

BMJ Open Models of comprehensive care for older persons with chronic diseases: a systematic review with a focus on effectiveness

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ABSTRACT

Introduction Ageing entails a variety of physiological changes that increase the risk of chronic non-communicable diseases. The prevalence of these diseases leads to an increase in the use of health services. The care models implemented by health systems should provide comprehensive long-term healthcare. We conducted this systematic review to determine whether any model of care for older persons have proven to be effective.

Methods A systematic review of literature was carried out to identify randomised clinical trials that have assessed how effective a care model for older patients with chronic diseases. A searches electronic databases such as MEDLINE, Turning Research Into Practice Database, Cochrane Library and Cochrane Central Register of controlled Trials was conducted from January 1966 to January 2021. Two independent reviewers assessed the eligibility of the studies. Interventions were identified and classified according to the taxonomies developed by the Cochrane Effective Practice and Organisation of Care and Cochrane Consumers and Communication groups.

Results Of the 4952 bibliographic references that were screened, 577 were potentially eligible and the final sample included 25 studies that evaluated healthcare models in older people with chronic diseases. In the 25 care models, the most frequently implemented interventions were educational, and those based on the provision of healthcare. Only 22% of the outcomes of interventions were identified as being effective, whereas 21% were identified as being partially effective; thus, more than 50% of the outcomes were identified as being ineffective.

Conclusions It was not possible to determine a care model as effective. The interventions implemented in the models are variable. The most effective outcomes were focused on improving the patient–healthcare professional relationship in the early stages of the intervention. The interventions addressed in the studies were similar to public health interventions as their main objectives focused on promoting health. Most studies were of low methodological quality.

INTRODUCTION

Ageing increases the risk of suffering from chronic non-communicable diseases

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses, and recommendations of the Cochrane Collaboration, which are well recognised approaches for conducting of systematic reviews.
- ⇒ A wide search strategy was carried out in the main electronic databases. In addition, the Cochrane Central Register of controlled Trials was reviewed.
- ⇒ Two reviewers independently completed the studies selection, data extraction and assessment risk of bias of the studies; disagreements were resolved by consensus and discussion.
- ⇒ All the interventions addressed in the 25 studies are similar to public health interventions as their main aims were the promotion of health. The most important problem identified refers to the low quality of the studies based on the results assessed using the risk of bias tool.

(CNCDS), especially cardiovascular diseases, cancer, chronic respiratory diseases and diabetes.¹ According to estimates by the WHO, the population aged over 60 years may increase from 605 million in 2000 to two billion by 2050,^{1 2} with a subsequent increase in the prevalence of CNCDS. Estimates in the United States indicate that in 2020, around 157 million people were living with some CNCDS and more than 81 million were suffering from more than one CNCDS, a condition known as multimorbidity (defined as the concomitant presence of two or more CNCDSs).^{1 3} CNCDS are the leading cause of premature death and morbidity among adults aged 30–69 years, with over 12 million deaths annually in low-income to middle-income countries.^{4 5} As these countries continue to progress through the demographic transition, the prevalence of CNCDS and multimorbidity in older individuals will continue to rise.^{4 5}

The health status tends to deteriorate among those with CNCs, which translates into increases in the use of healthcare services, associated costs and mortality.¹ This phenomenon affects both high-middle-income and low-income countries. In the USA, CNCs will account for an annual economic burden (treatment costs and loss of economic output) of US\$4.2 trillion by 2023.⁶ On their part, middle-income countries in Latin America will have to cope with the increase in CNCs, including chronic mental health diseases such as depression, dementia and alcohol-related disorders.⁴

As health is determined by multiple genetic, cultural, environmental, educational, social and economic factors,⁷ the care models implemented by health systems should provide services that meet multifactorial needs through a multidisciplinary care model that adapts to the needs of each person and, to the different contexts in which they live and age.⁸ Therefore, the provision of long-term care at home, in institutions (nursing homes or prolonged hospital stays), and in the community needs to be considered.²

There are different models of comprehensive integrated care for older individuals, among which the Integrated Care for Older People guidelines by the WHO is notable. This model promotes the detection and management of the decrease in the intrinsic capacity of older individuals as well as interventions to support caregivers. However, these guidelines do not provide for the specific care of CNCs or multimorbidity.⁹

Various studies have analysed the impacts of multimorbidity in older people and the effects of implementing care models for older people with multimorbidity.^{10–14} For instance, the outcomes from a systematic review have revealed that multimorbidity is associated with disability and negatively affects the quality of life while increasing health service use and health care-related costs. Part of these costs result from preventable complications.^{10 11} Another review evidenced that personalised and collaborative care planning tends to yield modest beneficial effects in terms of physical and psychological health along with self-care and that these effects become more evident when the intervention is more intensive and comprehensive and is integrated into routine patient care.¹²

Most of the older people, especially those in low-income and middle-income countries, live and age within the community and have limited access to high-specialty care. For this reason, it would be necessary to focus the provision of healthcare services for older individuals on the community and in the primary healthcare level.¹

In response to the need for improving healthcare for older persons there have appeared different care models focused on providing continuous care for chronic problems within the community or at the first level of care.^{9–14} These models of care tend to have multiple components and different interventions. Their effectiveness has been measured in terms of various outcomes and there have been few efforts at doing systematic evaluations of the results. This systematic review is intended to identify and

describe the effectiveness of different models of care for people aged 60 years and above with a focus on the management of CNCs at the first level of care or on a community basis.

METHODS

A systematic review of literature was carried out to identify randomised clinical trials that had assessed a model of care for the comprehensive care and management of older patients with CNCs. Chronic disease was defined as any slowly progressive long-lasting NCD, which usually requires long periods of supervision, observation or care.¹⁵

Studies with institutionalised, terminally ill and hospitalised patients or studies with patients in emergency units were excluded.

We considered a model of care to be effective when the study presented statistically significant improvement or benefits in the outcomes they assessed.

Literature search

MEDLINE, Turning Research Into Practice Database, Cochrane Library and Cochrane Central Register of controlled Trials were searched during the period from January 1966 to January 2021 to identify articles published in English and Spanish. The search strategies were based on free text terms and Medical Subject Headings terms (see online supplemental file 1). The terms used included elderly, oldest, old, aged, older, adults, chronic disease, chronic condition, illness, chronic illness, chronically, multiple chronic conditions, comorbidity or multimorbidity, primary healthcare, community health services, and health planning, model of care, integrated care, healthcare intervention programmes, clinical trial, randomised clinical trial, among others.

Data collection and extraction

Two independent reviewers assessed the studies' eligibility for inclusion. Disagreements were resolved by consensus with the aid of a third reviewer.

A reviewer entered the data obtained in predesigned Excel tables (Microsoft Office Excel 2007) and a second reviewer double-checked them.

Data analysis

The interventions were categorised according to the taxonomy developed by the Cochrane Effective Practice and Organisation of Care (EPOC) group, which is used to classify interventions from healthcare systems. The taxonomy in detail had been previously published,¹⁶ and the four main domains assessed in the taxonomy were: delivery arrangements, financial arrangements, governance arrangements and implementation strategies.

In addition, the data were categorised according to the Cochrane Consumers and Communication group's taxonomy.¹⁷ This taxonomy identifies outcomes that are potentially relevant and meaningful for healthcare

professionals, patients (consumers), general public, administrators as well as policy or decision-makers. This tool provides a comprehensive list with three main domains (consumer-oriented outcomes, healthcare provider-oriented outcomes and health service delivery-oriented outcomes).¹⁸ The outcomes were classed into three epigraphs based on their efficacy. The first epigraph, which was named 'effective', included the outcomes with clinical and statistical significance in favour of the group that received the intervention during each of the periods measured. The second epigraph, named as 'partially effective', included the outcomes that showed clinical significance (according to the author) but not statistical significance. This epigraph also included the outcomes that had been measured using different scales as well as those that showed clinical or statistical significance in favour of the intervention, although only in some of its measurements, within the intervention period. The last epigraph, named 'ineffective', included those outcomes with no significant clinical or statistical difference between the group that received the intervention and the control group. Finally, the outcomes were identified as primary or secondary based on the Cochrane EPOC group classification, which indicates the outcomes that are most relevant to patients as well as decision-makers.

Additionally, two independent reviewers assessed the methodological quality of the studies using the risk of bias tool.¹⁹

A qualitative synthesis of the outcomes was performed and the results of the same are shown in tables. However, a combined analysis of the effect of the interventions was not possible given the heterogeneity in the results and measures of effect.

Patient and public involvement

In this review, the participation of patients and the public has not been considered. However, we consider that knowing the interventions implemented in care models focused on elderly, as well as their effectiveness, can support and improve patient care. In addition, it will allow to know needs and future strategies to be implemented.

RESULTS

A total of 4952 bibliographic references related to the study topic were identified. Once duplicated entries were eliminated, 3193 titles and abstracts were reviewed for eligibility; among these, 577 articles that had been identified as relevant were reviewed in full text, to finally select 25 studies (figure 1). A total of 20 randomised controlled trials (RCTs) and 5 cluster RCTs, evaluating 25 healthcare models implemented in older people with CNCs, were included. Most studies were conducted in the USA (n=14); three in the Netherlands; two in Germany and the rest were in UK, Canada, Australia, Italy, Spain and Sweden.

Characteristics of the care models and type of interventions

The studies included a total of 15888 adults aged over 60 years with multimorbidity. Of these, 9187 belonged to the group that received care through one of the models, whereas 6701 belonged to the group that received the usual care. The most commonly reported CNCs in the studies were cardiovascular diseases, arthritis, mental illness (depression), nervous system disease (chronic pain), diabetes, chronic obstructive pulmonary disease and cancer.

The different models assessed in the studies included multidisciplinary care teams, including health professionals such as nurses, pharmacists, social workers, primary care doctors, physiotherapists, specialist doctors (cardiology and endocrinology), psychologists, occupational therapists and people who had previously received training on care for older adults. Eight studies revealed that the care models only considered one type of health professional to provide patient care (doctor, nurse or pharmacist).²⁰⁻²⁷ One study reported that there was no requirement for a health professional, but caregivers with experience caring for patients with Alzheimer's or other dementias as well as people with multimorbidities at the community level were required (see table 1).²⁸

The follow-up of the studies ranged between 3 and 32 months. Regarding the funding, 10 studies^{20 21 29-36} received at least one type of support or funding from a combination of different funders, including public hospitals, medical or pharmaceutical benefit schemes, support from the department of veterans affairs, regional home services, fee-for-service, prepaid plans or health plans and even a non-profit model. The remaining 15 studies^{22-28 37-44} did not report having received any funding whatsoever. The main features of the studies are described in table 1.

Each intervention of the identified models was analysed and subsequently classified based on its characteristics into one or more subcategories following the taxonomy proposed by the Cochrane EPOC group. A total of 23 different subcategories were identified. Table 2 represents the frequencies of use of each subcategory for the 25 studies analysed. The most commonly used type of intervention corresponds to the subcategory called 'educational meetings', which is defined as the attendance of courses, workshops, conferences or other educational events. This type of intervention belongs to the 'Implementation Strategies' domain. Online supplemental table 1 shows the topics covered by the 'educational meetings' intervention. Despite the fact that the studies reported having implemented a care model or programme, eight studies were identified as having administered a single intervention (table 2).^{23 26 28 32 38 42-44}

Based on the taxonomy proposed by the Cochrane EPOC group. Implementation strategies are interventions designed to bring about changes in healthcare organisations, the behaviour of healthcare professionals or the use of health services by healthcare recipients.

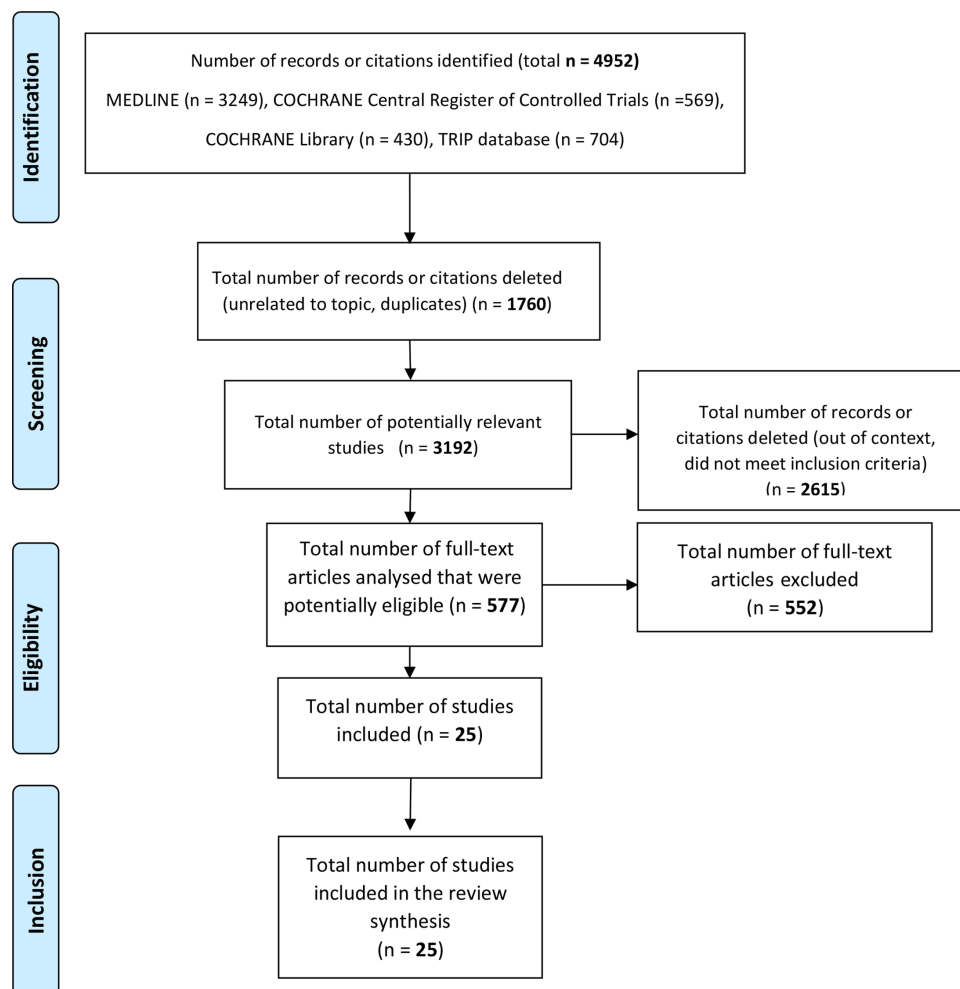


Figure 1 Flow chart demonstrating the study selection process. TRIP, Turning Research Into Practice.

In 12 studies, the administered intervention included the combination of 2 different subcategories.^{22 24 27 29–31 33 35 37 39–41} In most studies, at least one subcategory corresponded to ‘implementation strategies (educational),^{22 24 27 29–31 33 35 37 39 41} in combination with some other strategy. For example, with the intervention of ‘prescribing’ which is defined as ‘the selection of a drug by a duly qualified health worker to treat a patient’s health condition’,¹⁷ or the ‘site of service delivery’, which is defined as ‘changes in the place where care is provided; for example, home vs health centre, hospitalisation vs outpatient, specialised centre versus non-specialised centre’.¹⁷

In two studies, a combination of three subcategories to conduct the intervention^{21 34} was observed. In these studies, there was at least one educational subcategory, which was not necessarily intended for the patient but for the health providers, for example, through the intervention called ‘interprofessional education’, which is defined as ‘continuing education for health professionals involving more than one profession in combined and interactive learning’.¹⁷ By way of example, other types of interventions administered included ‘site of service delivery’, ‘voucher schemes’, defined as ‘the provision

of vouchers that can be exchanged for health services at specific facilities’.¹⁷ Finally, in two studies, the intervention was classified into four different subcategories. A study by Battersby *et al*³⁵ sought to verify whether coordinated care could improve health outcomes. To do this, the intervention subcategories used comprised of ‘care pathways’ (defined as the link between evidence and daily practice in specific conditions), ‘case management’ (defined as the introduction, modification or elimination of strategies to improve the management of patients), ‘teams’ (defined as the delivery of care through a multi-disciplinary team of healthcare workers), ‘audit and feedback’ (defined as a summary of the performance of health workers over a specified period of time).¹⁷ In a study by Coleman *et al*,³¹ the objective was to try to reorganise the provision of primary care services to better meet the needs of older people with chronic diseases, and the following subcategories were used: ‘interprofessional education’, ‘educational outreach visits’ (defined as personal visits by a trained person to health workers in their own working settings to provide information aimed at changing practice), ‘tailored interventions’ (defined as interventions intended to change the selected practice based on an assessment of the obstacles that need

Table 1 Characteristics of the studies included

Study	Country	Design	Scope of development	Duration (months)	Objective	No of participants	Age in years	Conditions	Model or programme	Comparator	Health professionals
Battersby 2007 ³⁵	Australia	RCT	Primary care	20	Evaluate the coordinated care	4603 patients Intervention/control by area: central 271/138, southern 887/427, Eyre 1353/513, western 604/410	62–74	▲ COPD ▲ Diabetes	SA HealthPlus	Usual care	General practitioners Nurses Social workers
Beck 1997 ²⁹	USA	RCT	Primary care	12	Compare the impact of group outpatient visits.	321 patients Intervention 160/control 161	72–75	▲ Arthritis ▲ Hypertension	Cooperative Healthcare Clinic (CHCC)	Usual care	Cardiologist Endocrinologist Physical therapist Nurse
Boult 2013 ³⁶	USA	Cluster RCT	Primary care	32	Evaluate the effect of guided care (GC)	904 patients: intervention 485/control 419	77.2	▲ Chronic diseases	GC	Usual care	Nurses Primary care Physicians
Coleman 1999 ³¹	USA	RCT	Primary care	24	Improve outcomes of common geriatric syndromes in frail older adults	169 patients: intervention 96/control 73	77.4	▲ Diabetes	Chronic Care Clinics (CCC)	Usual care	Physicians Nurse Pharmacist Social worker
Coleman 2001 ³²	USA	RCT	Primary care	24	Reduce emergency department utilisation	295 patients: intervention 146/control 149	74.1–74.0	▲ Hypertension ▲ Diabetes ▲ COPD	A model of primary care group visit intervention	Usual care	Nurse Pharmacist Dietitian Social worker
Counsell 2007 ³²	USA	RCT	Primary care	24	Test the effectiveness of Geriatric Resources for Assessment and Care of Elders (GRACE)	951 patients: intervention 474/control 477	71.8 (5.6)	▲ Hypertension ▲ Arthritis ▲ Diabetes	GRACE	Usual care	Nurse Geriatrician Pharmacist Physical therapist Mental health Social worker
Cucinotta 2004 ⁴⁴	Italy	RCT	Primary care	6	Verify the effectiveness of home assistance	127 patients: Intervention 66/control 61	83.21–85.20	▲ Diabetes	Model of home assistance	Usual care	General practitioner Trained person
Dubbert 2002 ²⁰	USA	RCT	Primary care	12	Evaluate the effects of Seniors Telephone Exercise Primary Care Study (STEPS)	181 patients: Intervention 1 (n=59); Intervention 2 (n=62); Control (n=60)	60–80	▲ Diabetes ▲ Arthritis ▲ Cardiovascular and cerebrovascular diseases	* STEPS	No calls	Nurse
Duggleby 2018 ³⁸	Canada	RCT	Primary care	6	Evaluate the effectiveness of My Tools 4 Care (MT4C) in carers	199 patients: Intervention 101/control 98	80.5 (7.4)	▲ Alzheimer's and other types of dementia	MT4C	Educational control	Carers of community

Continued

Table 1 Continued

Study	Country	Design	Scope of development	Duration (months)	Objective	No of participants	Age in years	Conditions	Model or programme	Comparator	Health professionals
Ford 2019 ²⁷	UK	Cluster RCT	Primary care	6	Assess the feasibility of goal setting	52 patients: Intervention 24/Control 28	77.18–80.42	▲ Chronic diseases	Goal setting	Usual care	General practitioners
Fried 2017 ²⁸	USA	RCT	Primary care	–	Study examines the effect of Tool to Reduce Inappropriate Medications (TRIM)	128 patients: Intervention 64/Control 64	>70	▲ Hypertension ▲ Diabetes	TRIM	Usual care	Clinician
Harpole 2005 ⁴³	USA	RCT	Primary care (18 clinics)	12	Determine the response of multidisciplinary treatment	1801 patients: Intervention 906/Control 895	71.0–71.4	▲ Depression ▲ Hypertension ▲ Arthritis ▲ Chronic pain	Improving Mood-Promoting Access to Collaborative Treatment (IMPACT)	Usual care	Nurse Psychologist General practitioner Psychiatrist.
Hochhalter 2010 ⁴¹	USA	RCT	Primary care	6	Test the efficacy of a patient engagement intervention	64 patients: Int1 20; Int2 23/Control (n=21)	73–76	▲ Arthritis ▲ COPD ▲ Diabetes ▲ Hypertension ▲ Depression	Making the most of your healthcare	Usual care	Physicians, Nurses
Jonkers 2012 ²³	Netherlands	RCT	Primary care	9	Examine the effects of Minimal Psychological Intervention (MPI)	361 patients: Intervention 183/Control 178	70.8 (6.5)	▲ COPD ▲ Diabetes ▲ Depression	MPI	Usual care	Nurses
Köberlein 2016 ⁴⁰	Germany	Cluster RCT	Primary care	15	Study the efficacy of inter-professional medication management	162 patients	76.8 (6.3)	▲ Hypertension, dyslipidaemia ▲ Chronic ischaemic heart disease	Case Management	The intervention group is its own control	Primary care physician Homecare specialist Pharmacist
Lamers 2010 ²²	Netherlands	RCT	Primary care	9	Evaluate the effectiveness of a nurse-led MPI	361 patients: Intervention 183/Control 178	70.6 (6.8)	▲ COPD ▲ Diabetes ▲ Depression	MPI	Usual care	Nurses
Leveille 1998 ³⁰	USA	RCT	Primary care	12	Evaluate the impact of a senior centre.	201 patients: Intervention 101/Control 100	77.2 (5.2)	▲ Arthritis ▲ Hypertension	Collaborative model*	Usual care	Geriatric nurse practitioner
Lin 2006 ³⁴	USA	RCT	Primary care (seven distinct regions)	12	Investigate whether collaborative care decreases pain and disability	1001 patients: Intervention 506/Control 495	72.0 (7.4)	▲ Osteoarthritis ▲ Depression	IMPACT	Usual care	Nurse Psychologist Physician

Continued

Table 1 Continued

Study	Country	Design	Scope of development	Duration (months)	Objective	No of participants	Age in years	Conditions	Model or programme	Comparator	Health professionals
Meng 2005 ²¹	USA	RCT	Primary care	24	Test the effect of healthcare service	1394 patients Int1 365; Int2 323; Int3 37/ Control 330	79.6–80.6	▲ Chronic diseases	The Medicare Primary and Consumer-Directed Care Demonstration.	Usual care	Nurse
Moral 2015 ²⁵	Spain	Cluster RCT	Primary care	18	Evaluate the effectiveness of Motivational Interviewing (MI)	154 patients: Intervention 70/ Control 84	75.6 (5.9)	▲ Hypertension ▲ Diabetes ▲ COPD ▲ Asthma	MI	Usual care	Family physicians
Poot 2019 ³⁷	Netherlands	RCT	Primary care	12	Investigate changes in the satisfaction in the care	754 patients: Intervention 151/ Control 603	78.5–87.2	▲ Chronic diseases	Integrated Systematic Care for Older People (SCOPE)	Usual care	Nurses General practitioners
Schäfer 2018 ³⁹	Germany	Cluster RCT	Primary care	12	Reduce the no of medications	604 patients: Intervention 299/ Control 305	73.3 (4.8)	▲ Cardiovascular disease ▲ Heart disease ▲ Diabetes	Chronic Care Model and Narrative Based Medicine	Usual care	General practitioners Physician Sociologist
Scott 2004 ³³	USA	RCT	Primary care	24	Evaluate the effect of CHCC	294 patients: Intervention 145/ Control 149	74.2 (7.6)	▲ Arthritis ▲ Hypertension ▲ Myocardial infarction	CHCC	Usual care	Physician Pharmacist Nurse Physical therapists
Toots 2019 ³⁸	Sweden	RCT	Primary care	12	Investigate exercise effects on falls	186 patients: Intervention 93/ Control 93	84.4 – 85.9	▲ Alzheimer dementia ▲ Depression	Umeå Dementia and Exercise Study	Usual care	Physiotherapists Occupational therapists
Touchette 2012 ²⁴	USA	RCT	Primary care	3	Evaluate the effect of Medication Therapy Management (MTM)	637 patients: Int1 211; Int2 218; Control 208	74.5 (6.6)	▲ Hypertension ▲ Arthritis ▲ Chronic pain	MTM	Usual care	Pharmacist
CHCC, Cooperative Healthcare Clinic; COPD, chronic obstructive pulmonary disease; RCTs, randomised controlled trials.											



Table 2 Type of interventions classified based on care models

Interventions	Beck, 1997 ²⁹	Levelli, 1998 ³⁰	Coleman 1999 ³¹	Coleman 2001 ³²	Dubbert 2002 ²⁰	Cuehnotta 2004 ⁴⁴	Scott 2004 ³³	Harpole 2005 ⁴⁹	Meng 2005 ²¹	Lin 2006 ³⁴	Battersby 2007 ³⁵	Counsell 2007 ⁴²	Hochhalter 2010 ⁴¹	Lamers 2010 ²²	Jonkers 2012 ²³	Touchette 2012 ²⁴	Boult 2013 ³⁶	Moral 2015 ²⁵	Koberlein 2016 ³⁰	Fried 2017 ²⁶	Schäfer 2018 ³⁹	Dugleby 2018 ²⁸	Toots 2019 ³⁸	Poor 2019 ³⁷	Ford 2019 ²⁷		
Implementation Strategies	Inter professional education																										
	Educational meetings																										
	Continuous quality improvement																										
	Patient-mediated interventions																										
	Tailored intervention																										
	Educational outreach visits or academic detailing																										
	Triage																										
	Educational materials																										
	Reminders																										
	Audit and feedback																										
	Site of service delivery																										
	Continuity of care																										
	Delivery arrangements	Group versus individual care																									
Shared care																											
Care pathways																											
Teams																											
Triage																											
Health information systems																											
Comprehensive geriatric assessment																											
Case management																											
Voucher schemes and Shared care																											
Prescribing																											
Governance arrangements	Voucher schemes and Shared care																										
	Prescribing																										

Continued

change), and ‘shared care’ (continuous collaborative clinical care provided by primary care physicians and specialists).

Effectiveness of interventions

The types of outcomes were classified according to the taxonomy proposed by the Cochrane Consumers and Communication group. This tool allowed for the stratification and identification of 42 categories to which each of the outcomes were assigned. Effectiveness was in turn classified into three categories: ‘effective’, ‘partially effective’ and ‘ineffective’ (table 3 and online supplemental table 2). Table 3 shows how more than 50% of the total outcomes evaluated are concentrated in the consumer-oriented outcomes domain. The classification of the type of result allowed the assignment within the same subcategory (table 4); however, to obtain it, each study required different scales and measures of effect.

One of the model characteristics identified as ‘effective’ is, for example, the training received by health professionals before the commencement of the intervention, which was focused on improving professional–patient communication skills²⁵ or on the management of depression in older people.²³ Another common factor shared by the models is that their interventions sought to establish a close relationship between the professional and the patient during the initial phases of each intervention, despite being carried out according to different methods. For example, in one of the models, the objective of the first stage was for the patient to share his/her feelings with the healthcare professional and for the latter to understand the origin of the symptoms as well as the patient’s daily routine.²³ In another model, healthcare professionals adhered to the following principles during the development of the intervention: (1) to resist the urge to correct, (2) to understand the patient’s own motivations, (3) to listen with empathy and (4) to empower the patient.²⁵ Finally, another model allowed the professional to know details about each patient’s personal situation by carrying out an interview as part of the exhaustive phase for the medication review.⁴⁰ This approach in the three models allowed the health professionals to understand aspects that were relevant in the daily life of older adults, and therefore, their motivations or needs. Thus, the suggestions made by the professionals with regard to the changes needed to be made by the patients became more precise.

We identified three studies^{23 25 40} that reported favourable outcomes in the group of older adults integrated into some of the models of care (Minimal Psychological Intervention, Motivational Interviewing and Case Management) compared with the usual care. None of the outcomes provided by these three studies reported data on clinical outcomes. Besides, most of these types of studies prioritised outcomes related to the quality of life or the reduction of hospital admissions.⁴⁵

On the other end, we find three models of care^{28 37 39} that evidence that none of the implemented interventions

Table 2 Continued

Author (Year)	Financial Arrangements	Voucher schemes	No of interventions
Interventions			3
Beck, 1997 ²⁹			3
Leville 1998 ³⁰			4
Coleman 1999 ³¹			1
Coleman 2001 ³²			2
Dubbert 2002 ²⁰			1
Cucinotta 2004 ⁴⁴			3
Scott 2004 ⁴³			1
Harpole 2005 ⁴²			3
Meng 2005 ²¹			3
Lin 2006 ³⁴			4
Battersby 2007 ³⁵			1
Counsell 2007 ⁴²			2
Hochhalter 2010 ⁴¹			2
Lamers 2010 ²²			1
Jonkers 2012 ²³			2
Touchette 2012 ²⁴			3
Bout 2013 ³⁶			2
Moral 2015 ²⁵			2
Köberlein 2016 ⁴⁰			1
Fried 2017 ²⁶			2
Schäfer 2018 ³⁸			1
Dugleby 2018 ³⁸			1
Toots 2019 ³⁸			3
Poot 2019 ³⁷			3
Ford 2019 ²⁷			2

**Table 3** Effectiveness of interventions in the studies (care models)

Type of outcome	Effective	Partially effective	Ineffective
Improved communication with provider*			X ²⁶
Patient satisfaction with the information provided*		X ³²	
Advance directives*	X ³²		
The decision/s made (eg, types of care plans agreed)*			X ²⁶
Availability of patient-held records or notes when required*		X ¹⁹	
Consumer–professional interactions experience*		X ³⁴	
Partner or family support*		X ¹⁹	
Communication skills/techniques*	X ²⁵		
Level of dependency*	X ³⁴		
Patient compliance (with treatment, medication)*	X ²⁴		
Self examination*		X ³⁰	
Diet*			X ²⁹
Other (consumption of alcoholic beverages)**		X ²⁹	
Complications, complication rate*	X ¹⁹	X ³⁰	
Level of patient-centred care†			X ²⁶
Choices offered†			X ³⁴
Quality of life, life satisfaction*	XX ^{32 41}	XXX ^{21 34 42}	XXXXX XX ^{19 26} 27 29 30 35 38
Admission to hospital‡	X ³²	XX ^{28 31}	XXXXX XX ^{23 29} 30 34 35 41 43
Readmission rate to hospital‡	XX ^{31 43}	X ²⁸	XXX ^{29 35 41}
Usage of specific services (eg, Use of outpatient treatment)‡		X ³⁴	XXXXX ^{23 28 32} 35 38
Rate of prescribing medications†	X ²³	X ³⁴	XXXX ^{25 26 32 38}
Level of anxiety, depression, mood, well-being*	XX ^{21 22}	X ⁴²	XXX ^{19 29 30}
Satisfaction with care*	XX ^{28 32}	XX ^{30 35}	XXX ^{36 38 41}
Level of activities of daily living*	X ²²	XX ^{30,41}	XXX ^{26 32 41}
Self-care abilities, self efficacy*	X ²³	XX ^{34 37}	XX ^{27 38}
Morbidity, mortality*	X ⁴³		XXX ^{26 35 41}
Costs of care (eg, costs of in-patient care, costs of home-care)‡	XX ^{32 34}		XX ^{29 30}
Carer satisfaction*	X ²⁸		X ³⁰
Length of stay in hospital‡	X ²⁹		XX ^{28 41}
Provision of or use of technical aids*	XX ^{28 29}	X ³⁰	
Agreement between personal values for outcomes and choice*	XX ^{23 26}		
Social activity*	X ²²	X ²⁹	
Factors affecting compliance*	X ²⁴		X ²⁵
Exercise*		X ¹⁹	X ²⁹
Side effects of drugs*		X ²³	X ³⁰
Costs of specific interventions (eg, educational, medical)‡		X ²⁸	X ³⁴
Reporting of adverse events‡	X ³⁹	X ²³	
Quality of care‡	X ³⁹		X ²⁵
Priority setting‡		X X ^{20 33}	
Use of services (eg, screening or vaccination programmes)*	X ³⁴	X ²⁸	
Knowledge of risk, accurate risk perception*		X ³²	
Knowledge about expected and undesired effects of treatment*			X ³⁸

Continued

Table 3 Continued

Type of outcome	Effective	Partially effective	Ineffective
Total no of outcomes reported in the studies	31	32	56
Based on the taxonomy by the Cochrane Consumers and Communication group. *Belong to the consumer-oriented outcomes domain. †Belong to the healthcare provider-oriented outcomes domain. ‡Belong to the health service delivery-oriented outcomes domain.			

improved the outcome for the patients whatsoever. The remaining models^{20–22 24 26 27 29–36 38 41–44} did not evidence a clear benefit for the participants, that is, despite some of their measurements indicating some type of improvement, the remaining outcomes shared a similar or lower value than that obtained in the control group (online supplemental table 2).

Out of the 25 healthcare models, only 22% of the 119 reported outcomes improved the conditions of patients. A total of 57% of the outcomes did not provide any benefit for the model's experimental group, whereas 21% of the outcomes did not show a clear effect regarding the benefit granted to the patients, mainly because they did not remain constant throughout the study period (table 4).

For the assessment of the methodological quality of the studies, the risk of bias tool was applied, which allowed us to observe that most of the studies had a high risk of bias (18 studies) or were at least unclear (7 studies). This indicates that the studies had low methodological quality as they did not use an appropriate method to allocate the interventions or for the randomisation process and were not blinded or did not describe the methods used during the study performance (online supplemental figures 1 and 2).

DISCUSSION

A total of 25 models of care were found in this systematic review that included 20 RCTs, and 5 cluster RCTs. The models of care were highly heterogeneous, as was expected since no restriction was set on the condition or disease at which they were aimed. Multiple strategies and interventions were found to be part of these models of care and it is not possible to assess accurately whether any specific combination of them rendered the outcomes observed for each model. However, some observations can be made.

Effective interventions

Across the 25 models of care, we identified 26 positive outcomes, which were the ones categorised as effective using the Cochrane Consumers and Communication group's taxonomy. We looked at the specific strategies or interventions that were present in the models of care that produced such positive outcomes and found a total of 14 different interventions. The most frequent interventions that rendered positive outcomes were strategies for

modifying site of service delivery, educational meetings, interprofessional education, educational outreach visits or academic detailing, and prescribing.

Regarding the site of service delivery, six out of eight studies which included a variant of this strategy—usually some form of home care—rendered significant outcomes, although in every case they were combined with a different set of interventions. An overview of systematic reviews examined the impact of home care versus alternative locations of care on health outcomes for older persons. They found heterogeneous evidence favouring home support but insufficient evidence to determine whether alternate locations of care had better impact than home care.⁴⁶ Our findings suggest that some forms of home care may contribute to produce favourable outcomes of the following types: quality of life, life satisfaction, morbidity, mortality, satisfaction with care, level of anxiety, depression, mood, well-being, provision of or use of technical aids, quality of care and reporting of adverse events.

Educational strategies were also frequent among the implementation strategies included in the models of care with effective outcomes in our systematic review.

Three studies were noticeable for having the most relevant outcomes.^{23 25 40} Of these, two studies focused on improving drug management and therapeutic adherence,^{25 40} whereas the third focused on reversing symptoms associated with depression, for example, to improve self-efficacy, daily functioning and social participation.²³ Another element shared by the studies is that their interventions intended to establish a close relationship between the professional and the patient during the initial phases of each intervention. In the model proposed by Jonkers *et al*.²³ the objective of the first stage was for the patient to share his/her feelings with the health professional and for the latter to understand the origin of the symptoms as well as the patient's daily routine. In the model of a study by Moral *et al*.²⁵ healthcare professionals adhered to the principles of resisting the urge to make corrections, understanding the patient's own motives, listening with empathy and empowering the patient. Finally, the model evaluated by Köberlein-Neu *et al*.⁴⁰ allowed for the professional to find out details about the personal situation of each patient through an interview as part of the exhaustive phase of the medication review.

Ineffective interventions

Three studies produced only ineffective outcomes.^{28 37 39} Interestingly, these studies implemented interventions



Table 4 Type of outcomes based on healthcare models

Type of outcome	Beck 1997 ²⁹	Levelling 1998 ³⁰	Coleman 1999 ³¹	Coleman 2001 ³²	Dubbert 2002 ²⁰	Cucinotta 2004 ⁴⁴	Scott 2004 ⁴³	Harpole 2005 ⁴⁵	Meng 2005 ²¹	Lin 2006 ³⁴	Battersby 2007 ³⁵	Counsell 2007 ⁴²	Hochhalter 2010 ⁴¹	Lamers 2010 ²²	Jonkers 2012 ²³	Touchette 2012 ²⁴	Boult 2013 ³⁶	Moral 2015 ²⁵	Köberlein 2016 ⁴⁰	Fried 2017 ²⁶	Schäfer 2018 ³⁹	Dugleby 2018 ²⁸	Touts 2019 ³⁸	Poot 2019 ³⁷	Ford 2019 ²⁷	
Consumer oriented outcomes																										
Agreement between personal values for outcomes and choice																										
Improved communication with provider																										
The decision (s) made																										
Quality of life, life satisfaction	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Morbidity, mortality						X																				
Satisfaction with care	X	X	X	X																						
Self-care abilities, self-efficacy										X																
Knowledge about expected and undesired effects of treatment																					X					
Factors affecting compliance																										
Patient compliance (with treatment, medication)																										
Side effects of drugs																										
Level of activities of daily living	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Level of anxiety, depression, mood, well-being																										
Social activity																										
Advance directives																										
Knowledge of risk, accurate risk perception																										
Patient satisfaction with the information provided																										
Exercise																										
Partner or family support																										
Availability of patient-held records or notes when required																										

Continued

Continued

Type of outcome	Beck 1997 ²⁹	Leveille 1998 ³⁰	Coleman 1999 ³¹	Coleman 2001 ³²	Dubbert 2002 ²⁰	Cuehnotta 2004 ⁴⁴	Scott 2004 ³³	Harpole 2005 ⁴⁹	Meng 2005 ²¹	Lin 2006 ³⁴	Battersby 2007 ³⁵	Counsell 2007 ⁴²	Hochhalter 2010 ⁴¹	Lamers 2010 ²²	Jonkers 2012 ²³	Touchette 2012 ²⁴	Bout 2013 ³⁶	Moral 2015 ²⁵	Koberlein 2016 ¹⁰	Fried 2017 ²⁶	Schäfer 2018 ³⁹	Dugleby 2018 ²⁸	Touts 2019 ³⁸	Poot 2019 ³⁷	Ford 2019 ²⁷	
Complications, complication rate					X																					
Carer satisfaction	X	X	X																							
Provision of use of technical aids	X	X	X																							
Self-examination			X																							
Others (consumption of alcoholic beverages)		X																								
Diet		X																								
Communication skills / techniques																				X						
Consumer-professional interactions experience									X																	
Level of dependency									X																	
Use of services (eg, screening or vaccination programmes)									X																	
Level of patient-centred care																										X
Rate of prescribing medications							X																			X
Choices offered																										
Health service delivery-oriented outcomes	X						X																			
Quality of care																										
Reporting of adverse events																										
Admission to hospital	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Readmission rate to hospital	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Length of stay in hospital	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Costs of specific interventions (eg, educational, medical)	X																									

Table 4 Continued



Table 4 Continued

Beck 1997 ²⁹	X	10	10	7
Leveille 1998 ³⁰	X	12	6	1
Coleman 1999 ³¹	X	6	2	1
Coleman 2001 ³²			2	1
Dubbert 2002 ²⁰			6	2
Cuechotta 2004 ⁴⁴	X	10	3	1
Scott 2004 ⁴³			2	1
Harpole 2005 ⁴³			1	2
Meng 2005 ²¹			X	1
Lin 2006 ³⁴	X	11	1	1
Battersby 2007 ³⁵			7	1
Counsell 2007 ⁴²			1	1
Hochhalter 2010 ⁴¹			2	1
Lamers 2010 ²²			4	1
Jonkers 2012 ²³			6	1
Touchette 2012 ²⁴			6	1
Bout 2013 ³⁶			2	1
Moral 2015 ²⁵			2	1
Köberlein 2016 ⁴⁰			5	1
Fried 2017 ²⁶			6	1
Schäfer 2018 ³⁹			2	1
Duggleby 2018 ²⁸			1	1
Toots 2019 ³⁸			1	1
Poot 2019 ³⁷			1	1
Ford 2019 ³⁷			1	1
Total=119				
Effectiveness of interventions: effective partially effective ineffective.				
HCFOO, Healthcare Provider-Oriented Outcomes.				

proved effective in other studies included in the review. Specifically, Duggleby *et al* implemented educational meetings²⁸; Schäfer *et al* implemented educational outreach visits and prescribing³⁹ and Poot *et al* implemented a combination of educational outreach visits, audit and feedback, and multidisciplinary teams.³⁷ However, neither attained any effective outcomes. Moreover, selection bias, lack of blinding of participants or outcome, were not reported in these three studies. It is not uncommon in systematic reviews to find similar studies producing contradicting results. These contradictory findings might be attributed to methodological reasons.

Remarks

Each of the 25 identified studies presented interventions with specific scopes. These interventions were integrated through different components, which allowed them to interact; however, establishing causal chains linking the intervention with the outcome is highly complex⁴⁷ and hence, the effectiveness of each of the studies depend on the objectives of the study or the needs of the participating population.

In addition, the lack of a standard definition or consensus on which conditions should be considered within multimorbidity, the impact of the context in which the intervention is developed (eg, the differences between countries in terms of the type of income, funding modes, the target population, ie, the general public or a specific socioeconomic level) as well as the source of the identified and collected measurements (electronic files, interviews, evaluation scales, as well as the context of the study) should also be considered as they are variables that affect the outcomes and hinder the comparability among studies.¹

The scarcity of effective interventions found in this review is in line with the findings of another systematic review by Smith *et al* that focused on interventions for improving outcomes for patients with multimorbidity in primary care and community settings.¹¹ Although it did not focus exclusively on older persons, most of the 17 RCTs included in it recruited participants in that age group. The single most relevant outcome found in that systematic review was an improvement in mean depression scores, with high-quality evidence supporting it. There was moderate-quality evidence that some interventions improved the healthcare providers' behaviour and enhanced health-related patient behaviours such as increased physical activity. The effect in other outcomes was less clear, with probable slight improvements in patient reported outcomes and medication adherence. However, no clear effect on clinical outcomes or in health service use was noted. Moreover, it was not possible to compare costs across studies.¹¹

Both in our systematic review and the one by Smith *et al*, the most common intervention types were educational strategies aimed either at patients or healthcare providers, implementation or enhancement of

multidisciplinary care and organisational modifications to delivery of care.¹¹ However, there is a growing claim for the inclusion of diverse approaches tailored to people living with complex multimorbidity or advanced illnesses. Mas Miquel *et al* propose an integrated model of care for older persons with complex chronic conditions, after identifying the following evidence-based clinical practices to include in the comprehensive care of these populations: multidimensional assessment by a multidisciplinary team; education of the patient and caregiver; anticipation to health crises; activation to alternatives to conventional hospitalisation; proactive care provision in case of hospital admission; health and social status changes monitoring in transitions; end-of-life care planning.⁴⁸ While these methods and arguments are compelling, these models will be empirically tested in the near future.

CONCLUSIONS

Out of the 25 studies identified, 3 studies were rated as effective, overall.

All the interventions addressed in the 25 models are similar to public health interventions as their main aims were the promotion of health and the prevention of disease complications at the community level. The most effective outcomes focused on improving the relationship between the patient and the healthcare professional in the early stages of the intervention; therefore, following this guideline is recommended. However, the most important problem identified in this review refers to the low quality of the studies based on the results assessed using the risk of bias tool. The multiplicity of variables and outcomes measured in each study also hinder their interpretation. To improve comparability among studies, a standardised reporting system for outcomes is warranted.

The evidence here presented suggests that enhancing, rearranging or building on the status quo is not enough where effectiveness of care delivery for older persons with chronic diseases is concerned. There is a need for innovative approaches that emphasise on patient-centredness, but also on integrated, continuous, easy-to-navigate care, while addressing methodological issues that guarantee good-quality evidence.

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REFERENCES

- World Health Organization. World report on aging and health, 2015. Available: <https://apps.who.int/iris/handle/10665/186463> [Accessed 13 Aug 2020].
- World Health Organization. 10 facts on ageing and the life course, 2020. Available: https://www.who.int/features/factfiles/ageing/ageing_facts/en/ [Accessed 13 Aug 2020].
- Lancet T. Tackling the burden of chronic diseases in the USA. *Lancet* 2009;373:185.
- World Health Organization. Aging and health, 2018. Available: <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health> [Accessed 20 Aug 2020].
- DeVol R, Bedroussian A. *An unhealthy America: the economic burden of chronic disease*. Milken Institute, 2007: 252.
- Almeida G, Artaza O, Donoso N. Primary health care in the region of the Americas: 40 years after the Alma-Ata Declaration. *Rev Pan Am Public Health* 2018;42:e104.
- World Health Organization. *Declaration of Alma Ata* [Internet]. Geneva: WHO, 2013. http://www.who.int/publications/almaata_declaration_en.pdf
- World Health Organization. Integrated care for older people: guidelines on community-level interventions to manage declines in intrinsic capacity, 2015. Available: <http://www.ncbi.nlm.nih.gov/books/NBK488250/9> [Accessed 05 Sep 2020].
- Western Australia Department of Health. Wa chronic health conditions framework 2011-2016, 2011. Available: <https://ww2.health.wa.gov.au/-/media/Files/Corporate/general-documents/Health-Networks/Chronic-conditions/Chronic-Health-Conditions-Framework.pdf> [Accessed 09 Sep 2020].
- Marengoni A, Angleman S, Melis R, *et al*. Aging with multimorbidity: a systematic review of the literature. *Ageing Res Rev* 2011;10:430-9.
- Smith SM, Wallace E, O'Dowd T, *et al*. Interventions for improving outcomes in patients with multimorbidity in primary care and community settings. *Cochrane Database Syst Rev* 2021;1:CD006560.
- Coulter A, Entwistle VA, Eccles A. Personalised care planning for adults with chronic or long-term health conditions. *Cochrane Database Syst Rev* 2015;3:CD010523.

- 13 Butterworth JE, Hays R, McDonagh STJ, *et al.* Involving older people with multimorbidity in decision-making about their primary healthcare: a Cochrane systematic review of interventions (abridged). *Patient Educ Couns* 2020;103:2078–94.
- 14 Aguilar-Salinas CA, Mehta R, Rojas R, *et al.* Management of the metabolic syndrome as a strategy for preventing the macrovascular complications of type 2 diabetes: controversial issues. *Curr Diabetes Rev* 2005;1:145–58.
- 15 McDonough K. Chronic diseases: an encyclopedia of causes, effects, and treatments. *RR* 2018;32:16–17.
- 16 The Cochrane Effective Practice and Organisation of Care Group (EPOC). The EpoC taxonomy of health systems interventions, 2016. Available: <https://epoc.cochrane.org/epoc-taxonomy> [Accessed 08 Dec 2020].
- 17 Cochrane consumers and communication group (CCCRG). Outcomes consumers and communication, 2012. Available: <https://cccr.org.cochrane.org/author-resources> [Accessed 08 Dec 2020].
- 18 Hill S. *The knowledgeable patient: communication and participation in public health: a Cochrane Handbook*. Chichester: Wiley, Blackwell, 2011.
- 19 Higgins JPT, Altman DG, Gøtzsche PC, *et al.* The Cochrane collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011;343:d5928.
- 20 Dubbert PM, Cooper KM, Kirchner KA, *et al.* Effects of nurse counseling on walking for exercise in elderly primary care patients. *J Gerontol A Biol Sci Med Sci* 2002;57:M733–40.
- 21 Meng H, Friedman B, Wamsley BR, *et al.* Effect of a consumer-directed voucher and a disease-management-health-promotion nurse intervention on home care use. *Gerontologist* 2005;45:167–76.
- 22 Lamers F, Jonkers CCM, Bosma H, *et al.* A minimal psychological intervention in chronically ill elderly patients with depression: a randomized trial. *Psychother Psychosom* 2010;79:217–26.
- 23 Jonkers CCM, Lamers F, Bosma H, *et al.* The effectiveness of a minimal psychological intervention on self-management beliefs and behaviors in depressed chronically ill elderly persons: a randomized trial. *Int Psychogeriatr* 2012;24:288–97.
- 24 Touchette DR, Masica AL, Dolor RJ, *et al.* Safety-focused medication therapy management: a randomized controlled trial. *J Am Pharm Assoc* 2012;52:603–12.
- 25 Moral RR, Torres LAPde, Ortega LP, *et al.* Effectiveness of motivational interviewing to improve therapeutic adherence in patients over 65 years old with chronic diseases: a cluster randomized clinical trial in primary care. *Patient Educ Couns* 2015;98:977–83.
- 26 Fried TR, Niehoff KM, Street RL, *et al.* Effect of the tool to reduce inappropriate medications on medication communication and deprescribing. *J Am Geriatr Soc* 2017;65:2265–71.
- 27 Ford JA, Lenaghan E, Salter C, *et al.* Can goal-setting for patients with multimorbidity improve outcomes in primary care? cluster randomised feasibility trial. *BMJ Open* 2019;9:e025332.
- 28 Duggleby W, Ploeg J, McAiney C, *et al.* Web-Based intervention for family carers of persons with dementia and multiple chronic conditions (my tools 4 care): pragmatic randomized controlled trial. *J Med Internet Res* 2018;20:e10484.
- 29 Beck A, Scott J, Williams P, *et al.* A randomized trial of group outpatient visits for chronically ill older HMO members: the cooperative health care clinic. *J Am Geriatr Soc* 1997;45:543–9.
- 30 Leveille SG, Wagner EH, Davis C, *et al.* Preventing disability and managing chronic illness in frail older adults: a randomized trial of a community-based partnership with primary care. *J Am Geriatr Soc* 1998;46:1191–8.
- 31 Coleman EA, Grothaus LC, Sandhu N, *et al.* Chronic care clinics: a randomized controlled trial of a new model of primary care for frail older adults. *J Am Geriatr Soc* 1999;47:775–83.
- 32 Coleman EA, Eilertsen TB, Kramer AM, *et al.* Reducing emergency visits in older adults with chronic illness. A randomized, controlled trial of group visits. *Eff Clin Pract* 2001;4:49–57.
- 33 Scott JC, Conner DA, Venohr I, *et al.* Effectiveness of a group outpatient visit model for chronically ill older health maintenance organization members: a 2-year randomized trial of the cooperative health care clinic. *J Am Geriatr Soc* 2004;52:1463–70.
- 34 Lin EHB, Tang L, Katon W, *et al.* Arthritis pain and disability: response to collaborative depression care. *Gen Hosp Psychiatry* 2006;28:482–6.
- 35 Battersby M, Harvey P, Mills PD, *et al.* Sa HealthPlus: a controlled trial of a statewide application of a generic model of chronic illness care. *Milbank Q* 2007;85:37–67.
- 36 Boulton C, Leff B, Boyd CM, *et al.* A matched-pair cluster-randomized trial of guided care for high-risk older patients. *J Gen Intern Med* 2013;28:612–21.
- 37 Poot AJ, Wopereis DM, den Elzen WPJ, *et al.* Changes in patient satisfaction related to their perceived health state during implementation of improved integrated care for older persons. *PLoS One* 2019;14:e0216028.
- 38 Toots A, Wiklund R, Littbrand H, *et al.* The effects of exercise on falls in older people with dementia living in nursing homes: a randomized controlled trial. *J Am Med Dir Assoc* 2019;20:835–42.
- 39 Schäfer I, Kaduszkiewicz H, Mellert C, *et al.* Narrative medicine-based intervention in primary care to reduce polypharmacy: results from the cluster-randomised controlled trial MultiCare agenda. *BMJ Open* 2018;8:e017653.
- 40 Köberlein-Neu J, Mennemann H, Hamacher S, *et al.* Interprofessional medication management in patients with multiple morbidities. *Dtsch Arztebl Int* 2016;113:741–8.
- 41 Hochhalter AK, Song J, Rush J, *et al.* Making the most of your healthcare intervention for older adults with multiple chronic illnesses. *Patient Educ Couns* 2010;81:207–13.
- 42 Counsell SR, Callahan CM, Clark DO, *et al.* Geriatric care management for low-income seniors: a randomized controlled trial. *JAMA* 2007;298:2623–33.
- 43 Harpole LH, Williams JW, Olsen MK, *et al.* Improving depression outcomes in older adults with comorbid medical illness. *Gen Hosp Psychiatry* 2005;27:4–12.
- 44 Cucinotta D, Savorani G, Piscaglia F, *et al.* The chronically ill elderly patients discharged from the hospital: interim report from a controlled study of home care attendance. *Arch Gerontol Geriatr Suppl* 2004;9:103–8.
- 45 Goodwin N, Sonola L, Thiel V. *Coordinated care for people with complex chronic conditions: key lessons and markers for success*. London: King's Fund, 2013. <https://www.hqsc.govt.nz/assets/General-NEMR-files-images/-nick-goodwin-co-ordinated-care-kingsfund-Nov-2013.pdf>
- 46 Devriendt E, De Brauwier I, Vandersaenen L, *et al.* Geriatric support in the emergency department: a national survey in Belgium. *BMC Geriatr* 2017;17:68.
- 47 Craig P, Dieppe P, Macintyre S. *Developing and evaluating complex interventions*, 2019. Available: <http://www.mrc.ac.uk/complexinterventionsguidance> [Accessed 11 June 2021].
- 48 Mas Miquel À, Miralles R, Heras C, *et al.* Designing a person-centred integrated care programme for people with complex chronic conditions: a case study from Catalonia. *Int J Integr Care* 2021;21:22.