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 & Rock-

wood, 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).

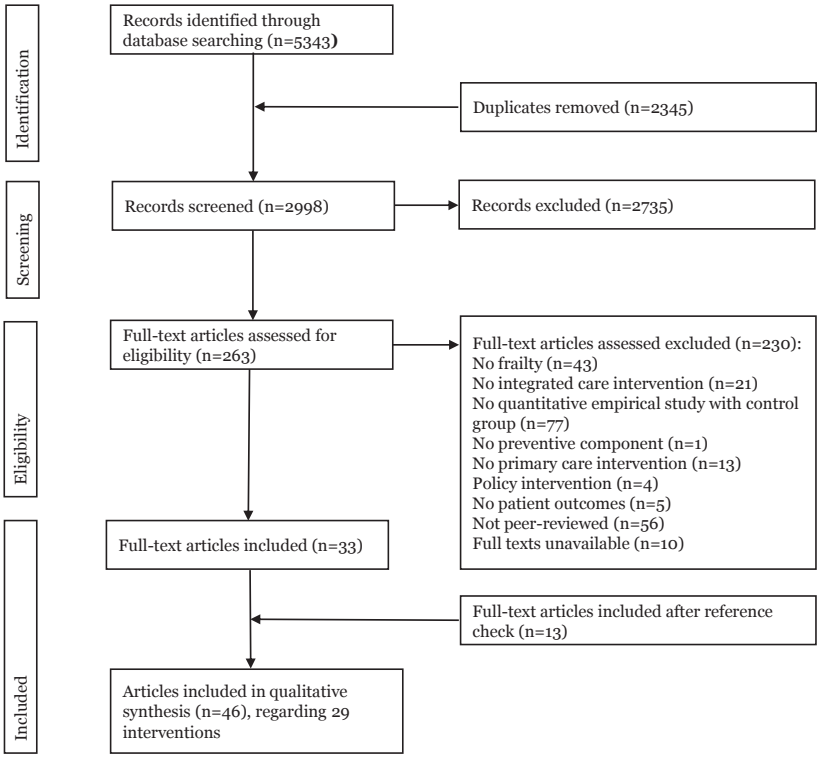

Figure 6.1: PRISMA flow chart

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		7
Sandberg et al. 2015a (Sandberg, Kristensson, Midlöv, & Jakobsson, 2015)				Utilization	Experimental group n=80; control group n=73	12 months	Sweden	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 institutio-nalization	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 institutio-nalization	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.

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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