

ORIGINAL ARTICLES

Cost-effectiveness of interventions for people with dementia without caregiver: A Systematic Review

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ABSTRACT

Objective: This study was conducted to answer the three questions: 1- What intervention with no caregiver to increase cost-effectiveness in patients with dementia have been implemented? 2- How has disease progression changed in these interventions? 3- How has cost effectiveness changed in these interventions?

Methods: The databases were searched from PubMed, Cochrane and Science Direct. Studies on cost-effectiveness of interventions for people with dementia without caregiver published from 2010 to 2020 have been filtered. Systematic review was carried out according to the Cochrane Collaboration methodology. Search for documents based on PICOTS standards: Population - Patients with dementia, regardless of disease severity; Intervention - Intervention with no-caregiver for dementia patients; Comparison - The intervention group and the control group; Outcome measure - Disease progression and Cost effectiveness; Time - Studies published from January to January 2020. Study design: A randomized controlled trial. Study subjects are not age restricted.

Results: 2163 documents were found, of which, there are 15 documents satisfy the criteria. (1) Modes of intervention: There are 3 studies on exercise interventions, 2 studies on drug treatment, the rest are different treatment programs. In which, the START program has done the most studies with 3 studies. (2) Disease progression: Out of the 15 studies, 14 found the difference between the intervention group and the control group. The intervention group mostly had higher QALYs and had better disease progression. (3) Cost-effectiveness: There are 11 out of 15 studies showing the cost-effectiveness of the intervention group compared with the usual care group. 4 remaining studies did not show a cost-effectiveness and there is no evidence of cost-effectiveness unless the service user is willing to pay certain amount for that intervention.

Conclusion: This study shows evidence of no-caregiver interventions that improve dementia and increase the cost-effectiveness of treatment.

Keywords: dementia, cost-effectiveness, no-caregiver, review.

INTRODUCTION

Dementia is one of the prominent health problems of the elderly in the 21st century (1). It is expected that by 2040, more than 80 million people will suffer from dementia

(2). Dementia could become a new medical burden in the future. One of the obvious consequences is the cost of treating the disease. Cost effectiveness is one of the important metrics for measuring the value of a healthcare service (3). In 2010, worldwide



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treatment costs for dementia were US \$ 604 billion, with 70% of these costs going to North America and Western Europe (4) (5). In the UK, long-term care costs for the elderly with dementia increased from £ 5.4 billion in 2002 to £ 16.7 billion in 2031 (6). Currently, there are many interventions available for people with dementia, but not all are cost-effective. The biggest reason that the interventions are not cost-effective is the cost of payments to experts and home care staff, travel expenses are often very high (7) (8) (9) (10).

Scientific evidence has shown that cost effective management can improve quality of life for people with dementia (11). It can relieve the person's suffering; reducing the unnecessary sedation associated with inappropriate drug use; allowing people with dementia to engage in relationships and being more active (11). The National Dementia Strategy in UK predicts a reduction of at least 6% in institutionalization cost as a result of early detection and diagnosis of dementia when assessing implementation costs (11). Therefore, finding cost-effectiveness and improving the quality of life interventions for people with dementia is essential.

In another aspect, the dependence on caregivers has a great effect on the mental health of people with dementia. Having a caregiver has many benefits for people with dementia, but there are also many disadvantages to both caregivers and people with dementia. For caregivers, they can be exhausted emotionally and physically while working with dementia patients and for people with dementia, they can be psychologically affected and less active in everything (10). In the world, there have been some cost-effectiveness of interventions for people with dementia without caregiver, but the effects are unclear. Example, the no-caregiver

intervention strategy in the UK did not provide strong evidence of cost-effectiveness (12). Many studies also show that reminiscence therapy is the most common, but there is little evidence of cost effectiveness (13).

For these reasons, an urgent need has been placed in the systematic synthesis of no-caregiver interventions to reduce the costs of dementia. Therefore, we conducted a systematic review of cost-effective interventions with no-caregivers for people with dementia for filling this gap.

METHODS

Study design

A systematic review was conducted to provide an overview of the best available evidence.

Method of search

This review was carried out according to the Cochrane Collaboration methodology (14). The primary output of Cochrane is the Cochrane database of systematic reviews, which is contained within the Cochrane Library. Cochrane reviews are systematic assessments of evidence of the effects of healthcare interventions and diagnostic tests, intended to help people to make informed decisions about healthcare based on the best available research evidence. Most are based on randomised controlled trials, but other types of evidence may also be taken into account, if appropriate. The document selection process is followed by the PRISMA document selection guidelines. The search databases included: Pubmed, Cochrane, Science Direct. Keywords used: dementia, cost-effectiveness, intervention, patient with dementia

Analytical framework

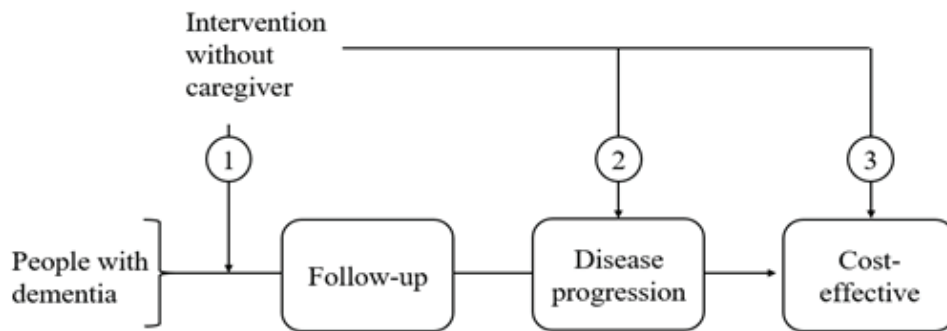


Figure 1. Analytical framework

This framework has helped researchers clearly orient the desired outcomes. Based on the research framework, there are three main outputs: 1) Modes of intervention without caregiver to increase cost-effectiveness in patients with dementia; 2) Disease progression of patient in these interventions; 3) Cost-effectiveness in these interventions.

Inclusion criteria

Search for documents based on PICOTS standards (15). Population: Patients with dementia, regardless of disease severity. Intervention: Intervention with no-caregiver for dementia patients. Comparison: The intervention group and the control group. Outcome measure: Disease progression and Cost effectiveness. Time: All studies published from January 2010 to January 2020. Study design: A randomized controlled trial (RCT).

Exclusion criteria

The interventions did not measure cost effectiveness and disease progression for people with dementia without a caregiver. Interventions is a research protocol. Studies were unpublished or non-peer reviewed. Full-text was not available in English. The interventions were not RCT.

Data abstraction

After searching, all results are imported into Microsoft Excel and duplicates are removed. Title, abstract and full text filtered by research criteria. Studies fully meeting the criteria were selected for research. Collected full-text articles were assessed for quality by two independent reviewers (PHT and VTH). Any disagreement between the two reviewers was resolved through discussion, or reviewed by a third party (BBH). Searched results were reported in the final report and presented by PRISMA schematic.

RESULTS

Search Results

From 3 search databases: Pubmed, Cochrane and Science Direct, we found a result of 2163 documents (Figure 2). After filtering the documents with the same title, 864 documents remain. After removal of materials, which was not a caregiver intervention with dementia; not related to cost effectiveness and quality of life; not in English, we have 101 documents left. After 101 documents were put into full-text filter, the remaining 15 documents met all the criteria and were included in the research results.

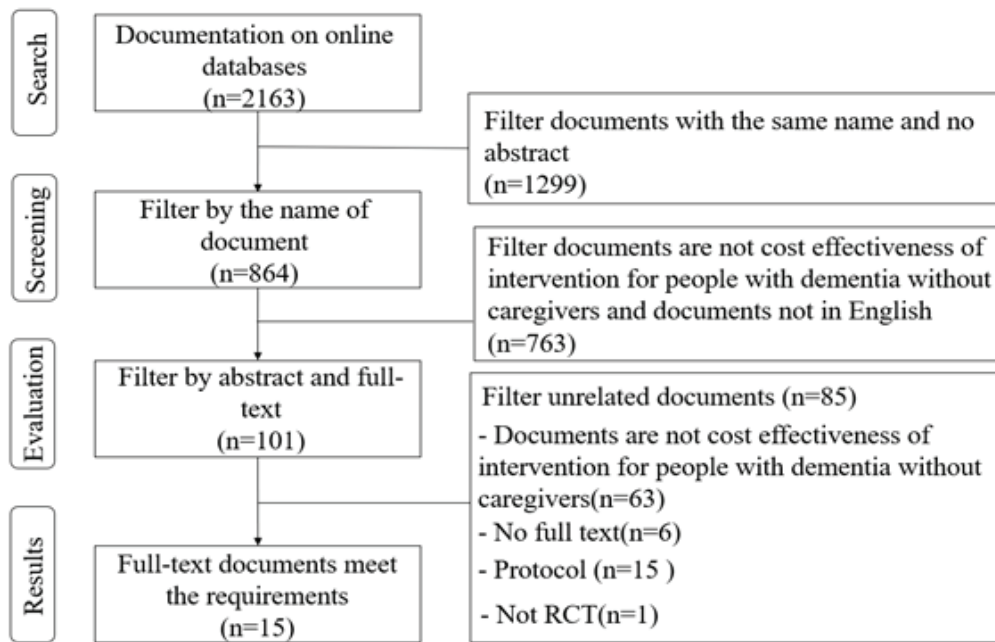


Figure 2. PRISMA diagram

Characteristics of studies

In the 15 selected studies, all of the studies were aimed at improving no-caregiver interventions with people with dementia (Table 1). All studies are RCT. In the demographic and intervention characteristics, there are 12 studies in the UK (16) (17) (10) (6) (18) (19) (20) (21) (22) (23) (13) (24). All studies have sample sizes before and after the intervention. All interventions had a follow-up time, of which 5 studies had only one follow-up time (16) (17) (18) (19) (1), the rest of the studies had two or more follow-up time, with at most 4 follow-up time in UK studies in 2014 (24). The studies were conducted for both men and women. Most of the studies were not age restricted, except for Lukasz Tanajewski's study in England (> 65 years old) (19).

Characteristics of interventions

There are 13 out of 15 studies comparing the intervention group with the usual care group

or using placebo, only 2 studies comparing 2 different types of intervention (16) (1) (Table 2). There are 3 studies on exercise interventions: Iftekhar Khan et al 2019's study compared the cost-effectiveness of a tailored exercise program versus usual care for people with dementia (25); Jennifer C Davis et al 2015's study compared between three participant groups of Exercise for Cognition and Everyday Living (EXCEL): twice weekly resistance training (RT), twice weekly aerobic training (AT) and the control group, twice weekly balance and tone classes (BAT) (1); D'Amico F et al 2016's study compared of two-arm parallel-group trial of a dyadic exercise (individually tailored, for 20-30 min at least five times per week) versus usual care for people with dementia (18). There are 2 studies on therapeutic drugs: Romeo R et al 2013's study compared the cost-effectiveness of sertraline and mirtazapine with placebo for depression in dementia (6) and D'Amico F et al 2015's study compared the Acetylcholinesterase inhibitors (ACHEI) with placebo (23). There's

a study on dietary supplements (ONS) versus dietary advice from Elia Met et al 2018 (16). Also there are other treatment programs, such as: Remembering Yesterday, Caring Today (RYCT) program compared to usual care (13); Individual cognitive stimulation therapy (iCST) compared with treatment as usual (TAU) (21); Compared Cognitive rehabilitation (CR) with TAU (20); Compared the Medical and Mental Health Unit (MMHU) with standard care (19); Compared cognitive stimulation therapy (CST) with TAU (17); Memory clinics (MC) compared to general practitioners (GP) care (26); Specially, there were 3 studies of a psychological intervention called STrategies for RelaTives (START) (10) (22) (24).

About disease progression, out of 15 studies, 14 have found a difference between the intervention group and the control group, mostly the intervention group had higher QALYs (16) (1) (10) (19) (21) (23) (24) and better disease progression (26) (17) (18) (25) (20) (22), only 1 study showed no difference between RYCT program and usual care (13).

About cost-effectiveness, there are 11 out of 15 studies showing the cost-effective of the intervention group compared with the usual care group. 4 remaining studies did not show a cost-effective and there is no evidence of cost-effective unless the service user is willing to pay £ 2,500 or more for that intervention (18) (13) (21) (20).

Table 1. Characteristics of RCT studies

	Author and year of publication	Location	Group		Sample size		Follow-up time	Characteristics of research subjects
			Intervention	Control	Pre intervention	Post intervention		
1	Meeuwse E et al 2013 (26).	Netherlands	MC	GP	175	160	12 weeks (6 weeks, 12 weeks)	Both sexes. No age limit
2	Elia Met et al 2018 (16).	UK	ONS	Dietary advice	104	76	12 weeks	Both sexes. No age limit
3	Jennifer C Davis et al 2015 (1).	Canada	RT, AT	Usual care	86	86	6 weeks	Both sexes. No age limit
4	Knapp M et al 2019 (17).	UK	CST	TAU	131	120	2 months	Both sexes. No age limit
5	Knapp M et al 2013 (10).	UK	START added to usual care	Usual care	260	205	2 months (1 month, 2 months)	Both sexes. No age limit
6	Romeo R et al 2013 (6).	UK	Receive sertraline and mirtazapine	Receive placebo	326	231	39 weeks (13 weeks, 39 weeks)	Both sexes. No age limit
7	D'Amico F et al 2016 (18).	UK	A dyadic exercise	Usual care	52	52	12 weeks	Both sexes. No age limit
8	Iftikhar Khan et al 2019 (25).	USA	Exercise added to usual care	Usual care	494	488	12 months (6 months, 12 months)	Both sexes. No age limit
9	Lukasz Tanajewski et al 2015 (19).	UK	MMHU	Usual care	600	599	3 weeks	Both sexes. > 65 years old
10	Clare L et al 2019 (20).	UK	CR	TAU	474	427	9 months (3 months, 9 months)	Both sexes. No age limit
11	Orgeta V et al 2015 (21).	UK	iCST	TAU	353	273	26 weeks (13 weeks, 26 weeks)	Both sexes. No age limit
12	Livingston G et al 2014 (22).	UK	START	Usual care	260	209	6 months (3 months, 6 months)	Both sexes. No age limit
13	D'Amico F et al 2016 (23).	UK	Receive ACHEI	Receive placebo	236	199	6 months (7 weeks, 3 months, 6 months)	Both sexes. No age limit

14	Woods RT et al 2016 (13).	UK	RYCT	Usual care	488	350	10 months (3 months, 10 months)	Both sexes. No age limit
15	Livingston G et al 2014 (24).	UK	START	Usual care	260	209	24 months (4 months, 8 months, 12 months, 24 months)	Both sexes. No age limit

Notes: *Memory clinics (MC) and general practitioners (GP) care; Oral nutritional supplements (ONS); Twice weekly resistance training (RT), twice weekly aerobic training (AT); Cognitive stimulation therapy (CST); STRategies for RelaTives (START); Medical and Mental Health Unit (MMHU); Cognitive rehabilitation (CR); Individual cognitive stimulation therapy (iCST); Acetylcholinesterase inhibitors (ACHEI); Remembering Yesterday; Caring Today (RYCT) program.*

Table 2. Characteristics of interventions

Author and year of publication	Results	
	Disease progression	Cost-effective
Meeuwssen E et al 2013 (26).	The patient MC group's MMSE cognitive score showed better than MC treatment costs € 1024 average. Cost effectiveness is € GP group. The patient's absorption score was higher in the MC group. 41442 per QALY lost if using MC instead of GP.	
Elia Met et al 2018 (16).	The ONS group achieved significantly more QALY than the ONS groups are cost effective compared to dietary advice.	
Jennifer C Daviset et al 2015 (1).	QALYS increased gradually after 6 months of intervention.	The total medical cost was significantly lower for the AT and RT group compared to the BAT group.
Knapp M et al 2019 (17).	There was a significant improvement in disease status in the intervention group by score of MMSE, Cog ADAS and QoL THER AD	There is a high probability that the CST group is more cost effective than the TAU group.
Knapp M et al 2013 (10).	There was a small improvement in QALYs in the intervention group.	START is 99% more cost effective than usual care and with HADS-T measures.
Romeo R et al 2013 (6).	There was a difference in the mean Cornell Scale for Depression in Dementia (CSDDD) between placebo and sertraline; between placebo and mirtazapine; and between mirtazapine and sertraline.	The treatment cost was less for the mirtazapine and sertraline groups compared to placebo.

D'Amico F et al 2016 (18).	There was a difference in General Health Questionnaire (GHQ) scores after 12 weeks, the intervention group showed better average score than the control group.	Doesn't appear to be cost-effective. At £ 500 pay, the exercise regimen is 80% more cost-effective.
Iftikhar Khan et al 2019 (25).	Average ADAS-Cog score was slightly reduced in the exercise group compared to usual care.	Probability of a cost-effective exercise program is <1%. The cost-effectiveness results are still robust for some sensitivity analyzes and subgroups The average price for the intervention group was higher than for the control group.
Lukasz Tanajewski et al 2015 (19).	The intervention group had higher QALYs scores than the control group.	The total medical cost for MMHU is lower than for the normal care group. The cost effective probability with a QALY loss is 39% and 59% when eliminate cases of loss QALY.
Clare L et al 2019 (20).	There was a statistically significant difference between the CR and follow-up groups at both 3 and 9 months The CR group had an MMSE score with a higher gain than the follow-up group.	There is no evidence of cost-effectiveness for QALYs. CR is cost effective when it is willing to pay 2,500 (£) or more.
Orgeta V et al 2015 (21).	iCST seems to improve quality of life.	Adjusted average cost no significant difference between groups. From the social perspective has shown that there are health benefits and cost savings.
Livingston G et al 2014 (22).	There was an improvement in disease status in the intervention group compared with the control group through the scales HQS, EQ-5D, HADS.	The intervention group was more cost effective than the control group
D'Amico F et al 2015 (23).	The MCST group QoL-AD score was higher than the control group, but there was no difference between groups in measured cognition (ADAS-Cog or any of the secondary outcomes).	The CSTs are cost-effective considering self-assessment as their primary outcome, cognitive (MMSE) and age are the secondary results. The CST in conjunction with ACHEI is cost effective when the result is perceptual.
Woods RT et al 2016 (13).	There is no difference in health outcomes between intervention and control group.	The intervention group did not seem cost-effective.
Livingston G et al 2014 (24).	The intervention group had lower HADS-T and higher QALYs than the control group.	If we are willing to pay £ 30,000/QALY, cost effectiveness will be over 99%.

DISCUSSION

Our research filters out studies distributed between 2013 and 2019, and 4/5 studies were from the UK. The studies are all design of RCTs, study duration from 3 weeks to 96 weeks. The types of interventions without a caregiver are diverse such as exercise interventions, medications, oral nutritional supplements, different treatment programs, etc. Almost studies have found that no-caregiver interventions for people with dementia have better health effects such as faster recovery, quality of life index higher (excepted the study of Woods RT et al in 2016). Overall, the no-caregiver intervention for people with dementia was more cost-effective (11/15 studies).

Comparing our results with other studies was difficult, the similar studies was few. However, we found a study in 2020 that found in 2019 more than 16 million family members and other unpaid caregivers provided an estimated 18.6 billion hours of care to people with Alzheimer's or other dementias. This care is valued at nearly \$244 billion, but its costs extend to family caregivers' increased risk for emotional distress and negative mental and physical health outcomes (27). We also found a number of studies that reviewed each type of intervention with no caregiver for people with dementia, and the results were both positive, such as improved difficulty eating and not taking the drug (28), exercise interventions reduce the number, frequency and rate of falls in people with neurological disorders (29) or a study that found that training a family caregiver in behavioral or cognitive interventions did not reduce a patient's severe agitation, albeit at a large cost (11).

There were four studies that did not increase cost effectiveness. The study of Orgeta V et al 2015 (21) and D'Amico F et al 2016 (18) both showed that there was no difference in cost effectiveness between the two intervention groups and the control group if people do not

pay a certain amount for their health. Orgeta V et al 2015's study was £ 500 or more and D'Amico F et al 2016's study was £ 2,500 or more. This showed that if you want to be cost-effectiveness of iCST intervention and a dyadic exercise, you need a certain amount of money. The Clare L et al 2019 study (20) also found that the intervention group was not cost effective because their intervention program may not be appropriate. Their CR program is considered too easy and has not stimulated the thinking of people with dementia. Woods RT et al 2016 (13) was the only study to show that neither disease progression nor cost-effectiveness showed any difference between the 2 groups. Their study did not guarantee the number of participants. Only about 57% of participants performed more than half of the intervention sessions in 10 months. Therefore, the results of their research may be affected and does not guarantee reliability.

Despite the lack of related studies, we are still aware of the limitations of the above study that our study hasn't had a standard scale to evaluate cost effectiveness and the data were not a specific type of intervention on people without dementia caregivers. Our study only filter studies written in English language without mentioning research in other languages. The data for this study were not sufficient to conduct a meta-analysis. Studies were only collected on three sources (PubMed, Cochrane and Science Direct), so data may not be complete. In addition, only taking studies from 2010 is also a limitation of this study. We advise the future research that evidence should be gathered from studies from many different languages and sources, used meta analysis for more solid evidence of the cost-effectiveness of interventions with no caregivers for people with dementia.

CONCLUSIONS AND RECOMMENDATIONS

This study has compiled the evidence of a more cost-effectiveness and more better

health progression of interventions with no caregivers for people with dementia. The types of interventions without a caregiver are diverse such as Memory clinics and general practitioners care; Oral nutritional supplements; Twice weekly resistance training, twice weekly aerobic training; Cognitive stimulation therapy; STrAtegies for RelaTives; Medical and Mental Health Unit; Cognitive rehabilitation; Individual cognitive stimulation therapy; STrAtegies for RelaTives; Acetylcholinesterase inhibitors; Remembering Yesterday, Caring Today program; Receive sertraline and mirtazapine; Receive ACHEI; A dyadic exercise; Exercise added to usual care. Almost studies have found that interventions have better health effects such as faster recovery, quality of life index higher (excepted Remembering Yesterday, Caring Today program). Overall, interventions was more cost-effective (excepted Individual cognitive stimulation therapy, A dyadic exercise, Cognitive rehabilitation and Remembering Yesterday, Caring Today program). The above results are very useful for society as a whole: Service users can make informed choices about what treatment is appropriate for their needs and policy-makers or organizations medical examinations decides which methods to apply to improve the quality of medical services for the people.

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