., Stolk, E., & Fabbricotti, I. (2015). Cost-effectiveness of integrated care in frail elderly using the ICECAP-O and EQ-5D: Does choice of instrument matter? *Eur J Health Econ, 16*, 437-450.

Manthorpe, J., & Iliffe, S. (2015). Frailty – from bedside to buzzword? *Journal of Integrated Care, 23*(3), 120-128.

Markle-Reid, M., & Browne, G. (2003). Conceptualizations of frailty in relation to older adults. *J.Adv.Nurs., 44*, 58-68.

Metzelthin, S. F. (2014). *An interdisciplinary primary care approach for frail older people: Feasibility, effects and costs* Maastricht University.

Metzelthin, S. F., Daniëls, R., van Rossum, E., Cox, K., Habets, H., de Witte, L. P., & Kempen, G. I. J. M. (2013). A nurse-led interdisciplinary primary care approach to prevent disability among community-dwelling frail older people: A large-scale process evaluation. *Int J Nurs Stud, 50*, 1184-1196.

Meyer, J. (2000). Using qualitative methods in health related action research. *British Medical Journal, 320*(7228), 178.

Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., . . . Baird, J. (2015). Process evaluation of complex interventions: Medical research council guidance. *BMJ (Clinical Research Ed.), 350*, h1258.

Newcomer, S. R., Steiner, J. F., & Bayliss, E. A. (2011). Identifying subgroups of complex patients with cluster analysis. *Am J Manag Care, 17*(8), e324-e332.

NHG. (2017). *Visie huisartsenzorg voor ouderen. samen werken aan persoonsgerichte zorg*. ().

Nicholson, C., Meyer, J., Flatley, M., & Holman, C. (2013). The experience of living at home with frailty in old age: A psychosocial qualitative study. *Int J Nurs Stud, 50*, 1172-1179.

Nieboer, A., Lindenberg, S., Boomsma, A., & Bruggen, A. C. V. (2005). Dimensions of well-being and their measurement: The SPF-IL scale. *Social Indicators Research, 73*(3), 313-353.

Ouwens, M., Wollersheim, H., Hermens, R., Hulscher, M., & Grol, R. (2005). Integrated care programmes for chronically ill patients: A review of systematic reviews. *International Journal for Quality in Health Care : Journal of the International Society for Quality in Health Care, 17*(2), 141-146.

Pialoux, T., Goyard, J., & Lesourd, B. (2012). Screening tools for frailty in primary health care: A systematic review. *Geriatrics & Gerontology International, 12*(2), 189-197.

Poot, A. J., Caljouw M. A. A., de Waard C. S., Wind, A. W. & Gussekloo J. (2016). Satisfaction in Older Persons and General Practitioners during the Implementation of Integrated Care. *PloS One,* 11:e0164536.

Puts, M., Shekary, N., Widdershoven, G., Heldens, J., Lips, P., & Deeg, D. (2007). What does quality of life mean to older frail and non-frail community-dwelling adults in the Netherlands? *Quality of Life Research, 16*(2), 263-277.

Raine, R., Fitzpatrick, R., Barratt, H., Bevan, G., Black, N., & Boaden, R. (2016). Challenges, solutions and future directions in the evaluation of service innovations in health care and public health. *Health Serv Deliv Res, 4*(16), 19-36.

Rijken, M., Hujala, A., van Ginneken, E., Melchiorre, M. G., Groenewegen, P., & Schellevis, F. (2018). Managing multimorbidity: Profiles of integrated care approaches targeting people with multiple chronic conditions in europe. *Health Policy (Amsterdam, Netherlands), 122*(1), 44-52.

Rockwood, K., & Mitnitski, A. (2007a). Frailty in relation to the accumulation of deficits. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 62*(7), 722-727.

Rockwood, K., & Mitnitski, A. (2007b). Frailty in relation to the accumulation of deficits. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 62*(7), 722-727.

Rockwood, K., Fox, R. A., Stolee, P., Robertson, D., & Beattie, L. (1994). Frailty in elderly people: An evolving concept. *Cmaj, 150*(4), 489-495.

Rockwood, K., Howlett, S., Stadnyk, K., Carver, D., Powell, C., & Stolee, P. (2003). Responsiveness of goal attainment scaling in a randomized controlled trial of comprehensive geriatric assessment. *Journal of Clinical Epidemiology, 56*(8), 736-743.

Ruikes, F. G., Meys, A. R., van, d. W., Akkermans, R. P., van Gaal, B. G., Zuidema, S. U., . . . Koopmans, R. T. (2012). The CareWell-primary care program: Design of a cluster controlled trial and process evaluation of a complex intervention targeting community-dwelling frail elderly. *BMC Fam Pract, 13*, 115.

RVS. (2017). *Zonder context geen bewijs. over de illusie van evidence-based practice in de zorg (no evidence without context. about the illusion of evidence-based practice in health care).* (No. 17-05). Den Haag: Raad voor Volksgezondheid en Samenleving.

Schrijvers, G. (2016). *Integrated care. better and cheaper*. Reed Business Information.

Schuurmans, H., Steverink, N., Lindenberg, S., Frieswijk, N., & Slaets, J. P. (2004). Old or frail: What tells us more? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 59*(9), M962-M965.

Spoorenberg, S. L. W., Wynia, K., Fokkens, A. S., Slotman, K., Kremer, H. P. H., & Reijneveld, S. A. (2015). Experiences of community-living older adults receiving integrated care based on the chronic care model: A qualitative study. *PLoS One, 10*(10), e0137803.

Spoorenberg, S. L. W. (2017). *Embracing the perspectives of older adults in organising and evaluating person-centred and integrated care* Rijksuniversiteit Groningen.

Steverink, N., Lindenberg, S., & Slaets, J. P. (2005). How to understand and improve older people's self-management of wellbeing. *European Journal of Ageing, 2*(4), 235-244.

Stijnen, M. M., Jansen, M. W., Duimel-Peeters, I., & Vrijhoef, H. J. (2014). Nurse-led home visitation programme to improve health-related quality of life and reduce disability among potentially frail community-dwelling older people in general practice: A theory-based process evaluation. *BMC Fam Pract, 15*, 173.

Stuck, A. E., Egger, M., Hammer, A., Minder, C. E., & Beck, J. C. (2002). Home visits to prevent nursing home admission and functional decline in elderly people: Systematic review and meta-regression analysis. *Jama, 287*(8), 1022-1028.

Sunderji, N., Ion, A., Lin, E., Ghavam-Rassoul, A., & Jansz, G. (2018). Participatory approaches to evaluating integrated care: The vital role for client inclusion and participation. *BMJ Quality & Safety, 27*(1), 90-91.

Theou, O., Cann, L., Blodgett, J., Wallace, L. M., Brothers, T. D., & Rockwood, K. (2015). Modifications to the frailty phenotype criteria: Systematic review of the current literature and investigation of 262 frailty phenotypes in the survey of health, ageing, and retirement in europe. *Ageing Research Reviews, 21*, 78-94.

Tsiachristas, A., Stein, K., Evers, S., & Rutten-van Mölken, M. (2016). Performing economic evaluation of integrated care: Highway to hell or stairway to heaven? *Int J Integr Care, 16*(4)

Valentijn, P. P., Schepman, S. M., Opheij, W., & Bruijnzeels, M. A. (2013). Understanding integrated care: A comprehensive conceptual framework based on the integrative functions of primary care. *Int J Integr Care, 13*(1), 655-679.

van Campen, C. (2011). *Kwetsbare ouderen [frail elderly]*. The Hague: The Netherlands Institute for Social Research.

van der Vorst, A., Zijlstra, G. R., De Witte, N., Duppen, D., Stuck, A. E., Kempen, G. I., . . . D-SCOPE Consortium. (2016). Limitations in activities of daily living in community-dwelling people aged 75 and over: A systematic literature review of risk and protective factors. *PloS One, 11*(10), e0165127.

Van Eissens, D. L., van Offenbeek, M. A. G., Broekhuis, H., & Slaets, J. P. J. (2014). A person-centred segmentation study in elderly care: Towards efficient demand-driven care. *Soc Sci Med, 113*, 68-76.

van Dijk, H., Cramm, J., & Nieboer, A. (2016). How to build an integrated neighborhood approach to support community-dwelling older people? *Int J Integr Care, 16*(2)

van het Bolscher-Niehuis, M. J., den Ouden, M. E., de Vocht H. M., & Francke, A. L. (2016). Effects of self-management support programmes on activities of daily living of older adults: A systematic review. *Int J Nurs Stud. 61*, 230-247

van Leeuwen, K. M., Bosmans, J. E., Jansen, A. P. D., Hoogendijk, E. O., Muntinga, M. E., Van Hout, H. P. J., . . . Van Tulder, M. W. (2015). Cost-effectiveness of a chronic care model for frail older adults in primary care: Economic evaluation alongside a stepped-wedge cluster-randomized trial. *J Am Geriatr Soc, 63*, 2494-2504.

van Rossum, E., & van Hout, H. (2016). Pro-actieve zorg voor kwetsbare ouderen: Terug bij af? *Huisarts En Wetenschap, 59*(10), 451-453.

Verlee, L., Van der Sande, R., Abel, R., Brandon, S., De Groot, J., Quist-Anholts, G., . . . Wisselink, H. (2016). Landelijke eerstelijns samenwerkings afspraak zorg voor kwetsbare ouderen. *Huisarts En Wetenschap, 60*(6), 1-12.

Vuik, S. I., Mayer, E. K., & Darzi, A. (2016). Patient segmentation analysis offers significant benefits for integrated care and support. *Health Affairs, 35*(5), 769-775.

Wagner, E. H., Davis, C., Schaefer, J., & Von Korff, M. (1999). A survey of leading chronic disease management programs: Are they. *Managed Care Quarterly, 7*(3), 56-66.

Wehrens, R., Oldenhof, L., Verweij, L., Francke, A., & Bal, R. (2017). Experimenteel sturen in netwerken: Een evaluatie van proces en structuur van het nationaal programma ouderenzorg. Rotterdam/Utrecht: Erasmus Universiteit, NIVEL.

Wiles, J. L., Wild, K., Kerse, N., & Allen, R. E. (2012). Resilience from the point of view of older people:'There's still life beyond a funny knee'. *Social Science & Medicine, 74*(3), 416-424.

Wiles, J. L., Leibing, A., Guberman, N., Reeve, J., & Allen, R. E. (2012). The meaning of "aging in place" to older people. *The Gerontologist, 52*(3), 357-366.

World Health Organization. (2015). WHO global strategy on people-centred and integrated health services. Geneva: World Health Organization.

SUMMARY

Frailty is described as the most problematic expression of population ageing because it is strongly related to a wide range of negative outcomes such as functional decline, loss of mobility, risk of falling, poor quality of life, hospitalization, institutionalization and mortality. As the number of (frail) older people is increasing, national health policies are facing pressure on how to allocate their financial resources among the increasing number of older people. As such, an important aim of national health policies is to prevent institutionalization. By preventing institutionalization, an increased number of frail older persons may age in place. However, this increases the complexity within primary care. The quality of primary care is under pressure because primary care is reactive, fragmented and lacks coordination.

Integrated care is advocated to solve these problems and can be defined as “a well-planned and well-organised set of services and care processes, targeted at multi-dimensional needs/problems of an individual client, or a category of persons with similar needs/problems” (Nies, 2004). Integrated care is described to have two essential features: (1) person-centeredness and (2) continuity of care. It is a complex phenomenon that aims to overcome barriers in a fragmented health care system. Professionals, policy makers and researchers have high expectations of integrated care and the wide range of aims it is supposed to achieve. However, it remains unclear whether integrated care can meet these high and diverse expectations. The aim of this thesis was therefore to explore the (cost-)effectiveness of preventive, integrated care for community-dwelling frail older people.

Part A of this thesis focuses on the Walcheren Integrated Care Model (WICM), which is an integrated care intervention with a specific focus on prevention. **Chapter 2** describes the WICM and the methodology of the evaluation study. To be more specific, the WICM is a comprehensive intervention combining evidence-based elements, involving geriatric assessments, case management, multidisciplinary teams, a single entry point, multidisciplinary protocols and discussions, web-based patient files, and a provider network into one intervention. It focuses on the entire chain of healthcare delivery, from detection to the provision of care, within prevention, cure, care, welfare and residence and in the area of in primary, secondary and tertiary care. The evaluation study of the WICM had a quasi-experimental design with before and after measurements, at three and twelve months. The WICM was implemented in three GP practices in the eastern region of Walcheren and was compared with care as usual. The control group was recruited in the other parts of the Walcheren region and consisted of five GP practices. Data was collected by questionnaires– all frail older people were visited by trained interviewers -, GP file research and time registrations from case managers.

In **chapter 3**, the short-term effects of the WICM are presented for a broad range of outcomes, including: health outcomes, health care utilization and satisfaction with care. A three month follow-up was chosen as previous research has shown that using the EASY care instrument as a geriatric assessment – which is an important element of the WICM -, is effective after three months. The results showed that the WICM enables frail older people to receive more love and friendship, which is an important dimension of quality of life. No other effects were found in terms of health outcomes, functional abilities, health care utilization or satisfaction with care. The fact that the WICM had no effect on health care utilization can be considered positive because it could be expected that a preventive integrated care intervention such as the WICM could lead to an increase in health care utilization in the short-term. This chapter shows that the high expectations of professionals, policy makers and researchers concerning comprehensive integrated care interventions and quick wins should be slightly tempered.

Chapter 4 studies the effectiveness of the WICM in terms of health outcomes, functional abilities and quality of life after twelve months to be able to explore the full potential of the intervention. The results showed that the WICM still had a positive effect on the dimension love and friendship and, furthermore, a moderately positive effect on general quality of life. The ability to receive love and friendship and general quality of life decreases in the control group but is preserved in the experimental group. These two finding are relevant since they comprise the personal evaluation of the frail older people themselves. Nevertheless, no effects were found on health outcomes such as, experienced health, mental health and social functioning, nor on functional abilities. This chapter shows that more insight is required in what specific combinations of preventive, integrated care elements are most effective.

Chapter 5 presents the cost-effectiveness of the WICM. Even though generating cost-effective care is an important aim of integrated care, there is a lack of empirical research estimating the cost-effectiveness. The cost-effectiveness analysis was conducted using a societal perspective. Thus, all costs related to the intervention and informal caregiving were included. Data on the costs were collected by questionnaires, which were filled in by both the frail older people and their informal caregivers. Furthermore, GP files, time registrations and reports from multidisciplinary meetings were also used to estimate the costs. The findings demonstrated that the costs of the WICM were higher compared to usual care. However, the results were statistically insignificant. This was mostly caused by the high intervention costs, which largely originated from the case management and the time spent by different professionals in the multidisciplinary meetings. The costs of health and social care did not increase due to the intervention, except for GP care that increased in the WICM. The effects on health-related quality of life were very limited, and as a result the WICM was not cost-effective. This chapter shows that health-related quality of life, as an effect measure may not be suitable when estimating the (cost-) effectiveness of integrated care for frail older people. Furthermore, in future research the specific cost categories of integrated care should be carefully considered.

Part B of this thesis critically reflects the concepts and methodologies used to explore the (cost-) effectiveness of integrated care for frail older people and places the results of the WICM in a broader perspective. **Chapter 6** contains a systematic review presenting the current body of evidence on preventive, integrated care for community-dwelling frail older people, including the WICM. Nine databases were searched for eligible studies with a comparison group and reporting at least one outcome regarding effectiveness or cost-effectiveness. A total of 2998 unique records were retrieved, of which, 46 studies (involving 29 different interventions) were included. Specific attention was paid to the different elements and levels of integrated care model adapted from Valentijn's Rainbow Model of Integrated Care. The systematic review revealed that the majority of the outcomes in the studies on preventive, integrated care showed no significant effects. In terms of health outcomes, effectiveness is demonstrated most often for seldom reported outcomes such as well-being. Outcomes regarding informal caregivers and professionals are rarely considered and negligible. Most promising are the care process outcomes that improve for preventive, integrated care interventions. Overall, health care utilization showed mixed results and the evidence for cost-effectiveness was limited. No clear relation was found between the elements and levels of integrated care and the effectiveness of integrated care. Given this limited and fragmented evidence for the effectiveness and cost-effectiveness of preventive, integrated care for frail older people, high expectations should be tempered. Another important result was the heterogeneity observed in evaluation research on preventive, integrated care for frail older people. This could be seen in the various research design applied, the different target population receiving the intervention, the elements and levels of integration of the interventions, and the outcomes used to measure (cost-) effectiveness. Furthermore, even the definition of frailty varied between the different interventions.

In **chapter 7** the heterogeneity within the population of frail older people is further explored by developing frailty profiles. In this study frailty profiles were identified based on the physical, psychological, social and cognitive domains of functioning and the severity within each domain. Secondary data-analyses was performed on the Older Person and Informal Caregiver Minimum Dataset on 43,704 respondents aged

60 years and older. This population was divided in subpopulations by using latent class analysis and were validated in a focus group with older people. Six profiles were distinguished: relatively healthy; mild physically frail; psychologically frail; severe physically frail; medically frail and multi-frail. The relatively healthy profile fundamentally differed from the other profiles because of the relatively mild problems across all domains. The mild physically frail and severe physically frail suffer from problems in the physical domain due to functional limitations but their perceived health and mental health is relatively good. The psychologically frail report sporadic physical problems but they experience poor mental health and low perceived health. The problems for the medically frail and multi-frail are not limited to one domain but are multi-dimensional, with a combination of problems extending to the social- and cognitive domain. This chapter showed that ‘the frail older person’ does not exist and that specific patterns underlie the problems in different domains of functioning. Acknowledging the heterogeneity of frail older people is crucial for tailoring and evaluating interventions and developing policy for frail older people.

In **chapter 8,** the effectiveness of integrated care was determined for each of the six frailty profiles developed in chapter 7. The aim was to explore whether the observed heterogeneity among the frail older people could explain the limited effectiveness of integrated care on health outcomes. An IPD-analysis of eight integrated care interventions in the Dutch primary care setting was performed, including the WICM studied in part A of this thesis. The eight interventions all have a pro-active approach, involving a comprehensive geriatric assessment and a multi-disciplinary and integrated follow-up. The IPD-analysis showed that for none of the six profiles effects were substantiated in terms functional limitations, mental health, social functioning, health-related quality of life and general quality of life. The results indicated that when the type and severity of the problems of the frail older people, and thereby the complexity, increases, the effects of integrated care on health outcomes also vary increasingly.

Chapter 9 presents the general discussion of this thesis, including the main findings and the subsequent the theoretical, methodological and practical considerations. A theoretical consideration for future research is that integrated care could be more properly aligned to the target population of frail older people. The heterogeneity of the target population frailty older people has increased since the conceptualization has expanded to the psychological and social domain. However, the underlying assumptions concerning effective integrated interventions have not changed. Integrated care interventions in primary care settings remain characterized by medical dominance, whereas, a more holistic and person-centered approach might be required.

Moreover, prevention might be integrated more carefully within the integrated care interventions. This could be achieved for example, by focusing on self-management and the abilities to adapt or to cope with deterioration in health and well-being. A methodological consideration of this thesis is the design of the evaluation of the main intervention – the WICM - was quasi-experimental, which could have led to selection bias. However, a randomized controlled trial for the WICM was impossible because of the important role of the GP, even as a cluster randomized design because of the limited numbers of participating GPs. In addition, the use of rigid designs is increasingly questioned for the evaluation of integrated care because the level of control and standardization in integrated care interventions is limited. The absence of a process evaluation of the WICM might have led to limited insights in the benefits of the intervention. The last methodological consideration is that outcome measures used should be better aligned to frail older people and, furthermore, go beyond traditional health outcomes by for example, including well-being and resilience. The practical implication of this thesis is that effective integrated care also requires research that is integrated, continuous, and person-centred to cover the complexities of daily practice. Bridges should be built between research, practice and policy and also researchers should work together more closely. Continuity could be improved by exchanging knowledge or context-based evidence between practice and research more quickly in order to keep learning continuously. Finally, this thesis showed that 'the frail older person' does not exist so the focus should lay on person-centeredness within integrated care interventions *and* research. In the end it is about the older person facing frailty who should be able to say (as my grandmother always said): "I have had a beautiful life".

SAMENVATTING

Kwetsbaarheid wordt omschreven als de meest problematische uiting van de vergrijzing, omdat het sterk gerelateerd is aan een reeks van negatieve gezondheidsuitkomsten, zoals functieverlies, mobiliteitsproblemen, valrisico's, slechte kwaliteit van leven, ziekenhuisopnamen, opname in het verpleeghuis en overlijden. Het aantal (kwetsbare) ouderen neemt toe en gezondheidszorg staat onder druk, omdat de krimpende budgetten verdeeld moeten worden onder de groeiende groep ouderen. Daarom is een belangrijk doel van het beleid om opname in het verpleeghuis te voorkomen. Dit betekent dat een groeiende groep kwetsbare ouderen thuis blijft wonen en de complexiteit in de eerstelijnszorg toeneemt. De kwaliteit van eerstelijnszorg staat onder druk, omdat de zorg reactief en gefragmenteerd is en een gebrek aan coördinatie heeft.

Integrale zorg wordt gezien als de oplossing voor bovengenoemde problemen. Integrale zorg is omschreven als: een goed geplande en georganiseerde set aan diensten en zorgprocessen, gericht op multidimensionele behoeften en problemen van een individuele cliënt of van een categorie van personen met vergelijkbare behoeften en problemen (Nies, 2004) en heeft twee belangrijke kenmerken: persoonsgerichtheid en continuïteit. Integrale zorg is een complex fenomeen dat barrières binnen het gefragmenteerde gezondheidszorgsysteem probeert te doorbreken. Professionals, beleidsmakers en onderzoekers hebben hoge verwachtingen van integrale zorg en de doelen die het potentieel kan behalen. Echter, het blijft tot op heden onduidelijk of integrale zorg deze hoge en diverse verwachtingen kan waarmaken. Het doel van dit proefschrift is daarom om meer inzicht te verkrijgen in de effectiviteit en kosteneffectiviteit van preventieve, integrale zorg voor thuiswonende kwetsbare ouderen.

Deel A van dit proefschrift richt zich op het Walcheren Integrale Zorgmodel (WICM), een integrale zorginterventie met een specifieke focus op preventie. In **hoofdstuk 2** worden het WICM en de methodologie van het evaluatieonderzoek nader omschreven. Het WICM is een veelzijdige interventie waarin meerdere effectieve elementen worden gecombineerd zoals: geriatrische behoeftebepaling, casemanagement, multidisciplinaire teams, 1-loket functie, multidisciplinaire protocollen en overleggen, een keteninformatiesysteem en een netwerkstructuur. De interventie richt zicht op de gehele keten van vroegsignalering tot zorgverlening in preventie, cure, care, welzijn en wonen in eerste- tweede- en derdelijn. Het evaluatieonderzoek van het WICM heeft een quasi-experimenteel design met voor- en nametingen na drie en twaalf maanden. Het WICM is geïmplementeerd in drie huisartsenpraktijken in de oostelijke regio van Walcheren en wordt vergeleken met reguliere zorg. De controlegroep is geworven in andere delen van Walcheren en bestaat uit vijf huisartsenprakijken. Dataverzameling vindt plaats via vragenlijsten – alle kwetsbare ouderen zijn bezocht door getrainde interviewers - , dossieronderzoek en tijdsregistraties van casemanagers.

In **hoofdstuk 3** worden de effecten van het WICM op korte termijn onderzocht voor een breed scala aan uitkomsten, waaronder gezondheidsuitkomsten, zorggebruik en tevredenheid met zorg. De drie maanden follow-up is gekozen, omdat eerder onderzoek aantoont dat het gebruik van het EASYcare-instrument als geriatrische behoeftebepaling – een belangrijk onderdeel van WICM– effectief is na een periode van drie maanden. Het WICM stelt ouderen in de gelegenheid om meer liefde en vriendschap te ontvangen en dit is een belangrijke dimensie van de kwaliteit van leven van ouderen. Er zijn geen andere effecten gevonden in termen van gezondheidsuitkomsten, zelfredzaamheid, zorggebruik en tevredenheid met zorg. De afwezigheid van effecten op zorggebruik wordt als een positief effect gezien, omdat het WICM, als een preventief model met screening, geriatrische behoeftebepaling en casemanagement, ook tot een stijging in zorggebruik had kunnen leiden op de korte termijn. Dit hoofdstuk toont aan dat verwachtingen van professionals, beleidsmakers en onderzoekers over veelzijdige integrale zorg interventies en ‘quick wins’ getemperd dienen te worden.

Hoofdstuk 4 onderzoekt de effectiviteit van het WICM in termen van gezondheidsuitkomsten, zelfredzaamheid en kwaliteit van leven na twaalf maanden om het volledige potentieel van de interventie te onderzoeken. De resultaten laten zien dat het WICM na twaalf maanden nog steeds een positief effect op liefde en vriendschap heeft en een matig effect op de algemene kwaliteit van leven. Het vermogen om liefde en vriendschap te ontvangen en de algemene kwaliteit van leven daalt in de controlegroep en blijft gehandhaafd in de experimentele groep. Deze twee bevindingen zijn relevant, omdat ze de persoonlijke evaluatie van de kwetsbare ouderen bevatten. Desondanks zijn er geen effecten gevonden op gezondheidsuitkomsten zoals ervaren gezondheid, mentale gezondheid, sociaal functioneren en zelfredzaamheid. Dit hoofdstuk toont aan dat meer inzicht is vereist in welke specifieke combinaties van preventieve, integrale zorg het meest effectief zijn.

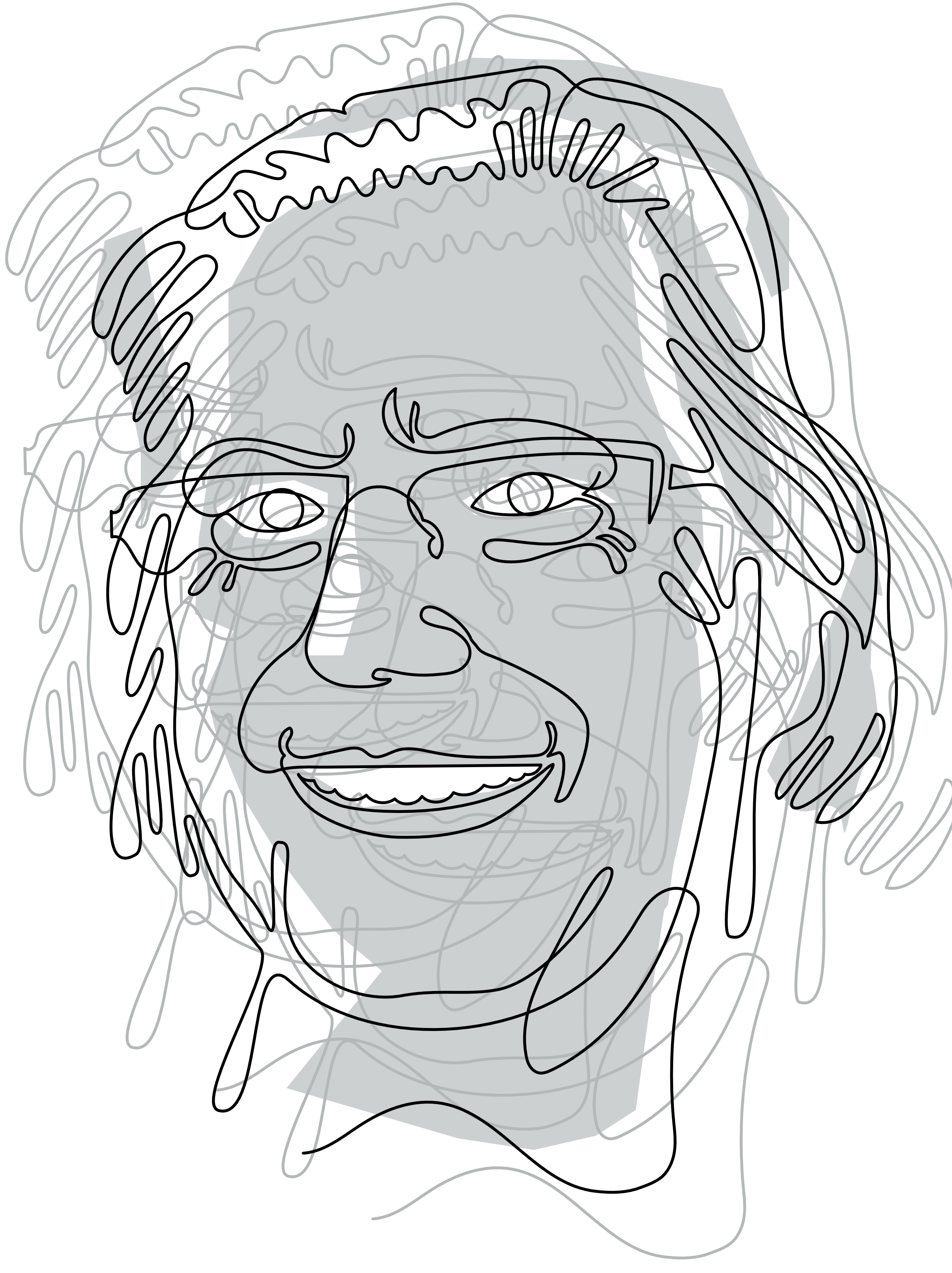
Hoofdstuk 5 presenteert de kosteneffectiviteit van het WICM. Hoewel het bereiken van kosteneffectieve zorg een belangrijk doel van integrale zorg is, is empirisch onderzoek beperkt. De kosteneffectiviteitsanalyse is uitgevoerd vanuit een maatschappelijk perspectief; alle kosten die gerelateerd zijn aan de interventie worden meegenomen, waaronder de kosten van mantelzorg. Data over de kosten zijn verzameld door middel van vragenlijsten die zijn ingevuld door de kwetsbare ouderen en mantelzorgers, patiëntendossiers, tijdsregistraties en notulen van multidisciplinaire overleggen. De bevindingen tonen aan dat de kosten van het WICM hoger zijn in vergelijking met reguliere zorg, hoewel dit verschil niet significant is. Dit verschil wordt bovenal veroorzaakt door de interventiekosten die vooral bestaan uit casemanagement, maar ook uit de tijd die besteed wordt aan multidisciplinaire overleggen door de verschillende professionals. De kosten van de verschillende typen zorg en welzijn stijgen niet door de interventie, met uitzondering van huisartsenzorg. De effecten van gezondheidsgerelateerde kwaliteit van leven zijn erg beperkt; resulterend in het niet kosteneffectief zijn van het WICM. Deze studie laat zien dat gezondheidsgerelateerde kwaliteit van leven als effectmaat wellicht niet de meest geschikte effectmaat is voor kwetsbare ouderen en dat de specifieke kostencategorieën voor integrale zorg goed overwogen dienen te worden.

Deel B van dit proefschrift reflecteert kritisch op de concepten en methodologieën die gebruikt worden om de (kosten)effectiviteit van integrale zorg voor kwetsbare ouderen te onderzoeken en plaatst de resultaten van het WICM in een breder perspectief. **Hoofdstuk 6** bevat een systematische review van de huidige stand van de evidentie van preventieve, integrale zorg voor thuiswonende kwetsbare ouderen. Negen databanken zijn doorzocht voor beschikbare studies met een controlegroep en waar tenminste één uitkomst van effectiviteit of de kosteneffectiviteit wordt gerapporteerd. 2998 unieke records zijn gevonden en na exclusie zijn 46 evaluatiestudies over 29 interventies geselecteerd, waaronder het WICM. Specifieke aandacht is besteed aan de verschillende elementen en niveaus van integratie die zijn afgeleid van Valentijns Regenboogmodel voor integrale zorg. De systematisch review onthult dat het merendeel van de gerapporteerde uitkomsten van de studies over preventieve, integrale zorg geen effect laat zien. In termen van gezondheidsuitkomsten wordt effectiviteit bovenal aangetoond voor uitkomsten die weinig onderzocht worden zoals welzijn. De uitkomsten voor informele zorgverleners en professionals worden weinig onderzocht en zijn verwaarloosbaar. Het meest veelbelovend zijn de proces-uitkomsten die verbeteren binnen preventieve, integrale zorg interventies. Zorggebruik laat wisselende resultaten zien en de kosteneffectiviteit van integrale zorg is beperkt. Er bestaat geen duidelijk relatie tussen de elementen en niveaus van integratie van de interventies en de effectiviteit. De hoge verwachtingen dienen getemperd te worden gegeven dit beperkte en gefragmenteerde bewijs voor de effectiviteit en kosteneffectiviteit van preventieve, integrale zorg voor kwetsbare ouderen. Een ander belangrijk resultaat is de enorme variatie in het onderzoek naar preventieve, integrale zorg voor kwetsbare ouderen. De populaties verschillen enorm tussen én binnen studies en kwetsbaarheid is anders gedefinieerd in elke interventie.

In **hoofdstuk 7** wordt de heterogeniteit van de populatie kwetsbare ouderen verder onderzocht door het ontwikkelen van kwetsbaarheidsprofielen. In deze studie worden kwetsbaarheidsprofielen onderscheiden op basis van de fysieke, psychologische, sociale en cognitieve domeinen van functioneren en de ernst van de problemen in deze domeinen. Secundaire data-analyse is uitgevoerd op de TOPICS-MDS data van 43.704 respondenten van 60 jaar en ouder. Deze populatie is verdeeld in subpopulaties met latente klasse analyse en zijn gevalideerd in een focusgroep met ouderen. Zes profielen zijn onderscheiden: relatief gezond, mild fysiek kwetsbaar, psychologisch kwetsbaar, ernstig fysiek kwetsbaar, medisch kwetsbaar en meervoudig kwetsbaar. Het relatief gezonde profiel verschilt fundamenteel van de andere profielen door de beperkte problemen in alle domeinen. De milde en ernstig fysieke kwetsbaren hebben last van problemen in het fysieke domein door functionele beperkingen, maar hun mentale en ervaren gezondheid is relatief goed. De psychologisch kwetsbaren hebben weinig fysieke problemen, maar zij ervaren een slechte mentale gezondheid en hun ervaren gezondheid is slecht. De problemen van de medisch en meervoudig kwetsbaren beperken zich niet tot een domein maar zijn juist multidimensioneel met een combinatie van problemen die zich uitbreiden naar het sociale en cognitieve domein. Dit hoofdstuk laat zien dat dé kwetsbare oudere niet bestaat en dat specifieke patronen onderliggend zijn aan de problemen in de verschillende domeinen van functioneren. Deze heterogeniteit van kwetsbare ouderen dient erkend te worden binnen interventies - om deze op maat te kunnen ontwikkelen - en binnen het evaluatieonderzoek van deze interventies.

In **hoofdstuk 8** wordt de effectiviteit van integrale zorg bepaald voor elk van de zes kwetsbaarheidsprofielen die ontwikkeld zijn in hoofdstuk 7. Het doel was om te onderzoeken in hoeverre de heterogeniteit van de populatie van kwetsbare ouderen de beperkte effectiviteit van integrale zorg op gezondheidsuitkomsten kan verklaren. Een meta-analyse op basis van individuele-patiëntengegevens van acht integrale zorginterventies in de Nederlandse eerstelijn is uitgevoerd, waaronder het WICM uit deel A van dit proefschrift. De acht interventies hebben een proactieve benadering en bevatten een geriatrische behoeftebepaling en een multidisciplinaire en integrale follow-up. Voor geen van de zes profielen worden effecten gerealiseerd op zelfredzaamheid, mentale gezondheid, sociaal functioneren, gezondheidsgerelateerde kwaliteit van leven en algemene kwaliteit van leven. De resultaten tonen aan dat wanneer het type en de ernst van de problemen van kwetsbare oudere, en daarmee de complexiteit, toeneemt, de effecten van integrale zorg op gezondheidsuitkomsten in toenemende mate variëren.

Hoofdstuk 9 presenteert de algemene discussie van dit proefschrift waaronder de belangrijkste bevindingen en de theoretische, methodologische en praktische reflecties op dit proefschrift. Een theoretische reflectie voor toekomstig onderzoek is dat integrale zorg meer toegespitst dient te worden op de doelpopulatie van kwetsbare ouderen. De heterogeniteit van de populatie is gestegen sinds de conceptualisatie zich heeft uitgebreid naar het psychologische en sociale domein. Echter, de onderliggende assumpties van effectieve integrale zorg zijn niet veranderd. Integrale zorg in de eerstelijnszorg worden nog steeds gekenmerkt door medische dominantie terwijl een meer holistische en persoonsgerichte benadering nodig is. Bovendien mag preventie meer geïntegreerd worden binnen integrale zorginterventies door te focussen op zelfmanagement en het vermogen van de ouderen om zich aan te passen aan achteruitgang. Een methodologische reflectie is dat het quasi-experimentele design van de belangrijkste interventie in dit proefschrift – het WICM – geleid kan hebben tot selectiebias. Echter, gerandomiseerd onderzoek met controlegroep en een belangrijke rol voor de huisarts is onmogelijk, evenals een cluster gerandomiseerd design voor het WIZM door het beperkt aantal deelnemende huisartsen. Bovendien wordt aan het gebruik van rigide designs steeds meer getwijfeld, omdat de mate van controle en standaardisatie in integrale zorginterventies erg beperkt is. Het ontbreken van een procesevaluatie van het WICM kan hebben geleid tot beperkte inzichten in de voordelen van de interventie. De laatste methodologisch reflectie is dat de uitkomstmaten beter toegespitst moeten worden op de populatie van kwetsbare ouderen en verder dienen te gaan dan de traditionele gezondheidsuitkomsten en ook welzijn en veerkracht dienen te bevatten. De praktische implicatie van dit proefschrift is dat effectieve integrale zorg ook onderzoek nodig heeft dat integraal, continue en persoonsgericht is om tegemoet te komen aan de complexiteit van de dagelijkse praktijk. We moeten bruggen bouwen tussen onderzoek, praktijk en beleid en onderzoekers zouden beter kunnen samenwerken. Continuïteit kan verbeteren door kennis en context-specifiek bewijs sneller uit te wisselen tussen praktijk en onderzoek om te kunnen blijven leren. Tot slot, persoonsgerichtheid is van groots belang in integrale zorginterventies en evaluatieonderzoek, omdat dit proefschrift laat zien dat dé kwetsbare oudere niet bestaat. Uiteindelijk gaat het om de ouderen die hun kwetsbaarheid aangaan. Zij moeten kunnen zeggen (zoals mijn grootmoeder altijd zei): Ik heb een prachtig leven gehad!



DANKWOORD

Kwetsbaarheid onder ogen komen. Met een titel als deze is het nu tijd om dit zelf te doen. Ik had dit proefschrift nooit kunnen schrijven zonder de mensen om me heen: bij BMG/ESHPM, thuis en de mensen die inmiddels tot beide categorieën behoren. Iedereen die me een beetje kent weet dat het schrijven van dit proefschrift geen rechtlijnig proces was: er waren pieken en dalen; er was kracht en zwakte. Net als uit mijn onderzoek naar voren kwam, waren de liefde en vriendschap van de mensen om me heen onmisbaar. Bedankt dat jullie in mij en in de afronding van dit proefschrift geloofden. Jullie hadden gelijk, ik kan het wel!

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CURRICULUM VITAE

PhD Portfolio & About the author

PhD Portfolio

Name: Willemijn Looman
Department: Erasmus School of Health Policy & Management
PhD period: 2011-2018
Promotor: Prof.dr. Robbert Huijsman
Copromotor: Prof.dr. Robbert Huijsman MBA

Courses

Participatory action research	2017
Design study training	2017
Course design	2016
Project Management for PhD students	2015
Thesis supervision	2014
ICT II	2014
ICT I	2014
Assessment and feedback	2013
Assessing written assignments	2013
Supervising small groups	2013
Supervising written assignments	2013
Academic writing in English	2012
Course Basic Didactics	2011
Tutor skills for Problem-Based Education (PGO)	2011

Presentations

Presentation at Platform Benoordenhout: “The frail older person does not exist’, The Hague (the Netherlands)	2018
Presentation at Robuust: ‘The frail older person does not exist’, Eindhoven (the Netherlands)	2018
Pitch at National Conference New Generation Elderly care, Nieuwegein (the Netherlands)	2017
Symposium at Gerontology conference: ‘More grip on frailty’ in the session: Sharing is the new multiplying: the added value of data sharing in research on older people, Ede (the Netherlands)	2017
Presentation at International Conference on Integrated Care: ‘Managing frailty: exploring the effectiveness of integrated primary care interventions by distinguishing subpopulations of frail older people’, Dublin (Ireland) – nominated Integrated Care Award	2017

Presentation at PhDs in the spotlight!, launch cooperation Graduate School and ESHPM: ‘Preventive, integrated care for frail older people’, Rotterdam (the Netherlands)	2016
Presentation at International Conference on Integrated Care: ‘Effects of an Integrated Care intervention on frail elderly’s health and quality of life: a quasi-experimental study’, Edinburgh (Scotland) – nominated Integrated Care Award	2015
Presentation at ESHPM seminar, in collaboration with Benjamin Janse: ‘Evaluating Integrated Care for the Frail Elderly: A Quest for the Holy Grail’, Rotterdam (the Netherlands)	2014
Presentation at NUZO (Network Utrecht Care for Older People), in collaboration with Dini Smilde: ‘Walcheren Integrated Care Model clarified’, Utrecht (the Netherlands)	2014
Presentation at International Conference on Integrated Care: ‘The cost-effectiveness of an integrated care model for frail elderly: the Walcheren Integrated Care Model’, Brussel (Belgium)	2014
Workshop at the National Care for the Elderly Programme, in collaboration with Jeanet Blom, Niek de Wit, Eric Moll van Charante and Irene Drubbel: ‘Identification of frailty in primary care’, Den Bosch (the Netherlands)	2013
Presentation at conference Elderly Care 2040: ‘GP and integrated care: a matter of quality’, Rotterdam (the Netherlands)	2013
Presentation at final symposium Geriatric Care Chain for Eldery in Walcheren, together with Isabelle Fabbricotti and Benjamin Janse: The effects of the Walcheren Integrated Care Model, Vlissingen (the Netherlands)	2013
Presentation at GENERO (Geriatric Network Rotterdam) symposium, in collaboration with Isabelle Fabbricotti and Benjamin Janse: ‘Integrated care for frail older people’, Rotterdam (the Netherlands)	2013
Poster presentation Geriatrics Day: ‘Effects of integrated care for frail older people: the Walcheren Integrated Care Model’, Den Bosch (the Netherlands)	2013
Presentation at International Conference on Integrated Care: ‘The effects of an integrated care model on frail elderly’, San Marino (Italy)	2012
Poster presentation GENERO (Geriatric Network Rotterdam) symposium: ‘Geriatric care chains for frail elderly in Walcheren’, (Fabbricotti I.N., van Eede F., Reiffers A., Janse B., de Kuyper R., Looman W.M.), Rotterdam (the Netherlands)	2011

Attended seminars and conferences

HSMO research colloquia & Science Club	2011-2017
Presentation Flemisch minister Jo Vandeurzen about Walcheren Integrated Care Model, Brussel (Belgium)	2016
Workshop Dr. Sanna Laulainen, Rotterdam (the Netherlands)	2015
GENERO (Geriatric Network Rotterdam) symposium, Rotterdam (the Netherlands)	2014
Seminar How to publish a world class paper, Rotterdam (the Netherlands)	2014
International Conference of Integrated Care, Berlin (Germany)	2013
Lustrum symposium iBMG, Rotterdam (the Netherlands)	2012
Conference ANBO Zuid-Holland, Berkel & Roderijs (the Netherlands)	2012
Conference National Care for the Elderly Programme, Ede (the Netherlands)	2011

Teaching activities

Integrated care (BA) – tutor workgroups & lecturer	2012 – 2017
Quantitative research methods (BA) – supervisor	2015 – 2016
Bachelor theses – supervisor & co-reader	2014 – 2015
Master theses – co-reader	2013 – 2014
Quantitative research methods (pre-master) - supervisor	2012 – 2015
Quantitative research methods (BA) - supervisor	2012 – 2013
Organisation Science (BA) – tutor workgroups	2012 – 2013

Personal grants

ZonMw micro-grant subsidy for research project (633400014): “Frailty profiles: more insights into the effectiveness of integrated care by distinguishing profiles of frail older people”	2016

Additional activities

Member learning community Beter Oud ‘Vroegsignalering’	Since 2018
Member ESHPM group informal care	Since 2017
Peer reviewer BMC Health Services Research	2017
Peer reviewer PLOS ONE	2017
Peer reviewer The European Journal of Health Economics	2015
Peer reviewer International Journal of Integrated Care	2015
Member group Synthesis of results of NPO projects on early identification of complex problems and multidisciplinary care for older people in Dutch general practice	2014-2016
Member project group data management	2013

Dutch reports

Van Bochove M., van Dijk H.M., Hoefman, R. Looman, W.M. (2018). White paper Informele Zorg en Ondersteuning. Rotterdam: Erasmus School of Health Policy & Management.

Looman, W.M. (2017). Essay: Integration of care and research is required. Skipr summer 2017.

International publications:

Blom, J.W., van den Hout, W.B., den Elzen, W.P.J., Drewes, Y.M., Bleijenberg, N., Fabbricotti, I.N., Jansen, A.P.D., Kempen, G.I.J.M., Koopmans, R., Looman, W.M., Melis, R.J.F., Metzelthin, S.F., Moll van Charante, E.P., Muntinga, M.E., Numans, M.E., Ruikes, F.G.H., Spoorenberg, S.L.W., Stijnen, T., Suijker, J.J., de Wit, N.J., Wynia, K., Wind, A.W., Gussekloo, J. & TOPICS-MDS research consortium. (2018). Effectiveness and cost-effectiveness of proactive and multidisciplinary integrated care for older people with complex problems in general practice: an individual participant data meta-analysis. *Age & Ageing*. 47: 705-714.

Looman, W.M., Fabbricotti I.N., Blom, J.W., Jansen, A.P.D., Lutomski, J.E., Metzelthin S.F., Huijsman, R. on behalf of the TOPICS-MDS research consortium. (2018). The frail older person does not exist: development of frailty profiles with latent class analysis. *BMC Geriatrics*. 18: 84.

Looman, W.M., Huijsman, R., & Fabbricotti, I.N. (2018). The (cost-)effectiveness of preventive, integrated primary care for community-dwelling frail older people: A systematic review. *Health & Social Care in the Community, April*, 1-30.

Janse, B. Huijsman, R., Looman, W.M. & Fabbricotti I.N. (2018). Formal and informal care for community-dwelling people over time: A comparison of integrated and usual care in the Netherlands. Health & Social Care in the Community, Mar:26(2) e280-e290.

Smits, L.C., Schuurmans, M., Blom, J.W., Fabbricotti, I.N., Jansen, A., Kempen, G.I.J.M., Koopmans, R., Looman, W.M., Melis, R., Metzelthin, S.F., Moll van Charante, E., Muntinga, M., Ruikes, F., Spoorenberg, S., Suijker, J.J., Wynia, K., Gussekloo, J., De Wit, N.J., & Bleijenberg, N. (2018). Unravelling complex primary care programmes to maintain independent living in older people: a systematic overview. *Journal of Clinical Epidemiology*. Ape; 96:110-119.

Looman, W.M., Fabbricotti, I.N., de Kuyper, R.D.M. & Huijsman, R. (2016). The effects of a pro-active integrated care intervention for frail community-dwelling older people: a quasi-experimental study with the GP-practice as single entry point. *BMC Geriatrics*, 16 (43), 1-10.

Looman, W.M., Huijsman, R., Boumans, C.A.M., Stolk, E.A. & Fabbricotti, I.N. (2016). Cost-effectiveness of the 'Walcheren Integrated Care Model' intervention for community-dwelling frail elderly. *Family Practice*, 33 (2), 154-160.

Makai, P., Looman, W.M., Adang, E.M.M., Melis, R.J.F., Stolk, E.A. & Fabbricotti, I.N. (2015). Cost-effectiveness of integrated care in frail elderly using the ICECAP-O and EQ-5D: does choice of instrument matter? *The European Journal of Health Economics*, 16 (4), 437-450.

Looman, W.M., Fabbricotti, I.N. & Huijsman, R. (2014). The short-term effects of an integrated care model for the frail elderly on health, quality of life, health care use and satisfaction with care. *International Journal of Integrated Care*, 14 (oct-dec), 1-11.

Fabbricotti, I.N., Janse, B., Looman, W.M., de Kuyper, R., van Wijngaarden, J.D.H. & Reiffers, A. (2013). Integrated care for frail elderly compared to usual care: a study protocol of a quasi-experiment on the effects on the frail elderly, their caregivers, health professionals and health care costs. *BMC Geriatrics*, 31 (13), 1-12.

Lucas, G.J.M., Wijst, A. van der, Curseu, P.L. & Looman, W.M. (2013). An Evaluation of Alternative Ways of Computing the Creativity Quotient in a Design School Sample. *Creativity Research Journal*, 25 (3), 348-355.

About the author

Willemijn Looman was born in Woerden on the 21st of January 1985. She studied Communication and Information Sciences at the University of Groningen. After a pre-master Sociology, she obtained a Research Master in Behavioural and Social Sciences (cum laude). After her graduation she worked as a research employee at the department of Organization Science at Tilburg University on a research project about creative work processes. In 2011, she started working as a junior researcher at the Erasmus School of Health Policy & Management (ESHPM). She was involved in the evaluation study of the Walcheren Integrated Care Model for frail older people, which resulted in a PhD trajectory. In 2016, she received a personal micro-grant from the Netherlands Organization for Health Research and Development for the research project "Frailty profiles: more insights into the effectiveness of integrated care by distinguishing profiles of frail older people". The results of her PhD were presented during national and international conferences and were published in international peer reviewed journals. During her PhD, Willemijn was also involved in other research projects on integrated care for older people with dementia and the evaluation of iPad courses for older people. Furthermore, she taught several courses at the ESHPM, such as Integrated Care and Quantitative research methods. As Willemijn strongly beliefs in integration of research, she collaborated with researchers from other integrated care projects and with her ESHPM colleagues within the multidisciplinary informal care group. In 2017, she started working as a Post-doctoral researcher at SELFIE, a Horizon2020 project on integrated care for people with multi-morbidity.

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