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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.

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

Analysis: We followed the realist and meta-narrative evidence syntheses: evolving standards (RAMESES) quality and publication criteria for our synthesis to systematically analyse and synthesize the existing literature and to identify (intervention-context-mechanism-outcome) configurations. We used normalization processes theory (NPT) to illuminate mechanisms surrounding implementation.

Results: Our primary research returned 1,735 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. Targeted allocation of resources to address specific needs, allows a greater alignment of skill-sets and reduces over-assessment of frail individuals. Earlier patient involvement may also improve intervention implementation and adherence.

Key words: frailty, general practitioners, interventions, tools, older people.

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 RAMESES standards entailing development and comparative analysis of ICMO configurations (intervention, context, mechanism, outcome).
- Normalisation process theory (NPT) constructs helped us to highlight factors surrounding the implementations 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' populations within primary studies and excluded related elderly populations whom did not diagnosed with frailty.

Introduction

Frailty is a promising but also somewhat contested multidimensional syndrome characterized 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 (e.g. pre-frail 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]

In England, contractual requirements have been introduced for general practitioners (GPs) to routinely identify and manage frail patients aged 65 years and older using an appropriate tool like electronic frailty index (eFI).[10] This policy emphasises the role of primary care in providing a stratified person centred approach according to levels of severity.[10,11] For individuals with moderate or severe frailty, key contractual requirements include a focus on GP practices

conducting a medication review, carrying out a falls assessment and enhancing access to health records to support care coordination.[10] It is also advocated that people with moderate and severe frailty would benefit from a comprehensive geriatric assessment (CGA) and subsequent care plan formulation.[11,12]

There is evidence that conducting a CGA in the hospital environment can lead to improved health outcomes in terms of reducing mortality; helping people remain in their own home; and in improving cognition.[13,14] The main elements usually include: systematic detection (versus conventional opportunistic case-finding), comprehensive assessment of needs, the development of a subsequent care plan and the delivery of the interventions within the care plan.[15] However, though a national policy priority, a recent systematic review highlighted limited and mixed evidence concerning the introduction of comprehensive geriatric assessments offered in the primary care setting to those perceived to be the most vulnerable older people.[16] Furthermore, the diversity of frailty interventions increases the challenge to define the best intervention that could be used to identify, assess and manage frailty in older people.[7] 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 of the literature to understand factors that support or inhibit implementation of frailty interventions in primary care.

Patients and public involvement

No patients or public were involved in this study.

Study design

This study has been informed by the principles underpinning rapid realist reviews (RRR)[17] in conjunction with normalization 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 synthesis (RAMESES) publication standards.[20]

As stated by Saul et al, rapid realist review 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, mechanisms, outcomes (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 (MeSH) and key words highlighted (Box 1) 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 re-run in September 2019. An electronic literature search was conducted using the following bibliographic databases: Cochrane Library, SCOPUS and EMBASE.

Box 1: MeSH and key words used in the search processes

(“frail*” or “frail elderly” or “frailty”) 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 “tool” or “tools” or “strategy” or “strategies” or “project” or “projects”). Basic Boolean operators (i.e. AND, OR) were used in the search strategy.

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 acknowledgment that there might be varying strengths of evidence. Using the primary and secondary exclusion criteria, KA screened the papers to ensure the eligibility to the study’s aim (Table 1). 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.

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.

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;	• Studies where there was no description of any intervention or guidelines; • Studies that did not report any outcome or results;

• Studies which focused on managing a specific condition in frail individuals; • Studies which were letters, notes, or conference abstracts only.	• 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.

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 designed to specifically recruit a frail (not- pre frail) population. We included studies adopting any type of screening and case finding method for frailty, such as physical function, professionals' opinion, Groningen frailty indicator (GFI) or Tilburg frailty indicator (TFI) tools.

Data extraction

KA extracted the relevant data into a spreadsheet to prepare for analysis (Supplementary Table S1). Then, an extraction 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 (Supplementary Table S2). Following NPT, KA also applied a series of questions to guide the evaluation of factors affecting the implementation of an intervention (Supplementary Table S3). On a weekly basis, KA shared the ICMO model and an original copy of each intervention study with TB and JT, which enhanced their discussion and supported the development of emergent themes. Between three and five interventions were typically reviewed at each meeting.

Data analysis

Three reviewers (KA, TB and JT) independently extracted relevant themes from studies, and weekly data sessions were held to critically appraise, analyse and synthesise emergent themes. After each meeting, themes were summarized 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 frailty interventions in primary care (i.e. '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. 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.

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 (MMAT),[26] and confirmed with TB and JT. A score was assigned to each intervention for each appraisal criteria met (out of five), to inform the confidence of findings obtained (Supplementary Table S4). This approach allowed a focus on more comprehensive papers without excluding weaker papers, which still contributed to the final evidence synthesis.[27]

Results

Figure 1 illustrates the article selection process for the review. Of 1735 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 (Supplementary Table S5), and a list of the records identified by the secondary search is provided in (Supplementary file1).

Families of frailty interventions

Through an iterative analysis of data from across the included studies, the frailty interventions 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 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 Comprehensive Geriatric Assessment (CGA),[28,48] the Resident Assessment Instrument–Home Care version (RAI-HC),[29,45] the interRAI Community Health Assessment instrument,[41–44] or the Easy-Care instrument.[32,34] In conjunction with 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 interventions in the community.[47]

Key factors influencing implementation

A. 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 (GCM), nurses spent 50 to 90 minutes conducting the initial assessment, an average of 37 minutes writing care plans, and a further 40 minutes 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 preventive home visitation programme, invested on average 85 minutes 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 persons' living environment, which supported decision making (i.e., 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 was 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 allowed the intervention to be adaptable and sustainable for primary care teams and for older people.[47]

B. 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 on 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 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 this as an important aspect of intervention design.

C. 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 skillset. For example, nurses were responsible for the assessment and development of the care plan, and were reported to have good organization 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 (i.e. more appropriate admissions) and allowed identified needs to be more swiftly met.[45,46]

Family 2: Targeting specific frailty needs

Out of the 29 intervention studies, 6 related to screening and targeting specific frailty needs. The interventions were conducted in Spain (n=2),[58,59] and in (n=1) Australia,[60] Austria,[61] China,[62] and Japan.[63]

In the main, these interventions aimed to address a specific need and produce observable outcomes such as mobility, functional, cognitive and emotional status, psychosocial status, hospitalization 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,[62] and resistance exercise, nutritional and psycho-social prorgammes.[63]

Key factors influencing implementation

A. Distribution of resources and professionals skill-sets

Our analysis of this family of interventions suggested that compared to 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 (i.e. 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 i.e. physical activity, nutritional intake, memory workshop and medication review. The monitoring was a priority: every 2 weeks there was 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] GPs skills were successfully used to perform medication reviews, where patients were re-educated about unnecessary drugs and successfully reduced their use.[58]

B. 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. [61–63] For example, acupressure treatment was designed as a caregiver administered treatment, which could be carried out at home or community settings.[62] After training,

'caregivers were requested to spend two 20 minutes sessions per week with the elderly doing homework assigned by the activity group'.[62] Participants revealed that they were in a better mood after the intervention,[62] and they experienced a significantly higher satisfaction in their ability to perform daily living activities.[62] In another multifactorial intervention in Japan, a psychosocial programme was conducted alongside the exercise and nutritional programmes.[63] The psychosocial programme consisted 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.[63] In another home-based intervention performed in Austria, trained non-professional volunteers visited malnourished frail older persons twice a week for approximately one 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.[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.[58,63]

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 to 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 frailty interventions, 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 approaches to identifying frail populations, such as systematic screening and active case finding. We did not explore the frailty patients' characteristics; but we have included a summary of the screening criteria in (Supplementary Table S5). To enhance trustworthiness, our findings were constructed through constant comparative methods, iterative testing and retesting of ICMO configurations, which were regularly updated.[21] Lack of contextual details (e.g. what happened after introducing the intervention) in the published studies limited our analysis. However, 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

Implementation of new classification codes such as frailty have the potential to both structure and constrain the delivery of primary care.[70] Our review of frailty interventions in primary care resonates with previous qualitative research exploring comprehensive geriatric assessments.[13]

Gardner et al [13] 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'. 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] suggests that a CGA approach potentially works if the resources and professionals skill set (i.e. 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 stigmatizing needs, known as 'hidden needs', such as cognitive problems.[76] 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 (e.g. time, workforce expansion). Our recent qualitative study highlighted widespread concern surrounding current capacity to address identified unmet needs of frail patients in primary care.[77] There is evidence to support the introduction of interventions targeting exercise training for people with different stages of frailty.[7] This RRR further suggests that incorporating social dimensions of care into interventions design may reduce the potential for loneliness and isolation and so enhance their implementation.[28,47,63,62,78–80]

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 over-assessment of people living with frailty. Earlier involvement of patients is another key factor that may facilitate implementation and increase adherence to the intervention.

Author contributorship

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

Competing interests

None declared

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Data sharing statement

No additional data are available.

Ethic statement

Ethics approval was not required.

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Figure 1: Modified PRISMA flow diagram for the primary literature search

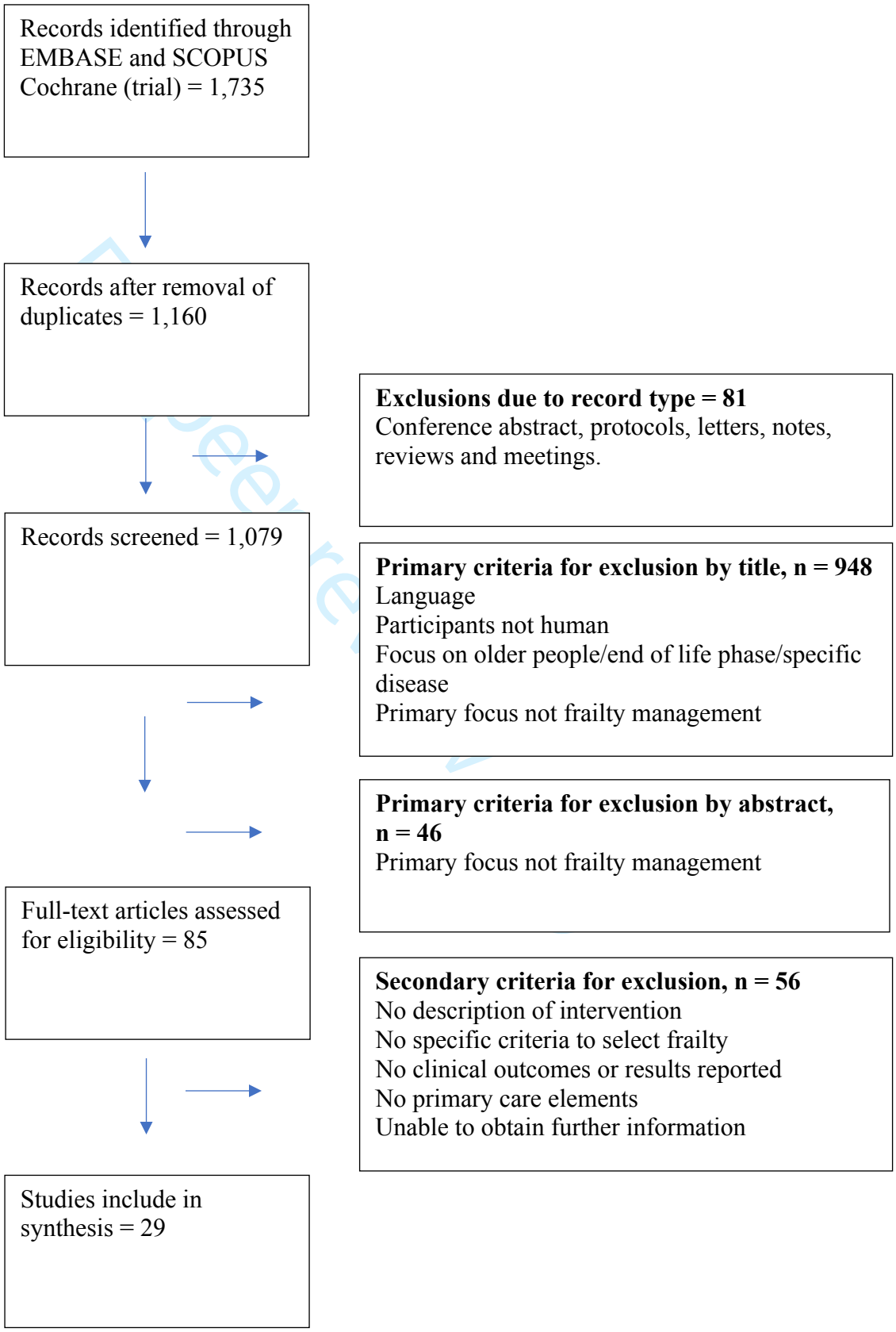

Figure 2: Secondary search processes

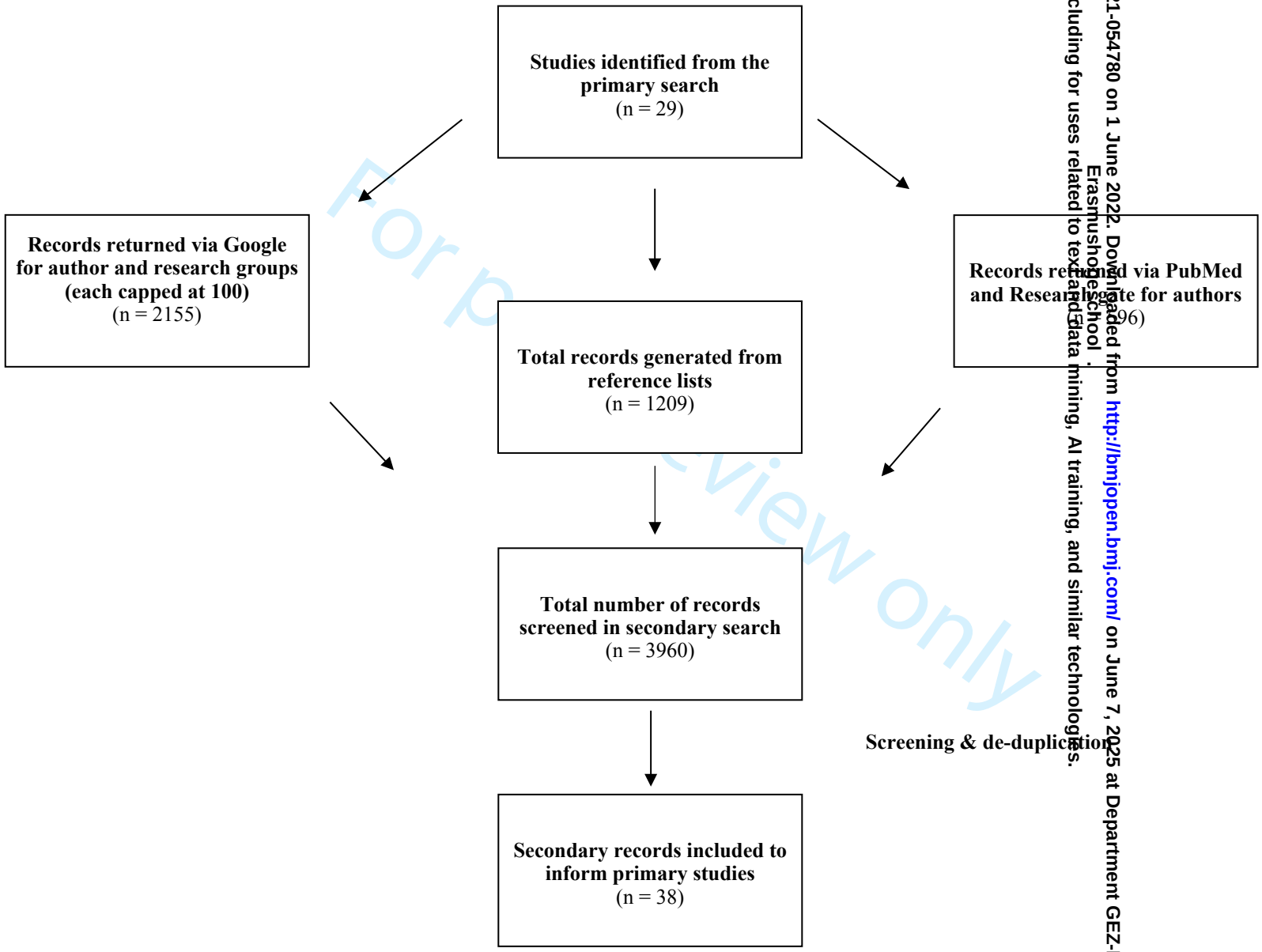

Table S1: First data extraction tool

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 S2: ICMO extraction tool

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

Table S3: 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 intervention function)	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?
	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 managing a set of practices?
	Could the existing practices be changed to sustain interventions working?

Table S4: 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 Bergeron 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 Olmera-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 Tarazona-Santabalbina 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 Lugtenberg 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 Sajino 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 MN 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.	Heinie P 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.		Slikke MJ Metzelthin et al. (2013)	4
Reducing disability in community-dwelling frail older people: Cost-effectiveness study alongside a cluster randomised controlled trial		Metzelthin et al. (2015)	4
Implementing care programmes for frail older people: A project management perspective.		Jill Candy Hasa 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. 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	Karen M van Leeuwen et al. (2015)	3
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)	3
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 Vetrigens 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. Stuman et al. (1999)	3
Implementation of an innovative web-based conference table for community-dwelling 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 H. 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).	Willemina Mijntje Looman et al. (2014)	4

Cost-effectiveness of a multidisciplinary intervention model for community-dwelling 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.	Rene 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.	Frank 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 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.	Nienke Pleijenberg RN et al. (2017)	3
Frail Older Adults' Experiences With a Proactive, Nurse-Led Primary Care Program		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. (2015)	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 Fabla 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 S5: 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, Australia	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	Barcelona	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	Francisco José Tarazona-Santabalbina et al. (2016)	Participants were randomized a volunteer who were sedentary, with a gait speed lower than 0.8	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	The MEP was very effective in improving the PPT (P<.001), SPPB(P¼.007), and in lowering of the frailty score assessed by Linda	Limited paper – there was not clear enough data on how the frailty intervention was implemented.

Community-Dwelling Frail Elderly: A Randomized Clinical Trial		meters per second and frail (met at least 3 of the frailty phenotype criteria).			functional performance measure. Those in the intervention group performed 65 minutes of daily activities, 5 days per week for 24 weeks.	Fried' criteria and Edmonton. The statistical analysis showed that in 31.4% of the intervention group, frailty was reversed after the exercise training program.	
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 community-dwelling 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, excepting 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 (COOP-WONCA 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	Metzelthin SF et al. (2013)	Older people (≥ 70 years) and (score ≥5 on	6 GP practices GPs = 12	Netherl ands	Nurse led interdisciplinary approach - frail older	Professionals and frail elderly were satisfied.	Time pressures was affecting the implementation

to prevent disability among community-dwelling frail older people: A large-scale process evaluation.		GFI).	Nurses = 7 OT= 6 PT= 20 Frail = 194		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.		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 patients consumed time. Lack of clarity on having an early purpose on what they were trying to achieve.
Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people: Cluster randomised controlled trial.	Slike Metzelthin et al. (2013)		270 /346	Netherl ands		No different with regards to disability	
Reducing disability in community-dwelling frail older people: Cost-effectiveness 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 multi-dimensional 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 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.			nurses 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. 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		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
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)		1147	Netherl ands		level of adherence varied between professionals, which most likely can be attributed to professional's individual characteristics and circumstances.	
Expanding access to pain care for frail, older people in primary care: A crosssectional study	Maaike E Muntinga et al. (2016)		781/ 1147	Netherl ands		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	Netherl ands		No significant differences between the GCM and usual care group better maintenance of ADL activities 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	Netherl ands	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)	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, follow-up 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	290 frail older people, 169 professionals participated in the ZWIP	Netherlands	The ZWIP consists of information about the frail older person's health, functioning and social situation, contact information about professionals	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.

		in the province of Gelderland or Noord-Brabant, the Netherlands; their informal care- givers; and healthcare and welfare professionals involved in their care.			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.		
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 EASY-Care two-step older persons screening instrument.	369/536	Netherlands	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.	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	2489/ 3092	Netherlands	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	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	Early involvement of patient was not clear Nurses did not address some of the clinical needs e.g. social care.

		included in a quarterly report when they met at least 1 of the			who were identified as frail received a home-based Comprehensive Geriatric Assessment, followed by evidence-based care planning, care coordination and follow-up.	frailty screening had a low probability to cost effect.	Resources of collaboration was always an issues.
Frail Older Adults' Experiences With a Proactive, Nurse-Led Primary Care Program	Bleijenberg, N et al. (2015)	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.	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 the but only when this service 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	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	Unclear how the technology helped to have a positive effect on frailty scores.

					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.	a sense of security in the patient could diminish the level of risk.	
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 free-of-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 speed, weakness, memory complaints, involuntary weight loss, poor social support). GFI was used to support the identification processes.	112/134 (The total number who completed the intervention out of the total who recruited)	Spain	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.	The reported improvement of physical function was statistically and clinically significant. The benefits were consistent across different initial frailty degrees, from milder to more advanced.	Clarity in the alignment between the assessment and management the needs, socialization 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 community-dwelling 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
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Reporting checklist for systematic review (with or without a meta-analysis).

Based on the PRISMA guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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		Reporting Item	Page Number
Title			
Title	#1	Identify the report as a systematic review	1
Abstract			
Abstract	#2	Report an abstract addressing each item in the PRISMA 2020 for Abstracts checklist	2
Introduction			
Background/rationale	#3	Describe the rationale for the review in the context of existing knowledge	3-4
Objectives	#4	Provide an explicit statement of the objective(s) or question(s) the review addresses	4
Methods			

Eligibility criteria	#5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses	6
Information sources	#6	Specify all databases, registers, websites, organisations, reference lists, and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted	5
Search strategy	#7	Present the full search strategies for all databases, registers, and websites, including any filters and limits used	7
Selection process	#8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and, if applicable, details of automation tools used in the process	6
Data collection process	#9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and, if applicable, details of automation tools used in the process	8
Data items	#10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (for example, for all measures, time points, analyses), and, if not, the methods used to decide which results to collect	6
Study risk of bias assessment	#11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and, if applicable, details of automation tools used in the process	8
Effect measures	#12	Specify for each outcome the effect measure(s) (such as risk ratio, mean difference) used in the synthesis or presentation of results	NA
Synthesis methods	#13a	Describe the processes used to decide which studies were eligible for each synthesis (such as tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5))	7

Synthesis methods	#13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics or data conversions	7
Synthesis methods	#13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses	NA
Synthesis methods	#13d	Describe any methods used to synthesise results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used	4-5
Synthesis methods	#13e	Describe any methods used to explore possible causes of heterogeneity among study results (such as subgroup analysis, meta-regression)	7
Synthesis methods	#13f	Describe any sensitivity analyses conducted to assess robustness of the synthesised results	7
Reporting bias assessment	#14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases)	8
Certainty assessment	#15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome	7
Data items	#10b	List and define all other variables for which data were sought (such as participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information	7
Results			
Study selection	#16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram (http://www.prisma-statement.org/PRISMAStatement/FlowDiagram)	9-10
Study selection	#16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded	10
Study characteristics	#17	Cite each included study and present its characteristics	11-16
Risk of bias in studies	#18	Present assessments of risk of bias for each included study	8

Results of individual studies	#19	For all outcomes, present for each study (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (such as confidence/credible interval), ideally using structured tables or plots	NA
Results of syntheses	#20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies	NA
Results of syntheses	#20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (such as confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect	NA
Results of syntheses	#20c	Present results of all investigations of possible causes of heterogeneity among study results	NA
Results of syntheses	#20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesised results	NA
Risk of reporting biases in syntheses	#21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed	NA
Certainty of evidence	#22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed	NA
Discussion			
Results in context	#23a	Provide a general interpretation of the results in the context of other evidence	16
Limitations of included studies	#23b	Discuss any limitations of the evidence included in the review	17
Limitations of the review methods	#23c	Discuss any limitations of the review processes used	17
Implications	#23d	Discuss implications of the results for practice, policy, and future research	18
Other information			
Registration and protocol	#24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered	4

Registration and protocol	#24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared	NA
Registration and protocol	#24c	Describe and explain any amendments to information provided at registration or in the protocol	NA
Support	#25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review	19
Competing interests	#26	Declare any competing interests of review authors	19
Availability of data, code, and other materials	#27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review	27

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BMJ Open

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

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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.

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 (RAMESES) quality and publication criteria for our synthesis to systematically analyse and synthesize the existing literature and to identify (intervention-context-mechanism-outcome) configurations. We used normalization processes theory (NPT) to illuminate mechanisms surrounding implementation.

Results: Our primary research returned 1,735 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 over-assessment of frail individuals. Second, earlier patient involvement may also improve intervention implementation and adherence.

Key words: frailty, general practitioners, interventions, tools, older people.

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 RAMESES standards entailing development and comparative analysis of ICMO configurations (intervention, context, mechanism, outcome).
- Normalisation process theory (NPT) constructs helped us to highlight factors surrounding the implementations 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' populations within primary studies and excluded related elderly populations whom did not diagnosed with frailty.

Introduction

Frailty is a promising but also somewhat contested multidimensional syndrome characterized 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 (e.g. pre-frail 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 guidelines to support primary care providers working with older people.[12] However, a recent systematic review highlighted limited and mixed evidence concerning the introduction of comprehensive geriatric assessments 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 e.g. 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] Fisterra guideline in Spain updated in 2020 "Frail elderly people: detection and management in primary care" highlighted 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 significant barrier to identifying and managing frailty in primary care.[15] Accordingly, screening for frailty in primary care are 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 persons' frailty, which might help to overcome the challenges of providing good care for an expanding aging 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 of the literature to understand factors that support or inhibit implementation of frailty interventions in primary care.

Patients and public involvement

No patients or public were involved in this study.

Study design

This study has been informed by the principles underpinning rapid realist reviews (RRR)[17] in conjunction with normalization 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 synthesis (RAMESES) publication standards.[20]

As stated by Saul et al, rapid realist review 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, mechanisms, outcomes (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 (MeSH) and key words highlighted (Box 1) 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 re-run in September 2019. An electronic literature search was conducted using the following bibliographic databases: Cochrane Library, SCOPUS and EMBASE.

Box 1: MeSH and key words used in the search processes

("frail*" or "frail elderly" or "frailty") 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 "tool" or "tools" or "strategy" or "strategies" or "project" or "projects"). Basic Boolean operators (i.e. AND, OR) were used in the search strategy.

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 acknowledgment 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 aim (Table 1). On a weekly meeting, TB checked all of included studies. Then, following the secondary exclusion criteria, KA scanned and included studies, 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.

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 e.g. studies only focussed on the pre-frail 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.

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 focussed on recruiting a frail population (i.e. we only excluded studies where the sole focus was pre-frail populations). We included studies adopting any type of screening and case finding method for frailty, such as physical function, professionals' opinion, Groningen frailty indicator (GFI) or Tilburg frailty indicator (TFI) tools.

Data extraction

KA extracted the relevant data into a spreadsheet to prepare for analysis (Supplementary Table S1). 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 (Supplementary Table S2). Following NPT, KA also applied a series of questions to guide the evaluation of factors affecting the implementation of an intervention (Supplementary Table S3). On a weekly basis, KA shared the ICMO model and an original copy of each intervention study with TB and JT, 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 JT) 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 summarized 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 (i.e. '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 (MMAT),[26] and confirmed with TB and JT. A score was assigned to each intervention for each appraisal criteria met (out of five), to inform the confidence of findings obtained (Supplementary Table S4). This approach allowed a focus on more comprehensive papers without excluding weaker papers, because all of the included studies has a good evidence that we excluded throughout the study analysis processes.[27]

Results

Figure 1 illustrates the article selection process for the review. Of 1735 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 (Supplementary Table S5), and a list of the records identified by the secondary search is provided in (Supplementary file1).

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 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 Comprehensive Geriatric Assessment (CGA),[28,48] the Resident Assessment Instrument–Home Care version (RAI-HC),[29,45] the interRAI Community Health Assessment instrument,[41–44] or the Easy-Care instrument.[32,34] In conjunction with 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 interventions in the community.[47]

Key factors influencing implementation (Figure 3)

A. 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 (GCM), nurses spent 50 to 90 minutes conducting the initial assessment, an average of 37 minutes writing care plans, and a further 40 minutes 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 preventive home visitation programme, invested on average 85 minutes 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 persons' living environment, which supported decision making (i.e., 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 was 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 facilitators that allowed the intervention to be adaptable and sustainable for primary care teams and for older people.[47]

B. 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 on 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 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.

C. 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 skillset. For example, nurses were responsible for the assessment and development of the care plan, and were reported to have good organization 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 (i.e. more appropriate admissions) and allowed identified needs to be more swiftly met.[45,46]

Family 2: Targeting specific frailty needs

Out of the 29 intervention studies, 6 related to screening and targeting specific frailty needs. The interventions were conducted in Spain (n=2),[58,59] and in (n=1) Australia,[60] Austria,[61] China,[62] and Japan.[63]

In the main, these interventions aimed to address a specific need and produce observable outcomes such as mobility, functional, cognitive and emotional status, psychosocial status, hospitalization 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,[62] and resistance exercise, nutritional and psycho-social prorgammes.[63]

Key factors influencing implementation (Figure 4)

A. Distribution of resources and professionals skill-sets

Our analysis of this family of interventions suggested that compared to 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 (i.e. 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 i.e. physical activity, nutritional intake, memory workshop and medication review. The monitoring was a priority: every 2 weeks there was 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] GPs skills were successfully used to perform medication reviews, where patients were re-educated about unnecessary drugs and successfully reduced their use.[58]

B. 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.[62] After training, 'caregivers were requested to spend two 20 minutes sessions per week with the elderly doing homework assigned by the activity group'.[62] Participants revealed that they were in a better mood after the intervention,[62] and they experienced a significantly higher satisfaction in their ability to perform daily living activities.[62] In another multifactorial intervention in Japan, a psychosocial programme was conducted alongside the exercise and nutritional programmes.[63] The psychosocial programme consisted 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.[63] In another home-based intervention performed in Austria, trained non-professional volunteers visited malnourished frail older persons twice a week for approximately one 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.[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.[58,63]

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 to 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 (Supplementary Table S5). We included only studies that focused mainly on a frail population, but acknowledge that targeting older people with pre-frailty 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 was 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 (e.g. 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 comprehensive geriatric assessments.[13] Gardner et al [13] 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 co-designing interventions, with a randomized control 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] suggests that a CGA approach potentially works if the resources and professionals skill set (i.e. 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 stigmatizing needs, known as 'hidden needs', such as cognitive problems.[76] This RRR further suggests that incorporating social dimensions of care into interventions design may reduce the potential for loneliness and isolation and so enhance their implementation.[28,47,63,62,77–

[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 (e.g. 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 co-design.

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 over-assessment of people living with frailty. Earlier involvement of patients is another key factor that may facilitate implementation and increase adherence to the intervention.

Author contributorship

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

Competing interests

None declared

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Data sharing statement

No additional data are available.

Ethic statement

Ethics approval was not required.

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Figure 1: Modified PRISMA flow diagram for the primary literature search

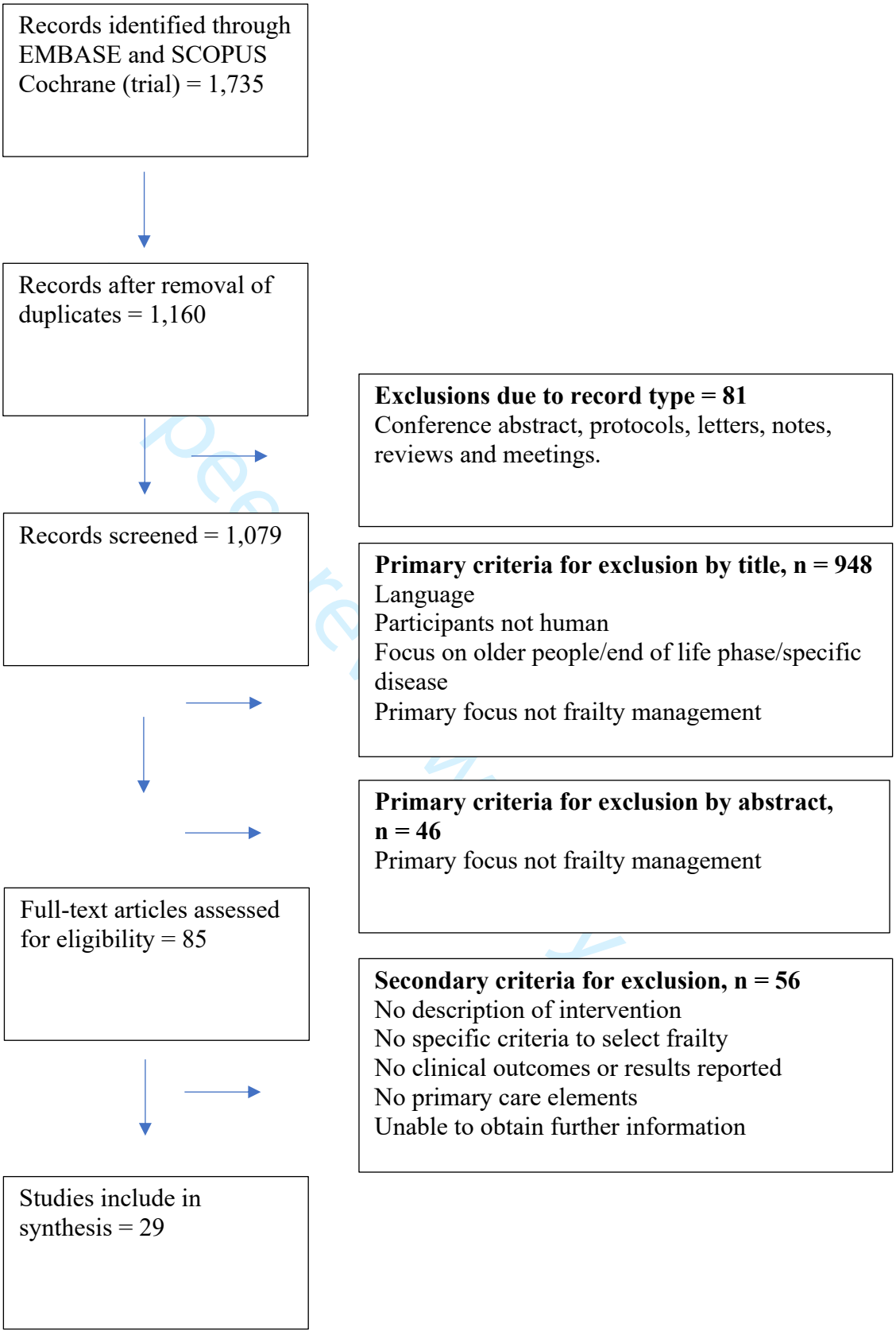

Figure 2: Secondary search processes

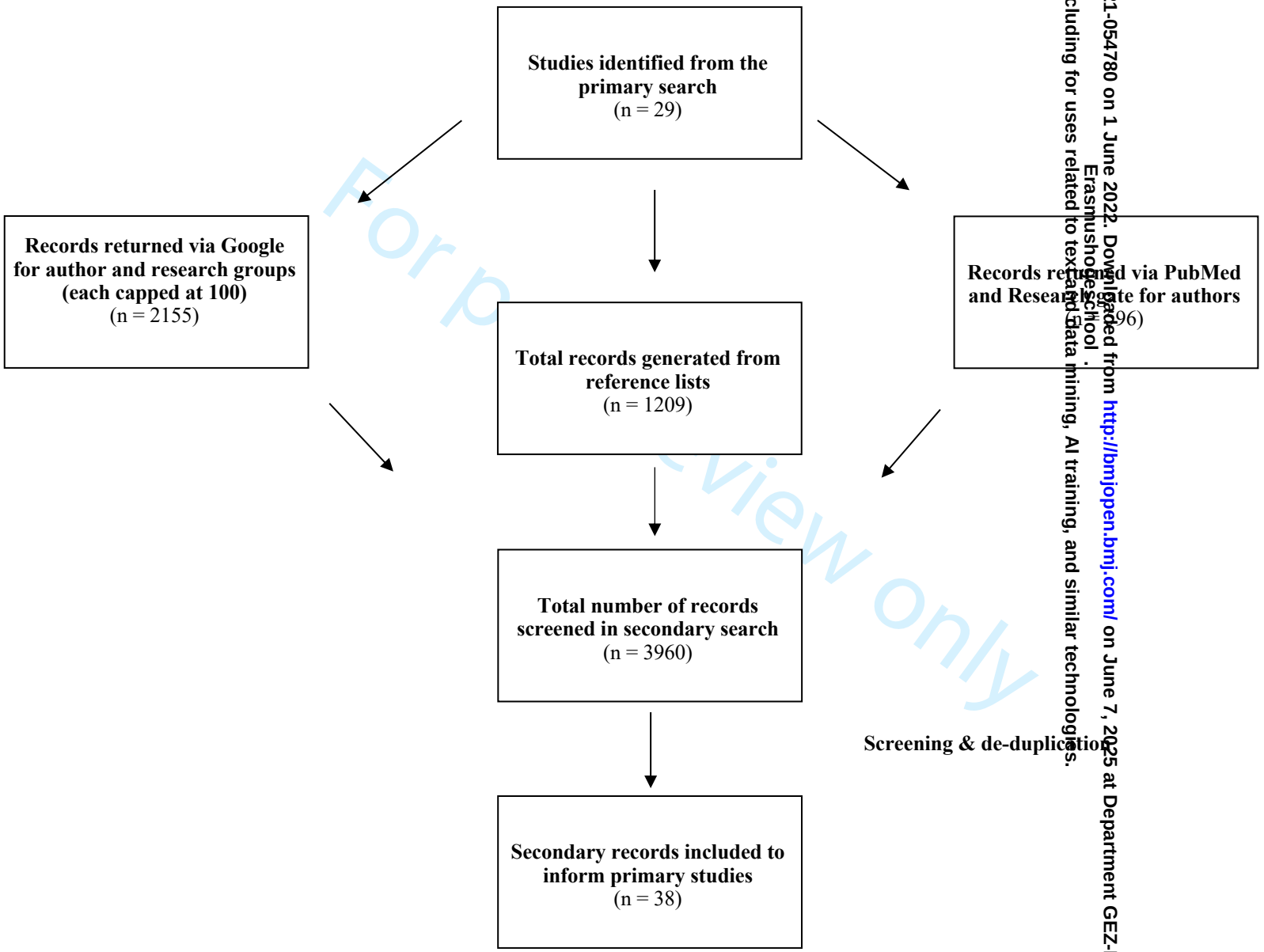

Figure 3: Summary of identified context, mechanisms and outcomes for family 1 – comprehensive assessment and management of frailty

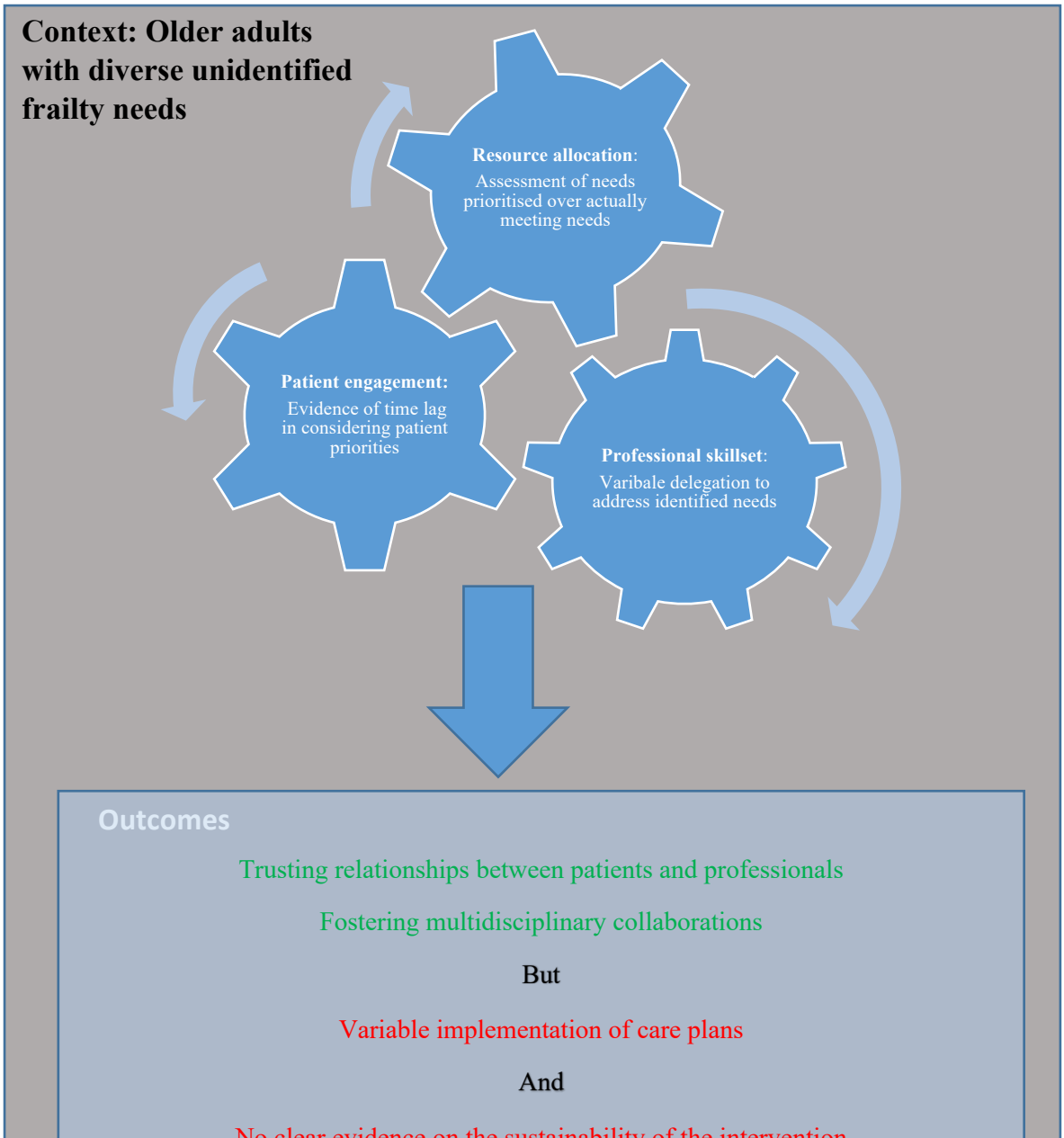

Figure 4: Summary of identified context, mechanisms and outcomes for family 2 – Targeting specific frailty needs

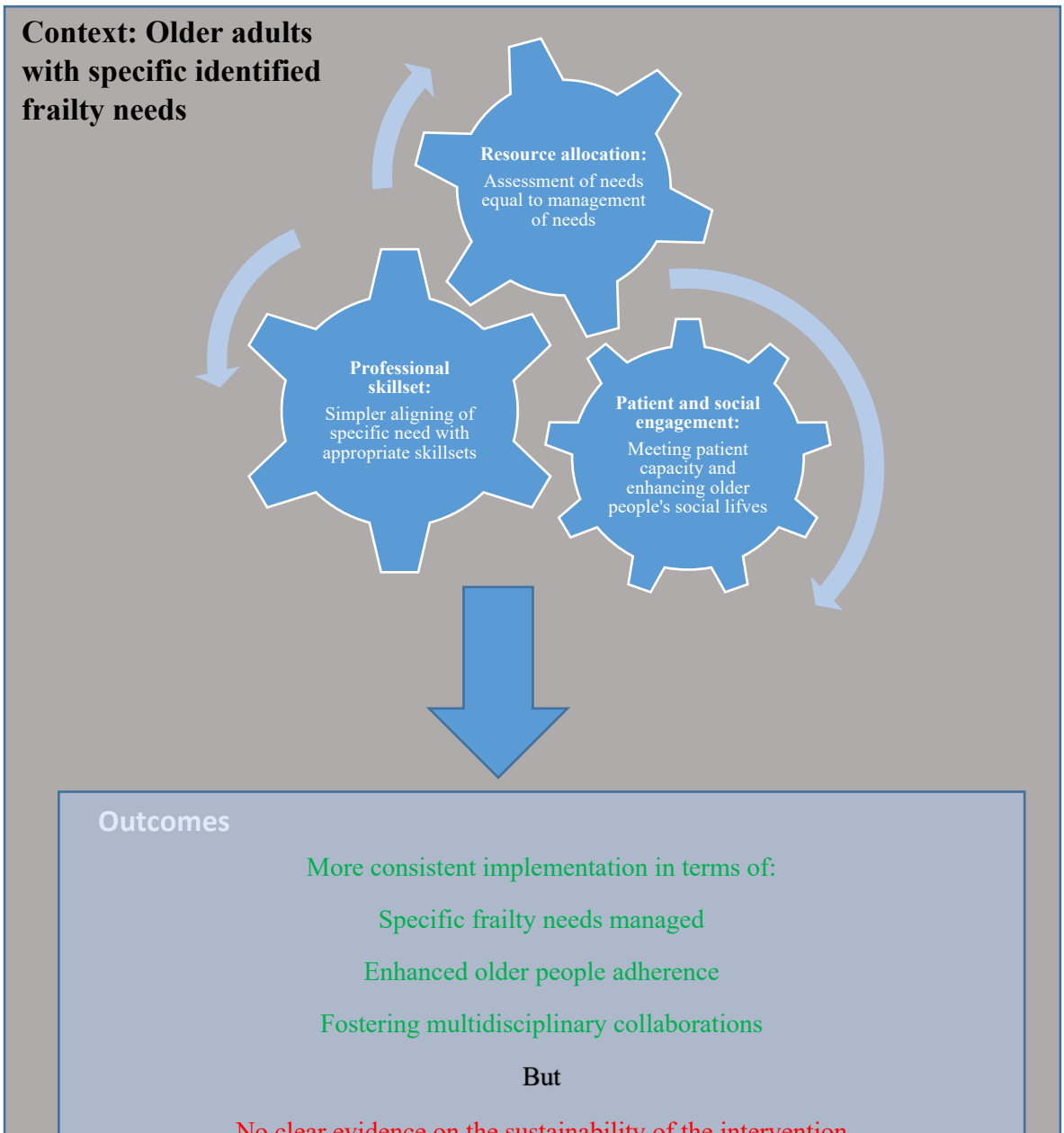

Table S1: First data extraction tool

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 S2: ICMO extraction tool

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

Table S3: 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 intervention function)	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?
	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 S4: 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 Bergeron 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 Olmera-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 Tarazona-Santabalbina 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 Lugtenberg 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 Sajino 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 MN 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.	Heinie P 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 community-dwelling frail older people: Cost-effectiveness study alongside a cluster randomised controlled trial		Metzelthin et al. (2015)	4
Implementing care programmes for frail older people: A project management perspective.		Jill Candy Isa 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. 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	Karen M van Leeuwen et al. (2015)	3
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)	3
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 Vetrigens 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. Stuman et al. (1999)	3
Implementation of an innovative web-based conference table for community-dwelling 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 H. 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).	Willemina Mijntje Looman et al. (2014)	4

Cost-effectiveness of a multidisciplinary intervention model for community-dwelling 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.	Rene 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.	Frank 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 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.	Nienke Pleijenberg RN et al. (2017)	3
Frail Older Adults' Experiences With a Proactive, Nurse-Led Primary Care Program		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. (2015)	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 Fabla 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 S5: 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, Australia	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 criteria.	267/352	Barcelona	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 1 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	Francisco José Tarazona-Santabalbina et al. (2016)	Participants were randomized a volunteer who were sedentary, with a gait speed lower than 0.8	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	The MEP was very effective in improving the PPB (P<.001), SPPB (P¼.007), and in lowering of the frailty score assessed by Linda	Limited paper – there was not clear enough data on how the frailty intervention was implemented.

Community-Dwelling Frail Elderly: A Randomized Clinical Trial		meters per second and frail (met at least 3 of the frailty phenotype criteria).			functional performance measure. Those in the intervention group performed 65 minutes of daily activities, 5 days per week for 24 weeks.	Fried' criteria and Edmonton. The statistical analysis showed that in 31.4% of the intervention group, frailty was reversed after the exercise training program.	
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 community-dwelling 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, excepting 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 (COOP-WONCA 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	Metzelthin SF et al. (2013)	Older people (≥ 70 years) and (score ≥5 on	6 GP practices GPs = 12	Netherl ands	Nurse led interdisciplinary approach - frail older	Professionals and frail elderly were satisfied.	Time pressures was affecting the implementation

to prevent disability among community-dwelling frail older people: A large-scale process evaluation.		GFI).	Nurses = 7 OT= 6 PT= 20 Frail = 194		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.		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 patients consumed time. Lack of clarity on having an early purpose on what they were trying to achieve.
Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people: Cluster randomised controlled trial.	Slike Metzelthin et al. (2013)		270 /346	Netherl ands		No different with regards to disability	
Reducing disability in community-dwelling frail older people: Cost-effectiveness 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 multi-dimensional 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 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.			nurses 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. 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		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
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)		1147	Netherl ands		level of adherence varied between professionals, which most likely can be attributed to professional's individual characteristics and circumstances.	
Expanding access to pain care for frail, older people in primary care: A crosssectional study	Maaike E Muntinga et al. (2016)		781/ 1147	Netherl ands		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	Netherl ands		No significant differences between the GCM and usual care group, better maintenance of ADL activities 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	Netherl ands	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)	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, follow-up 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	290 frail older people, 169 professionals participated in the ZWIP	Netherlands	The ZWIP consists of information about the frail older person's health, functioning and social situation, contact information about professionals	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.

		in the province of Gelderland or Noord-Brabant, the Netherlands; their informal care- givers; and healthcare and welfare professionals involved in their care.			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.		
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 EASY-Care two-step older persons screening instrument.	369/536	Netherlands	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.	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	2489/ 3092	Netherlands	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	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	Early involvement of patient was not clear Nurses did not address some of the clinical needs e.g. social care.

		included in a quarterly report when they met at least 1 of the			who were identified as frail received a home-based Comprehensive Geriatric Assessment, followed by evidence-based care planning, care coordination and follow-up.	frailty screening had a low probability to cost effect.	Resources of collaboration was always an issues.
Frail Older Adults' Experiences With a Proactive, Nurse-Led Primary Care Program	Bleijenberg, N et al. (2015)	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.	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 the but only when this service 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	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	Unclear how the technology helped to have a positive effect on frailty scores.

					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.	a sense of security in the patient could diminish the level of risk.	
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 free-of-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 speed, weakness, memory complaints, involuntary weight loss, poor social support). GFI was used to support the identification processes.	112/134 (The total number who completed the intervention out of the total who recruited)	Spain	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.	The reported improvement of physical function was statistically and clinically significant. The benefits were consistent across different initial frailty degrees, from milder to more advanced.	Clarity in the alignment between the assessment and management the needs, socialization 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

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Reporting checklist for systematic review (with or without a meta-analysis).

Based on the PRISMA guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title			
Title	#1	Identify the report as a systematic review	1
Abstract			
Abstract	#2	Report an abstract addressing each item in the PRISMA 2020 for Abstracts checklist	2
Introduction			
Background/rationale	#3	Describe the rationale for the review in the context of existing knowledge	3-4
Objectives	#4	Provide an explicit statement of the objective(s) or question(s) the review addresses	4
Methods			

Eligibility criteria	#5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses	6
Information sources	#6	Specify all databases, registers, websites, organisations, reference lists, and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted	5
Search strategy	#7	Present the full search strategies for all databases, registers, and websites, including any filters and limits used	7
Selection process	#8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and, if applicable, details of automation tools used in the process	6
Data collection process	#9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and, if applicable, details of automation tools used in the process	8
Data items	#10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (for example, for all measures, time points, analyses), and, if not, the methods used to decide which results to collect	6
Study risk of bias assessment	#11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and, if applicable, details of automation tools used in the process	8
Effect measures	#12	Specify for each outcome the effect measure(s) (such as risk ratio, mean difference) used in the synthesis or presentation of results	NA
Synthesis methods	#13a	Describe the processes used to decide which studies were eligible for each synthesis (such as tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5))	7

Synthesis methods	#13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics or data conversions	7
Synthesis methods	#13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses	NA
Synthesis methods	#13d	Describe any methods used to synthesise results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used	4-5
Synthesis methods	#13e	Describe any methods used to explore possible causes of heterogeneity among study results (such as subgroup analysis, meta-regression)	7
Synthesis methods	#13f	Describe any sensitivity analyses conducted to assess robustness of the synthesised results	7
Reporting bias assessment	#14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases)	8
Certainty assessment	#15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome	7
Data items	#10b	List and define all other variables for which data were sought (such as participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information	7
Results			
Study selection	#16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram (http://www.prisma-statement.org/PRISMAStatement/FlowDiagram)	9-10
Study selection	#16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded	10
Study characteristics	#17	Cite each included study and present its characteristics	11-16
Risk of bias in studies	#18	Present assessments of risk of bias for each included study	8

Results of individual studies	#19	For all outcomes, present for each study (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (such as confidence/credible interval), ideally using structured tables or plots	NA
Results of syntheses	#20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies	NA
Results of syntheses	#20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (such as confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect	NA
Results of syntheses	#20c	Present results of all investigations of possible causes of heterogeneity among study results	NA
Results of syntheses	#20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesised results	NA
Risk of reporting biases in syntheses	#21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed	NA
Certainty of evidence	#22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed	NA
Discussion			
Results in context	#23a	Provide a general interpretation of the results in the context of other evidence	16
Limitations of included studies	#23b	Discuss any limitations of the evidence included in the review	17
Limitations of the review methods	#23c	Discuss any limitations of the review processes used	17
Implications	#23d	Discuss implications of the results for practice, policy, and future research	18
Other information			
Registration and protocol	#24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered	4

Registration and protocol	#24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared	NA
Registration and protocol	#24c	Describe and explain any amendments to information provided at registration or in the protocol	NA
Support	#25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review	19
Competing interests	#26	Declare any competing interests of review authors	19
Availability of data, code, and other materials	#27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review	27

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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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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 re-run in 8th of 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 (RAMESES) quality and publication criteria for our synthesis to systematically analyse and synthesize the existing literature and to identify (intervention-context-mechanism-outcome) configurations. We used normalization processes theory (NPT) to illuminate mechanisms surrounding implementation.

Results: Our primary research returned 1,755 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 over-assessment of frail individuals. Second, earlier patient involvement may also improve intervention implementation and adherence.

Key words: frailty, general practitioners, interventions, tools, older people.

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 RAMESES standards entailing development and comparative analysis of ICMO configurations (intervention, context, mechanism, outcome).
- Normalisation process theory (NPT) constructs helped us to highlight factors surrounding the implementations 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' populations within primary studies and excluded related elderly populations whom did not diagnosed with frailty.

Introduction

Frailty is a promising but also somewhat contested multidimensional syndrome characterized 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 (e.g. pre-frail 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 guidelines to support primary care providers working with older people.[12] However, a recent systematic review highlighted limited

and mixed evidence concerning the introduction of comprehensive geriatric assessments 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 e.g. 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] Fisterra guideline in Spain updated in 2020 "Frail elderly people: detection and management in primary care" highlighted 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 significant barrier to identifying and managing frailty in primary care.[15] Accordingly, screening for frailty in primary care are 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 persons' frailty, which might help to overcome the challenges of providing good care for an expanding aging 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 of the literature to understand factors that support or inhibit implementation of frailty interventions in primary care.

Patients and public involvement

No patients or public were involved in this study.

Study design

This study has been informed by the principles underpinning rapid realist reviews (RRR)[17] in conjunction with normalization 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 synthesis (RAMESES) publication standards.[20]

As stated by Saul et al, rapid realist review 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, mechanisms, outcomes (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 (MeSH) and key words highlighted (Supplementary 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 re-run in 8th of 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 (Supplementary 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 acknowledgment 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 aim (Table 1). On a weekly meeting, TB checked all of included studies. Then, following the secondary exclusion criteria, KA scanned and included studies, 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.

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 e.g. studies only focussed on the pre-frail 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.

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 focussed on recruiting a frail population (i.e. we only excluded studies where the sole focus was pre-frail populations). We included studies adopting any type of screening and case finding method for frailty, such as physical function, professionals' opinion, Groningen frailty indicator (GFI) or Tilburg frailty indicator (TFI) tools.

Data extraction

KA extracted the relevant data into a spreadsheet to prepare for analysis (Supplementary 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 (Supplementary Table S3). Following NPT, KA also applied a series of questions to guide the evaluation of factors affecting the implementation of an intervention (Supplementary Table S4). On a weekly basis, KA shared the ICMO model and an original copy of each intervention study with TB and JT, 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 JT) 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 summarized 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 (i.e. '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 (MMAT),[26] and confirmed with TB and JT. A score was assigned to each intervention for each appraisal criteria met (out of five), to inform the confidence of findings obtained (Supplementary Table S5). This approach was helpful in focusing on more comprehensive papers without excluding any weaker papers.[27]

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 (Supplementary Table S6), and a list of the records identified by the secondary search is provided in (Supplementary file1).

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 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 Comprehensive Geriatric Assessment (CGA),[28,48] the Resident Assessment Instrument–Home Care version (RAI-HC),[29,45] the interRAI Community Health Assessment instrument,[41–44] or the Easy-Care instrument.[32,34] In conjunction with 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 interventions in the community.[47]

Key factors influencing implementation

A. 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 (GCM), nurses spent 50 to 90 minutes conducting the initial assessment, an average of 37 minutes writing care plans, and a further 40 minutes 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 preventive home visitation programme, invested on average 85 minutes 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 persons' living environment, which supported decision making (i.e., 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 was 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 facilitators that allowed the intervention to be adaptable and sustainable for primary care teams and for older people (Figure 3).[47]

B. 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 on 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 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).

C. 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 skillset. For example, nurses were responsible for the assessment and development of the care plan, and were reported to have good organization 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 (i.e. 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, 6 related to screening and targeting specific frailty needs. The interventions were conducted in Spain (n=2),[58,59] and in (n=1) Australia,[60] Austria,[61] China,[62] and Japan.[63]

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

hospitalization 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,[62] and resistance exercise, nutritional and psycho-social prorgammes.[63]

Key factors influencing implementation

A. Distribution of resources and professionals skill-sets

Our analysis of this family of interventions suggested that compared to 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 (i.e. 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 i.e. physical activity, nutritional intake, memory workshop and medication review. The monitoring was a priority: every 2 weeks there was 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] GPs skills were successfully used to perform medication reviews, where patients were re-educated about unnecessary drugs and successfully reduced their use (Figure 4).[58]

B. 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.[62] After training, 'caregivers were requested to spend two 20 minutes sessions per week with the elderly doing homework assigned by the activity group'.[62] Participants revealed that they were in a better mood after the intervention,[62] and they experienced a significantly higher satisfaction in their ability to perform daily living activities.[62] In another multifactorial intervention in Japan, a psychosocial programme was conducted alongside the exercise and nutritional programmes.[63] The psychosocial programme consisted 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.[63] In another home-based intervention performed in Austria, trained non-professional volunteers visited malnourished frail older persons twice a week for approximately one 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.[58,63]

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 to 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 (Supplementary Table S6). We included only studies that focused mainly on a frail population, but acknowledge that targeting older people with pre-frailty 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 was 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 (e.g. 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 comprehensive geriatric assessments.[13] Gardner et al [13] 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 co-designing interventions, with a randomized control 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] suggests that a CGA approach potentially works if the resources and professionals skill set (i.e. 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 stigmatizing needs, known as 'hidden needs', such as cognitive problems.[76] This RRR

further suggests that incorporating social dimensions of care into interventions design may reduce the potential for loneliness and isolation and so enhance their implementation.[28,47,63,62,77–79] 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 (e.g. 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 co-design.

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 over-assessment of people living with frailty. Earlier involvement of patients is another key factor that may facilitate implementation and increase adherence to the intervention.

Author contributorship

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

Competing interests

None declared

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Data sharing statement

No additional data are available.

Ethic statement

Ethics approval was not required.

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Modified PRISMA flow diagram for the primary literature search

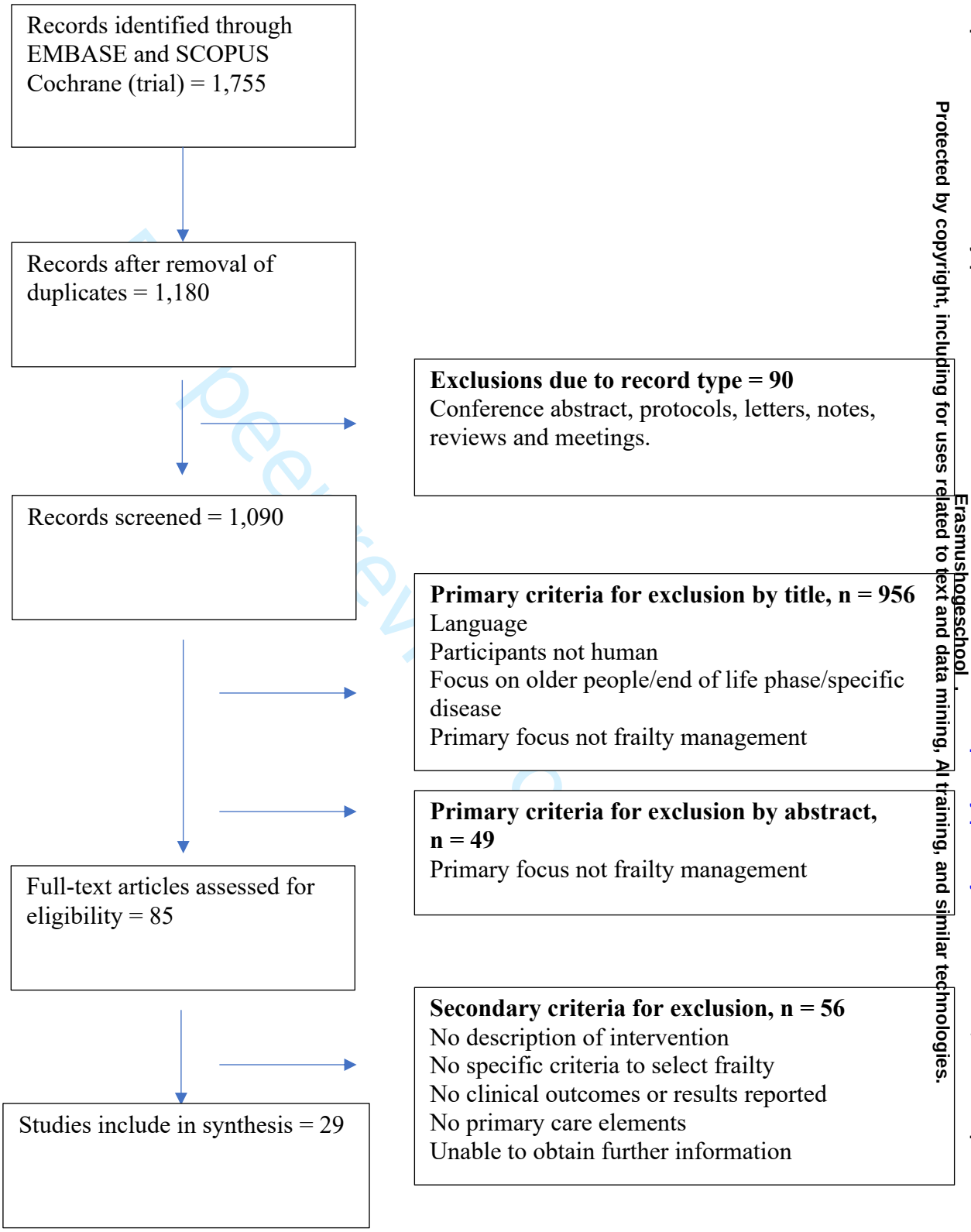

Figure 2: Secondary search processes

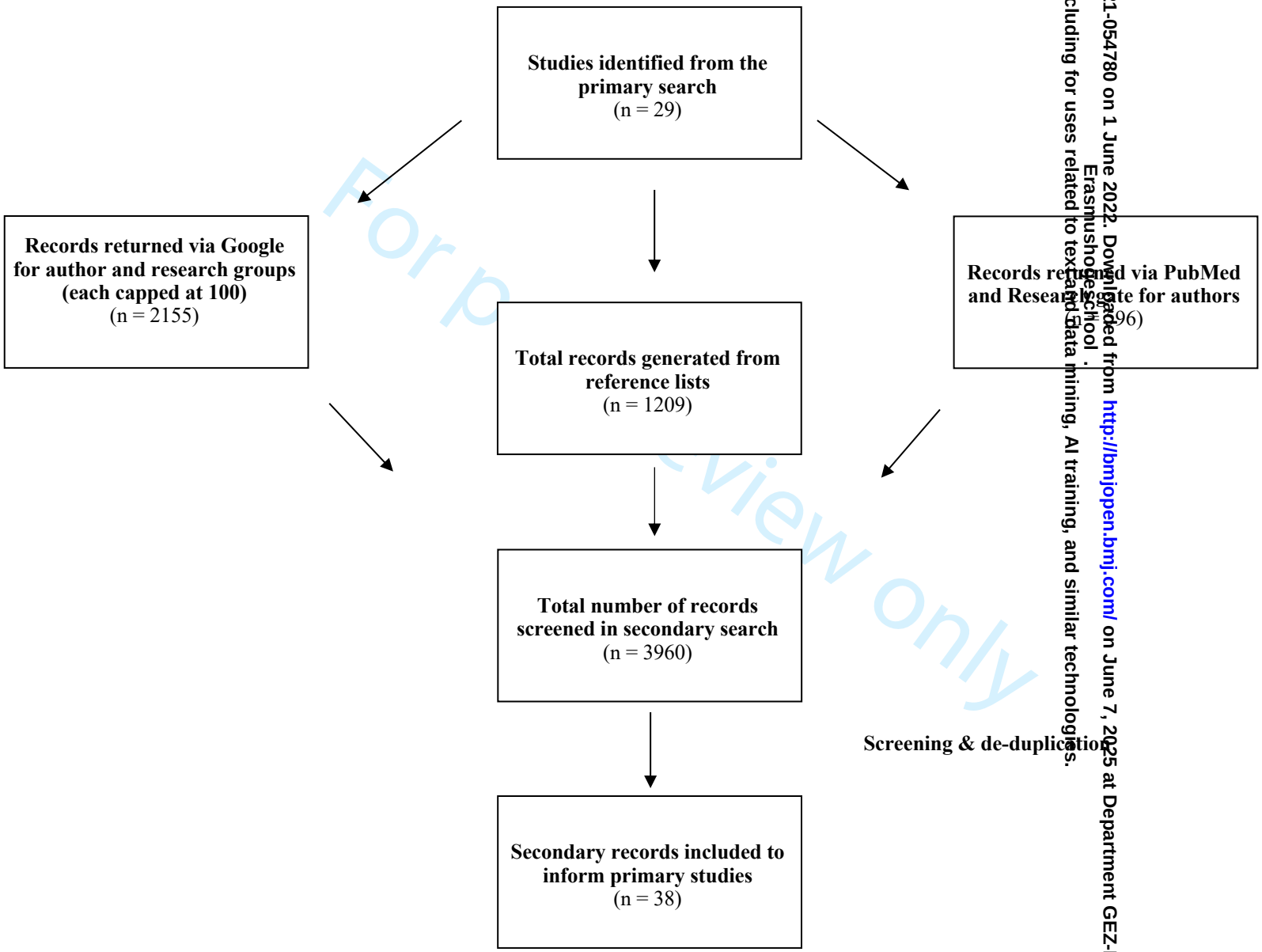

Figure 3: Summary of identified context, mechanisms and outcomes for family 1 – comprehensive assessment and management of frailty

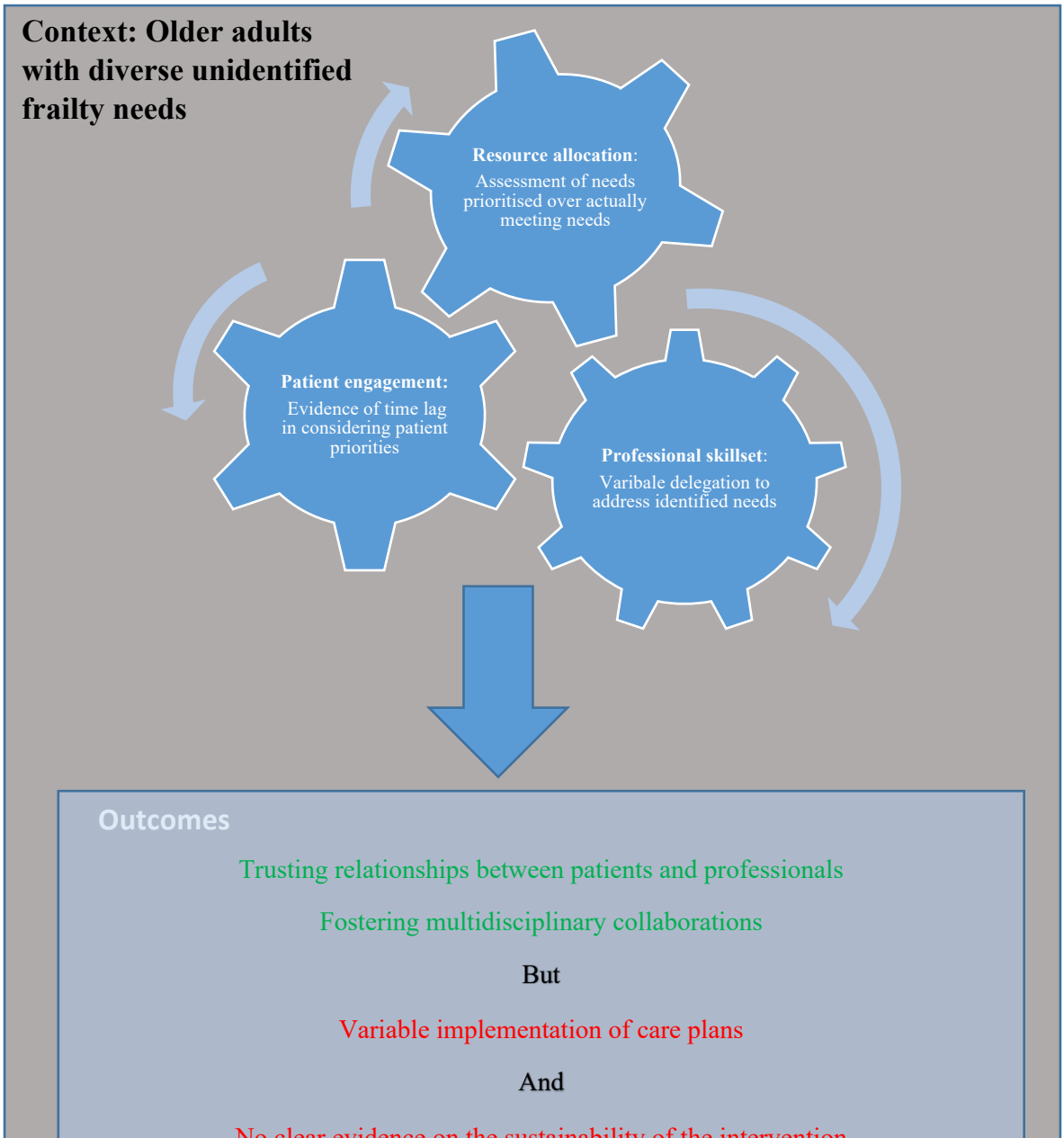

Figure 4: Summary of identified context, mechanisms and outcomes for family 2 – Targeting specific frailty needs

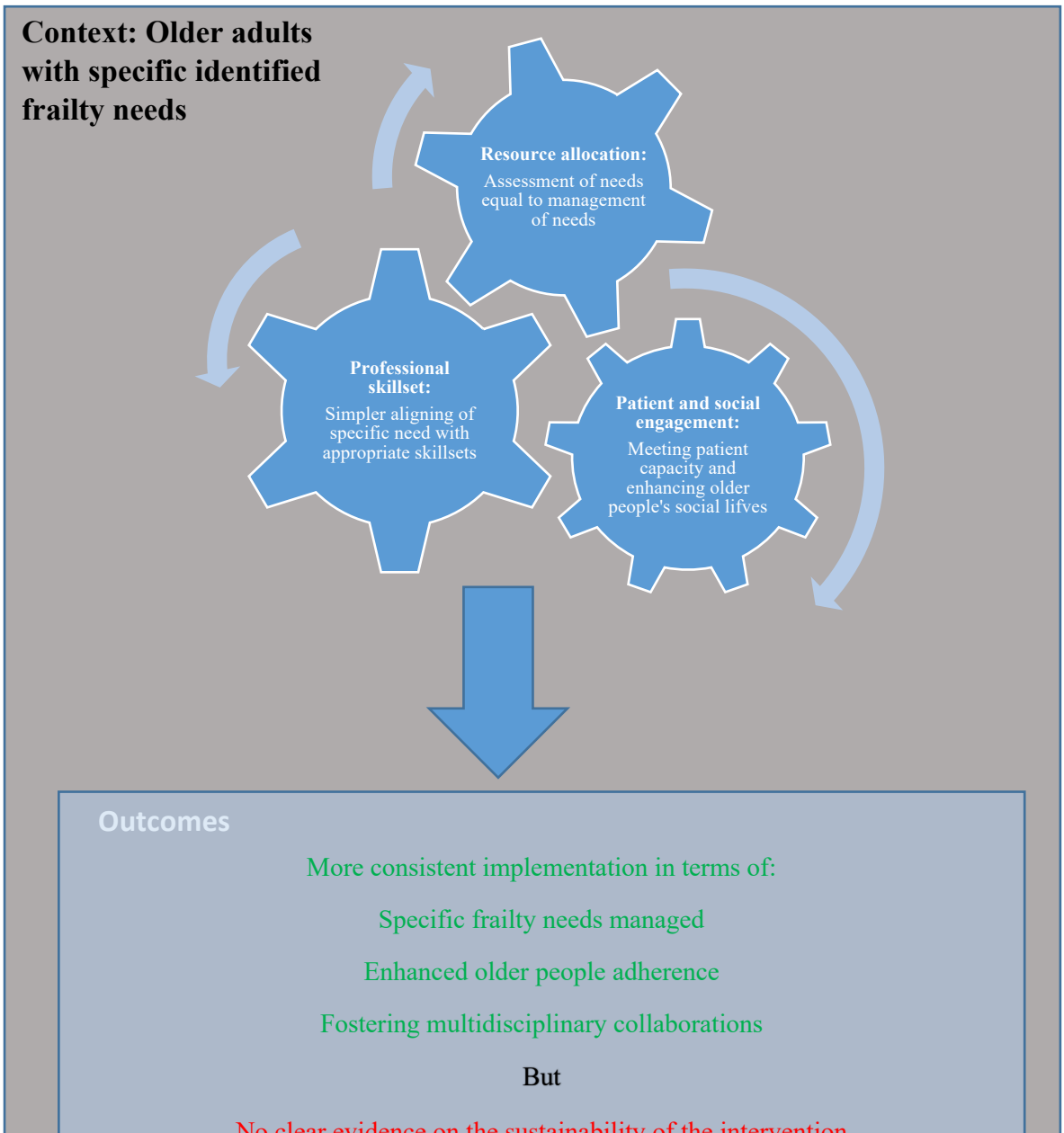

Table S1: Search Strategies

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. (2018)	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 Olazarán-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 Tarazona-Santabalbina 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 Lugtenberg 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 Iccino 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.	Heini E 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.	Metsemakers SF et al. (2013)	5
Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people: Cluster randomised controlled trial.		Slikke MJ, 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 Lindsa 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 T 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 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 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 Steigens 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 H.J. 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).	Willemina 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.	Renuj 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.	Franka 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 Buijenberg 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 Zazela 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, Australia	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 criteria.	267/352	Barcelona	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 6 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	Francisco José Tarazona-Santabalbina et al. (2016)	Participants were randomized a volunteer who were sedentary, with a gait speed lower than 0.8	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	The MEP was very effective in improving the PPT (p<.001), SPPB(p¼.007), and in lowering of the frailty score assessed by Linda	Limited paper – there was not clear enough data on how the frailty intervention was implemented.
Community-Dwelling Frail Elderly: A Randomized Clinical Trial		meters per second and frail (met at least 3 of the frailty phenotype criteria).			functional performance measure. Those in the intervention group performed 65 minutes of daily activities, 5 days per week for 24 weeks.	Fried criteria and Evaluation. The statistical analysis showed that in 31.4% of the intervention group, frailty was reversed after the exercise training program.	
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 based on vulnerable older persons.	How did the professionals link between needs and care was not clear.
A nurse-led interdisciplinary primary care approach	Metzelthin SF et al. (2013)	Older people (≥ 70 years) and (score ≥5 on	6 GP practices GPs = 12	Netherl ands	Nurse led interdisciplinary approach - frail older	Professionals and frail elderly were satisfied.	Time pressures was affecting the implementation
to prevent disability among communitydwelling frail older people: A large-scale process evaluation.		GFI).	Nurses = 7 OT= 6 PT= 20 Frail = 194		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		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 producing 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	Netherl ands	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	Netherl ands		A large share of persons 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	Netherl ands		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	Netherl ands	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	290 frail older people, 169 professionals participated in the ZWIP	Netherlands	The ZWIP consists of information about the frail older person's health, functioning and social situation, contact information about professionals	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.
		in the province of Gelderland or Noord-Brabant, the Netherlands; their informal care-givers; and healthcare and welfare professionals involved in their care.			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.		

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	Netherlnads	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 desire 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	Netherlands	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. And the nurse led to frailty screening had a low probability to cost effective	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 discharge 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 leas one sign of frailty (i.e. slow gai	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

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Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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In your methods section, say that you used the PRISMAreporting guidelines, and cite them as:

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R, Glanville J, Grimshaw JM, Hróbjartsson A, Lalu MM, Li T, Loder EW, Mayo-Wilson E, McDonald S, McGuinness LA, Stewart LA, Thomas J, Tricco AC, Welch VA, Whiting P, Moher D. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews

		Reporting Item	Page Number
Title			
Title	#1	Identify the report as a systematic review	1
Abstract			
Abstract	#2	Report an abstract addressing each item in the PRISMA 2020 for Abstracts checklist	2
Introduction			
Background/rationale	#3	Describe the rationale for the review in the context of existing knowledge	3-4
Objectives	#4	Provide an explicit statement of the objective(s) or question(s) the review addresses	4
Methods			

Eligibility criteria	#5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses	6
Information sources	#6	Specify all databases, registers, websites, organisations, reference lists, and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted	5
Search strategy	#7	Present the full search strategies for all databases, registers, and websites, including any filters and limits used	7
Selection process	#8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and, if applicable, details of automation tools used in the process	6
Data collection process	#9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and, if applicable, details of automation tools used in the process	8
Data items	#10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (for example, for all measures, time points, analyses), and, if not, the methods used to decide which results to collect	6
Study risk of bias assessment	#11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and, if applicable, details of automation tools used in the process	8
Effect measures	#12	Specify for each outcome the effect measure(s) (such as risk ratio, mean difference) used in the synthesis or presentation of results	NA
Synthesis methods	#13a	Describe the processes used to decide which studies were eligible for each synthesis (such as tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5))	7

Synthesis methods	#13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics or data conversions	7
Synthesis methods	#13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses	NA
Synthesis methods	#13d	Describe any methods used to synthesise results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used	4-5
Synthesis methods	#13e	Describe any methods used to explore possible causes of heterogeneity among study results (such as subgroup analysis, meta-regression)	7
Synthesis methods	#13f	Describe any sensitivity analyses conducted to assess robustness of the synthesised results	7
Reporting bias assessment	#14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases)	8
Certainty assessment	#15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome	7
Data items	#10b	List and define all other variables for which data were sought (such as participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information	7
Results			
Study selection	#16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram (http://www.prisma-statement.org/PRISMAStatement/FlowDiagram)	9-10
Study selection	#16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded	10
Study characteristics	#17	Cite each included study and present its characteristics	11-16
Risk of bias in studies	#18	Present assessments of risk of bias for each included study	8

Results of individual studies	#19	For all outcomes, present for each study (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (such as confidence/credible interval), ideally using structured tables or plots	NA
Results of syntheses	#20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies	NA
Results of syntheses	#20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (such as confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect	NA
Results of syntheses	#20c	Present results of all investigations of possible causes of heterogeneity among study results	NA
Results of syntheses	#20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesised results	NA
Risk of reporting biases in syntheses	#21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed	NA
Certainty of evidence	#22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed	NA
Discussion			
Results in context	#23a	Provide a general interpretation of the results in the context of other evidence	16
Limitations of included studies	#23b	Discuss any limitations of the evidence included in the review	17
Limitations of the review methods	#23c	Discuss any limitations of the review processes used	17
Implications	#23d	Discuss implications of the results for practice, policy, and future research	18
Other information			
Registration and protocol	#24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered	4

Registration and protocol	#24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared	NA
Registration and protocol	#24c	Describe and explain any amendments to information provided at registration or in the protocol	NA
Support	#25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review	19
Competing interests	#26	Declare any competing interests of review authors	19
Availability of data, code, and other materials	#27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review	27

This checklist was completed on 22. June 2021 using https://www.goodreports.org/, a tool made by the EQUATOR Network in collaboration with Penelope.ai