Effectiveness of KT tools addressing multiple high-burden chronic diseases affecting older adults

A systematic review

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Background

- More than half of older adults have ≥ 2 chronic conditions (e.g., diabetes, COPD, depression)
- Older adults have greater health care needs and experience more hospitalizations, yet only 55% receive appropriate care
- In response, different chronic disease management and KT strategies (CDM-KT) have been created…
  - Most are ***not developed for older adults***
  - Not created for ***sustained use***
  - Primarily focused on a ***single*** disease
- As a result, the care of older adults remains suboptimal

Objectives

- Systematic review to identify effective CDM-KT interventions/tools that integrate ≥ 2 high-burden chronic diseases affecting older adults
  - To determine which components of these interventions optimise their impact
- Realist review alongside SR to determine the mechanisms underpinning CDM-KT strategies

Methods: Protocol

- Our protocol has been published (BMJ Open; 2015)
- Registered with PROSPERO (the international prospective register of systematic reviews: CRD42014014489)
- We applied the PRISMA criteria for reporting this systematic review

Kastner M, et al. BMJ Open. 2015 Feb 3;5(2):e007640.

Methods: Search strategy

- **Search strategy:** Developed and executed by an experienced information specialist; validated using PRESS checklist
- **Data sources:** Medline, Embase, Cinahl, AgeLine, and the Cochrane Library for studies in any language from 1990 to Jan 2015 – *few multimorbidity studies published prior*
- **Other sources:** Searched the grey literature (Google Scholar and websites of relevant chronic disease organizations); scanned reference lists of included studies; expert-informed
- **Filters:** Applied a validated age-specific search filter to help focus studies on the older population (age ≥ 65 years)

Kastner M, et al. BMJ Open. 2015 Feb 3;5(2):e007640
Kastner M *et al*. J. Med Internet Res 2006; 24:e25.

Methods: Eligibility criteria

Population:

- Older adults age ≥ 65 years
- Patients had to have ≥ 2 high-burden chronic conditions (as identified by HQO, PHAC, WHO): we included the reported top 11 diseases

Intervention:

- Multi-chronic disease management KT interventions/tools (CDM-KT)
  - Facilitate ongoing, proactive and preventive support for optimal disease management; facilitate the uptake of knowledge about chronic conditions
  - Interventions had to be developed for or applied to an older adult population with ≥ 2 chronic conditions
  - Interventions had to be complex: multiple components/targets, and could include any quality improvement elements such as those outlined in the Cochrane EPOC taxonomy

Comparator:

- Other CDM-KT interventions, any control or usual care

Effective Practice and Organisation of Care (EPOC). EPOC Taxonomy; 2015
Shojania et al 2004.

Methods: Eligibility criteria

Outcomes:

- Primary: Impact of CDM-KT strategies for improving disease specific chronic disease management as reported by primary studies (e.g., glycaemic control as part of diabetes care)
- Secondary: Quality of life, functional status (including cognitive, physical, social and psychological functioning; usability, health service utilization, and costs

Study designs:

- All designs except for case-control, retrospective cohort, and opinion-driven reports (editorials, commentaries and narrative reviews)

Methods: Study selection

Study selection

- Involved a calibration exercise with all reviewers to ensure reliability of screening
  - Reviewer pairs independently applied eligibility criteria on a random sample of citations (titles/abstracts) – repeated until we reached 80% raw agreement
- Same procedure was used for selecting potentially relevant full-text articles
- Disagreements resolved through consensus at both levels

Methods: Data abstraction

Data abstraction

- Duplicate extraction using standardized form (study, population, intervention characteristics; risk of bias and quality assessment tools according to study design)
- We expected a wide range of chronic disease outcomes given that our search targeted 11 chronic diseases
- Data extracted according to the outcome categories of the Cochrane Consumer and Communication group:
  - *Treatment outcomes*
  - *Health status and well-being*
  - *Health behaviour*
  - *Knowledge and understanding*
  - *Evaluation of care*
  - *Skills acquisition*
  - *Health service delivery*

Cochrane Consumers and Communication Group: Taxonomy of outcomes 2012.

Methods: Data synthesis

- Descriptive summary according to study, population, and intervention characteristics
- Assessment of the effects of MCD-KT interventions/tools across different outcomes
- Given the anticipated complexity of interventions evaluated across studies, we expected a high level of heterogeneity
  - For any meta-analysis, we are using random effects model to account for between-trial variation
- We are also performing subgroup analyses to assess outcomes by:
  - Different disease clusters
  - Interventions with similar components or similar combinations of components

Methods: Data synthesis

- Decision to pool studies based on exploration of the potential sources of statistical, methodological and clinical heterogeneity

1. **Statistical heterogeneity:**
   - Assessment using the I^2 statistic (0%-40% = low; 30%-60% = moderate; 50%-90% = substantial; 75%-100% = considerable)
2. **Clinical heterogeneity:**
   - Examination of outcomes according to population characteristics (age, sex and disease cluster)
   - Examination of intervention components to determine those with similar or same components or combinations (e.g., ED + REM + FR)
3. **Methodological heterogeneity:**
   - ROB factors (e.g., randomization process; blinding, outcomes); study duration and loss to of follow-up

Methods: Intervention deconstruction

Objectives:

- To determine which intervention component or combination of components contributed to their impact; To identify studies that could potentially be pooled

Process:

- Each MCD-KT intervention was deconstructed by reviewer pairs, who independently coded components using content analysis
- Coding of elements involved creating a codebook iteratively as reviewer pairs deconstructed interventions – pilot tested
  - Initial codes guided by established QI criteria (*EPOC 2015; Shojania et al)*
  - Final decisions on codes through group discussion

Effective Practice and Organisation of Care (EPOC). EPOC Taxonomy; 2015
Shojania et al 2004.

Methods: Intervention deconstruction process

Author, Year	Intervention Name	Intervention Description
Alexopoulos 2014	Personalized, care management Intervention for Depressed Patients with COPD (PID-C)	Care managers offered PID-C to help depressed COPD patients identify obstacles to participation in treatment. They offered support and interventions (i.e., correcting misconceptions about their conditions, misunderstanding of recommendations, misattribution of symptoms, hopelessness, dissatisfaction with treatment experience, logistic barriers) targeting treatment obstacles specific to individual patients and help them to work both on their exercise regimens and to take antidepressants as prescribed by their own physicians. Training [of patients] consisted of didactics on COPD, depression, and the PID-C manual and three supervised practice cases. The first session (30 minutes) with patients occurred before discharge. The remaining sessions (30 minutes) were conducted in the patients' homes at weeks 3, 4, 8, 12, 16, 20, 24, and 26. The first session focused on alliance and evaluation of risks to treatment engagement in individual patients. Subsequent sessions consisted of clinical state review and reinforcement of plans to address treatment engagement. The care managers telephoned the patients' physicians and informed them of the patients' status and adherence to treatment and rehabilitation. Physicians' recommendations for depression and COPD were given according to clinical indication and not influenced by PID-C managers.

- Read through intervention description, and identify unique elements

Methods: Intervention deconstruction

Author, Year	Intervention Name	Intervention components					Intervention category[1]
		Definition	Coding	Delivered by (delivered to)	Setting	Format	
Alexopoulos 2014	Personalized, care management Intervention for Depressed Patients with COPD (PID-C)	**CM:** Care managers offered PID-C to help depressed COPD patients identify obstacles to participation in treatment. They offered support and interventions (i.e., correcting misconceptions about their conditions, misunderstanding of recommendations, misattribution of symptoms, hopelessness, dissatisfaction with treatment experience, logistic barriers) targeting treatment obstacles specific to individual patients and help them to work both on their exercise regimens and to take antidepressants as prescribed by their own physicians	Case management (CM)	Social Worker/Care Manager (Patient)	Hospital + Home	In-person	Delivery arrangement (coordination of care management of care processes)
		ED: Training [of patients] consisted of didactics on COPD, depression, and the PID-C manual and three supervised practice cases. The first session (30 minutes) with patients occurred before discharge. The remaining sessions (30 minutes) were conducted in the patients' homes at weeks 3, 4, 8, 12, 16, 20, 24, and 26. The first session focused on alliance and evaluation of risks to treatment engagement in individual patients. Subsequent sessions consisted of clinical state review and reinforcement of plans to address treatment engagement	Patient education (ED)	Social Worker/Care Manager (Patient)	Hospital + Home	In-person	Implementation strategy (educational materials)
		FR: The care managers telephoned the patients' physicians and informed them of the patients' status and adherence to treatment and rehabilitation. Physicians' recommendations for depression and COPD were given according to clinical indication and not influenced by PID-C managers.	Facilitated Relay (FR)	Social Worker/Care Manager (Physician)	Clinic	Telephone	Facilitated relay of clinical data to providers[2]

[1]Effective Practice and Organisation of Care (EPOC). EPOC Taxonomy; 2015. Available at: https://epoc.cochrane.org/epoc-taxonomy
[2]Shojania KG, McDonald KM, Wachter RM, Owens DK. Closing the quality gap: a critical analysis of quality improvement strategies—technical review 9. Rockville, MD: Agency for Healthcare Research and Quality, 2004.

Personalized Intervention for Depressed Patients with COPD (PID-C) = **CM + ED + FR**

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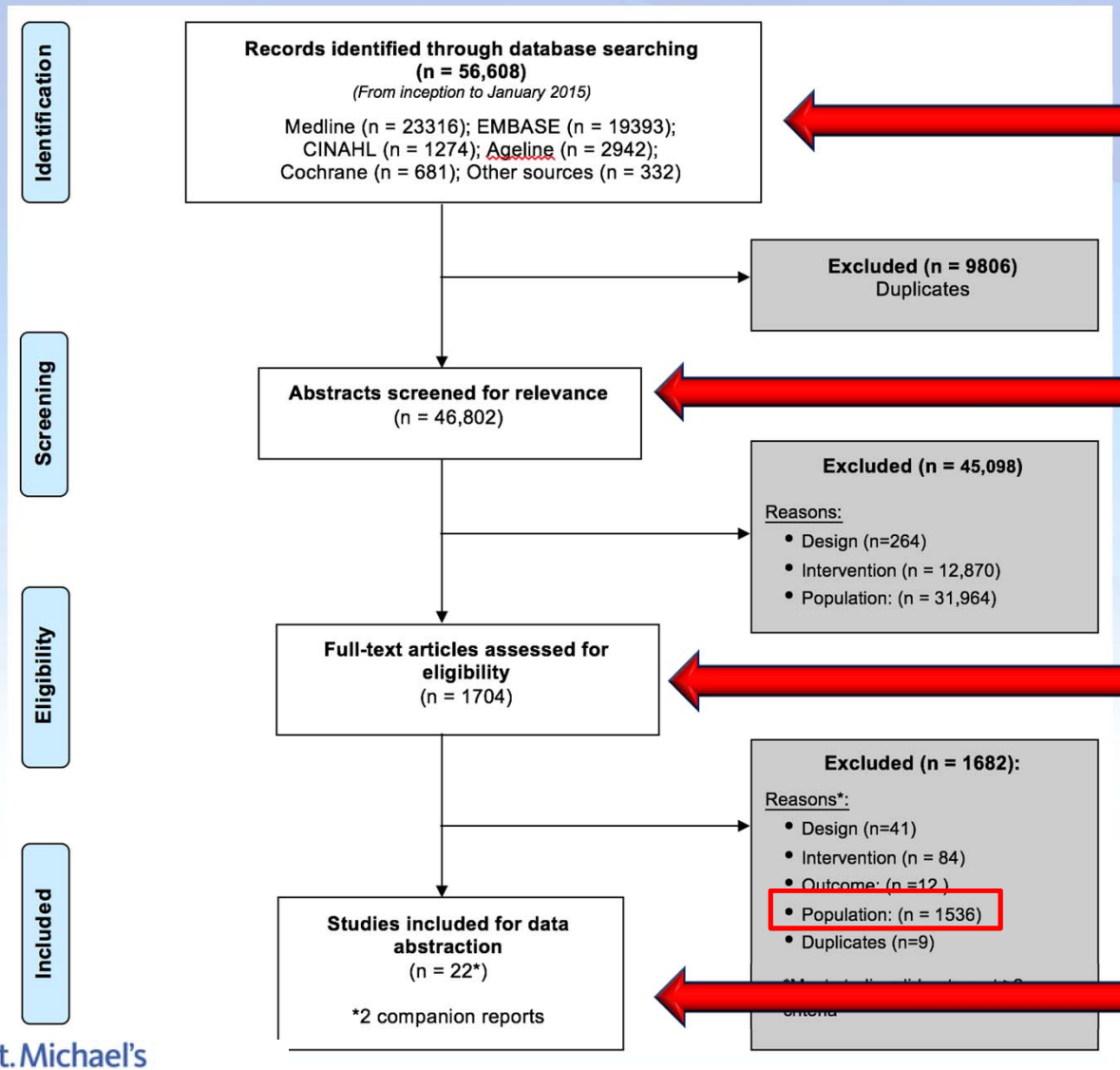
Results: Study selection



- Identified 56,608 citations
- 6 reviewer pairs screened 46,802 titles/abstracts
- 4 reviewer pairs screened 1704 full-text articles
- 20 studies + 2 companion reports met eligibility criteria

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Results: Study characteristics

- 20 studies and 2 companion reports
  - RCTs (n = 9); cluster RCTs (n = 5)
  - Uncontrolled trial (n = 1)
  - Mixed methods studies (n = 3)
  - Qualitative studies (n = 2)
- Studies were conducted between 2002 and 2015
  - US (n = 9)
  - Australia (n = 7)
  - Europe (n = 4)
- Follow-up reported in 15 studies (75%)
  - 2 to 52 weeks (mean 26 weeks)

Results: Population characteristics

- 11,783 older adults (mean age 67.3 years; 52% women)
- Interventions were targeted to older adults with different combinations of disease clusters
- 63% of all disease clusters included at least Diabetes (DM)
- Other chronic diseases among clusters:
  - **12 studies: Diabetes (DM) – 63%**
  - **7 studies: Depression (DEP) – 35%**
  - **7 studies: Chronic Obstructive Pulmonary Disease (COPD) – 35%**
  - 5 studies: Cardiovascular disease (CVD)
  - 5 studies: Congestive heart failure (CHF)
  - 4 studies: Dementia (DEM)
  - 2 studies: Arthritis (AT) or osteoarthritis (OA)

Results: Population characteristics

- Among different disease clusters, there was only one triad (DM + COPD + CHF); the remainder were dyads
- Disease dyad combinations were:
  - **DM + CVD (n = 5) – 26%**
  - **DM + DEP (n = 3) – 16%**
  - **CHF + COPD (n = 3) – 16%**
  - DEP + AT or OA (n = 2)
  - DEP + DEM (n = 2)
  - DEP + COPD (n = 2)
  - DM + CHF (n = 1)
  - DM + CKD (n = 1)
  - DM + COPD (n = 1)

Results: Intervention characteristics

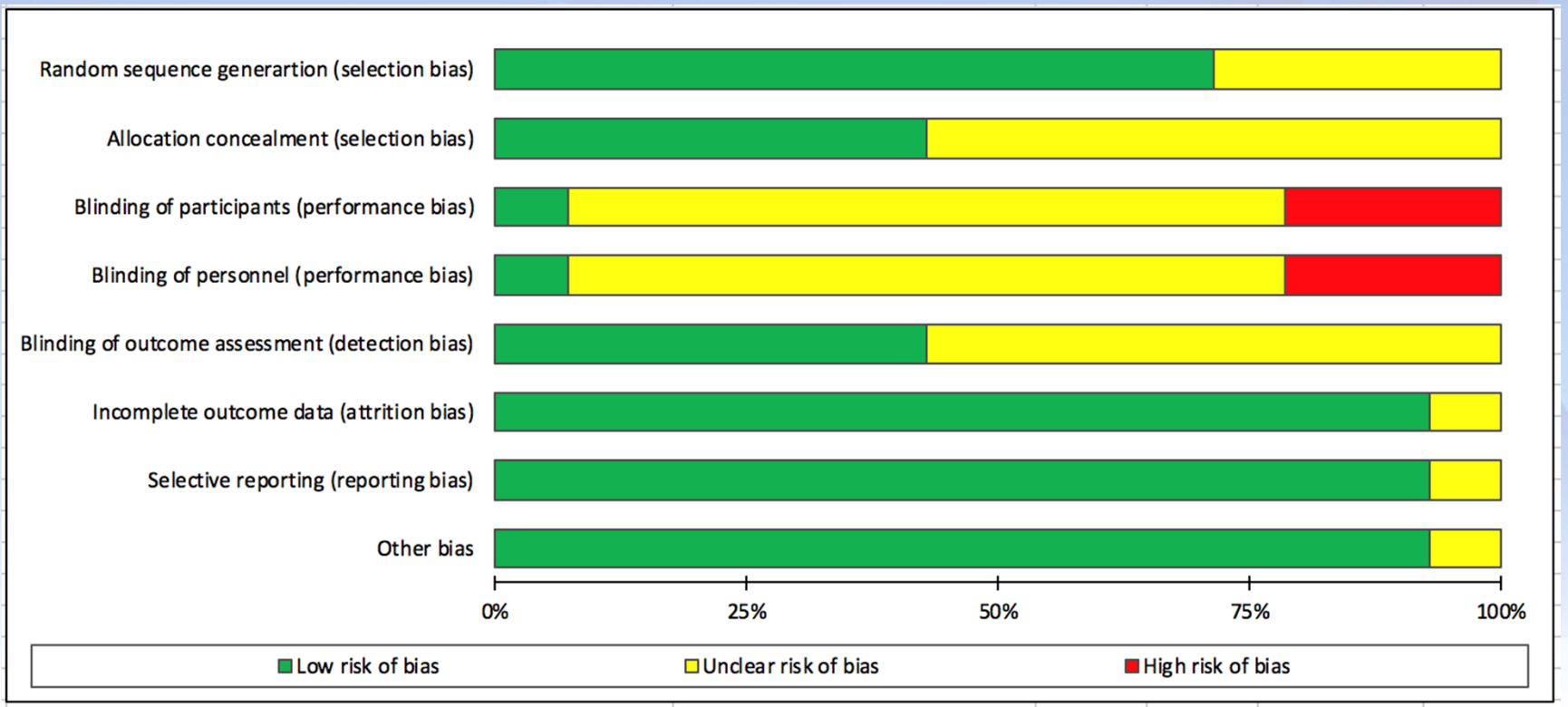
- Broad description of interventions (as reported by studies):
  - Collaborative care (n = 8)
  - Self-management with (n = 5) or without (n = 3) telecare or telemonitoring
  - Computer-based (n = 2)
  - Cognitive-behavioural (n = 2)
- Deconstruction of interventions revealed 9 unique components:

Intervention component	Intervention component code	Number of studies (%)
Education	ED	16 (76.19)
Disease management	DM	8 (38.10)
Self-management	SM	8 (38.10)
Care pathway management	CPM	7 (33.33)
Teams	TEAM	7 (33.33)
Case management	CM	6 (28.57)
Telemonitoring	TM	5 (23.81)
Reminder	REM	3 (14.29)
Facilitated relay	FR	2 (9.52%)

Results: Intervention characteristics

Author, Year	Type of intervention as described in study	Intervention component combination	Disease cluster
2-component interventions (n = 7)			
Becker, 2011	Computer-based	ED + SM	DM + CVD
White, 2012	Cognitive-behavioural	ED + SM	DM + CVD
Lamers, 2010	Cognitive-behavioural	ED + SM	DM + COPD or DM + DEP
McSweeney, 2011	Collaborative care	CPM + TEAM	DEM + DEP
Martin-Lesende, 2013	Self-management with TM	ED + TM	CHF + COPD
Whitten, 2007	Self-management with TM	DM + TM	CHF + COPD
Rahimpour, 2008	Self-management with TM	REM + TM	CHF + COPD
3-component interventions (n = 7)			
Alexopoulos, 2014	Collaborative care	CM + ED + FR	COPD + DEP
Lin, 2003	Collaborative	CM + DM + TEAM	AT + DEP
Schnipper, 2010	Computer-based	DM + ED + REM	DM + CVD
Noel, 2004	Self-management with TM	CM + ED + TM	DM + COPD + CHF
Bowles, 2009	Self-management with TM	DM + ED + TM	DM + CHF
Williams A, 2012-a	Self-management	DM + ED + SM	DM + CKD
Wu, 2012 (436060)	Self-management	ED + REM + SM	DM + CVD
4-component interventions (n = 4)			
Morgan, 2012	Collaborative care	CM + CPM + ED + SM	DM + CVD
Williams JW, 2004	Collaborative care	CPM + DM + ED + TEAM	DM + DEP
Brodaty, 2003	Collaborative care	CM + CPM + ED + TEAM	DEM + DEP
Eijkelberg, 2002	Collaborative care	CPM + DM + ED + TEAM	DM + COPD
5-component interventions (n = 2)			
Unutzer, 2008	Collaborative care	CM + DM + ED + SM + TEAM	OA + DEP
Naik, 2012	Self-management	CPM + ED + FR + SM + TEAM	DM + DEP

Results: Risk of bias



- 10 studies (71%) had low risk of bias for random sequence generation, and 13 studies (93) had low risk of bias for all 3 outcome data factors
- We identified unclear risk of bias for allocation sequence in 8 studies (57%), for blinding of participants and healthcare providers in 10 studies (71%), and for blinding of outcome assessors in 8 studies (57%)
- We identified high risk of bias in 3 studies (21%) for blinding of participants and personnel

Results

- Many different ways of representing data
- Results described across primary and secondary outcomes according to the broad categories suggested by the Cochrane Consumer and Communication group:
  - *Treatment outcomes (n = 13)*
  - *Health status and well-being (n = 7)*
  - *Health behaviour (n = 6)*
  - *Health service delivery (n = 5)*
  - *Knowledge and understanding (n = 4)*
  - *Evaluation of care (n = 4)*
  - *Skills acquisition (n = 4)*

Cochrane Consumers and Communication Group:
Taxonomy of outcomes 2012.

Results

Treatment outcomes (n = 13)

- **Depression (n = 10)**
  - 8 of 10 studies showed significant reductions in depressive symptoms or depression severity at follow-up
- **HbA1c (n = 4)**
  - 1 study found significant reduction of HbA1c; one study found a small effect (effect size 0.28)
  - 2 studies found no difference between groups
- **Pain (n = 2)**
  - Both studies found significant reduction in pain intensity or had less interference with daily activities due to pain
- **Mortality (n = 2)**
  - Groups did not differ for mortality in either study
- **Antidepressant use (n = 2) or change in antidepressant treatment strategy (initiation, increase, switch) (n = 1)**
  - All 3 studies found significant impacts

Results: Treatment outcomes

Depression (n = 10)

Shared disease cluster combo	Total no of studies	Disease clusters involved in significant impacts	Significant reduction in depressive symptoms or depression severity at follow-up
ED + SM	5	DM + DEP (n = 2) DM + CVD (n = 1) DEP + OA (n = 1)	4 of 5 studies (80%)
ED + CM	4	DEP + COPD (n = 1) DEP + OA (n = 1) DM + CVD (n = 1)	3 of 4 studies (75%)
ED + CP	4	DM + DEP (n = 2) DM + CVD (n = 1)	3 of 4 studies (75%)
ED + TEAM	4	DEP + DM (n = 2) DEP + OA (n = 1)	3 of 4 studies (75%)
CP + TEAM	4	DEP + DEM (n = 1) DEP + DM (n = 2)	3 of 4 studies (75%)
CP + ED + TEAM	3	DEP + DM (n = 2)	2 of 3 studies (67%)
CM + ED + SM	3	DM + DEP (n = 1) DM + CVD (n = 1) DEP + OA (n = 1)	All studies (100%)

ED = education; SM = self-management; CM = case management; CP = Care pathways; DM = diabetes; DEP = depression; CVD = cardiovascular disease; OA = osteoarthritis; DEM = dementia

Results: Treatment outcomes
HbA1c, Pain, Antidepressant use

Shared disease cluster combination	Total no of studies	Disease clusters involved	Significant outcomes	P-value
HbA1c				
CM + CP + ED + SM	1	DM + CVD	Intervention significantly reduced HbA1c compared with control	0.049
Pain				
CM + DM + TEAM	2	DEP + OA DEP + AT	Intervention in both studies significantly reduced pain intensity compared with control	0.021; 0.004
	1	DEP + AT	Intervention group had less interference with daily activities due to pain than controls	0.002
Antidepressant use				
CP + **ED** + CM + SM **CP** + **ED** + DM + TEAM	2	DM + CVD DM + DEP	2 studies found that antidepressants were taken significantly more by patients in the intervention group compared with controls	0.001; 0.025
CPM + TEAM	1	DEP + DEM	More people in the intervention group had a change in the antidepressant treatment strategy (initiation, increase, switch) than ctr.	0.02

ED = education; SM = self-management; CM = case management; CP = Care pathways; DM = diabetes; DEP = depression; CVD = cardiovascular disease; OA = osteoarthritis; DEM = dementia

Results

Health status and well-being (n = 7)

- **Psychosocial outcomes (n = 5):** Includes quality of life (QOL) measures to assess general, overall health and well-being, patient satisfaction
  - A study found significant improvement in overall QOL (scale of 0-10; p = 0.005*) - *DEP + AT*
  - Another study investigating health and well-being found no difference between groups (SF-36; p-value NR)
  - Of 2 studies investigating general health status, one found significant improvement (scale of 1-5; p <0.001*) – *DEP + AT*; whereas the other study did not (scale of 1-5; p = 0.76)
  - Another study found no improvement in patient satisfaction (p = 0.125) or health status (p = 0.506) on OARS scale

Results

Health status and well-being (n = 7)

- **Physical health (n = 4):** Includes measures of health-related functional status, overall functioning, general health status and and well-being
  - A study investigating the physical health component of QOL (SF-36) found no difference between groups (p = 0.43)
  - 2 studies investigated functional status: one found significant improvement in overall functioning and for the physical component of health-related functional status (12-item short form; p-value NR*), whereas the other study did not (OARS; p = 0.799)
  - 1 study found significant improvement in the intervention group for health-related functional impairment (Sheehan Disability Scale; p < 0.001*) – *DEP + AT*
- **Psychological health (n = 3):** measures of cognitive and mental health functioning
  - A study investigated diabetes-related emotional distress, and found significant reduction in the intervention group compared with control (ES 1.06*) – *DM + DEP*
  - A study found significant improvement in QOL for cognitive status (OARS; p=0.006*) while another study investigating the mental health component of QOL (SF-36) found no improvement (p = 0.14)

Results

Health status and well-being (n = 7)

Shared disease cluster combo	Total no of studies	Disease clusters involved	Significant outcomes	P-value
Psychosocial outcomes: QOL measures to assess general, overall health and well-being, patient satisfaction				
CM + DM + TEAM	1	DEP + AT	Significant improvement in overall QOL (scale of 0 to 10)	0.005
			Significant improvement in gen. health status (scale 1-5)	<0.001
Physical health: Includes QOL measures of health-related functional status/impairment, overall functioning				
CP + **DM** + ED + **TEAM**	1	DEP + DM	Significant improvement in overall functioning and health-related functional status	NR
CM + **DM** + **TEAM**	1	DEP + AT	Significant improvement in health-related functional impairment	<0.001
Psychological health: Includes QOL measures of cognitive and mental health functioning				
CP + **ED** + FR + SM	1	DM + DEP	Significant reduction in diabetes-related emotional distress	NR
CM + **ED** + TM	1	DM + COPD + CHF	Significant improvement in QOL for cognitive status (OARS)	0.006

CM = case management; DM = disease management; DEP = depression; AT = arthritis; CP = care pathways; FR = facilitated relay; SM = self-management; TM = telemonitoring; CHF = congestive heart failure

Results

Health behaviour outcomes (n = 6)

- **Compliance: Medication adherence (n = 2)**
  - A study showed that adherence to adequate antidepressants contributed to the advantage of the intervention for reducing depressive symptoms compared with controls ($p = 0.023^*$) – *COPD + DEP*
  - Another study showed no difference between groups for adherence to medication ($p = 0.681$)
- **Health-enhancing lifestyle/behav: Physical activity (n = 3)**
  - A study found a significant effect of exercise on reducing dyspnea-related disability (PFSDQ-M) ($p = 0.044$) – *DM + CVD*
  - Another study found significantly more people exercised 30 min/day in the intervention group compared with controls ($p < 0.001^*$) – *DM + CVD*
  - 1 study found significantly increased physical activity intention ($p=0.02^*$), perceived behavioural control ($p = 0.036^*$) and subjective norm ($p < 0.001^*$) in patients who received the intervention in the short-term (1-week) but not long-term (6-weeks; p-value not reported) – *COPD + DEP*

Results

Health behaviour (n = 6)

Shared disease cluster combo	Total no of studies	Disease clusters involved	Significant outcomes	P-value
Medication adherence: Antidepressants				
ED + CM + FR	1	COPD + DEP	Adherence to adequate antidepressants contributed to significant reduction in depressive symptoms	0.023
Health-enhancing lifestyle/behaviour: Physical activity				
ED + SM **ED + SM** + CM + CPM	2	**DM + CVD** (n = 2)	In both studies, patients in the intervention group engaged in significantly more physical activity than controls	<0.001; 0.044;
ED + CM + FR	1	COPD + DEP	1 study found a significant effect of exercise on reducing dyspnea-related disability (PFSDQ-M) (p = 0.044)	0.033

ED = education; CP = care pathways; CM = case management; FR = facilitated relay; SM = self-management; DM = diabetes; CVD = cardiovascular disease; DEP = depression

Results

Health service delivery (n = 5)

- **Service utilization: Hospitalizations, length of stay (n = 2)**
  - 1 study reduced at least one all-cause hospitalization admission compared with controls (p = 0.033*) but not all-cause hospitalizations (p = 0.250) cause specific hospitalizations (p = 0.328) or length of stay (p = 0.891) – *CHF + COPD*
  - 1 study found no difference between groups for rehospitalization (p = 0.15), but a significantly decreased time to rehospitalization (p = 0.01*) in the intervention group compared with controls – *CHF + DM*
- **Service utilization: ED use/urgent visits (n = 2)**
  - No difference between groups for ED use (p = 0.25) or time to ED use (p= 0.24)
  - No difference between groups for urgent visits (p = 0.798)
- **Service utilization: Mental health service use (n = 1)**
  - Significantly more intervention patients used mental health services or psychotherapy than control patients (p < 0.001*) – *DEP + AT*
- **Health economic outcomes (n = 1)**
  - No difference between groups for total outpatient costs (p-value not reported)

Results

Health service delivery (n = 5)

Shared disease cluster combo	Total no of studies	Disease clusters involved in significant impacts	Significant outcomes
Service utilization: Hospitalizations			
ED + **TM**	1	**CHF** + COPD	• 1 study found that the intervention reduced at least one all-cause hospitalization admission compared with controls
ED + **TM** + DM	1	**CHF** + DM	• 1 study found that the intervention significantly decreased time to rehospitalization in the intervention group compared with controls
Service utilization: Mental health service use			
CM + DM + TEAM	1	DEP + AT	• 1 study found that significantly more intervention patients used mental health services or psychotherapy than control patients

ED = education; TM = telemonitoring; DM = disease management; CM = case management; CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; DM = diabetes; AT = arthritis; DEP = depression

Results

Skills acquisition (n = 4)

- **Self-care skills: Depression self-efficacy (n = 1)**
  - 1 study found that patients in the intervention group had significantly more confidence in managing depression than those in the control group on a scale of 0 to 10 ($p = 0.029$)
  - This intervention was targeted to patients with DEP + OA, and its components were: CM + DM + ED + SM
- **Self-care skills: Self-management and self-efficacy**
  - 2 studies found no difference between groups for self-efficacy (7-item scale; ($p = 0.81$); DMSES and SDSCA scales in the other study (p-value not reported)
  - 1 study found no difference between groups for medication self-efficacy (p-value not reported)

DEP = depression; OA = osteoarthritis; CM = case management; DM = disease management; ED = education; SM = self-management

Results

Knowledge and understanding (n = 4)

- **Patient knowledge acquisition (n = 2)**
  - A study found a significant increase in medication knowledge in the group that received an intervention with telemonitoring compared with those who received the intervention with telephone alone (OSPSO scale; $p = 0.03^*$) – *DM + CHF*
  - Another study found that the intervention group had increased diabetes knowledge over time compared with controls ($p < 0.05^*$) – *DM + CVD*
- **Provider level of knowledge or skills (n = 2)**
  - In 1 study, significantly more patients in the intervention group were referred to an exercise program than controls ($p < 0.001$) and significantly more attended a mental health worker meeting ($p = 0.044$) – *DM + CVD*
  - 1 study showed that a significantly larger proportion of deficiencies in CVD/DM management were addressed by primary care physicians of patients in the intervention group compared with the control group (OR 1.14; 95% CI 1.02 to 1.28; $p = 0.02$) – *DM + CVD*

OSPSO = Omaha System Problem Rating Scale for Outcomes;

Results

Knowledge and understanding (n = 4)

Shared disease cluster combo	Total no of studies	Disease clusters involved	Significant outcomes	P-value
Patient knowledge acquisition				
ED + DM + TM	1	**DM** + CHF	• 1 study found that there was a significant increase in medication knowledge in the intervention group who received intervention with TM compared with those who received the intervention with telephone alone	0.03
ED + REM + SM	1	**DM** + CVD	• 1 study found that the intervention group had increased diabetes knowledge over time compared with the control group	<0.05
Provider level of knowledge or skills				
ED + CM + CP + SM	1	**DM + CVD**	• In 1 study, significantly more patients in the intervention group were referred to an exercise program than controls and significantly more attended a mental health worker visit	<0.001
ED + DM + REM	1	**DM + CVD**	• 1 study showed that a significantly larger proportion of deficiencies in management were addressed by primary care physicians of patients in the intervention group compared with the control group	0.044

Preliminary conclusions

Interventions that include…	Outcome category	Significant outcome	Population	No of studies
ED + SM	Treatment: Depression	Reduction in depressive symptoms or severity	DM + DEP (n = 2) **DM + CVD** DEP + OA	4
	Treatment: Health behaviour	Increase in physical activity	**DM + CVD**	2
ED + CP	Treatment: Antidepressant use	Increase in antidepressant use	DM + CVD **DM + DEP**	2
	Treatment: Depression	Reduction in depressive symptoms or severity	**DM + DEP (n = 2)** DM + CVD	3

ED: Reduced depressive symptoms or depression severity, and increased physical activity and antidepressant use in older adults with:

- DM + DEP or CVD, and DEP + OA

ED + SM: Reduced depressive symptoms or depression severity in:

- DM + DEP or CVD, and DEP + OA
- Increased physical activity in those with DM + CVD

ED + CP: Reduced depressive symptoms or depression severity in:

- DM + DEP and DM + CVD
- Increased antidepressant use in those with DM + DEP or CVD

Preliminary conclusions

Interventions that include…	Outcome category	Significant outcome	Population	No of studies
CM + ED	Treatment: Depression	Reduction in depressive symptoms or severity	DEP + COPD **DEP + OA** **DM + CVD**	3
CM + ED + SM	Treatment: Depression	Reduction in depressive symptoms or severity	DM + DEP **DM + CVD** **DEP + OA**	3
CM + ED + SM + DM	Skills acquisition: Depression self-efficacy	More confidence in managing depression	**DEP + OA**	1

CM: Reduced depressive symptoms or depression severity and provided more confidence in managing depression in older adults with:

- DEP + COPD or OA
- DM + CVD or DEP

CM + ED: Reduced depressive symptoms or depression severity in older adults:

- DEP + COPD or OA
- DM + CVD

CM + ED + SM:

- Reduced depressive symptoms or depression severity and increased confidence in managing depression in older adults with DEP + OA
- Reduced depressive symptoms or depression severity in older adults with DM + DEP or CVD

Preliminary conclusions

Interventions that include…	Outcome category	Significant outcome	Population	No of studies
CP + TEAM	Treatment: Depression	Reduction in depressive symptoms or severity	DEP + DM (n = 2) DEP + DEM	3
ED + TEAM	Treatment: Depression	Reduction in depressive symptoms or severity	DEP + DM (n = 2); DEP + OA	3
DM + TEAM	Health status and well-being	Improvement in overall functioning; health-related functional impairment	DEP + DM DEP + AT	2
CP + ED + TEAM	Treatment: Depression	Reduction in depressive symptoms or severity	DEP + DEM (n = 2)	2
CM + DM + TEAM	Treatment: Pain	Reduction in pain intensity	DEP + OA DEP + AT	2

TEAM: Reduced depressive symptoms or depression severity in older adults with:

- DEP + DM, DEM, OA or AT

CP + ED + TEAM: Reduced depressive symptoms or depression severity in: DEP + DEM

CM + DM + TEAM: Reduced pain intensity in: DEP + OA or AT

CP + TEAM: Reduced depressive symptoms or depression severity in: DEP + DM or DEM

ED + TEAM: Reduced depressive symptoms or depression severity in: DEP + DM or OA

DM + TEAM: Improved overall functioning, and health-related functional in: DEP + DM or AT

Summary

- Coordination of care approaches involving different combinations of **CM**, **TEAM**, and **CP** + implementation strategies involving **ED** reduced depressive symptoms in older adults with DM + (DEP or CVD or OA)
- Coordination of care approaches involving the combination of **CM + DM + TEAM** reduced pain intensity in DEP + (OA or AT)
- The combination of **CM + ED + SM** reduced depressive symptoms and increased confidence in managing depression in older adults with DEP + OA
- **ED + SM** reduced depressive symptoms and increased physical activity in older adults with DM + CVD
- **ED + CP** reduced depressive symptoms and increased antidepressant use in older adults with DM + (DEP or CVD)

Limitations

1. **Our systematic review yield imposed high screening burden**
   - Multimorbidity is not well indexed in the literature, so we developed a separate search strategy for each of the 11 high-burden chronic diseases, which was nested within the overall search strategy
   - Identifying whether the intervention was applied to populations with two or more chronic disease was difficult at both levels of screening
   - We had to be overinclusive in our selection, which increased our yield significantly
2. **Others may interpret interventions and their components differently**
   - Our approach to deconstructing interventions was highly systematic and performed in duplicate
   - Our interpretations wwere guided by EPOC criteria
   - We are also identifying context-mechanism-outcome configurations from our realist review, which will provide *explanations* for our intervention component configurations

Implications & Next steps

Strengths and significance:

- We have contributed to the current, limited knowledge of CDM-KT interventions that integrate the care of ≥ 2 chronic diseases affecting older adults for the top 10 high-burden chronic conditions
- We deeply examined a variety of interventions and outcomes, which provides a more in-depth understanding of multiple chronic disease management in this population
- Our findings highlight large gaps in the evidence – relatively few studies of interventions that are actually developed for ≥ 2 chronic conditions

Next steps:

- Complete remainder of analyses plan (sub-group & meta-analyses); Realist review alongside this systematic review to determine the mechanisms underpinning interventions
- Relevant findings from both SR and RR will be used to inform the development of a multi-chronic disease management tool

Acknowledgements

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Questions??

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Questions??

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