

DEMENTIA CASE MANAGEMENT EFFECTIVENESS ON HEALTH CARE COSTS AND RESOURCE UTILIZATION: A SYSTEMATIC REVIEW OF RANDOMIZED CONTROLLED TRIALS

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Abstract: The growing number of dementia patients leads to both policy, economic and health organization constraints. Many healthcare systems have developed case management programs in order to optimize dementia patients and caregivers care and services delivery. Nevertheless, to what extent case management programs can lead to an improvement of care and expenditures savings is not known. Thus, the objective of this paper was to analyse the efficacy of case management programs on health care cost, institutionalization and hospitalization. A systematic review of randomized controlled trials was therefore conducted of the databases MEDLINE and SCOPUS up to September 2009. Included were English language randomized controlled trials of case management for community dwelling dementia patients and their caregivers evaluating costs, institutionalization and hospitalization. An evaluation of the methodological quality was performed. Thirteen relevant studies concerning 12 trials were identified and included. None of the 7 low quality studies reported positive impact of case management on the outcomes of interest. Among the 6 good quality studies, 4 reported positive impact on institutionalization delay, institutionalization length or nursing home admission rate. In none of the good quality studies was evidence found for savings in health care expenditures or reduction in hospitalization recourse. The weak convincing evidences from randomized trials do not allow any conclusion about the efficacy of case management for dementia patient and caregivers on costs and resource utilization. Further research should focus on determining subgroups of caregivers who could benefit the most from case management.

Key words: Case management, dementia, randomized controlled trials, economic analysis, systematic review, institutionalization, hospitalization.

Dementia is projected to be as one of the largest health and political problems during the next decades as a consequence of both the growing prevalence and the enormous economic and social costs involved in caring for patients in most developed countries (1-3). A recent review from European studies reported that the median total annual cost of dementia was 28 000 per demented person (2). Costs associated with the care of patients with dementia can be divided into formal and informal costs (4). Both types of costs are important for the economic analysis of dementia. Formal costs are defined as those for which money is exchanged for care and informal costs measure the value of resource used that do not involve an exchange of money. Informal costs constitute a major part of the economic burden with more than 60% of the total cost in some countries and may become formal costs if caregivers are no longer able to care for dementia patients at home (2, 5). Formal costs of care are higher for dementia persons compared to elderly without dementia independently of country, healthcare system or range of cost items assessed (2). Among formal costs, major parts relate to patient institutionalization (6) and hospitalization mainly because of important rate of emergency admission and prolonged hospital stays (7, 8). On account of demographic pressure and consistent deficits in care in developed countries, there is a pressing need to implement evidence based intervention to optimize medical and social care for patients and their caregivers (9-11). Interventions enabling a

better management of care recipient and enhancing caregiver coping skills should reduce costs of the disease by delaying institutionalization and avoiding non scheduled hospitalization. In the last decades, new approaches for dementia health care delivery have emerged in order to improve care, outcomes and resource allocation. Indeed, the fragmentation of dementia care services, the lack of knowledge of provider and caregiver on social support and the difficulties to coordinate health and social services contribute to increase burden of caregivers and are particularly detrimental for dementia patients (12-14). Thus, when the burden becomes to high, the only answer for caregiver is often to put the patient in hospital or in nursing home (15-18). Education, counselling and support to caregivers are a potential means to cope with caregiver's psychological exhaustion and patient's behavioural crisis. Case Management (CM) which is a multicomposite intervention aiming to let a better self empowerment and to ensure patients' access to essential resources seems to be an attractive perspective in order to improve dementia care and to reduce costs. Thus, the objective of this paper was to review evidence of case management efficacy on care costs, hospitalization and institutionalization, in order to assist clinicians and policy makers in the implementation of case management programs.

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Methods

Case Management definition

The Case Management Society of America (CMSA) describes case management as “a collaborative process of assessment, planning, facilitation, and advocacy for options and services to meet an individual’s health need through communication and available resources to promote quality cost-effective outcomes” (19). Because the intervention area of the case manager in the scientific literature is not fixed, from interventions restricting to link individuals’ needs to community resources (20) to more global interventions including health assessment, services needs evaluation and care and social coordination (21) or guideline based care management (22), we had to define a conceptual model to include all relevant studies.

Based on the CMSA definition and literature review, the authors defined dementia case management as any intervention involving interaction between a case manager and patient-caregiver dyads and providing continuity and advocacy over time, support, information about community services, care and disease evolution, financial and legal advices. The case manager could also reduce fragmentation among services, monitor medication to avoid adverse reaction and give advice on behavioural management strategies tailored to needs of patients and families.

Identification of the relevant studies

This review considered intervention targeting caregiver and/or patients with dementia of any type or memory loss who lived in the community whatever their age and sex.

The search strategy was broad because the characteristics used to describe the concept of case management are multiple. The scientific literature was searched on September 2009 in the MEDLINE database of the library of medicine (started in 1966) and SCOPUS. Key word search criteria combined condition (dementia, Alzheimer, Lewy body and vascular disease), case management intervention (case management, patient care management, managed care programs, counselling) and outcome (economic, cost evaluation, hospitalization, institutionalization and nursing home). Titles of articles and abstracts extracted by the search were reviewed for relevance, and if potentially relevant the full-text article was retrieved. We also scrutinized the reference lists of all included articles, meta-analyses or reviews concerning our topic.

Selection criteria for review

Our systematic review included peer reviewed English-language studies that tested randomized controlled trials (RCT) of case management for community dwelling patients/caregivers dyads. Studies had to provide one or more outcomes of interest preselected:

- Informal costs (monetary valorisation of time spent caregiving)

- Cost analysis, cost-benefit, cost-utility, cost-effectiveness analyses
- Patient hospitalization rate or length of stays
- Patient emergency rate
- Rate of patient institutionalization, length of delay until institutionalization or time spent in nursing home

Studies focusing exclusively on psychoeducation, behavioural therapy or respite care were excluded. When these interventions were coupled with case management, studies were relevant for inclusion.

Quality assessment

The methodological quality of each included study was assessed independently by two authors because variability in the quality of included studies accounts for as much variability in the results as intervention characteristics (23). Based on the Cochrane Library recommendations and on multiple sources (24-26) studies were assessed and rated for the validity of their design and conduct (table 1).

Table 1
Criteria for rating methodological quality of studies

Quality aspects	Score
Quality control	1 = Intervention standardized by manual, care guidelines, published trials 0 = No standardization of intervention specified
Groups comparability	1 = Comparability between the control and treatment groups at entry on main variables 0 = No comparability between groups at entry on main variables
Follow up rate	2= 85%-100% follow-ups complete 1= 70%-84.9% follow-ups complete 0= <70% follow ups complete
Dropouts	1= Dropouts are clearly enumerated and/or compared with those completed cases on baseline 0= Dropouts are not reported
Blinding assessor	1= Assessment conducted by independent interviewers blind to group or objective outcomes 0= No blinding assessment
Analyses	1= Intention to treat analysis performed 0= No intention to treat analysis
Good quality studies	≥ 5
Weak quality studies	<5

Results

Study selection

The computerized indexed search resulted in 93 references and we found 4 relevant studies by hand search seeking studies references lists (21, 27-29). The main reasons for the exclusion of studies were: 1) the intervention did not correspond to our case management definition, 2) there were no outcomes of interest, 3) the study did not present an appropriate design. After exclusion of the irrelevant studies, our review was performed on 13 studies concerning 12 trials.

Table 2
Characteristics of the selected studies

Study	Follow-up length	Intervention length	Setting recruitment	Main clinical criteria inclusion	Number of subjects randomized
Mohide et al (29), 1990	6 months	6 months	Family physicians, geriatricians, community health services, social services, self-referrals	Diagnosis of primary dementia degenerative, multi-infarct or mixed	30 : intervention group 30 : control group
Weinberger et al (27), 1993	6 months	6 months	Memory disorders clinic	Possible or probable Alzheimer's Disease	193: intervention group 71: control group
Newcomer et al (20), 1999	3 years	3 years	Physician referral and self referral	Diagnostic of Alzheimer's Disease or vascular dementia	4151: intervention group 3944: control group
Miller et al (38), 1999	As above	As above	As above	As above	As above
Chu et al (28), 2000	18 months	18 months	Geriatric clinics	Possible diagnosis of early stage Alzheimer's Disease	37 : intervention group 38 : control group
Eloniemi-Sulkava et al (21), 2001	2 years	2 years	Home care institution	Dementing disease and requiring regular care	53 : intervention group 47 : control group
Wright et al (30), 2001	1 year	1 year	Behavioural intensive care unit	Alzheimer's Disease	68 : intervention group 25 : control group
Clark et al (35), 2004	1 year	1 year	Kaiser Permanente beneficiaries	Specific diagnosis of dementia or a symptom code indicating memory loss	NA
Callahan et al (31), 2006	18 months	1 year	Primary care practices	Alzheimer's Disease	84 : intervention group 69 : control group
Mittelman et al (32), 2006	17 years	Unlimited time	Alzheimer's Association, private physicians, other study participants, community agencies	Alzheimer's Disease	203 : intervention group 203 : control group
Chien et al (33), 2008	1 year	6 months	Dementia center	Alzheimer's Disease	44 : intervention group 44 : control group
Duru et al (36), 2009	18 months	18 months	Primary care practices	Occurrence of a dementia diagnosis code during the previous year	238 : intervention group 170 : control group
Brody et al (34), 2009	8.5 years	2 years	Research clinics in Australia, United Kingdom and United States	Alzheimer's Disease	79 : intervention group 76 : control group

NA: Not available

Characteristics of the studies included

Of the 12 trials, the follow-up period and the intervention length ranged from 6 months to more than 8 years (table 2). Six trials were rated as good quality and 6 trials were rated as weak quality. Although the populations of all studies consisted of community dwelling subjects, the recruitment took place in hospital, clinic services, primary care practice, Alzheimer association, home care institution or community agencies. In one trial, the selected patients were hospitalized and the intervention began at their discharge (30). In most studies, the severity of dementia at baseline varied from mild to severe and the mean caregiving duration reported in 2 studies varied from 36.5 months (27) to 72.4 months (29).

Case management intervention

In all trials, the case manager assessed and prioritized patient or caregiver needs. Moreover, common components in most trials were provision of caregiver's education and referrals to community resources. Case management could also include health care assessment. In a few trials, case management was provided in combination with respite care, self empowerment by behavioural therapy or behavioural problems management (30-34). The case manager was either a nurse (20, 21, 29-31, 33) or a social worker (20, 27, 28, 32, 35, 36). Brodaty et al reported an intervention based on three countries and involving both psychologists (in Australia) and social workers (in United States and United Kingdom) (34). In 9 studies (27-36), the case manager stepped in multidisciplinary team and in 2 studies the

case manager acted independently (20) or in collaboration with a physician (21). Trials with a long duration intervention (2 years or more) were rare (20, 21, 32, 34).

Economic evaluation

Three of the selected CM programs provided economic analyses and were only costs evaluations (20, 27, 36). None of them provided evidence of a cost reduction in favour of intervention groups (table 3). According our methodological quality scale, two studies were rated as weak quality studies (20, 27) and one as good quality (36). Newcomer et al reported on the MADDE program which incorporated a case manager intervention (nurse or social worker) planning and coordinating community services (20). The intervention caregivers had also access to a special benefit allowing reimbursement of a part of community care services. Two models were tested, the model A with a nurse case manager (person ratio 1:30) and a high per month reimbursement cap per person and the model B with a social worker case manager (person ratio 1:100) and a lower per month reimbursement cap per person. After 3 years, the savings (Medicare part A and part B expenditures) did not compensate the case management program costs. There was also no significant difference between model A and B and for each year separately. The study reported by Weinberger et al examined the effect of a 6-month CM intervention by a social worker (27). The case manager attempted to implement an individualized service plan and resolve barriers to service utilization. There was no difference in health patient

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Table 3
Intervention characteristics and main outcomes of the selected studies

Study	Intervention	Quality scores	Economic evaluation	Institutionalization	Hospitalization
Mohide et al, 1990	A nurse made health assessment, consulted caregiver's family physicians. A weekly respite at home was organized.	Standardized intervention: 0 Comparable groups: 0 Follow up rate: 1 Enumerated dropouts: 1 Blinding assessor: 1 Intention to treat analysis: 1 Total score: 4		No difference in both institutionalization rate and delay	
Weinberger et al, 1993	A social worker attempted to implement an individualized service plan, reinforced, assessed compliance with the service plan and attempted to resolve barriers to service utilization	Standardized intervention: 1 Comparable groups: 0 Follow up rate: 1 Enumerated dropouts: 0 Blinding assessor: 0 Intention to treat analysis: 0 Total score: 2	No difference in total patient expenditures (formal and informal costs)	No difference in institutionalization rate	No difference in both emergency visits and hospital days
Newcomer et al, 1999	A nurse (model A) or social worker (model B) linked caregivers with appropriate and acceptable community based formal services, provided psychological support to caregiver, insured that the monthly per-client costs were not exceeded	Standardized intervention: 0 Comparable groups: 1 Follow up rate: 2 Enumerated dropouts: 1 Blinding assessor: 0 Intention to treat analysis: 0 Total score: 4	No difference all sites combined and for model A and B separately over 3 years and for each year separately		
Miller et al, 1999	As above	As above		No difference in both institutionalization rate and delay all sites combined and for model A and model B separately No difference in home stays length	
Chu et al, 2000	A social worker provided education, referrals, to community resources, ongoing monitoring, supportive counselling, caregiving skill training in combination with occupational therapy, physical therapy, nursing care, respiratory therapy, in home respite, out of home respite if necessary	Standardized intervention: 0 Comparable groups: 1 Follow up rate: 1 Enumerated dropouts: 1 Blinding assessor: 0 Intention to treat analysis: 0 Total score: 3		No difference in nursing home admission rate over 2 years; significant institutionalization delay in favour intervention patient group (473 days vs 240 days, p=0.02)	
Eloniemi-Sulkava et al, 2001	A nurse provided systematic counselling, arrange social and health care services. Dyads could participate to annual courses with medical check up, psychological assessment, therapeutic group meetings, mental and social stimulation	Standardized intervention: 1 Comparable groups: 1 Follow up rate: 2 Enumerated dropouts: 1 Blinding assessor: 1 Intention to treat analysis: 1 Total score: 7		No difference in institutionalization rate and number of days at home	
Wright et al, 2001	A nurse identified troublesome behaviours in care recipient, monitored medication and provided supportive counselling to caregivers, referral to home health agencies, and support groups	Standardized intervention: 0 Comparable groups: 1 Follow up rate: 1 Enumerated dropouts: 0 Blinding assessor: 0 Intention to treat analysis: 0 Total score: 2			No difference in both hospital admissions and emergency visits rates
Clark et al, 2004	A social worker identified problems, developed strategies for using personal, family and community resources	Standardized intervention: 1 Comparable groups: 0 Follow up rate: 0 Enumerated dropouts: 0 Blinding assessor: 1 Intention to treat analysis: 0 Total score: 2			
Callahan et al, 2006	A nurse provided education on communication skills, caregiver coping skills, patients behaviour symptoms management, legal and financial advice. Dyads were invited to participate in voluntary group session	Standardized intervention: 1 Comparable groups: 1 Follow up rate: 2 Enumerated dropouts: 1 Blinding assessor: 1 Intention to treat analysis: 1 Total score: 7		No difference in institutionalization rate at 12 and 18 months	No difference in both hospitalization rate and mean hospital days at 12 and 18 months
Mittelman et al, 2006	A social worker provided resource information, referrals for auxiliary help, financial planning, management of patient behaviour problems. Caregivers were encouraged to join support groups	Standardized intervention: 1 Comparable groups: 0 Follow up rate: 2 Enumerated dropouts: 1 Blinding assessor: 0 Intention to treat analysis: 1 Total score: 5		Significant reduction in institutionalization rate (28.3%, p=0.025) and institutionalization delay (557 days) in favour intervention group	
Chien et al, 2008	A nurse provided orientation to dementia care, community support resources, family role and strength rebuilding, review of program and evaluation	Standardized intervention: 1 Comparable groups: 1 Follow up rate: 2 Enumerated dropouts: 1 Blinding assessor: 1 Intention to treat analysis: 1 Total score: 7		Significant reduction in institutionalization rate at 6 and 12 months (p<0.01) and length of institutionalization (p<0.001) in favour intervention group	
Duru et al, 2009	A social worker prioritized problems, taught problem solving, skills, initiated care plan action and send a problem list and recommendations to primary care physician. Primary care provider session education was proposed	Standardized intervention: 1 Comparable groups: 1 Follow up rate: 2 Enumerated dropouts: 1 Blinding assessor: 0 Intention to treat analysis: 1 Total score: 6	No difference in health care and caregiving service costs whatever the perspective considered (even if nursing home costs were excluded)	No difference in nursing home stays	No difference in both hospitalization length and emergency visits
Brodsky et al, 2009	A counsellor (psychologist or social worker) provided education disease, helped in understanding how to manage patient behaviour through individual and family sessions and telephone counselling (and/or face to face) on demand	Standardized intervention: 1 Comparable groups: 1 Follow up rate: 2 Enumerated dropouts: 1 Blinding assessor: 1 Intention to treat analysis: 0 Total score: 6		No difference in institutionalization length for all three countries pooled. Significant reduction in institutionalization rate in Australia in favour intervention group	

expenditures between control and intervention groups. At last, Duru et al (quality score = 6) performed a 18-month care management program for primary care of dementia which aimed to improve adherence to dementia guidelines (36). The case manager assessed caregiver's problems, initiate a care plan and inform the patient's primary care physician. The follow-up was ongoing with frequency based on need and reassessment every 6 months. Despite a better quality of care and an improved patient quality of life (22), the intervention did not demonstrate any cost offset for both payer and societal perspective and even excluding nursing home related costs.

Institutionalization

Eleven trials reported on nursing home admissions. Six were rated as good quality studies (21, 31-34, 36) and four of them reported positive trend on institutionalization (21, 32-34).

Among good quality studies, Eloniemi-Sulkava et al (quality score =7) investigated a 2-year program that consisted of systematic, comprehensive support by a nurse who addressed health problems of the care recipient and caregiver, behavioural symptoms of the patient and coordinated social and health services. Educational courses were offered annually. After 2 years of follow-up, a longer median time until institutionalization was reported in the intervention group (473 vs 240 days, $p=0.02$) for the 31 patients (17 intervention patients and 14 control patients) (37). Nevertheless, there was no difference in institutionalization rate (21). The New York University (NYU) study (quality score = 5) investigated an intensive counselling and support intervention (32). The authors compared a CM group including telephone counselling by social workers, encouragement of weekly support group participation and individual and family counselling sessions within the first 4 months to a control group receiving care as usual. The results showed an important reduction in nursing home placement rate of 28.3% ($p =0.025$) and a considerable institutionalization delay of 557 days compared to control patients. The authors estimated the saving per patient of about 90 000\$ for a 1.5 years delay. The extension of time in the community did not come at the expense of the caregiver health and burden. Indeed, the intervention group caregivers had greater satisfaction with social support and a decrease in symptoms of depression in comparison with the control caregivers. A third good quality study (quality score = 7) demonstrated that CM program could be effective in delaying nursing home admission. Chien et al reported a 12-month CM program with 12 education sessions and frequent home visits by a nurse case manager (33). At 6 and 12 months, significant reductions were found in frequency and length of institutionalization. Callahan et al (quality score =7) conducted a 12-month collaborative care management program (31). Dementia patients in intervention group were recommended with cholinesterase inhibitor and received education from a geriatric nurse. Primary care physicians of both control and intervention patients received the results of the initial

diagnostic assessment. At 12 and 18 months, no difference in nursing home rate was detected. The effect of counselling spouse of patients with Alzheimer's disease taking Donepezil was studied by Brodaty et al (quality score=6) (34). They compared across patients living in United States, United Kingdom and Australia and treated by Donepezil the effectiveness of a structured intervention which involved five counselling sessions (two individual counselling sessions and three family counselling sessions) within three months of enrolment and counselling by phone for up to two years. The intervention was based on the NYU program (32). There was no difference in institutionalization delay when data from the 3 countries were pooled. Nevertheless, in the small Australian sample, significantly fewer patients in the intervention group were admitted in nursing home at the end of the 8.5 years follow-up (23% vs 50%, $p<0.05$). At last, Duru et al did not demonstrate any impact of CM on nursing home stays (36).

Concerning the weak quality studies, none reported positive effect on institutionalization rate (27, 29, 30, 38) or delay (28-30, 38). Mohide et al (quality score = 3) experimented a nurse CM program combined with a four hour block of scheduled weekly in home respite (29). A nurse made health assessments of caregivers and could consult their primary physician. After a 6-month follow-up, no difference was detected in institutionalization rate and delay between intervention and control groups. Another trial by Chu et al (quality score = 3) combined CM with occupational therapy, physiotherapy, nursing care, respiratory therapy, in home respite and out of home respite if necessary for 18 months (28). This multicomposite intervention did not provide any effect on home stays length between groups. At last, Wright et al implemented a nurse CM for caregiver and dementia patients after discharge from a psychiatric unit (30). A clinical nurse specialist provided strategies for patients behaviour problems, monitored the medication and offered supportive counselling to caregivers. This study showed no significant effect on institutionalization rate and delay. Nevertheless, the percentage of patients at home at 12 months was higher for the intervention group than the control group (61% vs 56%, $p<0.05$) because of a higher mortality rate in control group.

Hospitalization

Four RCT reported data on hospitalization rate (31, 35), length (27, 31, 36) or emergency visits (27, 35, 36). Half had a low quality rating. Among them, Clark et al (quality score =2) examined the effectiveness of a care consultation providing CM for patients with a diagnosis of dementia or a symptom code indicating memory loss (35). Over a 12-month period, a social worker identified problems, developed strategies for using personal, family and community resources. Control group patients and caregivers received care as usual. No significant effect on hospitalization rate or emergency visits was found. In none of the other 3 studies, previously described, was evidence found for positive impact favouring CM group.

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Discussion

Our extensive literature search resulted in 12 RCT that examined the effects of CM for dementia patients living in the community and their caregivers on service use and costs. Drawing conclusion on CM effectiveness is hampered by the limited number and varying quality of the available studies. In addition, many studies lacked sufficient power due to low sample sizes or short follow-up period; indeed, hospitalizations and institutionalization are not very frequent and high sample sizes with quite long follow-up are required to demonstrate an efficacy. Nevertheless, evidence of effectiveness on the interest outcomes was provided in most of the good quality studies selected. Besides the methodological quality variability which could lead to variability in outcomes, others characteristics seemed as much important: intervention and follow-up length, dementia severity or caregiving duration and health care organization specificities.

Concerning the follow-up length, Mittelman et al demonstrated alongside a 17-year trial that the intervention could postpone nursing home admission of about 1.5 years and decrease institutionalization rate of about 28% (32). This finding outlined the importance of a substantial follow-up length in capturing the effects on institutionalization and thus dementia cost. Moreover, long interventions seem necessary to implement a care plan, assess barriers to implementation and optimize coordination between care providers and community services (39). Indeed, the 3 trials with good quality rating, follow-up and intervention length of at least 2 years, reported positive impacts on institutionalization delay (32, 37) or nursing home admission (32, 34). Nevertheless, whatever the impact demonstrated in randomized trials, efficacy of case management is strongly dependant of health care systems, usual care coordination and density of both social services and medical providers. Thus, integration of a case management program in a specific health care system is primordial and should be evaluated before to broadcast it in an area.

Another factor which seems to affect the intervention effectiveness is its population target. Two RCT showed that more cognitively impaired patients seem to benefit the most from CM by postponing institutionalization but the samples were too small to conclude (21, 28). Moreover the heterogeneity in caregiving duration could have affected the intervention impact, but most studies did not report this information.

Despite a large panel of community services available in most industrialized countries, a high proportion of dementia patient caregivers have unmet needs concerning support services because of unawareness or dissatisfaction (40-42). In this direction, the interest of an intervention such as CM which aims to link social and health services to caregivers could be a relevant issue. Indeed, in the MADDE demonstration, early community services utilization seemed to delay institutionalization (43). However, its effectiveness appears to

be strongly correlated to local resources and financial affordability of them which differ between areas, countries and health care organization. So the variability in outcomes could also be explained by the local health and service specificities.

Several important research gaps were identified in this review. One of the most pressing needs is to define which population could benefit the most of CM. Is it necessary to implement a preventive CM focusing on counselling and education for every diagnosed dementia cases or a more intensive intervention focused on severely demented subjects? Because the latter are at higher risk of hospitalizations and institutionalizations, demonstration of the efficacy of CM in this population is probably easier, requiring smaller sample size; yet, efficacy in less severe populations can not be ruled out. In addition, targeting too severe population, which is usually the most expensive ones, can also increase the overall care cost due to a longer survival.

The heterogeneity in setting recruitment and cases complexity could explain the non effectiveness observed in most RCT. Indeed, included caregivers do not have the same needs and expectations concerning the patient care because of many different factors (social environment, education level, degree of patient's impairment...). Thus, in trials could be included responders and non responders who are not likely to benefit from CM. Identifying these populations appears to be a new challenge for clinicians and researchers (3). Additional research questions include determining the professionals required and the optimal intensity of patient-caregiver contact. In our review, case managers were mainly nurses and social workers. Newcomer et al attempted to clarify this issue by studying two different models supported either by nurses with additional experience or training in the clinical and behavioural treatment or social workers as case managers (20). None was effective in terms of patient health care expenditures or nursing home admission. Unfortunately, MADDE was not designed to promote collaboration between the case manager and other health care practitioners in identifying and managing high-risk people. Owing to the lack of medical provider to face the growing number of dementia patients, delineate a professional profile is necessary. Moreover, as suggesting in most studies (20-22, 31) implementing a CM without a close collaboration with physicians in particular primary care physicians could not lead to any care processes enhancement and is doomed to failure. Concerning the CM intensity, insufficient intervention description hampered to clarify this issue.

Whereas cost-effectiveness studies on anti-dementia drugs are frequent, very few economic evaluations investigate non pharmacological intervention for community dwelling caregivers but some of them demonstrated a potential cost-effectiveness (44-46). Concerning a multicomposite intervention such as CM, there is a striking lack of high-quality evidence regarding economic evaluation. In addition, intervention costs are not always taking into account in this evaluation, lowering thus artificially the real costs in the

intervention group. In the selected studies only one good quality study reported the impact of a CM program with a relevant economic analysis. Duru et al did not provide any cost offset with both a societal and a payer perspective despite improved processes of care (22, 36). Nevertheless, the follow-up length should have been too short to capture intervention effects for such a steady intervention.

Issuing from this review, we can attempt some suggestions for developing high quality economic evaluations. The most appropriate method has been advanced to be the cost-utility analysis with a societal perspective based on a RCT design (47-49). Indeed, this perspective appears to be relevant for interpretation with the incorporation of both formal and informal costs. Informal caregiving covers about a third of a day's carer (50) and its growing is one of the main cause of psychological burden and patient institutionalization willingness. Nichols et al demonstrated a significant reduction of caregiving hours by a 6-month psychoeducation program through the REACH II project (46). Informal care is rarely included in economic evaluation studies because the collection of data is complex (51). However, the use of a valid instrument as the Resource Use in Dementia scale should be generalized to allow a standardized evaluation (52).

Moreover, as recommended by the National Institute of Clinical Excellence (47), a generic outcome as QALY assessed by the EQ-5D (53), is probably the most relevant concerning such an impaired population.

Conclusion

The results of our review suggest that, to date, for an economic perspective, support for dementia case management is not really grounded on well-researched facts. Even if evidence addressing large community dwelling population based CM with long follow up and high methodological quality is limited to only few evaluations (32, 34), these ones provide an encouraging way to emphasize rigorous methodological studies which aim to evaluate long-term effect of CM on cost as well as clinical effectiveness.

References

1. Comas-Herrera A, Wittenberg R, Pickard L, Knapp M. Cognitive impairment in older people: future demand for long-term care services and the associated costs. *International journal of geriatric psychiatry*. 2007 Oct;22:1037-45.
2. Jonsson L, Wimo A. The cost of dementia in Europe: a review of the evidence, and methodological considerations. *Pharmacoeconomics*. 2009;27:391-403.
3. Dartigues JF. Alzheimer's disease: a global challenge for the 21st century. *Lancet neurology*. 2009 Dec;8:1082-3.
4. Rice DP, Fox PJ, Max W, Webber PA, Lindeman DA, Hauck WW, Segura E. The economic burden of Alzheimer's disease care. *Health affairs (Project Hope)*. 1993 Summer;12:164-76.
5. Leon J, Neumann PJ. The cost of Alzheimer's disease in managed care: a cross-sectional study. *The American journal of managed care*. 1999 Jul;5:867-77.
6. Ernst RL, Hay JW, Fenn C, Tinklenberg J, Yesavage JA. Cognitive function and the costs of Alzheimer disease. An exploratory study. *Archives of neurology*. 1997 Jun;54:687-93.
7. Lyketsos CG, Sheppard JM, Rabins PV. Dementia in elderly persons in a general hospital. *The American journal of psychiatry*. 2000 May;157:704-7.
8. Fields SD, MacKenzie CR, Charlson ME, Sax FL. Cognitive impairment. Can it predict the course of hospitalized patients? *Journal of the American Geriatrics Society*. 1986 Aug;34:579-85.
9. Waldemar G, Phung KT, Burns A, Georges J, Hansen FR, Iliffe S, Marking C, Rikkert MO, Selmes J, et al. Access to diagnostic evaluation and treatment for dementia in Europe. *International journal of geriatric psychiatry*. 2007 Jan;22:47-54.
10. Knapp M, Prince M. *Dementia UK: the full report*. London: Alzheimer's Society; 2007.
11. Gallez C. Rapport sur la maladie d'Alzheimer et les maladies apparentées. OPEPS. 2005.
12. Pucci E, Angeleri F, Borsetti G, Brizioli E, Cartechini E, Giuliani G, Solari A. General practitioners facing dementia: are they fully prepared? *Neurol Sci*. 2004 Feb;24:384-9.
13. Cody M, Beck C, Shue VM, Pope S. Reported practices of primary care physicians in the diagnosis and management of dementia. *Aging & mental health*. 2002 Feb;6:72-6.
14. Turner S, Iliffe S, Downs M, Wilcock J, Bryans M, Levin E, Keady J, O'Carroll R. General practitioners' knowledge, confidence and attitudes in the diagnosis and management of dementia. *Age and ageing*. 2004 Sep;33:461-7.
15. Yaffe K, Fox P, Newcomer R, Sands L, Lindquist K, Dane K, Covinsky KE. Patient and caregiver characteristics and nursing home placement in patients with dementia. *Jama*. 2002 Apr 24;287:2090-7.
16. Vernooij-Dassen M, Felling A, Persoon J. Predictors of change and continuity in home care for dementia patients. *International journal of geriatric psychiatry*. 1997 Jun;12:671-7.
17. Brodaty H, McGilchrist C, Harris L, Peters KE. Time until institutionalization and death in patients with dementia. Role of caregiver training and risk factors. *Archives of neurology*. 1993 Jun;50:643-50.
18. Gaugler JE, Kane RL, Kane RA, Clay T, Newcomer R. Caregiving and institutionalization of cognitively impaired older people: utilizing dynamic predictors of change. *The Gerontologist*. 2003 Apr;43:219-29.
19. Case Management Society of America. *Standards of Practice for Case Management*, Revised 2010.
20. Newcomer R, Miller R, Clay T, Fox P. Effects of the Medicare Alzheimer's disease demonstration on Medicare expenditures. *Health care financing review*. 1999 Summer;20:45-65.
21. Eloniemi-Sulkava U, Notkola IL, Hentinen M, Kivela SL, Sivenius J, Sulkava R. Effects of supporting community-living demented patients and their caregivers: a randomized trial. *Journal of the American Geriatrics Society*. 2001 Oct;49:1282-7.
22. Vickrey BG, Mittman BS, Connor KI, Pearson ML, Della Penna RD, Ganiats TG, Demonte RW, Jr., Chodosh J, Cui X, et al. The effect of a disease management intervention on quality and outcomes of dementia care: a randomized, controlled trial. *Annals of internal medicine*. 2006 Nov 21;145:713-26.
23. Wilson DB, Lipsey MW. The role of method in treatment effectiveness research: evidence from meta-analysis. *Psychological methods*. 2001 Dec;6:413-29.
24. Juni P, Altman DG, Egger M. Systematic reviews in health care: Assessing the quality of controlled clinical trials. *BMJ (Clinical research ed)*. 2001 Jul 7;323:42-6.
25. Verhagen AP, de Vet HC, de Bie RA, Kessels AG, Boers M, Bouter LM, Knipschild PG. The Delphi list: a criteria list for quality assessment of randomized clinical trials for conducting systematic reviews developed by Delphi consensus. *Journal of clinical epidemiology*. 1998 Dec;51:1235-41.
26. The Cochrane Collaboration, editor. *Cochrane Reviewer's Handbook 4.2.2*; Updated march 2004.
27. Weinberger M, Gold DT, Divine GW, Cowper PA, Hodgson LG, Schreiner PJ, George LK. Social service interventions for caregivers of patients with dementia: impact on health care utilization and expenditures. *Journal of the American Geriatrics Society*. 1993 Feb;41:153-6.
28. Chu P, Edwards J, Levin R, Thompson J. The use of clinical case management for early stage Alzheimer's patients and their families. *American Journal of Alzheimer's Disease and Other Dementias*. 2000 September/October;15.
29. Mohide EA, Pringle DM, Streiner DL, Gilbert JR, Muir G, Tew M. A randomized trial of family caregiver support in the home management of dementia. *Journal of the American Geriatrics Society*. 1990 Apr;38:446-54.
30. Wright LK, Litaker M, Laraia MT, DeAndrade S. Continuum of care for Alzheimer's disease: a nurse education and counseling program. *Issues in mental health nursing*. 2001 Apr-May;22:231-52.
31. Callahan CM, Boustani MA, Unverzagt FW, Austrom MG, Damush TM, Perkins AJ, Fultz BA, Hui SL, Counsell SR, Hendrie HC. Effectiveness of collaborative care for older adults with Alzheimer disease in primary care: a randomized controlled trial. *Jama*. 2006 May 10;295:2148-57.
32. Mittelman MS, Haley WE, Clay OJ, Roth DL. Improving caregiver well-being delays nursing home placement of patients with Alzheimer disease. *Neurology*. 2006 Nov 14;67:1592-9.
33. Chien WT, Lee YM. A disease management program for families of persons in Hong Kong with dementia. *Psychiatric services (Washington, DC)*. 2008 Apr;59:433-6.
34. Brodaty H, Mittelman M, Gibson L, Seeher K, Burns A. The effects of counseling spouse caregivers of people with Alzheimer disease taking donepezil and of country

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- of residence on rates of admission to nursing homes and mortality. *Am J Geriatr Psychiatry*. 2009 Sep;17:734-43.
35. Clark PA, Bass DM, Looman WJ, McCarthy CA, Eckert S. Outcomes for patients with dementia from the Cleveland Alzheimer's Managed Care Demonstration. *Aging & mental health*. 2004 Jan;8:40-51.
 36. Duru OK, Ettner SL, Vassar SD, Chodosh J, Vickrey BG. Cost evaluation of a coordinated care management intervention for dementia. *The American journal of managed care*. 2009 Aug;15:521-8.
 37. Eloniemi-Sulkava U, Sivenius J, Sulkava R. Support program for demented patients and their carers: the role of dementia family care coordinator is crucial. In: Sons JWA, editor. Iqbal K, Swaab DF, Winblad B, Wisniewski HM Alzheimer's Disease and Related Disorders; 1999.
 38. Miller R, Newcomer R, Fox P. Effects of the Medicare Alzheimer's Disease Demonstration on nursing home entry. *Health services research*. 1999 Aug;34:691-714.
 39. Pinquart M, Sorensen S. Helping caregivers of persons with dementia: which interventions work and how large are their effects? *International psychogeriatrics / IPA*. 2006 Dec;18:577-95.
 40. van der Roest HG, Meiland FJ, Comijs HC, Derksen E, Jansen AP, van Hout HP, Jonker C, Dros RM. What do community-dwelling people with dementia need? A survey of those who are known to care and welfare services. *International psychogeriatrics / IPA*. 2009 Oct;21:949-65.
 41. Philp I, McKee KJ, Meldrum P, Ballinger BR, Gilhooly ML, Gordon DS, Mutch WJ, Whittick JE. Community care for demented and non-demented elderly people: a comparison study of financial burden, service use, and unmet needs in family supporters. *BMJ (Clinical research ed)*. 1995 Jun 10;310:1503-6.
 42. Dello Buono M, Busato R, Mazzetto M, Paccagnella B, Aleotti F, Zanetti O, Bianchetti A, Trabucchi M, De Leo D. Community care for patients with Alzheimer's disease and non-demented elderly people: use and satisfaction with services and unmet needs in family caregivers. *International journal of geriatric psychiatry*. 1999 Nov;14:915-24.
 43. Gaugler JE, Kane RL, Kane RA, Newcomer R. Early community-based service utilization and its effects on institutionalization in dementia caregiving. *The Gerontologist*. 2005 Apr;45:177-85.
 44. Graff MJ, Adang EM, Vernooij-Dassen MJ, Dekker J, Jonsson L, Thijssen M, Hoefnagels WH, Rikkert MG. Community occupational therapy for older patients with dementia and their care givers: cost effectiveness study. *BMJ (Clinical research ed)*. 2008 Jan 19;336:134-8.
 45. Martikainen J, Valtonen H, Pirttila T. Potential cost-effectiveness of a family-based program in mild Alzheimer's disease patients. *Eur J Health Econ*. 2004 Jun;5:136-42.
 46. Nichols LO, Chang C, Lummus A, Burns R, Martindale-Adams J, Graney MJ, Coon DW, Czaja S. The cost-effectiveness of a behavior intervention with caregivers of patients with Alzheimer's disease. *Journal of the American Geriatrics Society*. 2008 Mar;56:413-20.
 47. National Institute of Clinical Excellence. Guide to the methods of technology appraisal. 2004.
 48. Hjelmgren J, Berggren F, Andersson F. Health economic guidelines--similarities, differences and some implications. *Value Health*. 2001 May-Jun;4:225-50.
 49. Jonsson B. Ten arguments for a societal perspective in the economic evaluation of medical innovations. *Eur J Health Econ*. 2009 Oct;10:357-9.
 50. Gustavsson A, Jonsson L, McShane R, Boada M, Wimo A, Zbrozek AS. Willingness-to-pay for reductions in care need: estimating the value of informal care in Alzheimer's disease. *International journal of geriatric psychiatry*. 2009 Sep 14.
 51. Evers SM, Ament AJ, Blaauw G. Economic evaluation in stroke research : a systematic review. *Stroke; a journal of cerebral circulation*. 2000 May;31:1046-53.
 52. Wimo A, Winblad B, Stoffler A, Wirth Y, Mobius HJ. Resource utilisation and cost analysis of memantine in patients with moderate to severe Alzheimer's disease. *Pharmacoeconomics*. 2003;21:327-40.
 53. Jonsson L, Andreasen N, Kilander L, Soininen H, Waldemar G, Nygaard H, Winblad B, Jonhagen ME, Hallikainen M, Wimo A. Patient- and proxy-reported utility in Alzheimer disease using the EuroQoL. *Alzheimer disease and associated disorders*. 2006 Jan-Mar;20:49-55.