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Cost-effectiveness of a training intervention for caregivers of people living with dementia: a model for a UK-based economic evaluation

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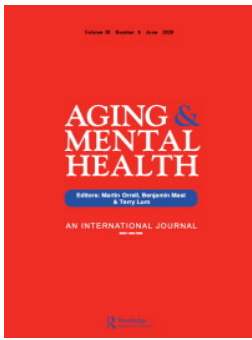
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Cost-effectiveness of a training intervention for caregivers of people living with dementia: a model for a UK-based economic evaluation

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ABSTRACT

Background: Informal caregivers play a vital role in supporting people living with dementia (PLwD) but often experience high levels of stress and limited support. Caregiver training programmes (CTPs) aim to improve caregiver knowledge, coping strategies and resilience, potentially reducing behavioural and psychological symptoms of dementia (BPSD) and delaying transitions to long-term care. This study evaluated the cost effectiveness of CTPs compared with usual care in the UK.

Methods: A decision tree economic model was developed in Microsoft Excel to simulate outcomes for a hypothetical cohort of community-dwelling PLwD and their caregivers. The model compared CTPs delivered in addition to usual care with usual care alone over 3- and 6-month time horizons, using a health and social care perspective. Quality-adjusted life years (QALYs) were estimated using EQ-5D utility values linked to changes in BPSD. Costs were sourced from published literature, UK national data sets and routinely collected service-use data.

Results: In the 3-month model, CTPs resulted in higher costs and modest QALY gains. In the 6-month model, CTPs were associated with lower costs and greater health benefits, suggesting potential longer-term cost-effectiveness. The intervention was dominant in the 6-month scenario, driven mainly by reduced probability of care home admission. Results were most sensitive to assumptions regarding care home admission risk.

Conclusion: CTPs may represent a cost-effective intervention within UK dementia care, although results remain sensitive to transition probability assumptions.

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KEYWORDS

Dementia; health economics; non-pharmacological therapies; caregiver training; psychosocial

Introduction

Many family members, friends and community members provide unpaid, informal care and support for people living with dementia (PLwD) (Patel et al., 2023). In the UK alone, there are an estimated 700,000 informal providers of care to PLwD (Lewis et al., 2014). As the population ages and formal care systems face increasing strain, reliance on informal caregiving is intensifying (Evandrou et al., 2024). These trends underscore an urgent need to address existing support gaps for informal caregivers within dementia care frameworks.

A 'family caregiver' is a term used to describe an informal caregiver who is related to the PLwD. Family caregivers of PLwD frequently report feeling ill-equipped and inadequately supported in their caregiving roles (Gomes da Rocha et al., 2022; Hazzan et al., 2022). The complex and progressive nature of dementia can be overwhelming, often resulting in caregiver stress and adverse physical and mental health outcomes (Tay et al., 2025).

Caregiver training programmes (CTPs) are structured interventions aimed at improving family caregivers' knowledge, skills and self-efficacy. These programmes typically support spouses, adult children and other family members who provide sustained care within community settings (Sadavoy et al., 2022). A key focus of CTPs is the management of behavioural and psychological symptoms of dementia (BPSD), such as agitation, aggression and wandering, symptoms that are prevalent among PLwD and are significant contributors to caregiver burden and premature institutionalisation (Cooper et al., 2024; Gitlin et al., 2010b; Mittelman et al., 2006).

CTPs typically equip caregivers with strategies to identify behavioural triggers and apply techniques such as distraction and redirection to reduce the frequency and severity of these behaviours (Gitlin et al., 2010b). By improving caregiver competence, these programmes have been shown to enhance caregiver well-being, reduce psychological distress, improve quality of life and reduce the severity of BPSD in care

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recipients (Cooper et al., 2024; Livingston et al., 2014). High levels of caregiver burden and distress are closely linked to crisis events, including unplanned hospital admissions and earlier transition into long-term care facilities (Schulz & Sherwood, 2008). By strengthening caregivers' capacity to manage behavioural symptoms, CTPs may help stabilise home-based care arrangements, potentially reducing avoidable hospital use and delaying institutionalisation. Therefore, CTPs that provide effective behavioural management strategies can alleviate caregiver distress, improve outcomes for both caregivers and PLWD, and support the sustainability of home-based care, potentially delaying institutionalisation (Gitlin et al., 2010a; Mittelman et al., 2006).

In the UK, a range of CTPs are available, and many offered free of charge (Dementia UK, 2023). These programmes are delivered by a range of support organisations, including the Alzheimer's Society, Dementia Adventure, Alzheimer Scotland and Carers Trust. However, there is substantial heterogeneity in their design and delivery (Felstead et al., 2023). There are variations in the session content, intended outcomes, delivery methods (e.g. in-person vs. online), frequency and duration of sessions, and facilitators' qualifications. This variability poses challenges for standardising CTPs and evaluating their effectiveness and cost-effectiveness across settings. Understanding these differences is essential to inform the development of scalable, evidence-based interventions that can be integrated into routine dementia care.

Relatively few randomised controlled trials (RCTs) have evaluated the cost-effectiveness of CTPs, and economic evidence is growing but is heterogeneous. In the absence of direct long-term trial data, economic modelling provides a valuable approach for estimating the potential costs and benefits of interventions by synthesising evidence from multiple sources. Such models are frequently used by policymakers to inform decisions about the adoption and commissioning of new services. Recent reviews and trial-based economic evaluations have highlighted a growing body of evidence supporting the effectiveness and potential cost-effectiveness of non-pharmacological and caregiver-focused dementia interventions, although important uncertainties remain regarding long-term outcomes, implementation and generalisability across settings (Eaglestone et al., 2023; Isaaq et al., 2025).

Previous modelling studies in dementia care have focused primarily on interventions designed to delay transition to long-term care. For example, Rosenvall et al. (2020) developed a simulation model evaluating care management, family support and rehabilitation interventions, demonstrating potential cost-effectiveness through delayed cognitive decline and postponed transition to institutional care.

Similarly, Jutkowitz et al. (2023) modelled four interventions, including two targeting caregiver education and support, and found the modest QALY gains alongside increased time spent living at home. These studies illustrate the potential economic value of interventions that strengthen caregiving capacity and delay institutionalisation. More recent studies, including the NIDUS Family trial, have further explored the effectiveness and economic implications of structured caregiver support interventions delivered within community settings (Cooper et al., 2024; Isaaq et al., 2025).

However, existing models have largely examined specific intervention packages within particular healthcare systems and often prioritise clinical and transition outcomes, with limited exploration of broader caregiver-focused training programmes in the UK context. Furthermore, heterogeneity in programme design and outcome measurement limits generalisability across settings. Robust, context-specific economic evaluation of CTPs within UK dementia care remains relatively limited. To our knowledge, the published UK-based decision-analytic modelling specifically evaluating structured CTPs compared with usual care is limited.

Although CTPs have demonstrated effectiveness in improving caregiver competence and reducing behavioural symptoms, robust evidence regarding their long-term cost-effectiveness remains limited. This highlights the need for rigorous economic evaluation to inform sustainable policy and commissioning decisions. Accordingly, this study aimed to develop a purpose-built economic model to evaluate the cost-effectiveness of CTPs for family caregivers of people living with dementia, compared with usual care.

Aim

The aim of this study was to conduct a model-based economic evaluation of a CTP for family caregivers of PLWD in a UK setting. A decision-tree model was developed and populated using the published literature and secondary data sources.

Methods

A purpose-built decision-tree model (Figure 1) was constructed using a cost-utility framework to compare the costs and health outcomes of a CTP intervention over a period of 3 months compared to usual care (no training received). The intervention was designed to improve caregivers' coping strategies for managing BPSD, with reductions in BPSD severity modelled as the key clinical outcome. Additionally, the model evaluated the impact of these reductions on delaying the transition of the PLWD to long-term care.

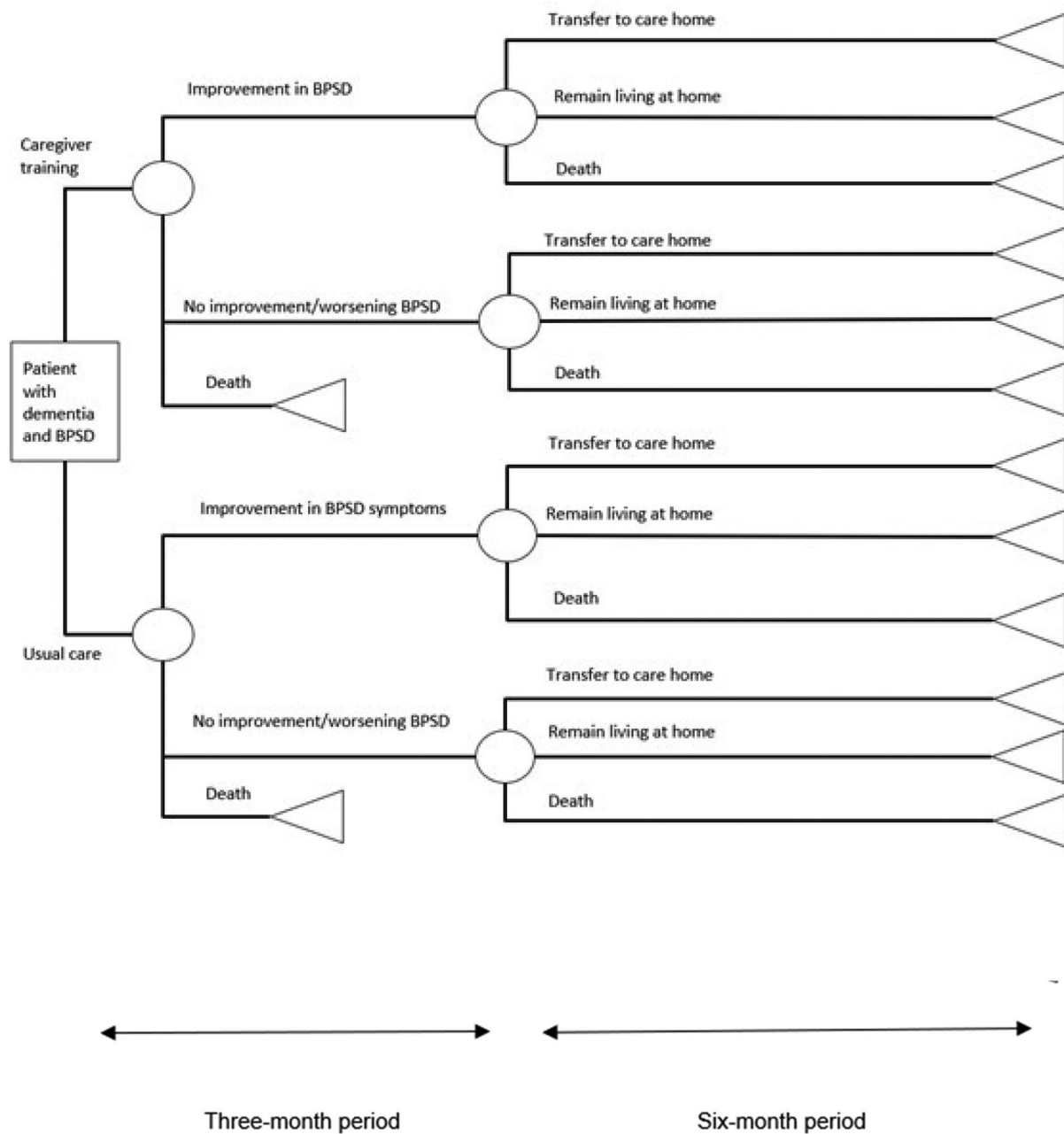


Figure 1. Structure of decision model for CTPs.

The primary outcome measure used in the economic model was quality-adjusted life years (QALYs), estimated using utility values reflecting changes in BPSD, consistent with best practice for health economic evaluations as recommended by NICE (2022).

Patient population and comparator

The model population consisted of a hypothetical cohort of UK-based, community-dwelling PLWD, whose family caregivers received either a CTP or usual care. Although the intervention targeted caregivers, outcomes were measured for the PLWD. The population was assumed to have moderate-stage dementia with BPSD, as reported by their caregivers.

Intervention: The intervention in the model was based on an in-person CTP delivered in community

settings, comprising eight sessions over a 3-month period. This structure was based on formats and content from previously published studies, facilitated by occupational therapists (Mohide et al., 1990; Silvestri et al., 2004).

The format of the training sessions was informed by a recent RCT, and included an initial evaluation of the PLWD and their communication patterns with their caregiver (Gitlin et al., 2010a). Caregivers participating in the intervention were provided with education on stress management techniques to support them in handling care-related challenges, such as resistance to care. Simple engagement activities were developed to involve the PLWD in daily tasks, such as meal preparation. Additionally, caregivers received guidance on adapting these techniques to accommodate future cognitive decline. In contrast, usual

care was defined as caregiving without access to structured training interventions.

Comparator: Usual care included routine care received at the GP, without any additional staffing or resource requirements, which was assumed not to differ between groups or require additional resources.

Costs were considered from a health and social care perspective, incorporating nursing home costs, inpatient and outpatient service use, and intervention costs.

Time horizon and discount rate

The model employed a 3-month time horizon, consistent with durations used in previously published studies (Brooks et al., 2024; Gitlin et al., 2010b; Mohide et al., 1990; Sadavoy et al., 2022). It was evaluated in two phases: a short-term analysis (3 months) and an extended analysis (6 months), which was considered sufficient to capture the principal short-term outcomes relevant to the effectiveness of the CTP. The extended model aimed to assess the longer-term impact of the intervention. Given the model's time horizon of less than 1 year, cost discounting was not applied, in accordance with standard practices in health economic evaluation.

Model structure

The model simulated a hypothetical cohort of individuals living with dementia and exhibiting behavioural and psychological symptoms of dementia (BPSD). Changes in BPSD were treated as the key clinical outcome. It was assumed that participation in a CTP would lead to a reduction in the frequency and severity of BPSD. This reduction was associated with a decreased likelihood of transition to long-term care, as well as changes in mental health service utilisation, including outpatient and inpatient admissions. These factors influenced overall healthcare costs and the projected place of residence (home vs. care facility) over the model's time horizon.

The model structure and methodological approach were informed by recent cost-effectiveness modelling of disease-modifying therapies conducted by NICE, as well as other established models in dementia and mental health (Kolovos et al., 2017; National Institute for Health and Care Excellence (NICE), 2011; Nguyen et al., 2018). The modelling process adhered to the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) for the transparent reporting of economic evaluations (Husereau et al., 2022). A decision-tree model was developed in Microsoft Excel to simulate the care pathways. The model compared two strategies: receipt of the CTP intervention versus usual care. Outcomes included

improvement or no improvement in BPSD, or death. For those continuing the intervention over an additional 3-month period, BPSD outcomes were further categorised as maintained improvement, no maintenance, or death. A cost-utility analysis was conducted, incorporating both costs and health outcomes measured in QALYs, in line with NICE guidance (National Institute for Health and Care Excellence (NICE), 2022). The incremental cost-effectiveness ratio (ICER) was calculated by dividing the difference in costs between the two strategies by the difference in QALYs gained.

Willingness-to-pay (WTP) thresholds were calculated to reflect the monetary value that individuals or society assign to health gains, thereby providing an evidence base to inform healthcare resource allocation. WTP is commonly applied as the value assigned to an additional year of life or one QALY, serving as a benchmark for determining whether an intervention offers good value for money (Sloan & Hsieh, 2017).

BPSD

The primary outcome used in the model was reduction in BPSD, as quantified by changes in EQ-5D scores (EuroQol 5-Dimensions). BPSD was selected as the primary clinical endpoint due to its established use in evaluating non-pharmacological interventions in dementia care (Beeri et al., 2002; Gitlin, Hodgson et al., 2010) and its responsiveness to change following effective caregiver interventions. Group-based CTPs have been assessed for their impact on BPSD management and have been recommended by NICE as the most effective delivery format (NICE, 2018).

BPSD symptom severity is commonly assessed using Neuropsychiatric Inventory (NPI) and the Revised Memory and Behaviour Problem Checklist (Chien & Lee, 2008; Hébert et al., 2003; Javadpour et al., 2009; Terracciano et al., 2020). However, EQ-5D provides a broader health-related quality of life perspective that is especially useful in economic evaluations. The EQ-5D is a widely used instrument for assessing health-related quality of life, including in dementia research where its anxiety/depression dimension is frequently used as a proxy for mood and emotional disturbances associated with BPSD (Birkenhager-Gillesse et al., 2022; Sadavoy et al., 2022). Changes in EQ-5D scores, particularly within the anxiety/depression domain, can reflect improvements or deteriorations in BPSD during interventions and are commonly converted into utility values for use in economic evaluations. The health state scores can be translated into utility values using country-specific value sets or algorithms, which assign weights to each combination of dimension levels to generate a single summary index score (Economics Network, n.d.).

QALYs were derived from utility scores reflecting changes in BPSD symptoms. BPSD reduction was used to estimate the improvements in health-related quality of life. Total expected costs were calculated separately for the intervention and usual care groups over a 3-month period. A 6-month model was also developed to assess the potential impact on care home transfer, assuming the improvements in BPSD symptoms observed in the 3-month model persisted.

Input parameters and sources

Where available, published sample sizes and uncertainty estimates, such as confidence intervals and variance measures, were extracted from the source literature to inform model inputs; however, these data were not consistently reported across all studies.

The model was populated using evidence from published studies and publicly available cost data sources. Model input parameters are presented (Table 1). The probability parameters used in the model were derived from evidence reported in several published trials examining caregiver-focused interventions and service utilisation among PLwD (Clevenger et al., 2018; Gitlin et al., 2010b; Scarmeas et al., 2007). These sources informed key transition probabilities within the model, including changes in behavioural symptom severity, probability of institutionalisation and patterns of health-care service use. Because the trial primarily reported institutionalisation using survival analysis, cumulative placement proportions extracted from the trial profile were used as pragmatic proxy parameters to represent relative admission risk within the decision model (Mittelman et al., 2006).

Table 1. Model input parameter values and sources of information.

Parameters	Value	Description	Source reference	Source type
Time horizon	3 months (base case); 6 months (extended model)	Reflects typical short-term programme lengths in CTPs	Silvestri et al. (2004); Williams, Newman and Hammar (2018)	Programme/observational studies
Definition of BPSD improvement	N/A	Reduction in ≥ 1 domain (frequency, severity, or caregiver reactivity)	Teri et al. (2005)	Randomised controlled trial, US
Probability of improvement in BPSD-CTP	0.627	Probability of improvement in BPSD symptoms - CTP	Gitlin et al. (2010a)	Randomised controlled trial, US
Probability of no improvement/worsening in BPSD-CTP	0.373	Residual probability of no improvement/worsening in BPSD symptoms with CTP	As above	As above
Probability of improvement/no change in BPSD symptoms with Usual care	0.551	Residual probability of improvement/no change in BPSD symptoms with Usual care	Gitlin et al. (2010a)	Randomised controlled trial, US
Probability of no improvement/worsening in BPSD - Usual care	0.449	Probability of no improvement/worsening in BPSD symptoms-Usual care	As above	As above
Probability of transfer to care home with BPSD improvement - CTP	0.24	Proxy proportion placed during follow-up (99/406) used to parameterise relative admission risk conditional on symptom improvement within the model	Mittelman et al. (2006)	Randomised controlled trial, US
Probability of transfer to care home with BPSD improvement - Usual care	0.27	Proxy proportion placed during follow-up (111/406) used to parameterise relative admission risk conditional on symptom improvement within the model	Mittelman et al. (2006)	Randomised controlled trial, US
Probability of transfer to care home - with NO improvement in symptoms CTP	0.28	Assumed probability of long-term care admission	Model assumption	Model assumption
Probability of transfer to care home - with NO improvement in symptoms with usual care	0.4	Assumed probability of long-term care admission	Model assumption	Model assumption
Probability of death with moderate dementia	0.0587	3-month probability derived from annual mortality probability (21.5%) using exponential conversion - Briggs et al. (2006)	As above	As above
Utility score (PLwD with BPSD, baseline)	0.35	Derived from EQ-5D using standard mapping methods	(Economics Network, n.d.)	Methodological guidance

Key: Behavioural and Psychological Symptoms of Dementia - BPSD; caregiver training programme - CTP; person living with dementia - PLwD; usual care - UC.

The primary outcome analysed in the model was QALYs, estimated using utility values reflecting changes in behavioural and psychological symptoms of dementia (BPSD). Reductions in BPSD were used to model the associated improvements in health-related quality of life. Total expected costs were calculated separately for the intervention and usual care groups over an initial 3-month time horizon. An extended 6-month scenario analysis explored the potential impact of sustained symptom improvements on transitions to residential care. The longer-term model assumed short-term reductions in BPSD observed in the base case were maintained over time.

Costs

Costs used in the model (Table 2) were measured in 2025 British pounds. Costs were not discounted as the time horizon was less than 1 year. The cost of usual care was assumed to be identical for both treatment arms and was excluded from cost calculations. The cost of the CTP was based on data from the TAPS study (Gitlin, Hodgson, et al., 2010). Costs associated with care home stays were informed by NHS service data (Jones et al., 2023; NHS England, 2023). Weekly care home costs were calculated as the average of three provision types: £916 for private sector residential care, £1,442 for local authority residential care and £1,212 for private sector nursing homes. This average figure was used as a representative estimate of typical long-term care costs across different settings.

Costs associated with inpatient and outpatient mental health care were estimated through a secondary analysis of service utilisation data from individuals diagnosed with mild cognitive impairment (MCI) or dementia within a UK-based cohort. This cohort was drawn from the South London and Maudsley NHS Foundation Trust (SLaM), which

provides mental health services to approximately 1.3 million residents across the boroughs of Croydon, Lambeth, Lewisham and Southwark – an area noted for its ethnic diversity, socio-economic deprivation and pronounced health disparities. Clinical data from SLaM are securely linked to the Clinical Record Interactive Search (CRIS) system, which enables access to anonymised, routinely collected electronic health records for ethically approved research under an opt-out model. Ethical approval for the use of CRIS data was granted by the South-Central Oxford C Research Ethics Committee (reference: 23/SC/0257). The analysis included all individuals aged 18 and over with a primary diagnosis of MCI or dementia recorded between 1 January 2010 and 31 December 2020, focusing on mental health service costs incurred during the year before and after diagnosis.

Sensitivity analysis

The economic model was developed and analysed using Microsoft Excel. One-way deterministic sensitivity analyses were conducted to independently vary key model parameters and test underlying assumptions. Uncertainty was anticipated in the estimation of several inputs, including the probability of improvement in BPSD, cost estimates, utility values and transition probabilities. As these parameters influence both costs and outcomes, sensitivity analyses were performed to assess the robustness of the model and the impact of input variability on cost-effectiveness outcomes.

In the 3-month model, parameter values were varied by 20% and 50% to explore uncertainty. For cost-related inputs, asymmetric variation ranges were applied to better reflect plausible real-world fluctuations. For example, intervention costs were allowed to increase by up to 50%, but only decrease by 20%, acknowledging that substantial cost reductions are

Table 2. Cost input parameters and sources of information.

Parameters	Value	Description	Source reference	Source type
Cost of CTP (total cost of intervention)	£1,332	Cost of training intervention (£167 per session, 8 sessions = £1,332)	Gitlin et al. (2010a)	Randomised controlled trial, US
Cost of usual care	£0	Cost of usual care assumed to be zero in both arms of the model	N/A	N/A
Cost of care home stay (per week)	£1,190	Calculation of mean care costs (per week). Calculated from an average cost of private sector residential care home, private sector nursing home and local authority residential care home	Jones et al. (2023)	Published NHS cost data
Cost of remaining living at home	£0	This is assumed to be zero, with the only costs being the cost of care detailed below	N/A	N/A
Cost of care with moderate dementia (per week)	£76	This figure was informed by the results of a CRIS database analysis of mental health service use	This figure was informed by the results of a CRIS database analysis of mental health service use	Patient-level data, UK
Cost of care with death	£0	Death was treated as terminal with no associated cost. Informed by previous modelling studies that have assigned a zero cost to death	Vandepitte et al. (2020)	Markov model for dementia

Key: Caregiver training programme – CTP; clinical record interactive search – CRIS.

unlikely due to fixed components such as staffing, training and infrastructure. In contrast, cost increases were considered more probable, driven by factors such as service expansion, wage inflation and regional cost differences. These asymmetric assumptions were visualised using a tornado diagram to illustrate their influence on the ICER. This approach enabled identification of the most influential

parameters and provided insight into the robustness of model outcomes under varying conditions. A full probabilistic sensitivity analysis was not undertaken due to limitations in the availability of parameter uncertainty data within the source literature.

Table 3. Assumptions used in the model.

Parameter	Assumption	Justification	Source
Population	PLwD had moderate stage dementia with BPSD symptoms at model entry.	Matches population in similar published CTPs	Teri et al. (2005)
Treatment effect	If transfer to care home occurred, this is assumed to happen at the three-month time point.	Assumptions reflect disease progression and generalisability across settings	Mittelman et al. (2006)
Maintenance of treatment effect	It was assumed that the effect of the intervention on BPSD symptoms, and the associated utility gain, was maintained over the second 3-month period.	Based on follow-up data from the START trial, which reported sustained reductions in caregiver anxiety and depression at 8-month post-intervention	Livingston et al. (2014)
Mortality	Death assumed at midpoint of model (6.5 wk for the initial 3-month model; 18.5 wk for the extended 6-month scenario). No additional costs after death.	Used in similar cost-effectiveness models; end-of-life costs excluded.	Vandepitte et al. (2020); ONS
Costs	Only NHS and social care provider costs included. Travel costs were excluded for both the intervention and usual care arms.	Focus on direct healthcare costs; travel costs considered negligible.	Jones et al. (2023)

Key: Behavioural and psychological symptoms of dementia – BPSD; caregiver training programme – CTP; person living with dementia – PLwD.

Assumptions

Several simplifying assumptions regarding the population, treatment effects and mortality were incorporated into the model. A summary of these assumptions is provided in Table 3. It was assumed that the CTP was delivered in addition to usual care. For individuals transferred to a care home during the intervention period, it was assumed they would receive six of the eight planned sessions, based on the rationale that certain home-based strategies would no longer be applicable post-admission.

Fixed utility values were applied to represent typical quality of life for each health state, enabling consistent estimation of QALYs across the model's time horizon. The model structure included two arms: one for individuals experiencing symptom improvement and another for those with no improvement or worsening symptoms. In the absence of detailed data, weighted utility values were used for the no improvement/worsening group to reflect a mixed population with either stable or deteriorating symptoms.

Results

The base case deterministic cost-effectiveness results for CTP versus usual care are presented. A summary of cost-effectiveness for the CTP, including the ICER, is shown in Table 4. Compared with usual care, the CTP was associated with higher costs and marginally greater QALY gains, resulting in an ICER of £315,783 per QALY gained.

The base case results for the 6-month model are presented. Compared with usual care, the CTP was associated with lower overall costs and greater health benefits. The intervention was therefore dominant over usual care in the 6-month scenario (Table 5).

Sensitivity analysis

Results of the sensitivity analysis were presented in tornado diagrams, which rank parameters by their influence on the ICER. For the 3-month model (Figure 2), the results showed that it was most

Table 4. Baseline results of the 3-month model – initial improvement.

Pathway	Weighted costs (£)	Incremental costs	Weighted QALYs*	Incremental QALYs*	ICER
Caregiver training programme	£2,222	£1,283	0.0919	0.0041	£315,783
Usual care	£939	x	0.0878	x	x

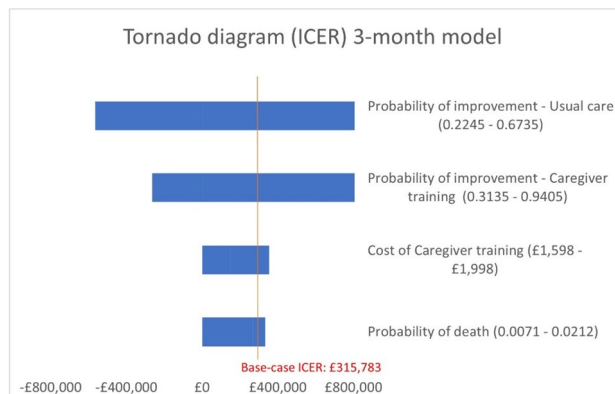


Figure 2. Tornado diagram showing key drivers of cost-effectiveness at 3 months.

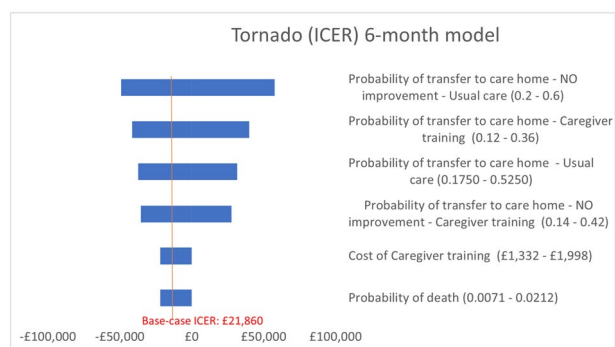


Figure 3. Tornado diagram showing key drivers of cost-effectiveness at 6 months.

sensitive to changes in probability of improvement and least sensitive to changes in cost and probability of death.

Sensitivity analysis of the 6-month model (Figure 3) indicated that the model was most sensitive to changes in the probability of care home admission. In contrast, variations in mortality rates and training costs had comparatively less influence on model outcomes, suggesting robustness in those areas. These findings highlight that the overall cost-effectiveness of the CTP was primarily driven by assumptions related to care home admission probabilities. Accurate estimation of these probabilities is therefore critical when interpreting the long-term economic impact of the intervention.

Discussion

This study provides preliminary evidence that caregiver training programmes may offer important longer-term economic and clinical benefits for PLWD, despite higher initial intervention costs. While the 3-month model suggested limited short-term cost-effectiveness, the 6-month scenario indicated that sustained improvements in BPSD may reduce care home admissions and associated healthcare costs over time. These findings support the potential value of non-pharmacological caregiver-focused interventions within dementia care.

The intervention model was grounded in established clinical and psychological frameworks, enhancing its credibility and potential for real-world effectiveness. The CTPs adopted a preventative approach, targeting caregivers early in the care pathway. By doing so, CTPs may reduce crisis-driven service utilisation and delay the transition of PLWD into long-term care. These programmes also support caregivers, who often represent an under-supported yet critical component of dementia care, by improving their knowledge, confidence, and resilience.

Comparison of the 3-month and 6-month model results indicated that the cost-effectiveness of CTPs improved over time. However, while CTPs may be cost-effective in the long term, their implementation requires upfront investment in staff training, programme coordination and potentially digital infrastructure. These initial costs may pose barriers in underfunded regions and should be considered when evaluating the feasibility of scaling such interventions.

The findings from this modelling work need to be viewed within the broader evidence base on the economics of dementia care. Previous reviews, including the systematic review and review of reviews by Eaglestone et al. (2023), have highlighted a growing body of economic evidence relating to non-pharmacological dementia interventions, including caregiver-focused and psychosocial approaches.

More recent evidence from the NIDUS Family trial has further demonstrated the potential effectiveness and cost-effectiveness of structured psychosocial caregiver support interventions for people living with dementia and their informal carers (Cooper et al., 2024; Isaaq et al., 2025). These findings further reinforce the importance of caregiver-focused approaches within community dementia care and highlight the increasing policy and research interest in scalable psychosocial interventions.

Consistent with this literature, this study suggests that intervention value may become more apparent over longer time horizons, particularly where delayed institutionalisation and wider impacts on service utilisation are considered.

Economic evaluations of psychosocial interventions have reported variable effects on quality of life outcomes, although several studies have identified modest but potentially meaningful improvements alongside relatively limited additional costs (Eaglestone et al., 2023). Consequently, cost-effectiveness estimates in this field tend to be highly sensitive to decisions around time horizon, analytical perspective and how utility is captured (Jutkowitz et al., 2023; Rosenvall et al., 2020). Consistent with studies of cognitive stimulation therapy, case management approaches, multicomponent caregiver support and recent modelling of music therapy interventions (Eaglestone et al., 2026), our analysis

Table 5. Results of the 6-month model – maintenance of improvement.

Pathway	Weighted costs (£)	Incremental costs	Weighted QALYs*	Incremental QALYs*	ICER
Caregiver training programme	£2,583	–£517	0.1826	0.0237	Dominant
Usual care	£3,100	x	0.1590	x	x

suggests that an intervention's value for money is strongly shaped by whether subsequent impacts such as delayed transition into residential care or shifts in service use are considered. When these wider system implications are incorporated, interventions are generally more likely to appear cost-effective.

At the same time, the results reflect challenges that are familiar across dementia economics. Structural choices within the model, combined with the limited availability of long-term evidence, play a significant role in shaping the outputs (Nguyen et al., 2018). A substantial proportion of the existing literature is based on short follow-up periods, which risks overlooking the more gradual relational and behavioural benefits that may unfold over time (Eaglestone et al., 2023). Moreover, QALY-driven approaches do not always capture outcomes that matter deeply to families, such as increased caregiver competence, improved relational stability and emotional resilience. These are central aims of many CTPs but are not consistently reflected in generic utility measures. In this respect, our findings align with wider calls for broader outcome frameworks and more nuanced modelling techniques that better represent the realities and complexity of community-based dementia support (Jutkowitz et al., 2023; Nguyen et al., 2018).

These findings are particularly relevant within mental health and ageing services, where supporting caregiver psychological well-being is central to sustaining home-based dementia care, and where behavioural symptom management remains a key driver of both caregiver distress and service utilisation.

Limitations

A decision tree structure was selected because the available evidence primarily reported short-term intervention outcomes over relatively limited follow-up periods, making this approach appropriate for the scope and structure of the available data. The model was intended as an exploratory economic evaluation rather than a full representation of the long-term progression of dementia. Nevertheless, dementia is a complex and progressive condition, and the authors acknowledge that a simple decision tree cannot fully capture the heterogeneity of disease trajectories, changes in cognitive and functional status or longer-term transitions in care needs. More flexible approaches, such as state-transition or survival-based models, may better represent the progressive nature of dementia and should be

considered in future research where sufficient longitudinal data are available to support model parameterisation.

The model structure included a pathway in which attendance at a CTP led to a reduction in BPSD, thereby lowering the probability of care home admission. However, the study used to inform intervention effectiveness reported a direct association between CTP participation and reduced care home admission rates, without explicitly linking this outcome to changes in BPSD (Gitlin et al., 2010b). As such, while the inclusion of BPSD as an intermediate step is clinically plausible, based on the established understanding of dementia progression and caregiver burden, it is not directly supported by empirical evidence. This limitation should be considered when interpreting the model structure, and further research is needed to clarify the extent to which BPSD mediates the relationship between CTPs and care home admission.

In addition, the cumulative placement proportions used to parameterise admission risk do not represent time-specific transition probabilities and therefore introduce structural uncertainty; however, extensive sensitivity analyses were undertaken to explore their influence.

Although one-way deterministic sensitivity analyses were conducted, a full probabilistic sensitivity analysis was not undertaken. Consequently, uncertainty surrounding the probability of cost-effectiveness at different willingness-to-pay thresholds could not be fully quantified.

The relatively short time horizon used in the present model may underestimate the longer-term costs associated with dementia care, as well as broader caregiver and societal impacts. Although caregiver outcomes were considered indirectly through behavioural symptom management and delayed institutionalisation, caregiver quality of life and wider societal costs were not explicitly modelled.

Recommendations

The findings of this study suggest that CTPs have the potential to represent a cost-effective component of community-based dementia care, particularly where reductions in behavioural symptoms and caregiver burden contribute to sustained home-based care. Given increasing pressure on NHS and social care services, investment in structured caregiver support may offer a proactive strategy to reduce crisis-driven service use and delay transfer to long-term care. Commissioners should consider the integration of

evidence-based CTPs within routine dementia pathways, ensuring programmes are standardised, scalable and accessible across diverse communities.

However, variability in programme design and delivery remains a challenge. Greater consistency in core components, outcome measurement and reporting standards would improve comparability across interventions and strengthen the economic evidence base.

Future work and implications

Several priorities for future research emerge. First, high-quality UK longitudinal data are needed to better estimate long-term outcomes, including health-care utilisation and time to institutionalisation. Second, future trials should continue to incorporate robust economic endpoints alongside clinical outcomes, including comprehensive assessment of caregiver quality of life and societal costs. Third, modelling approaches could further explore structural uncertainty and heterogeneity in caregiver populations, including variation by relationship type, co-residence status and dementia severity.

Finally, economic evaluation frameworks in dementia care may benefit from extending beyond narrow QALY-based approaches to better capture outcomes central to psychosocial interventions, including social connection, emotional wellbeing and relational stability. Ensuring that these dimensions are reflected in future analyses will support more informed policy and commissioning decisions.

Conclusion

This study developed an economic model to evaluate the cost-effectiveness of CTPs for family caregivers of PLWD in the UK. The model drew on published evidence of clinical effectiveness and UK-based cost data from national sources and service providers. The findings suggest that CTPs may represent a cost-effective component of community-based dementia care, particularly where improvements in caregiver competence and reductions in behavioural symptoms contribute to delayed institutionalisation.

While results were sensitive to assumptions regarding time horizon and transition probabilities, the analysis highlights the potential value of structured caregiver support within community-based dementia care. Further longitudinal and economic research would help strengthen the evidence base and reduce structural uncertainty. Nevertheless, the findings provide important preliminary economic evidence supporting the role of caregiver training programmes within community dementia care.

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