Supplemental materials for:

Khanassov V, Vedel I, Pluye P. Barriers to implementation of case management for patients with dementia: a systematic mixed studies review. *Ann Fam Med*. 2014;12(5):456-465.

Supplementary Appendix 1. Methodology and methods

Systematic Mixed Studies Review

As defined elsewhere by the second author (PP), systematic mixed studies review allows the integration of results from studies with diverse designs (quantitative, qualitative and mixed methods) to evaluate complex interventions.[38] This review applies mixed methods research designs to synthesize results of included studies as it preserves the integrity of the findings across different designs.[1] Including different forms of evidence derived from studies with a variety of types of methodologies and methods produces more relevant research for decision makers, and maximizes the use of review results (knowledge to action) by enhancing their utility and impact.[2] A systematic mixed studies review (i) overcomes the issue of a partial picture that results from relying on one type of research in isolation; (ii) answers a number of questions in the same review (e.g., identification of barriers and evaluation if they have been addressed);[3] and (iii) assists in the critical analysis of interventions from the viewpoint of participants targeted.[2]

The research question of our systematic review was: *for Community-Based Primary Health Care (CBPHC) patients with dementia, what are the relationships between the key outcomes of case management (CM) and barriers to implementation?*

The stages in the systematic review

As any systematic review, our systematic mixed studies review follows the standards of the PRISMA statement.[4] We thus followed five stages[38, 111] to conduct this systematic review:

Stage 1. Definition of eligibility criteria

Inclusion criteria

Population: people of any age and gender with any type of primary causes of dementia (Alzheimer disease, vascular dementia, Pick's disease, Lewy-Body dementia, Parkinson's disease, Huntington's disease)[5] and cognitive impairment. Primary causes of dementia cause irreversible loss of memory without any underlying medical condition (e.g., brain tumour).

Setting: CM intervention implemented in a range of community settings such as patients' homes and family physician's offices.[6-8]

Types of interventions: CM interventions that comprise all following components: assessment, coordination, monitoring, and delivery of services to meet patients' needs.[15, 39]

Type of studies: intervention studies assessing outcomes of CM for patients and caregivers (e.g., randomized controlled trial - RCT); intervention and non-intervention studies evaluating barriers to CM implementation (e.g., qualitative studies). Thus, all types of studies regardless the design were included.

Types of outcome measures: *clinical outcomes* (neuropsychiatric and behavioural symptoms, cognition, depression, functional status (ADLs/IADLs), perceived health, quality of life, risk of mortality), *service use* (nursing home, hospital and emergency department admission, length of hospital stay), *caregiver outcomes* (depression, burden, strain, quality of life, perceived health), *satisfaction* (patient-caregiver dyad, health care professionals), *cost-effectiveness,* and *other* outcomes (e.g., dementia detection rate).

Exclusion criteria

Population: secondary causes of dementia or cognitive impairment resulted from an underlying medical condition (e.g., vitamin B_{12} deficiency, brain tumor).

Setting: interventions conducted in a nursing home, a hospital without link to primary care, an assisted living facility, palliative or respite care, a day care center, a club due to different organizational and professional barriers, which are not directly relevant to primary care. This ensures more homogeneity in the selected studies.

Type of interventions: interventions focused on education of healthcare professionals, psycho-education, behavioural therapy, pharmacotherapy of cognitive impairment, performance of cognitive function tests.

Stage 2. Development of an extensive search strategy

A literature search was conducted by a specialized librarian; publications in English or French listed in MEDLINE, PsycInfo, EMBASE, the Cochrane Database of Systematic Reviews (CDSR) and Database of Abstracts of Reviews of Effects (DARE), and published between 1995 (official publication of the CM Standards of Practice)[6] and August 31, 2012 were searched.

The first search was expanded using snowballing techniques looking at the references in the selected studies and systematic reviews. Moreover, all companion articles of the intervention studies were searched (including articles on intervention implementation). To assure the exhaustiveness of our search we additionally looked for the citations of included studies in the Scopus database. The main key terms used to identify relevant studies were "case management" or "care management" or "case coordination".

As mentioned, all types of study designs were searched (qualitative, quantitative and mixed methods). The example of search strategy of qualitative studies in PsycINFO is as follows:

1   dementia/ or aids dementia complex/ or dementia with lewy bodies/ or presenile dementia/ or semantic dementia/ or senile dementia/ or vascular dementia/

or alzheimer's disease/ or cognitive impairment/ or corticobasal degeneration/ or creutzfeldt jakob syndrome/ or melas/ or neurodegenerative diseases/ or

neurofibrillary tangles/ or parkinson's disease/ or picks disease/ or pseudodementia/ or huntington disease/ or senile plaques/ (65226)

2   exp Cognitive Impairment/ (17076)

3   ((cognit* adj1 disorder?) or (cognit* adj1 impairment?)).mp. (26680)

4   pick?? disease.mp. (407)

5   (dementia? or alzheimer*).mp. (54468)

6   lewy body.mp. (865)

7   1 or 2 or 3 or 4 or 5 or 6 (80911)

8   case management/ or care management/ or care coordination or (case adj manag?).mp. (2310)

9   limit 8 to ("qualitative (maximizes sensitivity)" and (english or french) and human and yr="1990 -Current") (508)

10   7 and 9 (9)

11   "Qualitative Study".md. (89802)

12   8 and 11 (118)

13   exp qualitative research/ or exp grounded theory/ or exp interviews/ (11273)

14   exp Quasi Experimental Methods/ (69)

15   (research adj action).mp. (102)

16   exp questionnaires/ (10367)

17   (participatory adj research??).mp. (1022)

18   (grounded adj theor???).mp. (7278)

19   (quasi adj experimental).mp. (4551)

20   (questionnaire? or interview* or qualitative?).mp. (373594)

21   11 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 (411558)

22   8 and 21 (454)

23   9 or 22 (652)

24   limit 23 to (english or french) (648)

25   24 and 7 (10)

26   24 not 25 (638)

Stage 3. Identification of relevant studies and selection of the data

Based on the eligibility criteria, titles and abstracts were selected independently by two reviewers (VK, IV). Then, full text copies were examined for final inclusion. Differences in the coding were resolved by consensus or referred to a third reviewer (PP). Kappa scores were calculated to estimate inter-reviewer reliability.[9]

The data were extracted from each study by two researchers independently (VK, IV) and comprised:

- characteristics of the study participants (diagnosis, mean age, sex, cognitive function score, comorbidity, sample size);

- characteristics of intervention (main characteristics and other components, type of CM – individual versus team CM, involved healthcare professionals);

- design of the study (RCT, NRS, quantitative descriptive and qualitative studies) and methods;

- context of implementation (e.g., home-care program);

- outcomes from quantitative studies (e.g., neuropsychiatric and behavioural symptoms). Estimated outcomes in the included intervention studies were categorized and coded as "positive" (effect was significant) or "no effect" (no effect or non-significant).

- findings of qualitative studies (all specific themes relevant to CM implementation barriers).

Stage 4. Appraisal of the quality of included studies

The quality of the studies was assessed independently by two reviewers (VK, PP) using the Mixed Methods Appraisal Tool (MMAT)[10, 11] that was validated and has been designed for the critical appraisal of studies with diverse designs.[11] The tool demonstrated a good reliability: the consistency of the global quality score between reviewers (intra-class correlation) is 0.72 pre- and 0.94 post-discussion.[11]

Inter-rater reliability was calculated based on weighted kappa.[12] Studies of lower quality were not excluded from the synthesis, as our primary objective was to gain knowledge on dementia CM and highlight main aspects that must be addressed in future research. However, we performed a sensitivity analysis to assess the impact of lower-quality studies (with a score of 0 and 1) on the results.

Stage 5. Synthesis of included studies

A sequential explanatory synthesis design developed by Thomas *et al.* was used[13] to integrate qualitative evidence with quantitative findings: a quantitative synthesis was followed by a qualitative synthesis, and then the two were integrated (the results of the qualitative synthesis were used to explain the results of the quantitative synthesis).

Phase 1. Quantitative synthesis

We identified the key outcomes of the studies. While this review is based on a detailed definition of CM,[6] a meta-analysis was not possible due to the heterogeneity of CM implementation (CM performed either by a team or individual CM; different background of healthcare professionals involved in dementia CM; addition of other components to CM such as reminiscence therapy, cognitive stimulation; focus on anticholinesterase inhibitors prescription).

However, to evaluate the magnitude of the positive outcomes we calculated the effect size. To obtain the mean, the Cohen method was used: *Effect size=│m_1-m_2│/s*, where m_1 and m_2 are the means of the intervention and control groups, respectively, and *s* is the pooled standard deviation.[12] The effect size formula was applied to obtain the proportions: *Effect size=│Phi_1-Ph_2│*, where *Phi_1=2×Arcsin√P_1* and *Phi_2=2×Arcsin√P_2* and P_1 and P_2 are the proportions of the intervention and control groups, respectively. The effect size formula was used to determine the odds ratio: *Effect size=ln×OddsRatio×√3/π*. The Cohen's scale was used to interpret the effect size: < 0.2 = a weak effect; 0.2 to 0.5 = a small effect; 0.5 to 0.8 = an intermediate effect; > 0.8 = a large or significant effect.[12]

Furthermore, we developed three main groups of composite outcomes: clinical outcomes (including behavioural symptoms, cognition, depression, functional status, perceived health, quality of life, mortality), service use (including nursing home, hospital and emergency department admission, length of hospital stay), and outcomes for caregivers (including depression, burden, strain, quality of life, perceived health). They were dichotomized as either "no effect" (score 0) (no positive outcomes in the group) or positive (score 1) (at least one positive outcome in the group). The results of RCTs and non-randomized studies (NRSs) were analyzed and presented separately, as the Cochrane Collaboration strongly recommends against inferences derived from the integration of RCTS and NRS statistical results.[14, 15]

Phase 2. Qualitative synthesis

Grol *et al.*[16] recently underscored the potential role played by barriers to implementation in influencing outcomes, so we identified barriers to CM implementation in intervention and non-intervention studies and assigned each study to one of the following categories based on the classification developed by Chaudoir *et al.*:[17] barriers at the level of (i) the *organization* (aspects of the organization in which the innovation is implemented; e.g., organizations that misunderstand the case manager role), (ii) the *provider* (characteristics of the individual provider implementing the innovation; e.g., lack of training), and (iii) the *innovation* (aspects of the implemented innovation; e.g., a short engagement period). As one of the main characteristics of CM, we evaluated CM intensity using the method developed by Pacala *et al.,* [18] previously applied to CM by Somme *et al.*[19]

Phase 3. Integration of results from quantitative and qualitative syntheses

We followed a 2-step process to integrate results of the quantitative and qualitative syntheses. First, we identified whether the studies (RCTs and NRSs) had addressed barriers to implementation by matching the Phase 2 results with Phase 1 findings (cross-study synthesis).[13] This analysis was performed by two reviewers independently (VK, IV) with calculation of kappa scores to estimate inter-reviewer reliability.[9]

Second, we applied the Configurational Comparative Method[20] to build "barrier-outcome" configurations (Boolean algebra). This identifies patterns in the relationships between barriers (addressed/non-addressed) to implementation ("conditions") and outcomes.[20] The method was applied to RCTs only. It postulates that it is necessary for a certain condition or combination of conditions to be present (e.g., CM intensity, duration of the intervention) for an outcome to occur (e.g., fewer hospitalizations). To build "barrier-

outcome" configurations, we grouped studies that shared a given outcome (positive or "no effect") and we searched for their shared conditions (addressed or non-addressed barriers). We determined whether addressing one barrier was sufficient to result in a positive outcome. When this was not the case in some studies (the technical term is "remainder", and we use the lay term "outlier" in the method section to avoid technical jargon), we searched for (i) other addressed barriers, the combination of which could lead to positive outcome, or (ii) other factors that could explain the mismatch of "barrier-outcome" configurations.

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Appendix 2. Details on CM intensity

Assessment of CM intensity in selected intervention studies

ID #	CM intensity
	RCTs
16	12
17	12
20	5
24	11
26	11
31	11
32	10
52	12
55	11
62	10
63	12
64	12
66	10
71	12
95	8
25	8
57	9
60	12
61	12
69	8

Criteria used for CM intensity assessment:

1. Each manager works with < 60 clients (caseload)
2. Spends at least 50% of his/her time face-to-face with clients
3. Does the initial eligibility assessment him/herself
4. Personally communicates with PCP (and his/her team)
5. Organizes multidisciplinary team meetings
6. Puts in place the services provided by the organization that employs him/her
7. Puts in place the services that the client pays for directly
8. Helps the client make decisions regarding care
9. Puts in place the services that an organization other than the one that employs him/her pays for
10. Helps the client express decisions
11. Participates in educating clients about health problems

NRS	
[72]	8
[73]	11
[75]	12
[76]	10
[77]	13
[74]	12

* - based on the method developed by Pacala et al. [50] (score ≥11 - high CM intensity)

12. Provides advice to individuals (social work)

13. Provides advice to families (social work)

14. Meets with the client regularly

15. Monitors the client's situation via home visits

16. Monitors the client's situation by having him/her come in for a consultation

17. Works with clients being institutionalized

18. Works with clients during hospitalization

Appendix 3. Details on quantitative studies

(non-randomised and quantitative descriptive)

Table 1 Characteristics of Included Descriptive Studies

Study, region	Population	Sample size	Context of CM implementation	Main characteristics of the CM intervention	Type of CM/Healthcare professionals involved in CM
Verkade, 2010/ the Netherlands[12]	Experts in CM	30	-	-	-
Ghatak, 2011/USA[78]	Diagnosis: dementia Mean age: 75 Sex: 60% of females Cognitive function: not reported	237	Home-care program delivered by the outpatient department of specialised	- analysis of cognitive deficit; - assessment of the competency; - liaison with available resources; - development of a care strategy; - training of caregivers.	Team CM; Case manager: nurse; Other healthcare professionals: psychologist,

Comorbidity: not reported		community center			psychiatrist, neurologist, geriatrician; Role of specialists: not reported.
Jedenius, 2008/Sweden[79, 80]	Diagnosis: dementia Mean age: 78.3 Sex: 59.6% of females Cognitive function (MMSE): 21.8 Comorbidity: not reported	160-257 per year	Home-care program delivered by primary care practice	- collection of the medical information; - support of the patient-caregiver dyad; - care planning.	Team CM; Case manager: registered dementia nurse; Other healthcare professionals: FP.
Judge, 2011/USA[81]	Diagnosis: dementia Mean age: 80 Sex: 5.4% of females Cognitive function: not reported Comorbidity: not reported	93	Home-care program delivered by the Alzheimer Association in partnership with Veterans Affairs medical centers	- telephone-based multi-dimensional assessment; - regular follow-up' - in-person conference to review and discuss the results; - development of specific goals; - disease-related education and information provision; - coaching and emotional support; - assistance with support service.	Team CM; Case manager: social worker; Other healthcare professionals: FP.

Table 2 Clinical outcomes in Non-Randomised studies

# ID	Clinical outcomes						
	Behavioural/ psychological symptoms	Depression	Cognition	ADL/ IADL	Perceived health	QoL	Mortality

ID #							
72			1				
73	0	0					
75			0	0			
76	0		0	1			

0 – no effect on outcome (p>0.5); 1 - positive effect on outcome (p≤0.5);

ADL/IADL – activities of daily living/instrumental activities; QoL – quality of life.

Table 3 Outcomes of service use in Non-Randomised studies

ID #	Service use			
	HR	NHP	LOS	ED
72		1		
73	0	0	0	
75	0		0	0
77	0	0		

0 – no effect on outcome (p>0.5); 1 - positive effect on outcome (p≤0.5);

HR – hospitalisation rate; NHP – nursing home placement; LOS – length of hospital stay; ED - emergency department admission.

Table 4 Caregivers outcomes in Non-Randomised studies

ID #	Caregivers outcomes				
	Burden	Depression	Strain	Health	QoL
72		0			
73	1	0			
76			0		0

0 – no effect on outcome (p>0.5); 1 - positive effect on outcome (p≤0.5);

QoL – Quality of Life

Table 5 Satisfaction of the participants in Non-Randomised studies

ID #	Satisfaction of caregivers	Satisfaction of healthcare professionals
74	1	0#

0 – no effect on outcome (p>0.5); 1 - positive effect on outcome (p≤0.5).

Table 6 Other outcomes in Non-Randomised studies

ID #	Adherence to dementia guidelines	Medication management
72		1
74	1	

0 – no effect on outcome (<70%); 1 - positive effect on outcome (≥70%)

Appendix 4: Cross-study synthesis

Table 1 Cross-study synthesis matrix of RCTs

ID #	Barriers at the level of innovation				Barriers at the level of organization				Barriers at the level of provider	Composite outcomes		
	Restricted inclusion criteria	Low intensity of CM	Short duration of intervention	Short engagement period	Inadequate communication	Lack of CM integration	Absence of case manager co-location	Turnover of case managers	Lack of training in geriatrics	Clinical outcomes	Service use	Outcomes of caregivers
16	0	1	1	0	1	1	1	0	1	1	0	1
17	0	1	1	0	1	0	1	0	1	1	N/E	0
20	0	0	1	0	0	0	0	0	0	0	0	1
24	0	1	1	1	1	0	0	0	0	1	1	1
25	0	0	0	0	0	0	0	0	0	N/E	0	0
26	0	1	1	0	1	1	1	0	0	1	1	1
31	0	0	0	0	1	0	1	0	1	0	N/E	1
32	0	0	1	0	1	0	0	0	1	0	N/E	1
52	0	1	1	0	1	1	1	0	0	1	1	1
55	1	0	1	0	0	0	0	0	0	0	0	0
57	1	0	0	0	1	0	1	0	0	N/E	0	N/E
60	0	1	1	0	1	0	0	0	1	N/E	0	N/E
61	0	1	1	0	1	0	0	0	1	N/E	0	N/E
62	0	1	0	0	1	0	0	0	1	1	0	1
63	0	1	0	0	1	1	1	0	1	1	N/E	1

ID #	Barriers at the level of innovation				Barriers at the level of organization				Barriers at the level of provider	Composite outcomes		
	Restricted inclusion criteria	Low intensity of CM	Short duration of intervention	Short engagement period	Inadequate communication	Lack of CM integration	Absence of case manager co-location	Turnover of case managers	Lack of training in geriatrics	Clinical outcomes	Service use	Outcomes of caregivers
64	0	1	1	0	0	0	0	0	1	0	N/E	0
66	0	0	0	0	0	0	0	0	1	0	0	0
69	0	0	1	0	0	1	1	0	0	0	1	1
71	0	1	1	0	0	0	0	0	1	1	1	0
95	0	0	1	0	0	0	0	0	0	0	0	0

In the section of barriers: 0 – non-addressed barrier, 1 - addressed barrier
In the section of composite outcomes: 0 – negative outcome and 1 – positive outcome, N/E – non-estimated outcome

Table 2 Cross-study synthesis matrix of NRS

ID #	Barriers at the level of innovation				Barriers at the level of organization				Barriers at the level of provider
	Restricted inclusion criteria	Low intensity of CM	Short duration of intervention	Short engagement period	Inadequate communication	Lack of CM integration	Absence of case manager co-location	Turnover of case managers	Lack of training in geriatrics

ID #	Barriers at the level of innovation				Barriers at the level of organization				Barriers at the level of provider
	Restricted inclusion criteria	Low intensity of CM	Short duration of intervention	Short engagement period	Inadequate communication	Lack of CM integration	Absence of case manager co-location	Turnover of case managers	Lack of training in geriatrics
72	0	0	1	0	1	1	1	0	1
73	1	0	1	0	0	0	1	0	0
74	0	1	0	0	1	0	0	0	1
75	0	1	1	0	0	0	0	0	0
76	1	0	1	0	0	0	0	0	1
77	0	1	0	0	1	0	1	0	1

0 – non-addressed barrier, 1 - addressed barrier

Table 3 Barrier-Outcome Matching

Composite outcomes	Barriers	
	Addressed	Non-addressed
Positive	Total: 12 studies RCTs[16, 17, 24, 26, 31, 32, 52, 62, 63, 69, 71] NRSs[72]	Total: 1 study RCT[57]
Negative	Total: 5 studies RCTs[60, 61] NRSs[73, 76, 77]	Total: 7 studies RCTs[18, 25, 55, 64, 66, 95] NRSs[75]

RCT- randomized clinical trial; NRS – non-randomized study

Supplemental Table 1. Characteristics of Included Randomized Controlled Trials of Case Management Implementation

First Author, Year Country	Diagnosis and Comorbidity (if Reported)	Sample Size	Mean Age, y	Context of Implementation	Main Intervention Characteristics	Case Management Type and Health Care Professionals Involved
Callahan, 2006[12] United States	Dementia (moderate) Mean chronic disease score = 8.0	153	77.4	Home care program delivered by primary care practice	Development of individualized care plan for the patient-caregiver dyad Prescription of anticholinesterase inhibitors and memantine[a] Regular assessment of patients' behavior and memory Weekly review of care and adherence to guidelines by multidisciplinary team[a] Monitoring of health condition and communication of health care professionals via Web-based system[a]	Team case management Family physician, geriatrician, geriatric psychiatrist, psychologist, geriatric nurse practitioner (case manager)
Vickrey, 2006[13] Chodosh, 2006,[49] 2012[50] Duru, 2009[55] Connor, 2008[54] United States	Dementia (mild) Mean comorbidity index = 2.7	408	80.1	Home care program delivered by primary care practice	Problem list development with further elaborated care plan including guidelines for caregiver Regular reassessment of the patient's condition Liaison of the patient to support services by case manager Monitoring of health condition and communication of health care professionals via Web-based system[a]	Team case management Family physician, social worker (case manager)
Miller, 1999[17] Newcomer, 1999[15,16]	Dementia (moderate) cerebrovascular	8,095	78.9	Home care program	Liaison of the patient to support services by case manager	Individual case management

Study	Disease			Program	Intervention	Case management
Yordi, 1997[18] Shelton, 2001[19] Fox, 2000[20] United States	diseases (40.3%), diabetes (22.4%), degenerative nervous system conditions (16.8%)			delivered by Medicare	Psychological support to caregiver No data on referral to physician	Nurse, social worker, mental health worker, gerontology worker (case managers across different sites)
Clark, 2004[48] Bass, 2003[21] United States	Dementia and cognitive impairment	89	76.4	Home care program delivered by Alzheimer Association in collaboration with Kaiser Permanente	Specially trained staff of the Alzheimer`s Association initiated care consultation Structured assessment and care plan development for the patient-caregiver dyad Regular follow-up and reassessment No data on referral to physician	Individual case management Social worker (case manager)
Fortinsky, 2009[22] United States	Dementia	84	81.7	Home care program delivered by Alzheimer Association	Educational material for caregivers about the course of disease, legal and financial issues, community services Regular contacts by care consultant to assess patient's condition Elaborated plan action for caregiver; No data on referral to physician	Individual case management Social worker (case manager)
Chien, 2008[23] China	Dementia (moderate)	88	67	Home care program delivered by community dementia centers	Structured caregiver's needs assessment Care plan development for the dyad including educational training No data on referral to physician	Individual case management Nurse (case manager)
Dias, 2008[28] India	Dementia (mild to moderate)	81	79.4	Home care program delivered by community health service	Education of caregivers about the disease Emotional support to caregivers Improvement of caregivers' skills Referral to support groups No data on referral to physician	Team case management Psychiatrist home care advisor (case manager with no social or medical background)
Schoenmakers, 2010[29] Belgium	Cognitive impairment (moderate) Incontinence (33%)	62	-	Home care program delivered by primary care practice	Guidance of the caregiver in organizing home care Exploring problematic home care situations Monthly telephone call with the caregiver Regular home follow-up Permanent reach for advice No data on referral to physician	Team case management Family physician, primary care professional with a bachelor degree (case manager)
Chien, 2010[48] China	Dementia (moderate)	92	68.1	Home care program	Generation of the important problem areas	Team case management Psychiatrist, social

				delivered by community dementia centers	Individualized education and support program Improvement of home care and finance skills Close collaboration of case manager with psychiatrist	worker, nurse (case manager)
Chu, 2000[51] Canada	Dementia (mild)	78	78% >75	Home care program delivered by community-based center	Action plan development for the dyad Assistance with support service Provision of coping strategies No data on referral to physician	Individual case management Social worker (case manager)
Clarkson, 2006[53] United Kingdom	Cognitive impairment (mild) Heart failure (11%), osteoarthritis (25%), incontinence (17%), cardiovascular disease (12%)	256	82	Home care program delivered in the community care setting	Screening for eligible health problems Assessment and arranging the care plan Monitoring and regular review Presenting to the panel for consideration for home care admission[a]	Team case management Geriatrician, old age psychiatrist, social worker (case manager)
Eloniemi-Sulkava, 200[56] Finland	Dementia (moderate)	100	78.8	Home care program delivered by community health service (public health department)	Training courses for the patient-caregiver dyad about the disease and coping strategies Assistance with support service Systematic counseling; Regular follow-up Consultation with specialists in complex cases	Team case management/ Geriatrician, registered nurse specialized in public health (case manager)
Eloniemi-Sulkava, 2009[57] Finland	Dementia (moderate) Mean comorbidity index = 2.4	125	78	Home care program delivered by community health service (public health department)	Support plan development in cooperation with the dyad Training courses for the patient-caregiver dyad about the disease and coping strategies Assistance with support service Systematic counseling Regular follow-up	Team case management Geriatrician, public health registered nurse with advanced practice education and special education in dementia care (case manager)
Enguidanos, 2006[58] United States	Cognitive impairment (moderate)	452	79	Home care program delivered by Kaiser Permanente	Identification of health needs Assistance with support service In-home assessment and ongoing coordination Coordinated work of case manager with the Kaiser Permanente health care professionals	Team case management Geriatrician, social worker and nurse practitioner (case managers)
Hinchliffe, 1995[59]	Dementia	40	81	Home care	Medication management	Team case management

Study, Country	Population	N	Age	Setting	Intervention components	Case management type/provider
United Kingdom				program delivered in the community care setting	(prescription of neuroleptics, benzodiazepines)[a] Reminiscence therapy[a] Encouragement of regular toileting[a] Sleep hygiene[a] Coordination of the service (eg, referral to day centers, respite care) Assistance with the financial issues (eg, tax exemption of carriers) Education of caregivers Referral to the Alzheimer Association	Psychiatrist, clinical psychologist, community psychiatric nurse, social worker, occupational therapist, psychiatrist (case manager)
Jansen, 2005,[61] 2011[60] The Netherlands	Cognitive impairment (mild) With >1 chronic disease 81%	99	82.1	Primary care practice delivered home care program	In-home assessment Elaborated care plan development for the patient-caregiver dyad Liaison to support service Regular communication of case manager with family physician to inform about patient's health condition[a] Referral to specialists, if needed	Team case management Family physician, district nurse specialized in geriatric care (case manager)
Lam, 2009[62] China	Dementia (moderate)	102	78.6	Home care program delivered by the community-based center	In-home assessment and initial home visits Home-based program on cognitive stimulation[a] Assistance with support service No data on referral to physician	Individual case management Occupational therapist (case manager)
Laurant, 2004[63] The Netherlands	Dementia	…	…	Home care program delivered by primary care practice	Assessment of the patient's health and home situation Education of patients Coordination of the care and assistance with community health services and other health care professionals	Team case management Family physician, nurse (case manager)
Mittelman, 2004,[65,66] 2006[64] United States	Dementia	406	74.31	Home care program delivered by the Alzheimer disease center	Baseline assessment Individual and family counseling sessions tailored to each caregiver's situation Ad hoc telephone counseling Ongoing emotional support and education Referral for auxiliary help, financial planning and management of patient behavioral problems	Individual case management Social worker (case manager)

					No data on referral to physician	
Parsons, 2012[67] New Zealand	Cognitive impairment (moderate) Vision problems (71%), hearing problems (56.8%), communication problems (11.5%), falls (32%).	351	80.8	Home care program delivered by primary care practice	Liaison of the patient to support and rehabilitation services Maintenance and coordination of care Health prevention plan development by family physician Regular reassessment Regularly scheduled meetings of case manager and family physician	Team case management Family physician, nurse (case manager)
Wright, 2001[91] United States	Dementia (moderate) Mean number of coexisting medical conditions = 4.0	93	77.8	Home care program delivered by the community-based center	Problem identification and care plan development Caregiver support program Assistance with support service No data on referral to physician	Individual case management Nurse (case manager)

[a] *Components of case management intervention are different across the included studies.*

Supplemental Table 2. Characteristics of Included Nonrandomized Studies of Case Management Implementation

First Author, Year Country	Diagnosis and Comorbidity (if Reported)	Sample Size	Mean Age, y	Context of Implementation	Main Intervention Characteristics	Case Management Type and Health Care Professionals Involved
Aupperle, 2000[68] United States	Dementia (moderate)	39	80.4	Home care program delivered by primary care practice	Comprehensive neuropsychiatric evaluation Education about the disease Review of caregiver coping skills Behavioral management Assistance with community resources Long-term care planning, as well as legal and financial planning	Team case management Geriatric psychiatrist, nurse or social worker (case managers)
Challis, 2002[69] United Kingdom	Dementia	43	80.4	Home care program delivered by community mental health team	Planning and coordination of service delivery Work with the small number of service users Regular reassessment Close collaboration of health care professionals trough referral system	Team case management Specialist mental health team, social worker or clinical psychologist (case managers)
Cherry, 2004[70] United States	Dementia (moderate)	83	80	Home care program delivered by primary care practice	Comprehensive geriatric assessment Regular follow-up Assessment of family support adequacy Defining goals and development of treatment plan Assistance with support service through referrals Education of caregiver-patient dyads	Individual case management Social worker (case manager)
Hammer, 2001[71] United States	Cognitive impairment (64%)	25	…	Home care program delivered in the community care setting	Comprehensive assessment of the patient Assistance with support, rehabilitation services and resources Regular follow-up Assistance with primary care physician finding	Individual case management Nurse, gerontologic clinical nurse, social worker (case managers)
Specht, 2009[72] United States	Cognitive impairment (mild)	252	82.4	Home care program delivered by case	Patient-caregiver dyad assessment Individualized care plan development Assistance with support service Regular home visits and reassessment	Individual case management Nurse specialized in dementia care (case manager)

				management system		
Stevenson, 2006[73] Scotland, United Kingdom	Dementia (moderate)	65	83	Home care program delivered by community mental health team	Initial in-home assessment Care plan development Regular follow-up and readjustment Case conferences to discuss the findings Assistance with access to services (day care, respite care)	Team case management Psychogeriatrician, family physician, support workers, occupational therapist, social worker and F grade registered mental health nurse (case managers)

[a] *Components of case management intervention are different across the included studies.*

Supplemental Table 3. Barriers to Implementing Case Management

Main Categories of the Barriers	No. of Studies
Barriers at the level of organization	
Misunderstanding of the case manager's role by other health care professionals[9,60,78-80, 83-88,90] Reluctance to recognize the importance of the case manager in mobilization of resources in psychosocial support of the patient-caregiver dyad, extension of physician's role in terms of preventive care, reduction of time spent by a physician on the patient	12
Insufficient communication between health care professionals[9,29,78-90] Lack of clear system communication between primary and secondary care for timely consultation of complex cases, regular meetings to discuss cases	15
Large caseload[79,80,90] More than 50 patients per full-time case manager	3
Lack of case management integration in the current health care system[9,88,90] Absence of the full integration of case management in the primary care facility Case management was not considered to be a part of the primary care facility	3
Absence of case management and family physician co-location[82,84,86] Family physician and case manager work in different locations	3
Time constraints[79,80,83,87,88] Insufficient time to complete comprehensive assessment of the patient-caregiver dyad	5
Turnover of case managements[9,22,86] Lack of stability in human resources among case managements	3
Barriers at the level of the clinician	
Lack of involvement of family physicians in dementia care[13,85,86] Reluctance to work with patients with dementia due to the lack of adequate knowledge in geriatrics (eg, use of cognitive tests, detection of early symptoms of dementia)	3
Lack of training in geriatrics among health care professionals[9,28,79,80,82,83,86-90] Insufficient specific knowledge of dementia and other geriatric conditions among case managers Lack of adequate knowledge about available resources for patients with dementia and caregivers (eg, Alzheimer Association)	11
Barriers at the level of innovation	
Restricted inclusion criteria[15,29,86,90] Only patients with a confirmed dementia diagnosis eligible for case management Age-centered criteria of recruitment vs problem-centered	4
Low intensity of case management[9,29,62,65]	4

Infrequent follow-up Intervention of low fidelity provided by case managers (eg, reluctance to follow the guidelines/care plan) Absence of regular meeting of case manager with family physician and specialists	
Short duration of case management intervention[28,91] Intervention lasts less than 12 months	2
Short engagement period[70,83,86,88] Insufficient time to develop trust between the health care professionals	4

Supplemental Table 4. Dichotomized Data and Conditions

Type of Composite Outcome (No. of Studies)	Study Reference No.	Addressed Barriers to Implementation						Conclusion
		High-Intensity Case Management[a]	Long Duration of Intervention[b]	Sufficient Communication[c]	Case Manager and Family Physician Co-location[d]	Training in Geriatrics[e]	Other (Least Addressed) Barriers[f]	
Clinical outcomes								
Positive (n = 7)	12, 13, 21, 23, 48, 59, 67	1[g]	1 or 0	1 or 0	1 or 0	1 or 0	0 or 1	High intensity is sufficient for positive clinical outcomes[g]
No effect (n = 7)	15, 28, 29, 51, 62, 65, 91	0[g]	1 or 0	1 or 0	1 or 0	1 or 0	0 or 1	
Positive (n = 1)	48	0	0	1	0	1	0 or 1	Sufficient communication and training in geriatrics may lead to positive clinical outcomes
Outlier: No effect (n = 1)	60	1	1	0	0	1	0 or 1	Other factors: Low intervention fidelity Not aimed at and adapted to caregivers with more severe distress and problems Insensitive tools for detecting small changes
Service use								
Positive (n = 4)	21, 23, 58, 67	1[g]	1 or 0	1 or 0	1 or 0	1 or 0	0 or 1	High intensity is sufficient to optimize service use[g]
No effect (n = 6)	15, 22, 51,53,	0[g]	1 or 0	1 or 0	1 or 0	1 or 0	0 or 1	

Type of Composite Outcome (No. of Studies)	Study Reference No.	Addressed Barriers to Implementation						Conclusion
		High-Intensity Case Management[a]	Long Duration of Intervention[b]	Sufficient Communication[c]	Case Manager and Family Physician Co-location[d]	Training in Geriatrics[e]	Other (Least Addressed) Barriers[f]	
	58, 91							
Positive (n = 1)	65	0	1	0	1	0	0 or 1	Long duration of the intervention and co-location of case manger may lead to better service use
Outlier: No effect (n = 3)	12	1	1	1	1	1	0 or 1	Other factors: Selection and contamination bias; Low statistical power, no cluster analysis; Focus on neuropsychiatric symptoms only
	56, 57	1	1	1	0	1	0 or 1	Other factors: Contamination bias; Low statistical power
Outcomes for caregivers								
Positive (n = 8)	12, 21, 23, 28, 29, 48, 58, 59	1 or 0	1 or 0	1[g]	1 or 0	1 or 0	0 or 1	Communication is sufficient to produce positive outcomes for caregivers[g]
No effect (n = 6)	22, 51, 60, 62, 67, 91	1 or 0	1 or 0	0[g]	1 or 0	1 or 0	0 or 1	
Positive (n = 2)	15,65	1 or 0	1	0	1 or 0	1 or 0	0 or 1	Long duration of the intervention may lead to positive

Supplemental Table 4. Dichotomized Data and Conditions

Type of Composite Outcome (No. of Studies)	Study Reference No.	Addressed Barriers to Implementation						Conclusion
		High-Intensity Case Management[a]	Long Duration of Intervention[b]	Sufficient Communication[c]	Case Manager and Family Physician Co-location[d]	Training in Geriatrics[e]	Other (Least Addressed) Barriers[f]	
								outcomes for caregivers
Outlier: No effect (n = 1)	13	1	1	1	1	1	0 or 1	Other factors: Only 1 clinical outcome for caregivers (quality of life) was assessed, and it was high at baseline (ceiling effect)

Note: 1 = barrier addressed; 0 = barrier not addressed; 1 or 0 = either addressed or not.
[a] Based on the Pacala's score, ≥12 = high case management intensity[46] (Supplemental Appendixes 2 and 6).
[b] Intervention lasts ≥12 months.
[c] Regular meeting of case manager with support team (family physician or/and specialists) or family physician with specialists to discuss complex cases; Web-based tracking system to monitor the health condition, care plan, and communicate the results to the care team.
[d] Location of case manager and family physician at the same health care setting.
[e] In team case management: training in geriatrics of family physicians in team case management (use of cognitive screening test, detection of early symptoms of dementia, prescription of cholinesterase inhibitors and knowledge of their side effects, application of dementia treatment protocol); in individual and team case management: training of case managers in management of dementia and other geriatric conditions such as incontinence, frequent falls, depression (clinical symptoms, nonpharmacological care plan), mobilization of available support services (Alzheimer Association, rehabilitation centers, psychological support of caregivers); case managers with degree in dementia care.
[f] Other (the least addressed) barriers: lack of case management integration into the current health care system, restricted inclusion criteria, short engagement period.
[g] The most important Boolean configurations.

Supplemental Table 5. MMAT Quality Appraisal for Studies with Diverse Designs

Study Reference No.	Quality Appraisal				
	Randomization	Blinding	Outcome Data	Dropout Rate	Overall Score
Randomized controlled trials					
12	1	1	0	1	3
13	1	1	1	0	3
17	0	0	1	1	2
21	0	1	1	0	2
22	0	1	1	0	2
23	0	1	1	1	3
28	1	0	1	0	2
29	1	1	0	1	3
48	1	1	1	1	4
51	0	0	1	1	2
53	0	0	0	0	0
56	1	0	1	1	3
57	1	1	1	1	4
58	0	0	0	0	0
59	1	1	1	1	4
60	1	1	1	1	4
62	1	1	1	1	4
63	1	0	0	1	2
65	1	1	1	1	4
67	0	1	1	1	3
91	0	0	0	0	0
	Selection Bias	Appropriate Measurements	Compared Groups	Outcome Data	Overall Score
Nonrandomized studies					
68	0	1	1	1	3
69	1	1	1	1	4
70	0	0	1	1	2
71	0	1	0	1	2
72	1	1	0	1	3

	Source of Data	Methods of Analysis	Context	Reflexivity	Overall Score
73	1	1	1	1	4
Qualitative studies					
78	1	1	0	1	3
79	1	1	0	0	2
81	1	1	0	0	2
82	1	1	1	0	3
83	1	1	1	1	4
84	1	1	0	0	2
85	1	0	1	0	2
86	1	1	1	0	3
87	1	1	0	0	2
88	1	1	0	0	2
89	1	0	0	0	1
90	1	1	0	0	2

MMAT = Mixed Methods Appraisal Tool.
Note: 1 = criterion met; 0 = criterion not met or unable to determine.