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Understanding the implementation of interventions to improve the management of frailty in primary care: a rapid realist review

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ABSTRACT

Objective Identifying and managing the needs of frail people in the community is an increasing priority for policy makers. We sought to identify factors that enable or constrain the implementation of interventions for frail older persons in primary care.

Design A rapid realist review.

Data sources Cochrane Library, SCOPUS and EMBASE, and grey literature. The search was conducted in September 2019 and rerun on 8 January 2022.

Eligibility criteria for selecting studies We considered all types of empirical studies describing interventions targeting frailty in primary care.

Analysis We followed the Realist and Meta-narrative Evidence Syntheses: Evolving Standards quality and publication criteria for our synthesis to systematically analyse and synthesise the existing literature and to identify (intervention-context-mechanism-outcome) configurations. We used normalisation processes theory to illuminate mechanisms surrounding implementation.

Results Our primary research returned 1755 articles, narrowed down to 29 relevant frailty intervention studies conducted in primary care. Our review identified two families of interventions. They comprised: (1) interventions aimed at the comprehensive assessment and management of frailty needs; and (2) interventions targeting specific frailty needs. Key factors that facilitate or inhibit the translation of frailty interventions into practice related to the distribution of resources; patient engagement and professional skill sets to address identified need.

Conclusion There remain challenges to achieving successful implementation of frailty interventions in primary care. There were a key learning points under each family. First, targeted allocation of resources to address specific needs allows a greater alignment of skill sets and reduces overassessment of frail individuals. Second, earlier patient involvement may also improve intervention implementation and adherence.

PROSPERO registration number The published protocol for the review is registered with PROSPERO (CRD42019161193).

Strengths and limitations of this study

- ⇒ To our knowledge, this is the first realist review to explore factors supporting or inhibiting frailty interventions in primary care.
- ⇒ The synthesis was constructed based on Realist and Meta-narrative Evidence Syntheses: Evolving Standards standards entailing development and comparative analysis of intervention-context-mechanism-outcome configurations.
- ⇒ Normalisation process theory constructs helped us to highlight factors surrounding the implementation of interventions.
- ⇒ There was wide heterogeneity in the reporting of implementation processes, with more data for interventions that entailed qualitative evaluations.
- ⇒ The analysis focused on a defined 'frail' population within primary studies and excluded related elderly populations who were not diagnosed with frailty.

INTRODUCTION

Frailty is a promising but also somewhat contested multidimensional syndrome characterised by a reduction in resilience due to the accumulation of health deficits.[1–3] It tends to be progressive, leading to loss of independence, often triggered by a stressor event such as an episode of acute illness.[3] Frailty places individuals at risk of adverse health outcomes, including falls, unplanned hospitalisation and death.[1] It is highly prevalent among older people, increasing from 4% in people aged 65–69 years to greater than 16% in those aged 80 years and over.[4–6] The heterogeneity of frailty status also increased the challenges of understanding a frailty intervention due to the differences between individuals' capacity (eg, prefrail and frail).[7] Informed by emergent evidence, targeted support from health and care services is now advocated to improve the lives and outcomes for older people with frailty.[1 8 9]

Interventions using exercise, nutritional supplementation and comprehensive geriatric assessment (CGA) appear to be effective in improving frailty among older people in a hospital setting.[10 11] The NHS Long Term Plan issued a new CGA guideline to support primary care providers working with older people.[12] However, a recent systematic review highlighted limited and mixed evidence concerning the introduction of CGA offered in the primary care setting to those perceived to be the most vulnerable older people.[13] There is a need to ensure that frailty interventions are adaptable because of the mixed evidence, for example, the interventions improved adherence to medications but show no improvement in functional outcome.[13] Furthermore, the diversity of interventions targeting frailty increases the challenge to define the best intervention that could be used to identify, assess and manage frailty in older people.[7] The Fisterra guideline in Spain updated in 2020 'Frail elderly people: detection and management in primary care' highlighted that the most effective interventions in frailty are physical exercise and medication.[14]

However, there is no clear definition or tool for identifying frailty, and the lack of evidence regarding the usefulness of its detection is still considered to be a significant barrier to identifying and managing frailty in primary care.[15] Accordingly, screening for frailty in primary care is unlikely to translate into improved clinical outcomes in the absence of a clear evidence for clinical decision-making.[15] Moreover, without an active involvement of older patients in the study design and development of care plan related to frailty, it might negatively affect the impact of the intervention outcomes and its implementation.[16]

Therefore, recognising and acknowledging frailty in professional daily practice might help to enhance a better understanding of a person's frailty, which might help to overcome the challenges of providing good care for an expanding ageing population. Our study sought to gain greater clarity of factors that impact the implementation of frailty interventions in primary care.

METHODS

Objective

We conducted a rapid realist review (RRR) of the literature to understand the factors that support or inhibit implementation of frailty interventions in primary care.

Patient and public involvement

No patients or public were involved in this study.

Study design

This study has been informed by the principles underpinning RRR[17] in conjunction with normalisation process theory (NPT).[18] The published protocol for the review is registered with PROSPERO (CRD42019161193).[19] The reporting of this review is consistent with the Realist and Meta-narrative Evidence Syntheses: Evolving Standards publication standards.[20]

As stated by Saul *et al*, RRR methodology focuses on identifying 'families of interventions' (I) and to then explain why they produce 'outcomes' of interest (O) through generating specific changes in 'context' (C) that trigger particular 'mechanisms' (M).[21] This approach to applying realist methodology is particularly useful when research findings need to be rapidly adapted and iteratively refined to take account of emerging evidence in intervention development.[21] We considered implementation of frailty interventions in primary care through analysis of intervention-context-mechanism-outcome (ICMO) configurations. Reflecting our primary objective, our main outcome of interest was evidence of implementation. Realist methodology was appropriate as it allowed an illumination of the interactions between these configurations, particularly within the context of complex interventions implemented in primary care.

NPT is a theory of implementation that focuses on the work people do surrounding the implementation of new sets of practices.[22 23] NPT proposes four constructs, 'generative mechanisms', which characterise different types of work that 'people do as they work around a set of practices'.[23] The four NPT constructs comprise: coherence 'sense-making work', cognitive participation 'relational work to build and sustain a community of practice', collective action 'operational work to enact a set of practices' and reflexive monitoring 'formal and informal assessment of the new sets of practice'.[23 24] For the purposes of this study, NPT provided a sensitising framework to help consider mechanisms that enabled or constrained implementation of frailty interventions in primary care.

Search process

Literature search

To obtain the relevant papers for review, groups of Medical Subject Headings and keywords highlighted (online supplemental table S1) were used to screen for English language articles. The first reviewer (KA) conducted an initial scoping search to develop familiarity with the various kinds of frailty interventions relevant to primary care settings in March 2019. Subsequently, iterative and progressively more focused searches were used and run in September 2019. The search was then rerun on 8 January 2022 to update our results. An electronic literature search was conducted using the following bibliographic databases: Cochrane Library, SCOPUS and EMBASE. Full search strategies for all databases were included in online online supplemental table S1.

Data selection

The data selection process was performed in two stages with no time period restrictions. All forms of study design were included in order to present a comprehensive exploration of factors surrounding implementation, with acknowledgement that there might be varying strengths of evidence. Using the primary exclusion criteria, KA screened the papers to ensure the eligibility to the study's

Table 1 Primary and secondary exclusion criteria for the primary search

Primary exclusion criteria to screen (title and abstract)	Secondary exclusion criteria to screen (full text)
► Studies not written in English. ► Studies that include participants who are not human. ► Studies where the primary focus was not on the care of frail older people, for example, studies only focused on the prefrail population. ► Studies which focused on managing a specific condition in frail individuals. ► Studies which were letters, notes or conference abstracts only.	► Studies where there was no description of any intervention or guidelines. ► Studies that did not report any outcome or results. ► Studies where there were no primary care elements. ► Studies in which further information to make an assessment could not be obtained. ► Studies where there was no description or detail on how frail individuals were included in the study.

aim (table 1). On a weekly meeting, TB checked all of included studies. Then, following the secondary exclusion criteria, KA scanned and included the studies, and if there was doubt, TB double-checked the studies to ensure that inclusion criteria were met. During full-text screening, we considered all of the systematic reviews that might open a pathway of additional targeted searches explaining our interventions. Forward and backward citation searches were conducted on each identified key study, leading to additional studies being added to the review list throughout the process.

The secondary search was an iterative process from the published interventions identified in the primary search. This entailed:

- ► Searches of relevant articles in the reference list.
- ► Searches of the author on PubMed and ResearchGate.
- ► Searches of the author and research group on Google to identify relevant grey literature.

Participants in the interventions

To increase the clarity of our analysis and understanding of the intervention, the review examined the implementation of interventions that were primarily focused on recruiting a frail population (ie, we only excluded studies where the sole focus was prefrail populations). We included studies adopting any type of screening and case finding method for frailty, such as physical function, professionals' opinion, Groningen Frailty Indicator or Tilburg Frailty Indicator tools.

Data extraction

KA extracted the relevant data into a spreadsheet to prepare for analysis (online supplemental table S2). Then, an initial ICMO model was developed including use of NPT constructs. KA used this model to extract all of the relevant information, and created an ICMO model for each intervention in a separate file (online supplemental table S3). Following NPT, KA also applied a series of questions to guide the evaluation of factors affecting the implementation of an intervention (online supplemental table S4). On a weekly basis, KA shared the ICMO model and an original copy of each intervention study with TB and JYT, which enhanced their discussion and supported the development of themes. The ICMO model was helpful to address how, when, why and where the intervention was implemented. Between three and five interventions were typically reviewed at each meeting.

Data analysis

Three reviewers (KA, TB and JYT) independently extracted relevant themes from studies, and weekly data sessions were held to critically appraise, analyse and synthesise developing themes. After each meeting, themes were summarised and their relationships elicited. Through an iterative process, ICMO models for each intervention study developed as the study progressed, with researchers gaining increasing familiarity with RRR methodology.

Specifically, types of interventions targeting frailty in primary care (ie, 'families of interventions') were identified according to their common features and proposed sets of practices.[21] Analysis of the studies examined what local changes in practice 'context' occurred following the introduction of the intervention. NPT provided a sensitising framework to consider 'mechanisms' triggered. Using constant comparative methods, we examined the relationships between intervention, contextual changes, mechanisms and outcomes, both for individual studies and across types of 'families of intervention'. Through this iterative process, we constructed an understanding of factors underpinning the implementation of frailty interventions in primary care.

Quality appraisal

In keeping with realist methodology, appraising whether the main focus of each study was 'frailty in primary care' was a key factor.[25] Since we included multiple study designs in this RRR, all included studies were evaluated for methodological rigour by KA using the mixed methods appraisal tool,[26] and confirmed with TB and JYT. A score was assigned to each intervention for each appraisal criterion met (out of five), to inform the confidence of findings obtained (online supplemental table S5). This approach was helpful in focusing on more comprehensive papers without excluding any weaker papers.[27]

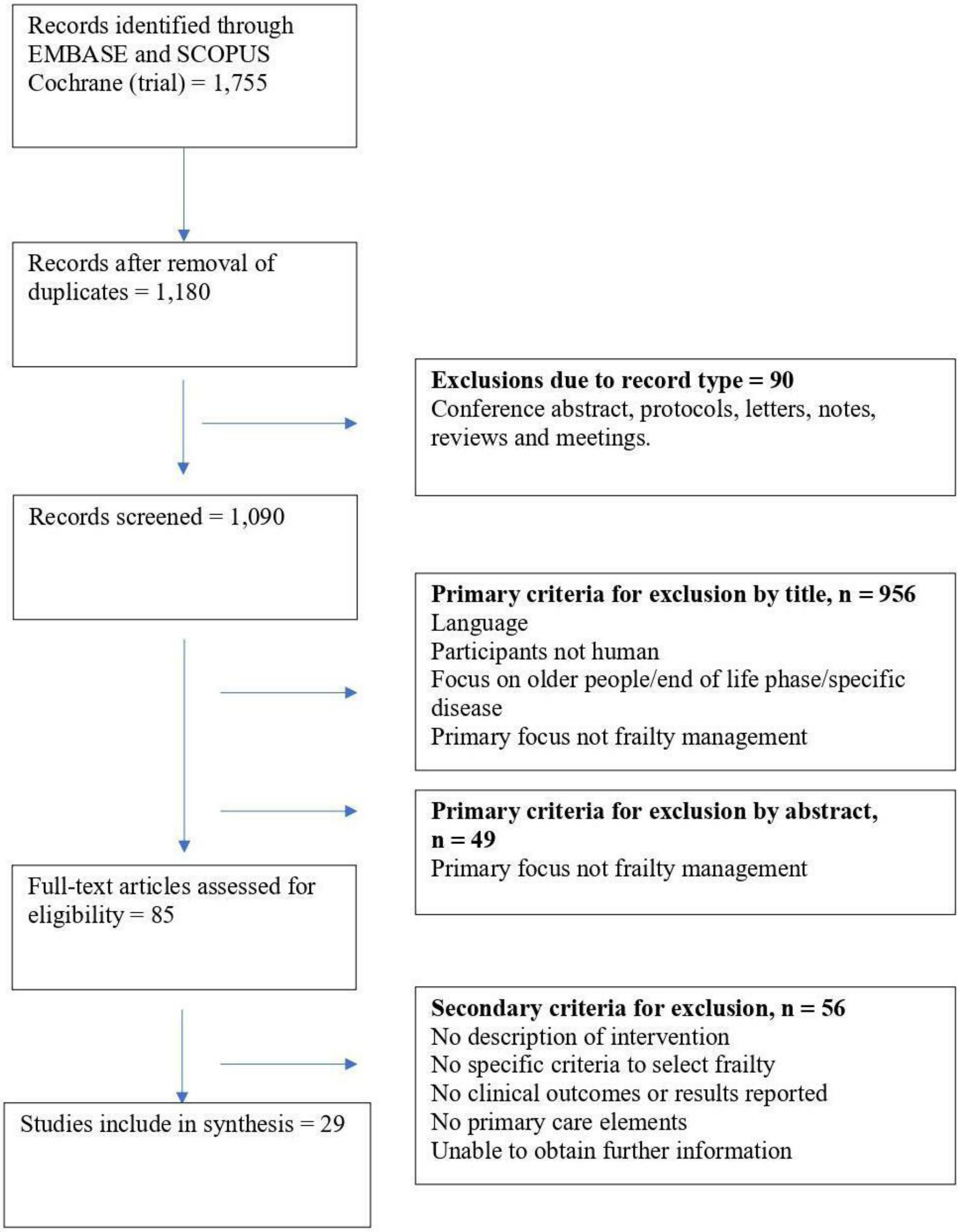

Figure 1 Modified Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram for the primary literature search.

RESULTS

Figure 1 illustrates the article selection process for the review. Of 1755 studies screened for relevance, 85 articles underwent full-text review, leading to 29 intervention studies contributing to the analysis. Included studies were published between 2000 and 2019. Most were conducted in Netherlands (n=17) and Spain (n=3), with nine other countries represented by one study each: Japan, China, Australia, Austria, Canada, France, USA, Switzerland and Mexico.

The iterative secondary search identified 38 records further that provided further insight into each of the 29 intervention studies (figure 2). A descriptive overview of the interventions is presented in online supplemental table S6, and a list of the records identified by the secondary search is provided in online supplemental file 1.

Families of frailty interventions

Through an iterative analysis of data from across the included studies, the interventions targeting frailty were grouped into two 'families': (1) interventions aimed at comprehensive assessment and management; and (2) interventions targeting specific frailty needs. Comparative analysis of the ICMO configurations identified three key related factors underpinning the implementation

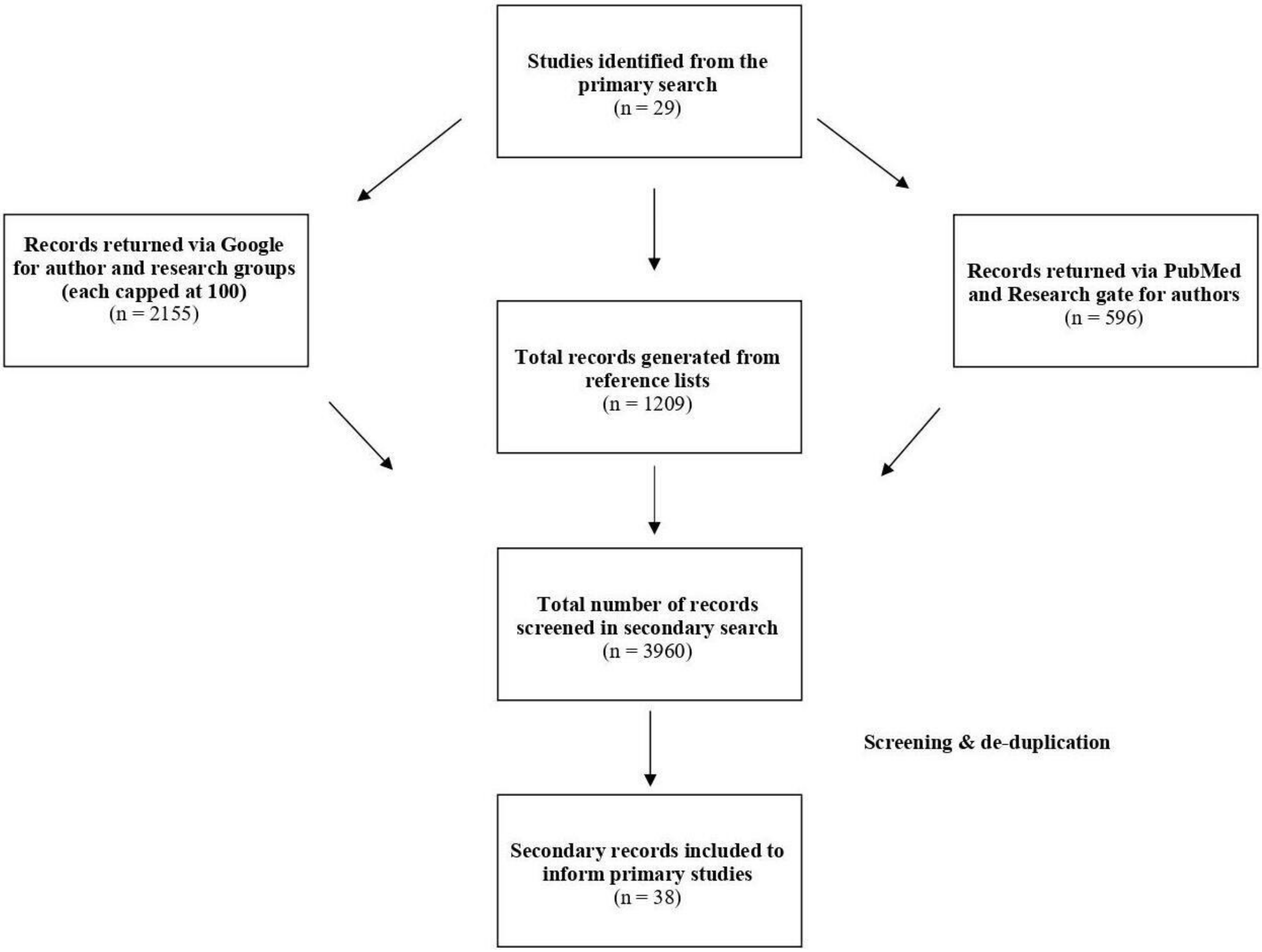

Figure 2 Secondary search processes.

of frailty interventions in primary care: distribution of resources, patient engagement and the skill set of the professionals involved. The studies used the term 'resources' in different ways and referred to the use of time, the presence of multidisciplinary team members, enabling technology, as well as access to secondary care and community resources.

Family 1: comprehensive assessment and management of frailty

Of the 29 included studies, 23 interventions related to this family. Interventions were mostly carried out in the Netherlands (n=17),[28–44] with the others conducted (n=1) in France,[45] Switzerland,[46] Spain,[47] Canada,[48] Mexico[49] and the USA.[50]

Common design features across these interventions included a focus on developing a care plan and consideration of patients' preferences, with some aiming to improve collaboration between primary and secondary care organisations.[28–50] Participants in the intervention groups tended to receive an in-home multidimensional geriatric assessment by a nurse. These were generally completed using assessment tools, which varied across the interventions: the CGA,[28 48] the Resident Assessment Instrument-Home Care version,[29 45] the interRAI Community Health Assessment instrument[41–44] or the Easy-Care instrument.[32 34] In conjunction with general practitioners (GPs) or through extended team meetings, a preliminary care plan was formulated. The approach then tended to entail a second home visit conducted by the nurse to discuss and finalise the care plan with the patient. In the main, nurses were responsible for planning and coordinating care delivery, providing periodic evaluation and monitoring of care plans.[28–50] In only one intervention, participants were referred to a geriatrician or physical therapist who performed the CGA and then designed a tailored multifactorial intervention in the community.[47]

Key factors influencing implementation

Distribution of resources

Our comparative analysis of the intervention studies suggested that in the main, professionals invested considerable time in performing an assessment to identify patients' problems, with less time made available for managing the identified needs. For example, in the geriatric care model, nurses spent 50–90 min conducting the initial assessment, an average of 37 min writing care plans and a further 40 min preparing and carrying out multidisciplinary team meetings,[42] but just over half an hour on 'discussing care plans' during follow-up visits.[42] Subsequently, care plans and follow-up visits were not always carried out as intended depending on time pressure or on assessment outcomes, with some nurses not writing a care plan at all when there was limited time or when no health needs were identified.[42]

The [G]OLD (Getting OLD the ealthy way) hpreventive home visitation programme invested on average 85 min per older person from preparation of the home visit to formulating the care plan.[28 51] Professionals considered home visiting helpful to gain an overview of a person's living environment, which supported decision-making (ie, a possible transition to a nursing home).[28 51] However, in some cases, the time needed to complete an assessment and develop a care plan for frail older people proved considerably longer than anticipated.[52 53] For example, it took extra evaluation to clarify the urgency of the problem,[52] or it took time for elderly patients to become acquainted with the nurses and to share their stories.[53] In the disability prevention programme, some nurses substituted second home visits by a telephone discussion of the care plan for patients with less complicated issues.[37 54] No data were available for time spent on executing the care plan or the suggested management for any of these studies. A key implementation barrier for proactive elderly care is that nurses spent most of the time doing the assessment to develop a care plan and then they struggle to implement the care plan for each individual.

In contrast, the '+AGIL Barcelona' intervention allocated resources for both a comprehensive assessment and the management of identified frailty needs. This entailed evaluating the needs through a CGA conducted by a geriatrician and physical therapist, and then providing exercise groups (also encouraging socialisation), promotion of a Mediterranean diet, health education and medication reviews, along with ongoing primary care practitioner input. The patients and family also received the CGA results on the same day of the evaluation and agreed a tailored care plan together—there was no time lag to patient involvement. Adjusting the available resources and support of the geriatric team and community resources were a facilitator that allowed the intervention to be adaptable and sustainable for primary care teams and for older people (figure 3).[47]

Patient engagement

As the first home visit in most interventions tended to focus on assessment, with the care plan then being created in discussion between the nurse and the GPs with the patient more involved in the second visit,[28 30 32 39 41 42 44 55] this could create a mismatch between patients and professionals' priorities. Some patients then lack motivation to implement the intervention or resisting changes.[28] For example, one patient indicated that proactive nurse visits tended to be 'meddling in other people's affairs', especially when there was no specific request for help.[28] In other interventions, it became 'overwhelming' for older people when it did not match their needs or provided no further perceived benefits.[56] Implementing proactive care plans can thus create tensions around people's autonomy. Conversely, nurses indicated that in some cases it was important to gain trust before older people would want to share their problems, if they had these, and experiences with them.[53] Proactive visits by nurses in some interventions were well received by older people, as they felt anything could be discussed with nurses,[57] including non-medical issues.[36] One intervention conducted in the Netherlands attempted to maintain patient and professional relationships through the use of a web-based conference table. However, although patients appreciated their concerns being delivered to their GPs, they were less comfortable using the computer and preferred face-to-face contact.[31] Only one study completed the assessment and a care plan on the same day.[47] Involving patients directly into the development of care plans resulted in high adherence (90.2% attended >75% exercise sessions) and significant improvements in physical function.[47] There was limited evidence on the degree to which patients were involved in developing and executing their care plan. Although many projects saw the importance of involving older people when designing the intervention, there was evidence to suggest that older people priorities and preferences were not considered during implementation (figure 3).

Professional skill set

Use of a multidisciplinary team was a key feature across this family of frailty interventions. However, in the main, there was limited evidence on how management of needs identified in a care plan was delegated across different disciplines, which limited the analysis to understand the translation of care plan into practice. Analysis indicated that professionals encountered a number of barriers to deliver the care for frail older persons based on the intervention and skill set. For example, nurses were responsible for the assessment and development of the care plan, and were reported to have good organisation and communication skills.[37] However, at times, this was insufficient to implement a care plan with difficulties reported undertaking medication reviews,[51] or creating plans for patients with mental problems.[28] Alternatively, a successful feature was the enhanced role of geriatricians in fostering collaboration and sharing information between primary care and hospital settings, which enabled smoother transitions of care (ie, more appropriate admissions) and allowed identified needs to be more swiftly met (figure 3).[45 46]

Family 2: targeting specific frailty needs

Out of the 29 intervention studies, six related to screening and targeting specific frailty needs. The interventions were conducted in Spain (n=2),[58 59] and in Australia (n=1),[60] Austria,[61] China[6262] and Japan.[62]

In the main, these interventions aimed to address a specific need and produce observable outcomes such as mobility, functional, cognitive and emotional status,

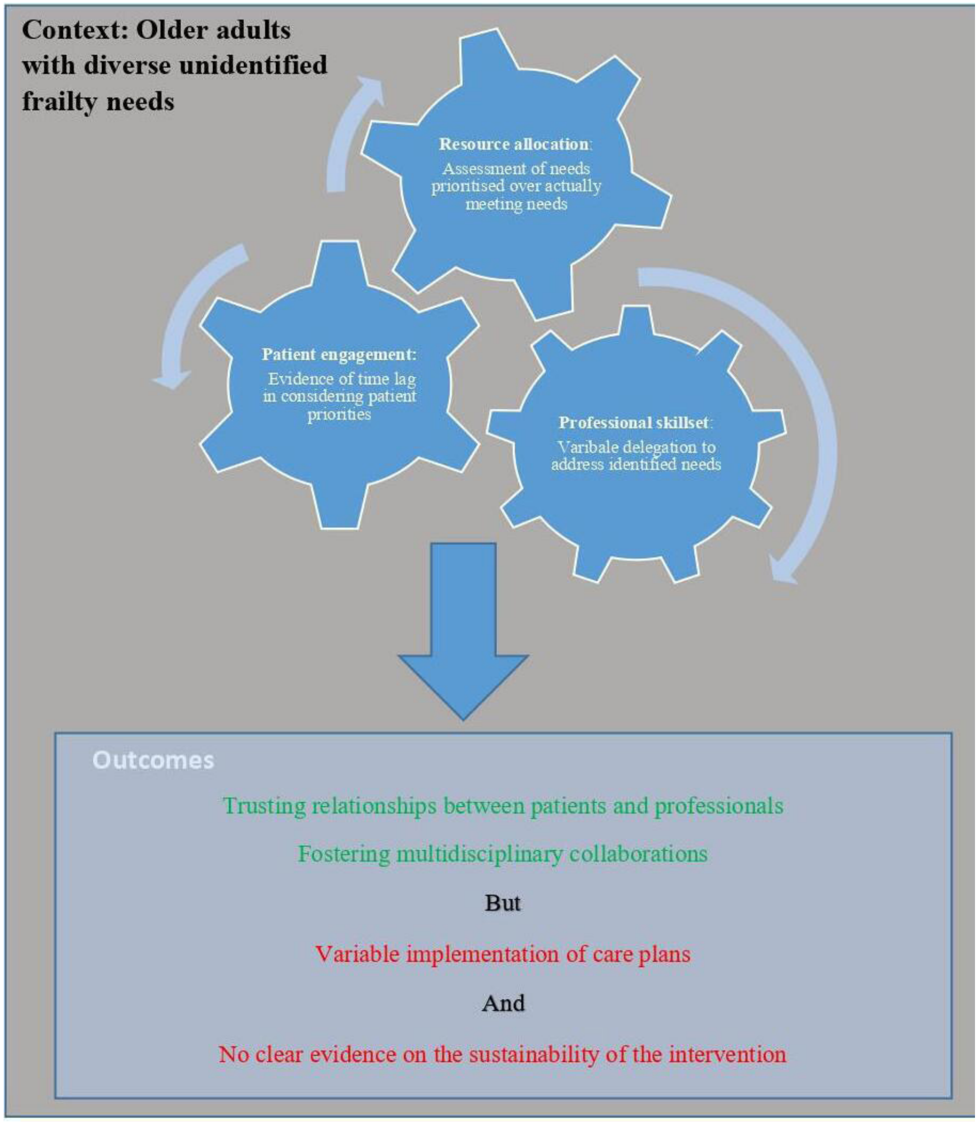

Figure 3 Summary of identified context, mechanisms and outcomes for family 1—comprehensive assessment and management of frailty.

psychosocial status, hospitalisation and level of pain.[58–63] These mostly entailed multifactorial interventions including physical activity, memory workshops, medication review,[58] a combined exercise programme,[59] nutritional supplementation, referral to a psychiatrist, encouraging social engagement and home exercise programmes,[60] nutritional and physical programmes alongside social support,[61] acupressure treatment,[63] and resistance exercise, nutritional and psychosocial programmes.[62]

Key factors influencing implementation

Distribution of resources and professional skill sets

Our analysis of this family of interventions suggested that compared with the more comprehensive (family 1) interventions, there was clearer and more adaptable allocation of resources across both the assessment and management of specific needs. Likewise, the care plan appeared more straightforward to align professional skill sets to address specific needs. One example of a multifactorial interdisciplinary intervention conducted in Australia, older participants were recruited if they met three or more of phenotype criteria (ie, weight loss, exhaustion, low physical activity, slowness, weakness), and then according to the needs participants were assigned either nutritional intervention, referral to psychiatrist or home physical activity sessions. The intervention also entailed ongoing reassessment throughout the intervention phase.[60] The physiotherapist was able to coordinate the intervention in the community with 'well-prepared health and care services for older people', resulting in a high level of adherence to the intervention.[60 64] In another multifactorial intervention conducted in Barcelona, participants were screened for frailty using phenotype criteria and then they were aligned to the interventions according to their needs, that is, physical activity, nutritional intake, memory workshop and medication review. The monitoring was a priority: every 2 weeks there was

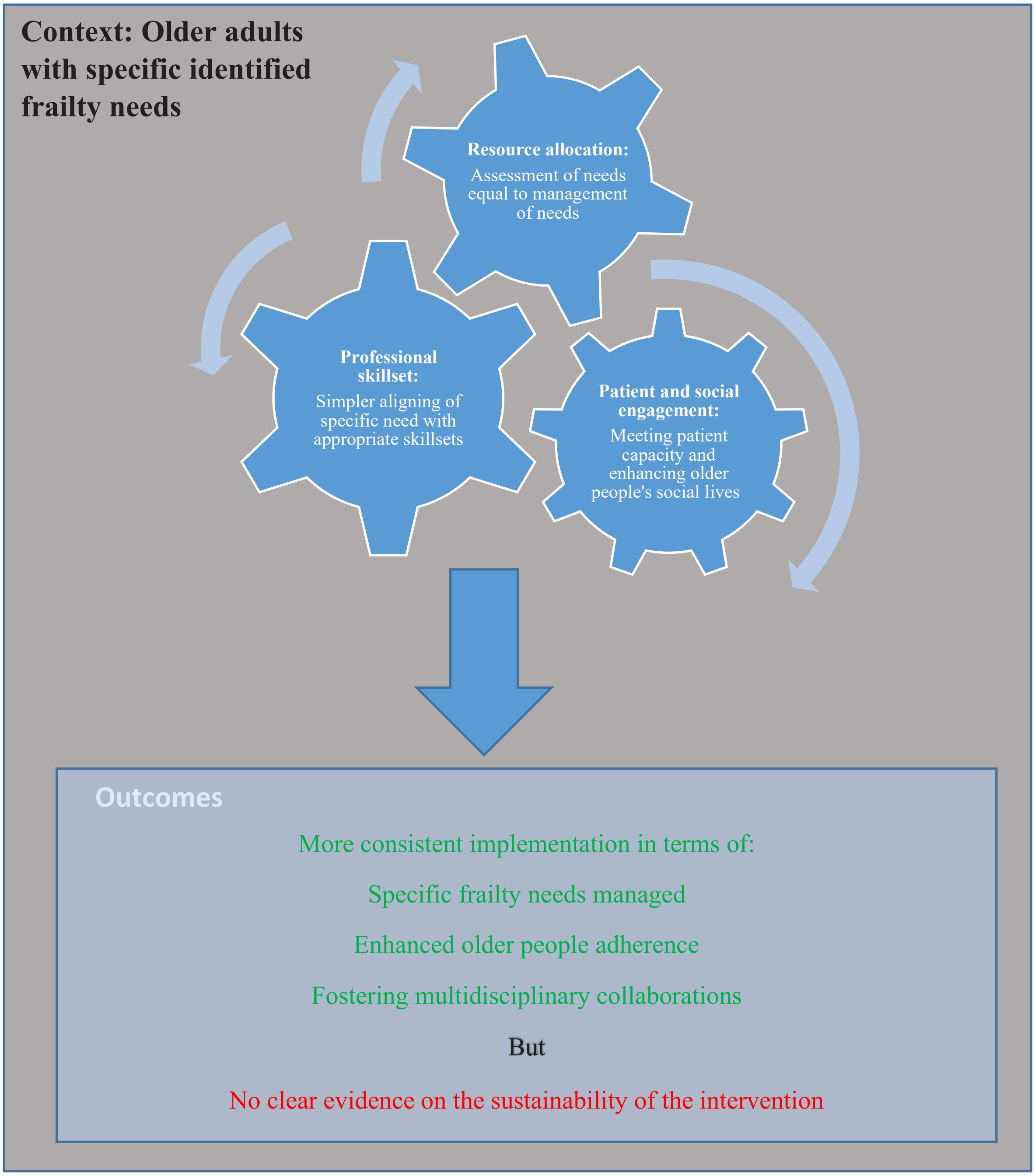

Figure 4 Summary of identified context, mechanisms and outcomes for family 2—targeting specific frailty needs.

an evaluation of progression, measuring intensity and number of repetitions of physical activity, which resulted in a sustained 'improvement in mobility and strength performance'.[58 65] GP skills were successfully used to perform medication reviews, where patients were re-educated about unnecessary drugs and successfully reduced their use (figure 4).[58]

Patient and 'social' engagement

Analysis suggested that patients appreciated the intervention when it met their needs and capacity. Promoting the social life of participants was considered a key feature of some interventions that facilitated implementation.[61–63] For example, acupressure treatment was designed as a caregiver-administered treatment, which could be carried out at home or community settings.[63] After training, 'caregivers were requested to spend two 20 minutes sessions per week with the elderly doing homework assigned by the activity group'.[63] Participants revealed that they were in a better mood after the intervention,[63] and they experienced a significantly higher satisfaction in their ability to perform daily living activities.[63] In another multifactorial intervention in Japan, a psychosocial programme was conducted alongside the exercise and nutritional programmes.[62] The psychosocial programme consisted

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of practical and group activities to discuss hobbies and interests. Participants also discussed how to continue the exercise after the intervention. Consequently, sessions were completed as planned with evidence that the participants continued the exercise programme even after the intervention.[62] In another home-based intervention performed in Austria, trained non-professional volunteers visited malnourished frail older persons twice a week for approximately 1 hour. The first group of older people performed a nutritional and physical activity intervention, with the control group receiving social support only.[61] Adherence to the visit was higher in the physical exercise group but both groups demonstrated improvement in nutritional and frailty scores. The study suggested that social support alone can have a significant impact on nutrition and frailty status in older persons (figure 4).[61]

Sustainability of frailty interventions

Overall, there was no clear evidence to capture the long-term sustainability of the interventions. In the interventions aimed at comprehensive assessment and developing care plan, an imbalance between time investment and the available resources in proportion to the problems detected might be a factor that constrained long-term implementation.[28 35 42 55 57 66] Further, our analysis suggested that older people's interests and perceptions needed to be considered earlier to understand how much they are willing to be part of the intervention.[29 36] It was evident from interventions targeting specific frailty needs that the enhancement of community networks and social interaction influenced the interventions being sustained for at least 3 months.[58 62]

DISCUSSION

Statement of the principal findings

In this review, we identified two families of interventions and highlighted factors that enabled and constrained their implementation. These related to the distribution of resources, patients' engagement and the professional skill set to target identified need. For interventions entailing a comprehensive approach to frailty, our analysis suggested that time to form trusting relationships was important but that a disproportionate amount of resource may be consumed by assessment compared with the implementation of management plans. Furthermore, the development and resourcing of a professional skill set to address a range of needs was not necessarily explicit from the outset. In contrast, interventions targeting specific frailty needs demonstrated greater clarity regarding the distribution of resources, with alignment of a professional skill set to a specific need (and thus seem easier to implement). Our analysis further suggested that incorporating social factors into intervention design might support implementation and sustainability.

Strengths and limitations

A key strength of this study is that it provides an evidence-based map of interventions in primary care for managing the 'needs' of frail older people. Our focus was to evaluate factors underpinning successful implementation of interventions targeting frailty, rather than drawing strong conclusions on effectiveness. In addition, we acknowledge that our review of intervention studies takes the concept of frailty at face value and does not take into account literature that critiques the 'power relations' surrounding the introduction of frailty into routine practice.[67–69] However, we acknowledge the heterogeneity of the frailty groups, with interventions highlighting a range of frailty approaches to identifying frail populations, such as eFi and phenotype. We did not explore how each approach has been used, but we have included a summary of the screening criteria in online online supplemental table S6. We included only studies that focused mainly on a frail population, but acknowledge that targeting older people with prefrailty might be more effective in implementing strategies and interventions for vulnerable older adults than for those who are actually frail as there may be less 'residual capacity' for improving the care of older people.

Several limitations to examining implementation exist from available evidence. First, there were no data on time taken to execute care plans, nor for whether identified needs were fully addressed. Furthermore, few studies provided evidence around the sustainability of interventions. Lack of contextual details (eg, what happened after introducing the intervention) in the published studies also limited our analysis. However, to enhance trustworthiness, our findings were constructed through constant comparative methods, iterative testing and retesting of ICMO configurations, which were regularly updated.[21] Additionally, our secondary search identified accompanying articles revealing further contextual data and evaluation for certain interventions. Rigour was maintained through three reviewers attending regular data meetings.

Comparison of our findings with other studies

Our review of frailty interventions in primary care resonates with previous qualitative research exploring CGA.[13] Gardner *et al*[10] found that patients and carers 'wanted their knowledge and priorities to be included in the assessment and care plan and that, at times, the integration of social and personal care needs was unclear'. One method may be to involve older people in codesigning interventions, with a randomised controlled trial aiming to reverse frailty and build resilience awaiting definitive evaluation.[70] Findings from the wider literature, including our previous analysis of dialogue surrounding self-management support for people with long-term conditions, highlight the potential for assessment tools to reinforce a checklist approach to consultations, potentially disrupting (and delaying) patient and caregiver involvement in care planning discussions.[71–73] Furthermore, Macdonald *et al*[7] suggest that a CGA approach potentially works if the resources and professional skill set (ie, geriatrician) allocated to address the identified needs.[7] However, there are still limitations to outcome measurement of the interventions,[7] two studies demonstrated no significant differences between intervention and control groups in terms of frailty measures.[74 75] Our review also highlights clear potential challenges in implementing comprehensive assessment to develop a care plan in primary care.

Implications for policy and practice

Some older people want to maintain their privacy, and may be reluctant to reveal certain types of possibly stigmatising needs, known as 'hidden needs', such as cognitive problems.[76] This RRR further suggests that incorporating social dimensions of care into intervention design may reduce the potential for loneliness and isolation and so enhance their implementation.[28 47 62 63 77–79] Our analysis suggested that comprehensive assessment and visiting older people at home enabled trusting relationships between patients and professionals to form as well as fostering multidisciplinary collaborations. Though important, this was insufficient to ensure effective implementation of care plans without adequate extra resourcing (eg, time, workforce expansion). There is also evidence to support the introduction of interventions targeting exercise training for people with different stages of frailty.[7] Our recent qualitative study highlighted widespread concern surrounding current capacity to address identified unmet needs of frail patients in primary care.[80] There appears to be a role for both families of 'comprehensive' and 'specific' approaches to frailty in primary care, matching the approach to identified need by involving older people early or through codesign.

CONCLUSION

There remain challenges to achieving successful implementation of frailty management interventions in primary care to improve health outcomes for older people with frailty. Developing a specific care plan helps professionals to manage the identified needs, allowing a greater alignment of skill sets and avoiding overassessment of people living with frailty. Earlier involvement of patients is another key factor that may facilitate implementation and increase adherence to the intervention.

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Contributors The idea for this article originated from an ongoing PhD research programme around patient frailty in primary care (KA). DR, KA, TB, HvM and JYT conceived the article. TB, JYT and KA developed the study design. KA extracted the themes and developed the final result under the supervision of TB and JYT. KA wrote the manuscript with contributions and comments from DR, HvM, TB and JYT. TB is the guarantor of the article.

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REFERENCES

1 Clegg A, Young J, Iliffe S, *et al*. Frailty in elderly people. *Lancet* 2013;381:752–62.
2 Puts MTE, Toubasi S, Atkinson E, *et al*. Interventions to prevent or reduce the level of frailty in community-dwelling older adults: a protocol for a scoping review of the literature and international policies. *BMJ Open* 2016;6:e010959.
3 Moody DNE, Lyndon HNE, GNK DS. *Toolkit for general practice in supporting older people living with frailty*, 2017.
4 Song X, Mitnitski A, Rockwood K. Prevalence and 10-year outcomes of frailty in older adults in relation to deficit accumulation. *J Am Geriatr Soc* 2010;58:681–7.
5 Fried LP, Tangen CM, Walston J, *et al*. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci* 2001;56:M146–57.
6 Gilardi F, Capanna A, Ferraro M, *et al*. Frailty screening and assessment tools: a review of characteristics and use in public health. *Ann Ig* 2018;30:128–39.
7 Macdonald SH-F, Travers J, Shé Éidín Ní, *et al*. Primary care interventions to address physical frailty among community-dwelling adults aged 60 years or older: a meta-analysis. *PLoS One* 2020;15:e0228821.
8 Binder EF, Schechtman KB, Ehsani AA, *et al*. Effects of exercise training on frailty in community-dwelling older adults: results of a randomized, controlled trial. *J Am Geriatr Soc* 2002;50:1921–8.
9 Gill TM, Baker DI, Gottschalk M, *et al*. A program to prevent functional decline in physically frail, elderly persons who live at home. *N Engl J Med* 2002;347:1068–74.
10 Gardner M, Shepperd S, Godfrey M, *et al*. Comprehensive geriatric assessment in hospital and hospital-at-home settings: a mixed-methods study. *Health Serv Deliv Res* 2019;7:1–206.
11 Ellis G, Gardner M, Tsiachristas A, *et al*. Comprehensive geriatric assessment for older adults admitted to hospital. *Cochrane Database Syst Rev* 2017;9:CD006211.
12 British Geriatrics Society. Comprehensive geriatric assessment toolkit for primary care practitioners 2019:1–48.
13 Garrard JW, Cox NJ, Dodds RM, *et al*. Comprehensive geriatric assessment in primary care: a systematic review. *Aging Clin Exp Res* 2020;32:197–205.
14 Lesende IM, Iturbe AG, Abizanda Soler P, *et al*. Update of the Spanish Fisterra guideline "Frail elderly people: detection and management in Primary Health Care". What contributes and highlight. *Health and Primary Care* 2021;5:1–5.
15 Abyad A. Is primary health care capable of addressing frailty? *Eur Geriatr Med* 2021;12:899–902.

16 Holroyd-Leduc J, Resin J, Ashley L, *et al*. Giving voice to older adults living with frailty and their family caregivers: engagement of older adults living with frailty in research, health care decision making, and in health policy. *Res Involv Engagem* 2016;2:23.
17 Rycroft-Malone J, McCormack B, Hutchinson AM, *et al*. Realist synthesis: illustrating the method for implementation research. *Implement Sci* 2012;7:1.
18 Murray E, Treweek S, Pope C, *et al*. Normalisation process theory: a framework for developing, evaluating and implementing complex interventions. *BMC Med* 2010;8:63.
19 Alharbi K, Marwijk Hvan, Reeves D. Understanding the implementation of interventions to improve the management of frailty in primary care: a rapid realist review protocol 2018:1–4.
20 Wong G, Greenhalgh T, Westhorp G, *et al*. RAMESES publication standards: realist syntheses. *J Adv Nurs* 2013;69:1005–22.
21 Saul JE, Willis CD, Bitz J, *et al*. A time-responsive tool for informing policy making: rapid realist review. *Implementation Sci* 2013;8:1–15.
22 May CR, Cummings A, Girling M, *et al*. Using normalization process theory in feasibility studies and process evaluations of complex healthcare interventions: a systematic review. *Implement Sci* 2018;13:80.
23 May C, Murray E, Finch T, *et al*. Normalization process theory on-line users' manual and toolkit. *NPT* 2010.
24 May C, Finch T, Implementing FT. Implementing, embedding, and integrating practices: an outline of normalization process theory. *Sociology* 2009;43:535–54.
25 Pawson R, Greenhalgh T, Gill H. *Realist Synthesis : An Introduction Realist synthesis: an introduction*, 2004.
26 Hong Q, Pluye P, bregues S F. Mixed MethodsAppraisal Tool (MMAT), Version 2018. User guide, 2018. Mcgill. Available: http://mixedmethodsappraisaltoolpublic.pbworks.com/w/file/fetch/127916259/MMAT_2018_criteria-manual_2018-08-01_ENG.pdf%0Ahttp://mixedmethodsappraisaltoolpublic.pbworks.com/
27 Pawson R. Digging for Nuggets: How 'Bad' Research Can Yield 'Good' Evidence. *Int J Soc Res Methodol* 2006;9:127–42.
28 Stijnen MMN, Jansen MWJ, Duimel-Peeters IGP, *et al*. Nurse-Led home visitation programme to improve health-related quality of life and reduce disability among potentially frail community-dwelling older people in general practice: a theory-based process evaluation. *BMC Fam Pract* 2014;15:1–14.
29 van Hout HPJ, Jansen APD, van Marwijk HWJ, *et al*. Prevention of adverse health trajectories in a vulnerable elderly population through nurse home visits: A randomized controlled trial [ISRCTN05358495]. *J Gerontol A Biol Sci Med Sci* 2010;65A:734–42.
30 Vestjens L, Cramm JM, Nieboer AP. Quality of primary care delivery and productive interactions among community-living frail older persons and their general practitioners and practice nurses. *BMC Health Serv Res* 2019;19:496.
31 Robben SHM, Perry M, Huisjes M. Implementation of an innovative web-based conference table for community-dwelling frail older people their informal caregivers and professionals: a process evaluation. *BMC Health Serv Res*2012:1–12.
32 Looman WM, Fabbricotti IN, Huijsman R. The short-term effects of an integrated care model for the frail elderly on health, quality of life, health care use and satisfaction with care. *Int J Integr Care* 2014;14:e034.
33 Melis RJF, Adang E, Teerenstra S, *et al*. Cost-Effectiveness of a multidisciplinary intervention model for community-dwelling frail older people. *J Gerontol A Biol Sci Med Sci* 2008;63:275–82.
34 Ruikes FGH, Zuidema SU, Akkermans RP, *et al*. Multicomponent program to reduce functional decline in frail elderly people: a cluster controlled trial. *J Am Board Fam Med* 2016;29:209–17.
35 Bleijenberg N, Drubbel I, Neslo RE, *et al*. Cost-Effectiveness of a proactive primary care program for frail older people: a cluster-randomized controlled trial. *J Am Med Dir Assoc* 2017;18:1029–36.
36 Bleijenberg N, Boeije HR, Onderwater AT, *et al*. Frail Older Adults' Experiences With a Proactive, Nurse-Led Primary Care Program: A Qualitative Study. *J Gerontol Nurs* 2015;41:20–9.
37 Metzelthin SF, Daniëls R, van Rossum E, *et al*. A nurse-led interdisciplinary primary care approach to prevent disability among community-dwelling frail older people: a large-scale process evaluation. *Int J Nurs Stud* 2013;50:1184–96.
38 Metzelthin SF, van Rossum E, de Witte LP, *et al*. Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people: cluster randomised controlled trial. *BMJ* 2013;347:f5264–12.
39 Metzelthin SF, van Rossum E, Hendriks MRC, *et al*. Reducing disability in community-dwelling frail older people: cost-effectiveness study alongside a cluster randomised controlled trial. *Age Ageing* 2015;44:390–6.
40 Bindels J, Cox K, Abma TA, *et al*. Implementing care programmes for frail older people: a project management perspective. *Health Policy* 2015;119:9–16.
41 van Leeuwen KM, Bosmans JE, Jansen APD, *et al*. Cost-Effectiveness of a chronic care model for frail older adults in primary care: economic evaluation alongside a Stepped-Wedge cluster-randomized trial. *J Am Geriatr Soc* 2015;63:2494–504.
42 Muntinga ME, Van Leeuwen KM, Schellevis FG, *et al*. From concept to content: assessing the implementation fidelity of a chronic care model for frail, older people who live at home. *BMC Health Serv Res* 2015;15:18.
43 Muntinga ME, Jansen APD, Schellevis FG, *et al*. Expanding access to pain care for frail, older people in primary care: a cross-sectional study. *BMC Nurs* 2016;15.
44 Hoogendijk EO, van der Horst HE, van de Ven PM, *et al*. Effectiveness of a geriatric care model for frail older adults in primary care: results from a stepped wedge cluster randomized trial. *Eur J Intern Med* 2016;28:43–51.
45 de Stampa M, Vedel I, Buyck J-F, *et al*. Impact on hospital admissions of an integrated primary care model for very frail elderly patients. *Arch Gerontol Geriatr* 2014;58:350–5.
46 Di Pollina L, Guessous I, Petoud V, *et al*. Integrated care at home reduces unnecessary hospitalizations of community-dwelling frail older adults: a prospective controlled trial. *BMC Geriatr* 2017;17:53.
47 Pérez LM, Enfedaque-Montes MB, Cesari M, *et al*. A community program of integrated care for frail older adults: +AGIL Barcelona. *J Nutr Health Aging* 2019;23:710–6.
48 Theou O, Park GH, Garm A, *et al*. Reversing frailty levels in primary care using the cares model. *Can Geriatr J* 2017;20:105–11.
49 Favela J, Castro LA, Franco-Marina F, *et al*. Nurse home visits with or without alert buttons versus usual care in the frail elderly: a randomized controlled trial. *Clin Interv Aging* 2013;8:85–95.
50 Coleman EA, Grothaus LC, Sandhu N, *et al*. Chronic care clinics: a randomized controlled trial of a new model of primary care for frail older adults. *J Am Geriatr Soc* 1999;47:775–83.
51 Stijnen MMN, Jansen MWJ, Vrijhoef HJM, *et al*. Development of a home visitation programme for the early detection of health problems in potentially frail community-dwelling older people by general practices. *Eur J Ageing* 2013;10:49–60.
52 Melis RJF, van Eijken MIJ, Boon ME, *et al*. Process evaluation of a trial evaluating a multidisciplinary nurse-led home visiting programme for vulnerable older people. *Disabil Rehabil* 2010;32:937–46.
53 Bindels J, Cox K, Widdershoven G, *et al*. Care for community-dwelling frail older people: a practice nurse perspective. *J Clin Nurs* 2014;23:2313–22.
54 Daniels R, van Rossum E, van den Heuvel W. Feasibility of an interdisciplinary programme to prevent disability in frail older persons. *Frail elderly, Identification and Disability Intervention in Primary Care* 2011.
55 Metzelthin SF, van Rossum E, de Witte LP, *et al*. Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people: cluster randomised controlled trial. *BMJ* 2013;347:f5264.
56 Melis RJF, van Eijken MIJ, Teerenstra S, *et al*. A randomized study of a multidisciplinary program to intervene on geriatric syndromes in vulnerable older people who live at home (Dutch EASYcare study). *J Gerontol A Biol Sci Med Sci* 2008;63:283–90.
57 Daniels R, van Rossum E, Metzelthin S, *et al*. A disability prevention programme for community-dwelling frail older persons. *Clin Rehabil* 2011;25:963–74.
58 Romera-Liebana L, Orfila F, Segura JM, *et al*. Effects of a primary care-based multifactorial intervention on physical and cognitive function in frail, elderly individuals: a randomized controlled trial. *J Gerontol A Biol Sci Med Sci* 2018;73:1668–74.
59 Tarazona-Santabalbina FJ, Gómez-Cabrera MC, Pérez-Ros P, *et al*. A multicomponent exercise intervention that reverses frailty and improves cognition, emotion, and social networking in the community-dwelling frail elderly: a randomized clinical trial. *J Am Med Dir Assoc* 2016;17:426–33.
60 Cameron ID, Fairhall N, Langron C, *et al*. A multifactorial interdisciplinary intervention reduces frailty in older people: randomized trial. *BMC Med* 2013;11:65.
61 Luger E, Dorner TE, Haider S, *et al*. Effects of a home-based and Volunteer-Administered physical training, nutritional, and social support program on malnutrition and frailty in older persons: a randomized controlled trial. *J Am Med Dir Assoc* 2016;17:671. e9–671.e16.
62 Seino S, Nishi M, Murayama H, *et al*. Effects of a multifactorial intervention comprising resistance exercise, nutritional and psychosocial programs on frailty and functional health in community-

dwelling older adults: a randomized, controlled, cross-over trial. *Geriatr Gerontol Int* 2017;17:2034–45.
63 Chan CWC, Chau PH, Leung AYM, *et al*. Acupressure for frail older people in community dwellings-a randomised controlled trial. *Age Ageing* 2017;46:957–64.
64 Fairhall N, Sherrington C, Kurrle SE, *et al*. Effect of a multifactorial interdisciplinary intervention on mobility-related disability in frail older people: randomised controlled trial. *BMC Med* 2012;10:120.
65 Romera L, Orfila F, Segura JM, *et al*. Effectiveness of a primary care based multifactorial intervention to improve frailty parameters in the elderly: a randomised clinical trial: rationale and study design. *BMC Geriatr* 2014;14:125.
66 Bleijenberg N, Drubbel I, Schuurmans MJ, *et al*. Effectiveness of a proactive primary care program on preserving daily functioning of older people: a cluster randomized controlled trial. *J Am Geriatr Soc* 2016;64:1779–88.
67 Grenier AM. The conspicuous absence of the social, emotional and political aspects of frailty: the example of the *White Book on Frailty*. *Ageing Soc* 2020;40:2338–54.
68 Tomkow L. The emergence and utilisation of frailty in the United Kingdom : a contemporary biopolitical practice 2020:695–712.
69 Pickard S, Cluley V, Danely J, *et al*. New horizons in frailty: the contingent, the existential and the clinical. *Age Ageing* 2019;48:466–71.
70 Travers J, Romero-Ortuno R, Shé Éidin Ní, *et al*. Involving older people in co-designing an intervention to reverse frailty and build resilience. *Family Practice* 2021:cmab084.
71 Blakeman T, Chew-Graham C, Reeves D, *et al*. The quality and outcomes framework and self-management dialogue in primary care consultations: a qualitative study. *Br J Gen Pract* 2011;61:666–73.
72 Blakeman T, Bower P, Reeves D, *et al*. Bringing self-management into clinical view: a qualitative study of long-term condition management in primary care consultations. *Chronic Illn* 2010;6:136–50.
73 Collins S, Britten N, Ruusuvuori J. Patient participation in health care consultations: qualitative perspectives. *Journal of Interprofessional Care* 2007;22:222–3.
74 Li C-M, Chen C-Y, Li C-Y, *et al*. The effectiveness of a comprehensive geriatric assessment intervention program for frailty in community-dwelling older people: a randomized, controlled trial. *Arch Gerontol Geriatr* 2010;50 Suppl 1:S39–42.
75 Behm L, Eklund K, Wilhelmson K, *et al*. Health promotion can Postpone frailty: results from the RCT elderly persons in the risk zone. *Public Health Nurs* 2016;33:303–15.
76 Ivanoff SD, Duner A, Eklund K, *et al*. Comprehensive geriatric assessment of frail older people: ideals and reality. *J Interprof Care* 2018;32:728–34.
77 Valtorta NK, Kanaan M, Gilbody S, *et al*. Loneliness and social isolation as risk factors for coronary heart disease and stroke: systematic review and meta-analysis of longitudinal observational studies. *Heart* 2016;102:1009–16.
78 National Academy for Social Prescribing. Dedicated to the advancement of social prescribing through promotion, collaboration and innovation, 2019. Available: https://socialprescribingacademy.org.uk/ [Accessed 11 December 2019].
79 Munford LA, Wilding A, Bower P, *et al*. Effects of participating in community assets on quality of life and costs of care: longitudinal cohort study of older people in England. *BMJ Open* 2020;10:e033186.
80 Alharbi K, van Marwijk H, Reeves D, *et al*. Identification and management of frailty in English primary care: a qualitative study of national policy. *BJGP Open* 2020;4:bjgpopen20X101019.

Table S1: Search Strategies

Database	Search strategy	Limitations
SCOPUS	(TITLE-ABS-KEY ("frail*" OR "frail elderly" OR "frailty")) AND (TITLE-ABS-KEY (("general practitioners," OR " general practitioner" OR " family physician," OR "primary care" OR " primary medical care"))) AND (TITLE-ABS-KEY ("interventions" OR " intervention study" " OR "models" OR " model" OR "strategy" OR "strategies " OR "project" OR "projects"))	Tool OR Tools Guidance OR Guideline Policy OR Policies OR Healthcare policies
EMBASE	frail OR frail elderly OR frailty . [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] AND general practitioners OR general practitioner OR family physician OR primary care OR primary medical care . [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word] AND interventions OR intervention study OR models or model OR strategy OR strategies OR project OR projects . [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	Same limitation were used
Cochrane library	• PICO Advanced search Elderly – Population AND Primary healthcare services – Intervention AND Frailty – Outcome • Search manager engine was used and the Mesh function was activated Frail older adult And primary healthcare services And intervention	
Note	SCOPUS treat singular as plural so we do not have to add it both in our search terms	

Mesh term	(“frail*” or “frail elderly” or “frailty” or “ frailty syndrome” or “frail elders” or “ Frail older adult”) and (“general practitioners” or “ general practitioner” or “family physician” or “primary care” or “ primary medical care”), and (“interventions” or “intervention study” or “models” or “model” or “strategy” or “strategies” or “project” or “projects”). Basic Boolean operators (i.e. AND, OR) were used in the search strategy.

Table S2: First data extraction tool

Title	
Authors	
Primary outcomes	
Sample size	
Intervention	
Results	
Major limitations/challenges	
Facilitators	
Year	
Setting	
Study location	
Secondary outcomes	
Population	
Other outcomes	
Define frailty	
Theory/theories underpinning interventions	

Table S3: ICMO extraction tool

Setting				
Intervention Implementation to enhance key sets of practices	**Context** Specific changes to context following the interventions	**(Generative) Mechanisms** Enabling or constraining implementation & outcomes	**Outcomes** Process and Health Outcomes	
Training:	**Contextual changes:**	**Coherence:**	**Primary outcome:**	**Secondary Outcomes:**
Assessments and care plans		**Cognitive Participation:**		
Key set of practices		**Collective Action:**	**Other outcomes:**	
		Reflexive Monitoring:		

Table S4: NPT questions guidance

NPT component	Questions
Coherence (i.e., meaning and sense-making by participants)	Was the intervention easy to describe and or implement?
	Did participants understand what tasks/practice/action require of them?
	Did it have a clear purpose for all relevant participants? Was it clear for frail elderly people?
	Were the benefits of a particular practice/task (e.g. care planning frailty) valued by all participants? Did all participants see its potential value?
	What benefits did the intervention bring and to whom?
	Was there being an understanding of how to implement the new requirement?
	Did a particular task fit with the overall goals and activity of the practice?
Cognitive participation (i.e., commitment and engagement by participants)	Did professionals believe they included the correct people to drive forward the implementation?
	Did participants engage with other staff within or across organization to implement the interventions?
	Who was actively engage to plan/ prepare working with the interventions?
	Did they be prepared to invest time, energy and work in it?
	Whether the participants can undertake their roles and tasks, whether any barriers and facilitators were encountered to deliver care for frail patients based on the interventions?
	Did the practice team undertake work to arrange a shared contribution to implement interventions? If so, what was the work?
Collective Action (i.e., the work participants do to make the	How did the intervention affect the work of participants? What did professionals need to do to make the interventions work?
	How did the interventions affect the patient and professional consultation?
	What impact did the intervention have on the job responsibility? How did the interventions fit with other things that professionals need to do in the same settings?

intervention function)	Did the staff intake extensive training before they can use it? What did the professionals do to become skilled and resourced users?
	How was the intervention linked to organisational structure (e.g. practice meeting, using guidance, following existing model)?
	How was a particular task (e.g. visiting patient at home) resourced? What resources (financial, policy, staffing) were available to support interventions implementing or working?
Reflexive Monitoring (i.e., participants reflect on or appraise the intervention)	How were participants likely to perceive the intervention once it had been in use for a while?
	Had implementing the intervention been adapted based on experiences? If so, how?
	Was it be clear what effects the intervention has had for patients or professionals?
	Did participants share feedback about a particular practice with others? If so, what was discussed?
	Had the organisation developed strategies of keeping up to date with a approach to managing a set of practices?
	Could the existing practices be changed to sustain interventions working?

Table S5: Quality assessment result

Title	Interventions	Author	Rigour
A community program of integrated care for frail older adults: Agil Barcelona	Designing a multidisciplinary intervention in the community, including a) multi-modal physical activity (PA) sessions, b) promotion of adherence to a Mediterranean diet c) health education and d) medication review.	L M Pérez et al. (2019)	4
A multifactorial interdisciplinary intervention reduces frailty in older people: randomized trial	Multifactorial interdisciplinary interventions (including nutritional supplementation, referral to psychiatrist, encourage social engagement, physiotherapy sessions and performed a home exercise program)	Ian D Cameron et al. (2013)	4
Effects of a primary care-based multifactorial intervention on physical and cognitive function in frail, elderly individuals: A randomized controlled trial	A multifactorial interventions including (a structure physical activity conducted by physiotherapists – intake of hyperproteic nutritional shake which was daily for 6 weeks, memory workshops and medication review).	Laura Romera-Liebana et al. (2018)	4
A Multicomponent Exercise Intervention that Reverses Frailty and Improves Cognition, Emotion, and Social Networking in the Community-Dwelling Frail Elderly: A Randomized Clinical Trial	A combined program of endurance, strength, coordination, balance and flexibility exercise that have the potential to impact a variety of functional performance measure. Those in the intervention group performed 65 minutes of daily activities, 5 days per week for 24 weeks.	Francisco José TarazonaSantabalbina et al. (2016)	3
Effects of a Home-Based and Volunteer-Administered Physical Training, Nutritional, and Social Support Program on Malnutrition and Frailty in Older Persons: A Randomized Controlled Trial	Physical training and nutrition intervention of the first group versus only social support intervention of the second group.	Eva Luger Et al. (2016)	3
A Study on Effects of Acupressure Among the Frail Elderly in the Community Dwellings	A 15 minutes structured acupressure protocol with specific acupoints and applications technique will be performed on the elderly participants twice a week by the research team in YCHSS centers. The caregiver of the elderly will be trained and perform the same acupressure protocol on the elderly at 2 additional occasions during the week.	Clara W.C. Chan et al. (2017)	4
Effects of a multifactorial intervention comprising resistance exercise, nutritional and psychosocial programs on frailty and functional health in community-dwelling	Multifactorial intervention (resistance exercise, nutritional education and psychosocial programs).	Satoshi Seino et al (2017)	3

older adults: a randomized, controlled, cross-over trial			
Nurse-led home visitation programme to improve health-related quality of life and reduce disability among potentially frail community-dwelling older people in general practice: A theory-based process evaluation	GOLD home visitation program – home visit for conducting CGA and a tailored care and treatment, multidisciplinary care management, and targeted intervention and follow-up.	Mandy M N Stijnen et al. (2014)	5
Prevention of adverse health trajectories in a vulnerable elderly population through nurse home visits: A randomized controlled trial	Visiting program including a proactive home visits by trained nurse to do the assessment and then designed and executed a care plan.	Hein P J van Hout et al. (2010)	4
A nurse-led interdisciplinary primary care approach to prevent disability among community-dwelling frail older people: A large-scale process evaluation.	Nurse led interdisciplinary approach - frail older people and their informal caregiver, if available, receive a home visit by the practice nurse who does a multidimensional assessment focusing on existing problems in performing daily activities and on risk factors for disability. After the home visit, the general practitioner and practice nurse discuss whether additional assessments by other inpatient or outpatient healthcare professionals are needed. On the basis of the assessment phase, a preliminary treatment plan is formulated. During a second home visit by the practice nurse, a final treatment plan is formulated.	Metzelthin SF et al. (2013)	5
Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people: Cluster randomised controlled trial.		Slike Metzelthin et al. (2013)	4
Reducing disability in communitydwelling frail older people: Costeffectiveness study alongside a cluster randomised controlled trial		Metzelthin et al. (2015)	4
Implementing care programmes for frail older people: A project management perspective.		Jill Bindelsa et al. (2014)	3
Cost-Effectiveness of a Chronic Care Model for Frail Older Adults in Primary Care: Economic Evaluation Alongside a Stepped-Wedge Cluster-Randomized Trial.	Nurse led - Geriatirc Care model (GCM) – nurses conduct a multi-dimensional geriatric assessment, PN write a care plan after each assessment in consultation with the primary care professionals , later in a second visit nurses discuses care plan with the older person.	Karen M. van Leeuwen et al. (2015)	3
From concept to content: assessing the implementation fidelity of a chronic care	Second visit – nurses provide information on guideline concordant management and treatment options to be involved	Maaike E Muntinga et al. (2015)	3

model for frail, older people who live at home.	in decision making – at all times; older person's wishes remained central. Review of actions listed on care plan with patient		
Expanding access to pain care for frail, older people in primary care: A crosssectional study		Maaike E Muntinga et al. (2016)	3

Effectiveness of a Geriatric Care Model for frail older adults in primary care: Results from a stepped wedge cluster randomized trial.		Emiel O.Hoogendijk et al. (2016)	4
Quality of primary care delivery and productive interactions among community-living frail older persons and their general practitioners and practice nurses	Older persons are screened for frailty by the geriatric nurse or practice nurse during a home visit, each frail older person is discussed in multidisciplinary consultation, the practice team discusses and agrees upon (self-management) interventions, the care plan is discussed with the frail older patient, finally. Finally, follow-up of the frail older person was provided by a multidisciplinary team.	Lotte Vestigens et al. (2019)	4
Chronic Care Clinics: A randomized controlled trial of a model of primary care for frail older adults.	Patients invited to, An extended (30 minutes) visit to the patient's physician and team nurse dedicated to developing a shared treatment plan that emphasized the reduction of disability; A session with the pharmacist (15 minutes), held in the primary care examination room, ; A patient self management group session (45 minutes), led by a team nurse or social worker, and The provision of health status assessment information to the practice team at the time of the CCC visits.	E.A. Coleman et al. (1999)	3

Implementation of an innovative webbased conference table for communitydwelling frail older people, their informal caregivers and professionals: a process evaluation.	The ZWIP consists of information about the frail older person's health, functioning and social situation, contact information about professionals involved in their care, and care-related goals formulated by or with the frail older person, a secure messaging system for communication between the frail older person and one or more professionals or between professionals, and tailored educational materials for the frail older person and informal caregiver.	Sarah HM Robben et al. (2012)	5
The short-term effects of an integrated care model for the frail elderly on health, quality of life, health care use and satisfaction with care	The general practitioners detected frailty, elderly patients were visited by their nurse who assessed their health, the assessment was discussed in a multidisciplinary meeting, a multidisciplinary treatment plan was then formulated in consultation with the elderly person and his or her informal caregiver(s).	Wilhelmina Mijntje Looman et al. (2014)	4
Cost-effectiveness of a multidisciplinary intervention model for communitydwelling frail older people	The model used problem based selection procedure performed by GPs rather than population screening to identify patients eligible. A geriatric specialist nurse visited the patient at home. Up to six visits for additional geriatric evaluation and management were planned within the next 3 months. Starting off from a wide multidimensional assessment, the intervention team developed an individualized, integrated treatment plan for each patient.	René J F Melis Et al. (2008)	4
Multicomponent program to reduce functional decline in frail elderly people: A cluster controlled trial.	CareWell primary care program - Proactive, individually tailored care plans were formulated for each participant; these plans were based on individual health-related goals and needs as assessed with the EASY-Care TOS. Care plans were revised during the team meetings at least every 6 months and stored in the information portal.	Franca G.H. Ruikes et al. (2016)	3
Cost-Effectiveness of a Proactive Primary Care Program for Frail Older People: A Cluster-Randomized Controlled Trial	In first group, there was no trained registered nurse to deliver the additional steps of the proactive care program. In the second group, the frailty screening was followed by the	Nienke Bleijenberg RN et al. (2017)	3

Frail Older Adults' Experiences With a Proactive, Nurse-Led Primary Care Program	nurse-led care intervention. Patients who were identified as frail received a home-based Comprehensive Geriatric Assessment, followed by evidence-based care planning, care coordination and follow-up.	Bleijenberg, N et al. (2015)	5
Integrated care at home reduces unnecessary hospitalizations of community-dwelling frail older adults: a prospective controlled trial.	The intervention received an additional home geriatric assessment by community geriatrics unit (GCU)	Laura Di Pollona et al. (2017)	3
Nurse home visits with or without alert buttons versus usual care in the frail elderly: a randomized controlled trial	After screening , participants were allocated to the control NV + AB (nurse home visits including alert button) or NV alone (nurse home visits alone). Participants in the intervention group received weekly visits from a nurse over a period of 9 months. This group of patients was also able to contact their nurses on whenever they felt the need by pressing the alert button, but the other group did not include emergency care or technological support via the alert button.	Jesus Favela et al (2013)	3
Reversing Frailty Levels in Primary Care Using the CARES Model	Providers teams were trained in using the comprehensive geriatric assessment (CGA)	Olga Theou et al. (2017)	3
	frailty levels among patients, the CGA was used to inform the creation of a wellness plan to identify goals most important to the patients, and patients were paired with a free-of-charge, telephone-based health coach for a period of up to six months.		
Impact on hospital admissions of an integrated primary care model for very frail elderly patients	The nurse performed a home-based comprehensive geriatric assessment, developed an individualized care plan, coordinated all the required services during the follow-up. Nurses and primary care physician received support as needed from geriatricians participating.	de Stampa et al. (2014)	4
Total score in (%)			73%

Table S6: An overview of the 29 frailty interventions for primary care

Title	Author	Screening strategy	Final sample size	Setting	Intervention	Findings	Themes of group discussion
Specific assessment and management frailty needs							
A multifactorial interdisciplinary intervention reduces frailty in older people: randomized trial	Ian D Cameron et al. (2013)	Adults aged 70 years or older with three or more of the CHS frailty criteria; not usually living in a residential aged care facility, without moderate or severe cognitive impairment.	216/241	Sydney, Australi a	Multifactorial interdisciplinary interventions (including nutritional supplementation, referral to psychiatrist, encourage social engagement, physiotherapy sessions and performed a home exercise program).	The intervention reduced frailty and improved mobility in older people who met the CHS frailty criteria – The benefit of the intervention was not evident at 3- month follow-up and became apparent only at 12 months.	Early link between the identified needs and healthcare services.
Effects of a primary care-based multifactorial intervention on physical and cognitive function in frail, elderly individuals: A randomized controlled trial	Laura Romera-Liebana et al. (2018)	Screening criteria set gait time between 10 and 30 seconds in the (TGUGT); scored (MEC-35 Lobo) ≥18 points (no severe cognitive impairment); and Fried modified crit eria.	267/352	Barcelo na	A multifactorial interventions including (a structure physical activity conducted by physiotherapists – intake of hypercritic nutritional shake which was daily for 6 weeks, memory workshops and medication review).	After 3 and 18 months, adjusted means difference between groups showed significant improvements for the intervention group in all comparisons: Short Physical Performance Battery improved, handgrip strength, functional reach, and number of prescriptions decreased.	Significant improvement were still observed at 18 months. High level of adherence. Clarity on what they were trying to do.

A Multicomponent Exercise Intervention that Reverses Frailty and Improves Cognition, Emotion, and Social Networking in the Community-Dwelling Frail Elderly: A Randomized Clinical Trial	Francisco José Tarazona-Santabalbina et al. (2016)	Participants were randomized a volunteer who were sedentary, with a gait speed lower than 0.8 meters per second and frail (met at least 3 of the frailty phenotype criteria).	100 who were eligible – no more data available.	Valencia, Spain	A combined program of endurance, strength, coordination, balance and flexibility exercise that have the potential to impact a variety of functional performance measure. Those in the intervention group performed 65 minutes of daily activities, 5 days per week for 24 weeks.	The MEP was very effective in improving the PPT (P<.001), SPPB(P¼.007), and in lowering of the frailty score assessed by Linda Fried's criteria and Edmonton. The statistical analysis showed that in 31.4% of the intervention group, frailty was reversed after the exercise training program.	Limited paper – there was not clear enough data on how the frailty intervention was implemented.
Effects of a Home-Based and Volunteer-Administered Physical Training, Nutritional, and Social Support Program on Malnutrition and Frailty in Older Persons: A Randomized Controlled Trial	Eva Luger Et al. (2016)	The screening criteria for recruitment were persons at risk of malnutrition or malnourished persons, according to the (MNA-SF), rail, according to the Frailty Instrument for Primary Care of the (SHARE-FI).	66/80	Vienna, Austria	Physical training and nutrition intervention of the first group versus only social support intervention of the second group.	Improved in nutritional score and frailty status in both groups after 12 weeks.	Social support alone improved patients' health.

A Study on Effects of Acupressure Among the Frail Elderly in the Community Dwellings	Clara W.C. Chan et al. (2017)	The screening procedure included participants were scored 5 or above in the (TFI). They were also physically fit to sit on a chair and cognitively competent to understand instructions from the practitioner and to sign the consent form.	79/108	Hong Kong	A 15 minutes structured acupressure protocol with specific acupoints and applications technique will be performed on the elderly participants twice a week by the research team in YCHSS centers. The caregiver of the elderly will be trained and perform the same acupressure protocol on the elderly at 2 additional occasions during the week.	The treatment group showed improvement in all measurements in comparing to the control group i.e. physical score, sleep quality, pain intensity.	Flexible as it could be implemented at home. Patients satisfaction. Caregiver involvement. Address and reduce the pain may encourage the patients to implement the intervention.
Effects of a multifactorial intervention comprising resistance exercise, nutritional and psychosocial programs on frailty and functional health in communitydwelling older adults: a randomized, controlled, cross-over trial	Satoshi Seino et al (2017)	Screening criteria a score of 2 or higher on the (CL15).	67/77	Japan	Multifactorial intervention (resistance exercise, nutritional education and psychosocial programs).	The interventions had a significant reductions in Check-List 15 score, frailty prevalence, Timed Up and Go test , and Geriatric Depression Score, and improvements in the Dietary Variety Score, and protein and micronutrient intakes at 3 months, all of which, excluding protein and micronutrient intakes, persisted at 6 months.	Social capital highly linked to health outcomes in the frail population. Included a clear purpose from the beginning on what they want to achieve. There was a design to align needs to care.
Comprehensive assessment and management of frailty needs							

Nurse-led home visitation programme to improve health-related quality of life and reduce disability among potentially frail community-dwelling older people in general practice: A theory-based process evaluation	Mandy M N Stijnen et al. (2014)	Aged 75 years or older from GPs system, practices were purposefully select older people who had not been in contact for consultation for more than 6 months before the start of the study.	24 General practices (14 GPs and 13 PNs)	Netherl ands	GOLD home visitation program – home visit for conducting CGA and a tailored care and treatment, multidisciplinary care management and targeted intervention and follow-up.	Acceptable but there were barriers and challenges to fully implement the proposed plan.	Assessment was time consuming. Patients appreciated nurses visits and work.
Prevention of adverse health trajectories in a vulnerable elderly population through nurse home visits: A randomized controlled trial	Hein P J van Hout et al. (2010)	A score in the lowest quartile on at least two of six self-reported functional health domains (COOPWONCA charts), defined frail health.	617/658	Nertherl ands	Visiting program including a proactive home visits by trained nurse to do the assessment and then designed and executed a care plan.	No effects of home visits by nurses in vulnerable older persons.	How did the professionals link between needs and care was not clear.
A nurse-led interdisciplinary primary care approach to prevent disability among communitydwelling frail older people: A large-scale process evaluation.	Metzelthin SF et al. (2013)	Older people (≥ 70 years) and (score ≥5 on GFI).	6 GP practices GPs = 12 Nurses = 7 OT= 6 PT= 20 Frail = 194	Netherl ands	Nurse led interdisciplinary approach - frail older people and their informal caregiver, if available, receive a home visit by the practice nurse who does a multidimensional assessment focusing on existing problems in performing daily activities and on risk factors for disability. After the home visit, the general practitioner and	Professionals and frail elderly were satisfied.	Time pressures was affecting the implementation processes and the main elements of the interventions. The need was identified but then was not clear who has the skill to manage the needs. Building a trusting relationship with
Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people:	Slike Metzelthin et al. (2013)		270 /346	Netherl ands		No different with regards to disability	

Cluster randomised controlled trial.					practice nurse discuss whether additional assessments by other inpatient or outpatient healthcare professionals are needed. On the basis of the assessment phase, a preliminary treatment plan is formulated. During a second home visit by the practice nurse, a final treatment plan is formulated.		patients consumed time. Lack of clarity on having an early purpose on what they were trying to achieve.
Reducing disability in community-dwelling frail older people: Costeffectiveness study alongside a cluster randomised controlled trial	Metzelthin et al. (2015)		270/346	Netherl ands		The intervention under study led to an increase in healthcare utilization and related costs without providing any beneficial effects.	
Implementing care programmes for frail older people: A project management perspective.	Jill Bindelsa et al. (2014)		interview in 2009 (n=10) and in 2012 (n=13) and a focus group in 2012 (n=5)	Netherl ands		Successful in two regions – in third region there was a level of uncertainty. Issued that influenced the implementation were the quality of the collaboration between institutions, the adaptation to existing structures , project leadership and securing future funding.	
Cost-Effectiveness of a Chronic Care Model for Frail Older Adults in Primary Care: Economic Evaluation Alongside a Stepped-	Karen M. van Leeuwen et al. (2015)	First, primary care physicians considered older people to be frail based on the loss of resources in the	782/1147	Netherl ands	Nurse led - Geriatirc Care model (GCM) – nurses conduct a multidimensional geriatric assessment,	No significant different in costs	Adherence to the GCM was high for most elements of the intervention – but did not monitor the extent to which the
Wedge Cluster-Randomized Trial.		physical domain and/or the			nurses write a care plan after each assessment in		

From concept to content: assessing the implementation fidelity of a chronic care model for frail, older people who live at home.	Maaike E Muntinga et al. (2015)	psychosocial domain, or polypharmacy then older adults aged 65 and over, who had a PRISMA-7 score of 3 or more were eligible to participate.	1147	Netherlands	consultation with the primary care professionals , later in a second visit nurses discuses care plan with the older person. Second visit – nurses provide information on guideline concordant management and treatment options to be involved in decision making – at all times; older person's wishes remained central. Review of actions listed on care plan with patient	level of adherence varied between professionals, which most likely can be attributed to professional's individual characteristics and circumstances.	actions in the care plans were carried out as intended. It was not clear whether limited use of the care plans may service as an alternative explanation for the lack of effectiveness of the GCM
Expanding access to pain care for frail, older people in primary care: A crosssectional study	Maaike E Muntinga et al. (2016)		781/ 1147	Netherlands		A large share of people's pain complaints had already been identified by a primary care physician prior to the CGA.	
Effectiveness of a Geriatric Care Model for frail older adults in primary care: Results from a stepped wedge cluster randomized trial.	Emiel O.Hoogendijk et al. (2016)		782/1147	Netherlands		No significant differences between the GCM and usual care group, better maintenance of ADL activity but no significant And No significant effects of the intervention on total and acute hospital admissions.	
Quality of primary care delivery and productive interactions among community-living frail older persons and their general practitioners and practice nurses	Lotte Vestigens et al. (2019)	Screening by suing a TFI score of 5 or higher (range 0–15) were identified as frail.	358/464	Netherlands	Older persons are screened for frailty by the geriatric nurse or practice nurse during a home visit, each frail older person is discussed in multidisciplinary consultation, the practice team discusses and agrees upon (selfmanagement)	No significant different between groups to overall perceived quality of primary care.	Focus on screening but then there was no time to follow up.

					interventions, the care plan is discussed with the frail older patient, finally. Finally, followup of the frail older person was provided by a multidisciplinary team.		
Chronic Care Clinics: A randomized controlled trial of a model of primary care for frail older adults.	E.A. Coleman et al. (1999)	The chronic Disease Score used to identify frail participants, then physicians were using their experience to select the participants .	127/169	Seattle	Patients invited to, An extended (30 minutes) visit to the patient's physician and team nurse dedicated to developing a shared treatment plan that emphasized the reduction of disability; A session with the pharmacist (15 minutes), held in the primary care examination room, ; A patient self management group session (45 minutes), led by a team nurse or social worker, and The provision of health status assessment information to the practice team at the time of the CCC visits.	After 24 months, no significant improvements in frequency of incontinence, proportion with falls, depression scores, physical function scores, or prescriptions for high risk medications were demonstrated. The costs were not significantly different between groups.	Uncertainty in using the time, the professionals were creating time and recourses but they were not sure for what purpose.

Implementation of an innovative web-based conference table for community-dwelling frail older people, their informal caregivers and professionals: a process evaluation.	Sarah HM Robben et al. (2012)	Participants of the study were community-dwelling frail older people, who were patients of participating general practices in the province of Gelderland or Noord-Brabant, the Netherlands; their informal care-givers; and healthcare and welfare professionals involved in their care.	290 frail older people, 169 professional s participated in the ZWIP	Netherl ands	The ZWIP consists of information about the frail older person's health, functioning and social situation, contact information about professionals involved in their care, and care-related goals formulated by or with the frail older person, a secure messaging system for communication between the frail older person and one or more professionals or between professionals, and tailored educational materials for the frail older person and informal caregiver.	Overall positive but included several limitations mainly frail older population are likely to face some level of difficulties in engaging with e- health intervention.	Technology might not be a type of intervention used by frail older people.

The short-term effects of an integrated care model for the frail elderly on health, quality of life, health care use and satisfaction with care	Wilhelmina Mijntje Looman et al. (2014)	Frailty was screened with the (GFI)- The score ranges from 0 to 15. Elderly with a score of 4 or more were considered as being frail.	417/446	Netherl nads	The general practitioners detected frailty, elderly patients were visited by their nurse who assessed their health, the assessment was discussed in a multidisciplinary meeting, a multidisciplinary treatment plan was then formulated in consultation with the elderly person and his or her informal caregiver(s).	It has a little effect on health, care usage, and satisfaction with care in the frail elderly. The only significant effect was found for one dimension of the ICECAP. The frail elderly in the experimental group felt that they were better able to receive the love and friendship they desired than the frail elderly in the control group.	Social and non healthcare factors resulted a big effect on outcomes. Lack of evidence about active involvement of patients.
Cost-effectiveness of a multidisciplinary intervention model for community-dwelling frail older people	René J F Melis Et al. (2008)	Physicians screened for frailty and referral older patients to the interventions. They had one or more limitations in cognition,	131/151	Netherl ands	The model used problem based selection procedure performed by GPs rather than population screening to identify patients eligible. A geriatric specialist nurse visited the patient	The new interventions is cost-effective at reasonable costs	Time and costs consuming – but it might make sense to understand problem and then set the recommendations.

		(instrumental) activities of daily living, or mental well-being.			at home. Up to six visits for additional geriatric evaluation and management were planned within the next 3 months. Starting off from a wide multidimensional assessment, the intervention team developed an individualized, integrated treatment plan for each patient.		Patient engaged on clear plan and when they understand the purpose. Better adherence of GPs in medical problems.
Multicomponent program to reduce functional decline in frail elderly people: A cluster controlled trial.	Franca G.H. Ruikes et al. (2016)	Community-dwelling frail elderly people aged ≥70 years were identified with the EASYCare two-step older persons screening instrument.	369/536	Netherl ands	CareWell primary care program - Proactive, individually tailored care plans were formulated for each participant; these plans were based on individual healthrelated goals and needs as assessed with the EASY-Care TOS. Care plans were revised during the team meetings at least every 6 months and stored in the information portal.	No beneficial effects of the program among frail elderly people.	It was not clear how professionals engage with each other – who was actively engage in the plan.

Cost-Effectiveness of a Proactive Primary Care Program for Frail Older People: A Cluster-Randomized Controlled Trial	Nienke Bleijenberg RN et al. (2017)	First, a software application identified patients at risk for frailty by screening routine (EMR) data from general practices. Patients aged 60 years and older were included in a quarterly report when they met at least 1 of the following criteria: a frailty index ≥0.20, polypharmacy of ≥5 medications in chronic use, or a consultation gap. 2. After the frailty screening based on EMR data, patients at risk received Groningen Frailty Indicator to measure the level of frailty.	2489/ 3092	Netherl ands	In first group, there was no trained registered nurse to deliver the additional steps of the proactive care program. In the second group, the frailty screening was followed by the nurse-led care intervention. Patients who were identified as frail received a homebased Comprehensive Geriatric Assessment, followed by evidencebased care planning, care coordination and follow-up.	The probability of cost effectiveness of screening plus nurse care versus GP care was 55% , frailty screening followed by the nurse led care is less cost effective than frailty screening followed by GP care. Adding the nurse led to frailty screening had a low probability to cost effect.	Early involvement of patient was not clear Nurses did not address some of the clinical needs e.g. social care. Resources of collaboration was always an issues.
Frail Older Adults' Experiences With a Proactive, Nurse-Led Primary Care Program	Bleijenberg, N et al. (2015)		11 interviews of participants who received nurse led approach.	Netherl ands		The results regarding the perception and appreciation of this type of care showed a somewhat different perspective, most older adults appreciate the proactive care provided by RN, but only when this care was needed.	

Integrated care at home reduces unnecessary hospitalizations of community-dwelling frail older adults: a prospective controlled trial.	Laura Di Pollona et al. (2017)	Screened for frailty by one of four alarms or risk factors (impaired cognition, falls, social isolation, or frailty of the informal caregiver support) detected by the RAI-HC.	153/301	Geneva	The intervention received an additional home geriatric assessment by community geriatrics unit (GCU).	The intervention reduced the rate of hospitalizations after the first year, decreased unnecessary hospitalizations due to social problem, lowered the rate of emergency room visits after the first year, and increased the proportion of patients dying at home.	Better linkage between geriatric and primary care – linkage with geriatrician may help to direct the patients on how to use the resources.
Nurse home visits with or without alert buttons versus usual care in the frail elderly: a randomized controlled trial	Jesus Favela et al (2013)	Patients were aged over 60 years with a frailty index score higher than 0.14.	115/133	Mexico	After screening , participants were allocated to the control NV + AB (nurse home visits including alert button) or NV alone (nurse home visits alone). Participants in the intervention group received weekly visits from a nurse over a period of 9 months. This group of patients was also able to contact their nurses on whenever they felt the need by pressing the alert button, but the other group did not include emergency care or technological support via the alert button.	The NV+AB group reported improvement in almost all components of frailty phenotype and even when these changes were slight, a visiting nurse combined with technology that produces a sense of security in the patient could diminish the level of risk.	Unclear how the technology helped to have a positive effect on frailty scores.

Reversing Frailty Levels in Primary Care Using the CARES Model	Olga Theou et al. (2017)	Older people were screened for frailty by using both CFS and FI.	26/51	Canada	Providers teams were trained in using the comprehensive geriatric assessment (CGA) frailty levels among patients, the CGA was used to inform the creation of a wellness plan to identify goals most important to the patients, and patients were paired with a freeof-charge, telephone-based health coach for a period of up to six months.	Change in frailty scores between baseline and follow up after six months.	There was emphasis between patients and processionals defining the plan together but it was not clear when intervention was implemented Concern was emphasized regarding the length of CGA especially the paper format.
Impact on hospital admissions of an integrated primary care model for very frail elderly patients	de Stampa et al. (2014)	Using the Contact Assessment (CA) tool- Persons with a score of 6 or more were defined	219/428	Paris	The nurse performed a home-based comprehensive geriatric assessment, developed an individualized care	The risk of having at least one unplanned hospital admission decreased at one year and the planned hospital	Hospital geriatrician can direct the transition , and provided more care coordination.
		as having complex needs with a mix of medical, psychological, social conditions and functional impairments.			plan, coordinated all the required services during the follow-up. Nurses and primary care physician received support as needed from geriatricians participating.	admissions rate increased, without a significant change in total hospital admissions	
A community program of integrated care for frail older adults: Agil Barcelona	L M Pérez et al. (2019)	Individuals aged ≥80 years presenting at least one sign of frailty (i.e. slow gait	112/134 (The total number who completed the	Spain	Designing a multidisciplinary intervention in the community, including a) multi-modal physical	The reported improvement of physical function was statistically and clinically significant. The benefits were	Clarity in the alignment between the assessment and management the needs, socialization

		speed, weakness, memory complaints, involuntary weight loss, poo social support). GFI was used to support the identification processes.	intervention out of the total who recruited)		activity (PA) sessions, b) promotion of adherence to a Mediterranean diet c) health education and d) medication review.	consistent across different initial frailty degrees, from milder to more advanced.	was also encouraged with exercise.

(CHS) Cardiovascular Health Study
(CL15) Check-List 15
(GFI) Groningen Frailty indicator
(TGUGT) Get-up-and-Go test
(MEC-35 Lobo) Mini-Examination Cognitive of Lobo
(MNA-SF) Mini Nutritional Assessment short form
(PRISMA) Program of Research to Integrate Services for the Maintenance of Autonomy
COOP_WONCA
(RAI-HC) Resident Assessment Instrument Home Care
(SHARE-FI) Survey of Health, Ageing, and Retirement in Europe (TFI)
Tilburg Frailty Indicator

Supplementary file 1: A list of additional studies

1. Bindels J, Cox K, Widdershoven G, van Schayck OCPP, Abma TA. Care for communitydwelling frail older people: a practice nurse perspective. J Clin Nurs [Internet]. 2014 Aug 1;23(15–16):2313–22. Available from: http://dx.doi.org/10.1111/jocn.12513
2. Fairhall N, Aggar C, Kurrle SE, Sherrington C, Lord S, Lockwood K, et al. Frailty intervention trial (FIT). BMC Geriatr. 2008;8:1–10.
3. Fairhall N, Sherrington C, Kurrle SE, Lord SR, Lockwood K, Howard K, et al. Economic Evaluation of a Multifactorial, Interdisciplinary Intervention Versus Usual Care to Reduce Frailty in Frail Older People. J Am Med Dir Assoc [Internet]. 2015;16(1):41–8. Available from: http://dx.doi.org/10.1016/j.jamda.2014.07.006
4. Fairhall N, Sherrington C, Kurrle SE, Lord SR, Lockwood K, Cameron ID. Effect of a multifactorial interdisciplinary intervention on mobility-related disability in frail older people: randomised controlled trial. BMC Med. 2012;10.
5. Murayama H, Nishi M, Shimizu Y, Kim MJ, Yoshida H, Amano H, et al. The hatoyama cohort study: Design and profile of participants at baseline. J Epidemiol. 2012;22(6):551–8.
6. Makai P, Perry M, Robben SHM, Schers HJ, Heinen MM, Rikkert MGMO, et al. Evaluation of an ehealth intervention in chronic care for frail older people: Why adherence is the first target. J Med Internet Res. 2014;16(6):1–8.
7. Robben SHM, Huisjes M, Van Achterberg T, Zuidema SU, Olde Rikkert MGM, Schers HJ, et al. Filling the gaps in a fragmented health care system: Development of the health and welfare information portal (ZWIP). J Med Internet Res. 2012;14(5).
8. Makai P, Perry M, Robben SHM, Schers H, Heinen M, Rikkert MGMO, et al. Which frail older patients use online health communities and why? A mixed methods process evaluation of use of the health and welfare portal. J Med Internet Res [Internet]. 2014;16(12). Available from: https://www2.scopus.com/inward/record.uri?eid=2-s2.084965191679&doi=10.2196%2Fjmir.3609&partnerID=40&md5=6bfea3c8c1cd78892127 8b5582dc0e4c
9. Looman WM, Fabbricotti IN, De Kuyper R, Huijsman R. The effects of a pro-active integrated care intervention for frail community-dwelling older people: A quasiexperimental study with the GP-practice as single entry point Health services research. BMC Geriatr [Internet]. 2016;16(1):1–10. Available from: http://dx.doi.org/10.1186/s12877-016-0214-5
10. Looman WM, Huijsman R, Bouwmans-Frijters CAM, Stolk EA, Fabbricotti IN. Costeffectiveness of the “Walcheren Integrated Care Model” intervention for communitydwelling frail elderly. Fam Pract. 2016;33(2):154–60.
11. Fabbricotti IN, Janse B, Looman WM, De Kuijper R, Van Wijngaarden JDH, Reiffers A. Integrated care for frail elderly compared to usual care: A study protocol of a

quasiexperiment on the effects on the frail elderly, their caregivers, health professionals and health care costs. BMC Geriatr [Internet]. 2013;13(1). Available from: https://www2.scopus.com/inward/record.uri?eid=2-s2.084877349757&doi=10.1186%2F1471-2318-13-31&partnerID=40&md5=147e190382d7698bbb9c0e134e64db1e

12. Ruikes FGH, Meys ARM, Van De Wetering G, Akkermans RP, Van Gaal BGI, Zuidema SU, et al. The CareWell-primary care program: Design of a cluster controlled trial and process evaluation of a complex intervention targeting community-dwelling frail elderly. BMC Fam Pract [Internet]. 2012;13. Available from: https://www2.scopus.com/inward/record.uri?eid=2-s2.084870384686&doi=10.1186%2F1471-2296-13-115&partnerID=40&md5=2888a546cbe5057a14327dd6d4836d5b
13. Ruikes FGH, Adang EM, Assendelft WJJ, Schers HJ, Koopmans RTCM, Zuidema SU. Cost-effectiveness of a multicomponent primary care program targeting frail elderly people. BMC Fam Pract [Internet]. 2018;19(1). Available from: https://www2.scopus.com/inward/record.uri?eid=2-s2.085047112855&doi=10.1186%2Fs12875-018-0735-4&partnerID=40&md5=e50291f32112cc003c020dea9416e4a9
14. Melis RJF, Van Eijken MIJ, Borm GF, Wensing M, Adang E, Van De Lisdonk EH, et al. The design of the Dutch EASYcare study: A randomised controlled trial on the effectiveness of a problem-based community intervention model for frail elderly people [NCT00105378]. BMC Health Serv Res [Internet]. 2005;5. Available from: https://www2.scopus.com/inward/record.uri?eid=2-s2.028744455568&doi=10.1186%2F1472-6963-5-65&partnerID=40&md5=a26b1ad4d0bccd11f7526b66a312eabb
15. Melis RJF, Van Eijken MIJ, Boon ME, Olde Rikkert MGM, Van Achterberg T. Process evaluation of a trial evaluating a multidisciplinary nurse-led home visiting programme for vulnerable older people. Disabil Rehabil. 2010;32(11):937–46.
16. Romera L, Orfila F, Segura JM, Ramirez A, Möller M, Fabra ML, et al. Effectiveness of a primary care based multifactorial intervention to improve frailty parameters in the elderly: a randomised clinical trial: rationale and study design. BMC Geriatr [Internet]. 2014;14:125. Available from: https://www.cochranelibrary.com/central/doi/10.1002/central/CN-01112225/full
17. Dorner TE, Lackinger C, Haider S, Luger E, Kapan A, Luger M, et al. Nutritional intervention and physical training in malnourished frail community-dwelling elderly persons carried out by trained lay "buddies": Study protocol of a randomized controlled trial. BMC Public Health. 2013;13(1):1–11.
18. Van Hout HPJ, Nijpels G, Van Marwijk HWJ, Jansen APD, Van't Veer PJ, Tybout W, et al. Design and pilot results of a single blind randomized controlled trial of systematic demand-led home visits by nurses to frail elderly persons in primary care [ISRCTN05358495]. BMC Geriatr. 2005;5:1–9.
19. Stijnen MMN, Duimel-Peeters IGP, Jansen MWJ, Vrijhoef HJM. Early detection of health problems in potentially frail community-dwelling older people by general practices - Project [G]OLD: Design of a longitudinal, quasi-experimental study. BMC Geriatr

[Internet]. 2013;13(1). Available from: https://www2.scopus.com/inward/record.uri?eid=2-s2.084872308127&doi=10.1186%2F1471-2318-13-7&partnerID=40&md5=29389120044784fc9035e4639bc382f6
20. Vedel I, De Stampa M, Bergman H, Ankri J, Cassou B, Blanchard F, et al. Healthcare professionals and managers' participation in developing an intervention: A preintervention study in the elderly care context. Implement Sci. 2009;4(1):1–11.
21. Vestjens L, Cramm JM, Birnie E, Nieboer AP. Evaluating an integrated primary care approach to improve well-being among frail community-living older people: A theoryguided study protocol. BMC Geriatr. 2018;18(1):1–17.
22. Vestjens L, Cramm JM, Nieboer AP. An integrated primary care approach for frail community-dwelling older persons: a step forward in improving the quality of care. BMC Health Serv Res [Internet]. 2018;18(1):28. Available from: https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-017-2827-6
23. Muntinga ME, Hoogendijk EO, Leeuwen KM Van, Hout HPJ Van, Twisk JWR, Horst HE Van Der, et al. Implementing the chronic care model for frail older adults in the Netherlands : study protocol of ACT (frail older adults : care in transition). 2012;
24. Melis RJF, Van Eijken MIJ, Teerenstra S, Van Achterberg T, Parker SG, Borm GF, et al. A randomized study of a multidisciplinary program to intervene on geriatric syndromes in vulnerable older people who live at home (Dutch EASYcare Study). Journals Gerontol - Ser A Biol Sci Med Sci [Internet]. 2008;63(3):283–90. Available from: https://www2.scopus.com/inward/record.uri?eid=2-s2.0-44349106967&doi=10.1093%2Fgerona%2F63.3.283&partnerID=40&md5=633d8aeddc172333dda73b1b256f4073
25. Bleijenberg N, Drubbel I, Dam VH, Numans ME, Schuurmans MJ, Wit NJ De. Proactive and integrated primary care for frail older people : design and methodological challenges of the Utrecht primary care PROactive frailty intervention trial (U-PROFIT). 2012;
26. Bleijenberg N, Drubbel I, Schuurmans MJ, Dam H ten, Zuithoff NPAA, Numans ME, et al. Effectiveness of a Proactive Primary Care Program on Preserving Daily Functioning of Older People: A Cluster Randomized Controlled Trial. J Am Geriatr Soc [Internet]. 2016 Sep 1 [cited 2017 Oct 27];64(9):1779–88. Available from: http://dx.doi.org/10.1111/jgs.14325
27. Bleijenberg N, Dam VH, Drubbel I, Numans ME, Wit NJ De, Schuurmans MJ. Development of a Proactive Care Program (U-CARE) to Preserve Physical Functioning of Frail Older People in Primary Care. 2013;230–7.
28. Stijnen MMN, Jansen MWJ. Development of a home visitation programme for the early detection of health problems in potentially frail community-dwelling older people by general practices. 2013;49–60.
29. Bindels J, Cox K, De La Haye J, Mevissen G, Heijing S, van Schayck OCP, et al. Losing connections and receiving support to reconnect: experiences of frail older people within care programmes implemented in primary care settings. Int J Older People Nurs. 2015;10(3):179–89.
30. Haider S, Dorner TE, Luger E, Kapan A, Titze S, Lackinger C, et al. Impact of a homebased physical and nutritional intervention program conducted by lay-volunteers on

handgrip strength in prefrail and frail older adults: A randomized control trial. PLoS One. 2017;12(1):1–15.
31. Grabovac I, Haider S, Winzer E, Kapan A, Schindler KE, Lackinger C, et al. Changes in health parameters in older lay volunteers who delivered a lifestyle-based program to frail older people at home. Wien Klin Wochenschr. 2018;130(21–22):637–44.
32. Kapan A, Winzer E, Haider S, Titze S, Schindler K, Lackinger C, et al. Impact of a lay-led home-based intervention programme on quality of life in community-dwelling pre-frail and frail older adults: A randomized controlled trial. BMC Geriatr. 2017;17(1):1–11.
33. Haider S, Grabovac I, Winzer E, Kapan A, Schindler KE, Lackinger C, et al. Change in inflammatory parameters in prefrail and frail persons obtaining physical training and nutritional support provided by lay volunteers: A randomized controlled trial. PLoS One. 2017;12(10):8–10.
34. Kapan A, Luger E, Haider S, Titze S, Schindler K, Lackinger C, et al. Fear of falling reduced by a lay led home-based program in frail community-dwelling older adults: A randomised controlled trial. Arch Gerontol Geriatr [Internet]. 2017;68:25–32. Available from: http://dx.doi.org/10.1016/j.archger.2016.08.009
35. Bleijenberg N, Ten Dam VH, Steunenberg B, Drubbel I, Numans ME, De Wit NJ, et al. Exploring the expectations, needs and experiences of general practitioners and nurses towards a proactive and structured care programme for frail older patients: A mixedmethods study. J Adv Nurs. 2013;69(10):2262–73.
36. Daniels R, Van Rossum E, Metzelthin S, Sipers W, Habets H, Hobma S, et al. A disability prevention programme for community-dwelling frail older persons. Clin Rehabil. 2011;25(11):963–74.
37. Metzelthin SF, Van Rossum E, De Witte LP, Hendriks MR, Kempen GI. The reduction of disability in community-dwelling frail older people: Design of a two-arm cluster randomized controlled trial. BMC Public Health [Internet]. 2010;10. Available from: https://www2.scopus.com/inward/record.uri?eid=2-s2.077956530473&doi=10.1186%2F1471-2458-10-511&partnerID=40&md5=49688a13d7608b46c4a25ef018375f3f
38. Inzitari, M., Pérez, L. M., Enfedaque, M. B., Soto, L., Díaz, F., Gual, N., Martín, E., Orfila, F., Mulero, P., Ruiz, R., & Cesari, M. (2018). Integrated primary and geriatric care for frail older adults in the community: Implementation of a complex intervention into real life. *European journal of internal medicine*, *56*, 57–63. https://doi.org/10.1016/j.ejim.2018.07.022.