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A cost effectiveness analysis of maintenance cognitive stimulation therapy (MCST) for people with dementia: examining the influence of cognitive ability and living arrangements.

Abstract

Objectives: Identify if cost-effectiveness of Maintenance Cognitive Simulation Therapy (MCST) differs by type of living arrangement and cognitive ability of the person with dementia. Findings are used to perform a value of information analysis to inform decisions about future research on the effectiveness and cost-effectiveness of MCST in people with these characteristics.

Methods: Incremental cost-effectiveness analysis applying seemingly unrelated regressions using data from a multicentre RCT of MCST versus **treatment as usual in a population which had already received 7 weeks of CST** for dementia (ISRCTN: 26286067). The findings from the cost-effectiveness analysis are used to inform a value of information analysis.

Results: The results are dependent upon how quality adjusted life years (QALYs) are measured but suggest that MCST might be cost-effective compared to standard treatment for those who live alone and for individuals with higher levels of cognitive functioning. If a further RCT was to be conducted evaluating the cost-effectiveness of MCST for those with higher cognitive functioning and those who lived alone, value of information analysis suggests a total sample of 48 complete cases for both sub-groups would be required for a two-arm trial. The expected net gain of conducting future research for these two population sub-groups is £920 million.

Conclusion: Preliminary results suggest that MCST may be most cost-efficient for people with dementia who live alone and/or who have higher cognition. Future research in this area is needed.

Key Words: Maintenance Cognitive Simulation Therapy; Cognitive Functioning; Residency; Cost-effectiveness; Expected Value of Sample Information

Introduction

Approximately 46.8 million people worldwide are living with dementia. In 2015, it was projected that dementia cost the worldwide economy \$818 billion USD (Prince et al. 2015). Globally the number of people living with dementia is predicted to increase; yet there is still much to do to improve both the quality of their lives and the quality of care they receive (Prince et al. 2013). There is a growing evidence base supporting non-pharmacological interventions, with systematic reviews helping to summarise the evidence (Knapp et al. 2013; Prince et al. 2011); however for some interventions, the research to date is limited to small, poor quality studies (Olarazan et al 2004). Cognitive Stimulation Therapy (CST) is a 7-14 weeks, group-based, non-drug intervention delivered by a trained group facilitator, in which individuals participate in a range of cognitive and social exercises. High quality trials have shown that CST delivers significant patient benefits (cognitive function, communication, quality of life) (Orrell et al. 2014; Knapp et al. 2006; Spector et al. 2003) whilst systematic reviews have confirmed its cost-effectiveness (Knapp et al. 2012; Prince et al. 2011). It is one of a small number of non-drug interventions to be recommended as part of routine care in international guidance (Prince et al. 2011; NICE 2013).

Maintenance Cognitive Simulation Therapy (MCST) is an extension of CST delivered over 16-24 weeks. Results from a multicentre, randomised controlled trial comparing MCST with a single CST course (ISRCTN: 26286067) (Orrell et al. 2014) showed that MCST improved cognition for patients taking acetylcholinesterase inhibitor medication (ACHEIs) but the primary economic evaluation reported mixed results (D'Amico et al. 2015). Compared to current treatment, the likelihood of MCST being cost-effective was dependent upon how quality of life was measured. Questions remain as to whether certain subgroups of people with dementia might benefit more than others from MCST; a more targeted use of MCST might be a more efficient- use of resources.

The aim of this paper was to determine whether MCST was more cost-effective for specific sub-groups of people living with dementia based on their level of cognition and living arrangements- either in the community or in a care home. The analysis is best considered exploratory and hypothesis-generating; we use value of information (VOI) analysis (Willian and Pinto 2005) as a means to reduce uncertainty around these estimates to help inform future research decisions.

Methods

Data:

The data utilised in this study were collected for the within-trial economic analysis (D'Amico et al. 2015). Details of the trial population are reported elsewhere (Orrell et al 2014) The analysis employed a societal perspective i.e. that is both costs and benefits borne by the health sector are considered alongside those of the individual and their carers'. The cost and outcome data is the same as that used in the primary economic evaluation (D'Amico et al 2015) and the assumptions underlying the generation of the cost and benefit variables are outlined there.

All analyses was divided by five subgroups which were defined as: a person with dementia who lives in the community either i) with family/friends ii) on their own or iii) in a care home and whether their cognition, as measured by ADAS-Cog (Alzheimer's Disease Assessment Scale-Cognition) subscale was in the iv) upper or v) lower 50% score range, where lower scores reflect better cognition. For the sample the 50% cut-off was a score of 39.

Sub-group categories are not mutually exclusive. If individuals are in two sub-groups then their data will be used in the analysis for both sub-groups of which they are members. The sample size is too small to do any additional analysis on participants who are classified as being part of more than one sub-group (e.g. higher cognitive functioning/living alone) (n=29).

Table 1 reports the numbers of study participants in either treatment arm falling into each of the specified sub-groups. The numbers in each residential sub-group are small re-emphasising that results should be considered exploratory.

Outcome Variables

The costs used in the analysis relate to the NHS and local authorities, patients, and families (i.e. carers). Table 2 shows ~~a breakdown of the different costs from a societal perspective, the costs of unpaid carer inputs (which are used as the cost measures in the main analysis) from a societal perspective for each sub-group of interest.~~ The largest societal costs were reported for those living in the community with a friend or family member, followed by those with lower cognitive functioning. The standard deviations reported in Table 2 illustrate the highly skewed nature of the data showing that a number of participants had very high costs.

Effectiveness measures used in the analysis are:

EQ-5D 3L (self-reported) and EQ-5D 3L proxy (completed by family carers or care centre workers) - a generic health related quality of life measure where higher scores indicate a better quality of life EuroQol Group 1990).

DEMQOL (self-reported) and DEMQOL proxy (completed by family carers or care centre workers) - a dementia-specific quality of life score where higher scores indicate better quality of life (Smith et al. 2007;Rowen et al. 2012).

~~Effectiveness measures collected These measures were collected prior to receiving any interventions,~~ after the seven weeks of the initial CST programme (baseline), three months after the beginning of the MCST groups, and six months after the start of the MCST groups (Orrell et al 2014) are used to estimate QALYs using the area under the curve approach (Whitehead and Ali 2010).

Table 3 presents the quality of life scores at each of the study measurement points. These are reported for each treatment and sub- group.

Incremental Cost Effectiveness Analysis:

Data collected on costs and effects of the intervention were combined to obtain an incremental cost-effectiveness ratio (ICER) for each sub-group. ICERs were estimated using a seemingly unrelated regression (SUR) approach. **This approach assumes** that there were correlated unobserved factors associated with both costs and benefits (Willan et al. 2004). In this analysis, differences in mean costs and effects are adjusted for baseline characteristics of the study group, such as marital status, gender, age, and baseline cognitive functioning to correct for subtle imbalances between the treatment and intervention groups.

The analysis calculates the mean difference in costs between the intervention and control groups divided by the difference in effect between the intervention and control groups for each sub-group. This gives us the cost per additional unit of effectiveness (e.g. a QALY gained) for MCST relative to standard practice.

To represent the statistical imprecision surrounding estimates of costs and cost-effectiveness the results are presented as plots of costs and effects and cost-effectiveness acceptability curves (CEACs). CEACs show the probability that an intervention would be considered cost-effective at different threshold values for society's willingness to pay for a one unit increase in quality of life as measured by EQ-5D and DEMQOL. If society is willing to pay this upper value then they will be willing to pay a lower value.

To produce plots of costs and effects and CEACs the estimates of mean costs and effects for each sub-group were bootstrapped 1000 times. These bootstrapped estimates were then plotted and used to estimate the Net Benefit statistic, which represents society's willingness to pay for

a unit of effectiveness as measured by an improvement in health related quality of life. In the UK, this value for a QALY is typically set at £20,000 (NICE 2013).

Value of information

Next, we performed Expected Value of Sample Information (EVSI) analysis for any of the sub-groups identified where MCST may be cost-effective. EVSI is used to compare the value of information from a future research trial with the total costs (TC) of obtaining this information to calculate the expected net gain (ENG) from conducting further research (Willan and Pinto 2005). To estimate the EVSI, the number of patients to benefit from a further trial is multiplied by the expected opportunity loss per patient of this additional research (as the intervention is not being implemented). **Formally this is shown using the formula below:**

$$EVSI(n) = N(n) * \left[D\left(b_o, \frac{c_A}{h_k}, v_o\right) - E_b \cdot D\left(b_1, \frac{c_A}{h_k}, v_1\right) \right] \quad (2)$$

Where:

b_0 and v_0 = incremental net benefit and variance at time 0 (before trial)

b_1 and v_1 = incremental net benefit and variance at time 1 (once additional information becomes available)

E_b = the estimate of incremental net benefit derived from the trial data

c_A = the cost of adopting the new intervention into clinical practice

h = the time horizon (or the useful life expectancy of the intervention)-10 years in this case

k = severity of dementia to which the intervention should be applied

FC / VC= the fixed and variable cost components of running a new trial.

a = the annual accrual rate into the trial

$N(n)$ = number of patients to benefit from the new information-number of new annual diagnosis of cognitive impairment in the UK (225,000 new individuals diagnosed with dementia is the figure we use in the analysis).

If the analysis shows that $EVSI < £0$, then current information is adequate for decision-making, and no further research is needed. If EVSI has a positive value this suggests there is value to be gained from future research. A positive ENG means the value of acquiring additional

information ~~from running a future trial on the population group of interest~~ exceeds its cost and it worthwhile to fund this additional research.

As a comparison to optimal sample size calculations from EVSI a standard sample size calculation was estimated using the standard deviations from the control and treatment groups. Recent guidance suggests that several approaches should be considered to determine sample size (Cook et al. 2014).

Results

Incremental Cost-Effectiveness Analysis:

Table 4 presents the incremental costs, effects and incremental cost per unit of effect for each treatment comparison and each sub-group from a societal perspective. Because we need complete data on both costs and effects and baseline characteristics the sample sizes do not directly correspond to the simpler analyses presented in Tables 1-3.

Table 5 shows that for the majority of the ~~sub-groups~~ current care either dominates or MCST is associated with a very high incremental cost per unit of increase in HRQoL. The exceptions are where we consider comparisons for those who live alone, where treatment on average dominates or where the incremental cost per unit of effect gained is modest. Other exceptions are for the comparisons for those within a care home using the Proxy DEMQOL and those in the upper 50% of scores at baseline using the ADAS-COG using the QoL-AD and Proxy DEMQOL.

Because of the small sample sizes, the results in Table 5 are associated with considerable uncertainty. Cost-effectiveness acceptability curves are ~~therefore~~ presented in tabular form (columns showing probability cost-effectiveness given society's willingness to pay for a QALY estimated using EQ-5D-3L for each sub-group.) ~~In addition, Figure 1 shows the cost-~~

effectiveness acceptability curves in a graphical format. Only for those that live alone is there a probability that treatment is likely to be cost-effective.

EVSI:

From the cost-effectiveness analysis two sub-groups showed the most promising results in terms of potential cost-effectiveness: patients with higher cognitive functioning measured using the ADAS-Cog and patients that live alone. Given the considerable imprecision around the estimates of cost-effectiveness, because of the small sample sizes for each sub-group, it is reasonable to question how worthwhile it would be to conduct further research to investigate whether treatment could be cost-effective for these sub-groups. Figure 1 shows the EVSI and ENG for each sample size. The optimal sample size is where both ENG and EVSI are at their highest value. The VOI analysis showed that there was added value to be gained from additional research. The ENG of this additional research is £920m which is greater than the cost of £41m (financial cost of conducting the trial plus the opportunity cost of not conducting this additional research). We would need complete case information on 17 patients *in each arm* or 34 complete cases to maximise ENG. Allowing for an attrition rate of 40% means that a sample size of 48 would be required. In the trial an attrition rate of 13% was observed (Orrell et al. 2014).

Sample Size Calculation:

Standard statistical tests were employed to calculate the sample size that would be required if a trial on MCST was run on the two sub-groups. The sample size required to detect a statistically significant difference at $p < 0.05$ of one standard deviation in the outcome measure would be $n=59$ for each arm or $n=118$ in total.

If it was decided that a future trial were to be conducted, the two sample size calculations could be compared and contrasted to determine the optimal sample size for a future trial.

Discussion

Our results identify two sub-groups where MCST might potentially be cost-effective: 1) people with dementia with higher cognitive functioning as measured by the ASAS-Cog and 2) people with dementia who live alone. Because of the small sample sizes used in the analysis and the fact that the trial where the data comes from was not powered to detect changes by the sub-groups used in the analysis these results should be interpreted with caution. Bootstrapping removes some of this uncertainty but it is possible that our sample may not be representative of the general population in these sub-groups. EVSI showed that a more modest sample size of 34 complete cases would be required to confirm that standard treatment is the most cost-effective option compared with MCST for these two sub-groups. This compares with conventional statistical approaches which suggest that to identify a difference of 5% between groups a sample of 118 complete cases would be needed. From an economic perspective the sample required for an internally valid RCT is smaller when using the value of information approach than when using a conventional statistical approach. In reality a larger sample size may be needed to provide reassurance about the external validity of the trial findings than predicted by the value of information analysis. A larger sample size would also give protection from other features not currently considered e.g. clustering of outcomes.

Nevertheless, the expected net gain (ENG) to the UK NHS of this additional research is £920m; this represents a considerable value and reflects the rapidly ageing populations and predicted future costs of dementia care (Prince et al 2013; Prince et al. 2015) as well as the need to identify more cost effective service provision (Knapp et al. 2013) in a time of financial austerity.

Approximately one-third of people with dementia live alone (Mirando-Castillo et al. 2010). People with dementia who live alone may be one of the groups to benefit most from CST; this group often present greater challenges for care professionals. Those living alone are have a higher risk of admission to care homes than those who live with other family members. The costs of being in a care home will be higher than those of community care. If, as our data suggests, MCST may be cost-effective in terms of benefits measured as QALYS compared to the cost of the intervention such therapy may help facilitate independent living for longer in a group who are at higher risk of being admitted to care homes or hospital (Knapp et al. 2016; Luppá et al. 2010; Yaffe et al. 2002; Herbert et al. 2001). For those with higher cognitive functioning, MCST may reduce the rate of cognitive decline, keeping these individuals independent for longer requiring less high cost care such as day care centres etc.

Author Contributions:

HB performed the analysis and drafted the paper. FA and AR critically reviewed the paper. MO, LV, MK, LR developed the project and critically reviewed the paper. MK also lead on trial economic evaluation

Data Sharing:

The original study team will be able to share any data that would be available for additional research contact MO or MK.

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Table 1: Samples in each sub-group

Sub-group		Treatment	Control
Living arrangements	Living alone n=46	Baseline: 23	Baseline: 23
		1-3 mths: 23	1-3 mths: 23
		4-6 mths: 22	4-6 mths: 23
	Lives with someone n=63	Baseline: 37	Baseline: 26
		1-3 mths: 37	1-3 mths: 26
		4-6 mths: 35	4-6 mths: 22
	Care home n=92	Baseline: 44	Baseline: 48
		1-3 mths: 44	1-3 mths: 48
		4-6 mths: 40	4-6 mths: 42
ADAS-Cog	ADAS-Cog (upper 50%) n=104	Baseline: 57	Baseline: 47
		1-3 mths: 62	1-3 mths: 47
		4-6 mths: 58	4-6 mths: 43
	ADAS-Cog (lower 50%) n=104	Baseline: 52	Baseline: 62
		1-3 mths: 52	1-3 mths: 57
		4-6 mths: 52	4-6 mths: 50

Table 2: Cost of unpaid carer inputs (0-6 months) from a societal perspective by sub-group and allocation group using the opportunity cost assumption

Cost of intervention	Control					Treatment				
	Care Home	Lives alone	Lives with someone	ADAS-Cog (lower 50%)	ADAS-Cog (upper 50%)	Care Home	Lives alone	Lives with someone	ADAS-Cog (lower 50%)	ADAS-Cog (upper 50%)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Total Health and Social care costs	17381 (4200)	5900 (4874)	3157 (3169)	13684 (6929)	8831 (8380)	18520 (3701)	5973 (3933)	4250 (2848)	14535 (7367)	8633 (7306)
Unpaid carer costs	104 (460)	3255 (4315)	11868 (7459)	2714 (6130)	4960 (6600)	115 (509)	3080 (3000)	14603 (8064)	4140 (7898)	6633 (8140)
Total societal costs	17485 (3947)	9155 (5100)	15026 (7250)	16398 (5614)	13791 (6802)	18635 (3627)	9053 (3973)	18853 (7639)	18675 (5093)	15266 (7575)
n	42	22	23	50	43	40	22	35	48	58

^a ADAS-Cog measured at baseline. CST intervention costs measured pre-baseline for 7 weeks of CST for both treatment and control.

Table 3: Quality of Life Measures By Time Point, Allocation Group and Sub Category

Tool	Control				Treatment					
	Care Home	Lives alone	Lives with someone	ADAS-Cog (lower 50%)	ADAS-Cog (upper 50%)	Care Home	Lives alone	Lives with someone	ADAS-Cog (lower 50%)	ADAS-Cog (upper 50%)
Baseline										
QoL-AD	36.5 (34.8-38.3)	37.9 (35.9-40.0)	35.6 (33.1-38.2)	35.4(33.8-36.9)	38.1 (36.6-39.6)	35.1 (33.5-36.8)	36.7 (35.5-37.8)	37.3 (35.7-39.0)	36.3 (35.0-37.5)	36.1 (34.8-37.3)
DEMQOL	96.2 (93.8-98.5))	95.6 (90.8-100.3)	93.6 (86.8-100.4)	94.6 (91.3-97.9)	96.1 (92.8-99.3)	93.8 (90-97.7)	95.7(91.4-100)	95.4 (91.9-98.9)	96.7(94-99.2)	93.3 (90.2-96.4)
Proxy DEMQOL	102.1 (100.0-105.8)	104.5 (99.4-110.0)	100.0 (94.7-104.9)	101.6 (98.5-104.6)	103.4 (100.0-106.8)	106.1(102.7-109.5)	99.3 (93.5-105.1)	98.7 (93.3-104.2)	102.3 (98.5-106.1)	102.4 (98.9-105.9)
EQ-5D	0.8 (0.7-0.8)	0.9 (0.8-1.0)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.8)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.8)
Proxy EQ-5D	0.7 (0.6-0.7)	0.8 (0.7-0.9)	0.7 (0.6-0.8)	0.7 (0.6-0.7)	0.7 (0.6-0.8)	0.7 (0.6-0.8)	0.7 (0.6-0.8)	0.6 (0.5-0.7)	0.7 (0.6-0.7)	0.7 (0.6-0.8)
3 MONTHS										
QoL-AD	35.3 (33.5-37.1)	39.2 (37.6-40.9)	36.0 (33.7-38.2)	35.9 (34.2-37.5)	36.9 (35.5-38.4)	35.8 (34.1-37.5)	35.8 (34.1-37.4)	37.5 (35.7-39.4)	36.5 (35.0-38.1)	36.2 (34.9-37.5)
DEMQOL	95.9 (92.5-99.3)	95.6 (91.6-100.3)	93.8 (89.4-98.2)	95.7 (92.8-98.7)	94.4 (91.3-97.6)	95.1 (91.4 -98.8)	95.1(90.2-100)	93.3 (89-97.6)	96.6 (93.7-99.4)	92 (88.7-95.4)
Proxy DEMQOL	103.8 (100.8-106.8)	100.0 (96.1-103.8)	97.5 (93.5-101.6)	100.1 (97.0-103.3)	100.1 (97.3-102.9)	103.8 (100.8-106.8)	100.0 (96.1-103.8)	97.5 (93.5-101.6)	100.1 (97.0-103.3)	100.1 (97.3-102.9)
EQ-5D	0.8 (0.7-0.8)	0.9 (0.9-1.0)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.8)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.8)
Proxy EQ-5D	0.5 (0.5-0.6)	0.7 (0.6-0.8)	0.6 (0.5-0.7)	0.5 (0.5-0.6)	0.6 (0.5-0.7)	0.6 (0.6-0.7)	0.7 (0.6-0.8)	0.6 (0.5-0.7)	0.6 (0.5-0.7)	0.7 (0.6-0.7)
6 MONTHS										
QoL-AD	35.6 (33.5-37.6)	38.2 (36.4-40.1)	34.9 (32.3-37.5)	36.0 (34.0-37.8)	35.8 (34.2-37.4)	36.0 (34.0-37.9)	36.6 (34.5-38.8)	38.6 (36.8-40.4)	37.1 (35.4-38.8)	37.1 (35.7-38.5)

DEMQOL	95.3 (91.7-99)	96.4 (90.7-102.1)	93 (86.9-99)	96 (92.1-100)	93.8 (90.3-97.4)	96.4 (93.2-99.7)	95.8 (90.5-101)	93 (88-98)	97 (94.1-100)	93.2 (90-96.5)
Proxy DEMQOL	105.3 (102.0-108.6)	97.5 (91.1-103.9)	97.1 (89.4-104.7)	100.0-96.0-103.7)	103.0 (98.8-107.2)	106.5 (103.1-110.0)	97.6 (92.8-102.4)	97.5 (93.3-101.7)	102.0 (98.8-105.1)	100.1 (96.6-103.6)
EQ-5D	0.8 (0.7-0.8)	0.9 (0.8-0.9)	0.7 (0.5-0.8)	0.8 (0.7-0.8)	0.8 (0.7-0.8)	0.7 (0.6-0.8)	0.8 (0.8-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.9)	0.8 (0.7-0.8)
Proxy EQ-5D	0.6 (0.5-0.7)	0.7 (0.6-0.8)	0.6 (0.4-0.7)	0.5 (0.4-0.6)	0.7 (0.6-0.8)	0.7 (0.6-0.8)	0.6 (0.4-0.7)	0.6 (0.5-0.7)	0.5 (0.5-0.6)	0.7 (0.6-0.8)

^aConfidence Intervals are in parenthesis.

Table 4: Incremental cost-effectiveness ratios, from a societal perspective, over 1-6 month by sub-categories

1-6 Months	Care Home			Lives Alone			Lives with someone			ADAS-Cog (lower 50%)			ADAS-Cog (upper 50%)		
	Incr Cost	Incr Effect	ICER	Incr Cost	Incr Effect	ICER	Incr Cost	Incr Effect	ICER (£)	Incr Cost	Incr Effect	ICER	Incr Cost	Incr Effect	ICER
	Mean [95% CI]	Mean [95% CI]		Mean [95% CI]	Mean [95% CI]		Mean [95% CI]	Mean [95% CI]		Mean [95% CI]	Mean [95% CI]		Mean [95% CI]	Mean [95% CI]	
QALY (EQ-5D)	909 [14, 1804]	-0.01 [-0.07, 0.06]	Con Dom	-194 [-5138, 4751]	0.07 [-0.13, 0.27]	1082 ⁸	2260 [-2325, 6844]	0.01 [-0.08, 0.10]	23164 ²	1215 [-328, 2758]	0.00 [-0.05, 0.05]	7867 ¹³	477 [-2390, 3344]	0.00 [-0.05, 0.05]	2362 ²⁰
QALY (Proxy EQ-5D)	904 [5, 1803]	-0.03 [-0.13, 0.07]	Con Dom	-149 [-5109, 4811]	0.10 [-0.09, 0.30]	7419	2246 [-2321, 6813]	0.04 [-0.08, 0.15]	61175	1216 [-324, 2755]	-0.02 [-0.06, 0.02]	Con Dom	472 [-2413, 3357]	0.03 [-0.03, 0.09]	1445 ⁷
QALY (DEM QOL)	960 [-140, 2060]	-0.002 [-0.07, 0.07]	Con Dom	-2472 [-13163, 82193]	0.08 [-0.29, 0.44]	-7955	2771 [-3163, 8704]	0.01 [-0.07, 0.09]	30218 ⁴	1567 [-310, 3444]	-0.01 [-0.04, 0.02]	Con Dom	939 [-2299, 4177]	0.02 [-0.004, 0.05]	4145 ⁸
QALY (Proxy DEMQ OL)	922 [-11, 1855]	0.01 [-0.02, 0.04]	12988 ⁶	-195 [-5204, 4815]	-0.02 [-0.10, 0.07]	1168 ³	2523 [-2204, 7251]	0.00 ² [-0.06, 0.06]	15447 ⁶⁵	1201 [-355, 2757]	0.00 ⁴ [-0.01, 0.02]	2894 ²⁶	617 [-2342, 3577]	0.02 [-0.01, 0.05]	2588 ⁹

^aCost in 2010/11 UK pounds;

^b all CIs based upon bootstrapping mean differences with 1000 replications

Table 5: Incremental cost per QALY (estimated using self-reported EQ-5D) from a societal perspective by sub-group

Sub group	Intervention	Incremental cost (£)	Incremental QALYs	Incremental cost per QALY	Probability cost-effective given society's willingness to pay for a QALY			
					£0	£20,000	£30,000	£50,000
Upper cognitive	Control				78%	73%	70%	65%
	Treatment	477	0.00	£236,220	22%	27%	30%	35%
Lower cognitive	Control				82%	76%	72%	67%
	Treatment	1215	0.00	£786,713	18%	24%	28%	33%
Lives with someone	Control				94%	77%	70%	59%
	Treatment	2260	0.01	£231,642	6%	23%	31%	41%
Lives alone	Control				63%	45%	41%	37%
	Treatment	-194	0.07	-2667	37%	55%	59%	63%
Care home	Control				100%	82%	69%	55%
	Treatment	909	-0.01	Con Dom	0%	18%	31%	45%

^aTx Dom = treatment dominant; Con Dom = control dominant

Table 6: Expected Value of Sampling Information Results

n*	17
EVSI	£ 962,178,716
Financial Cost	£375,004
Opportunity Cost	£ 40,858,057
Total Cost	£ 41,233,061
ENG	£ 920,945,655

^aComplete cases in a single arm of a study

Figure 1: Cost Effectiveness Acceptability Curves for the 5 Sub-groups

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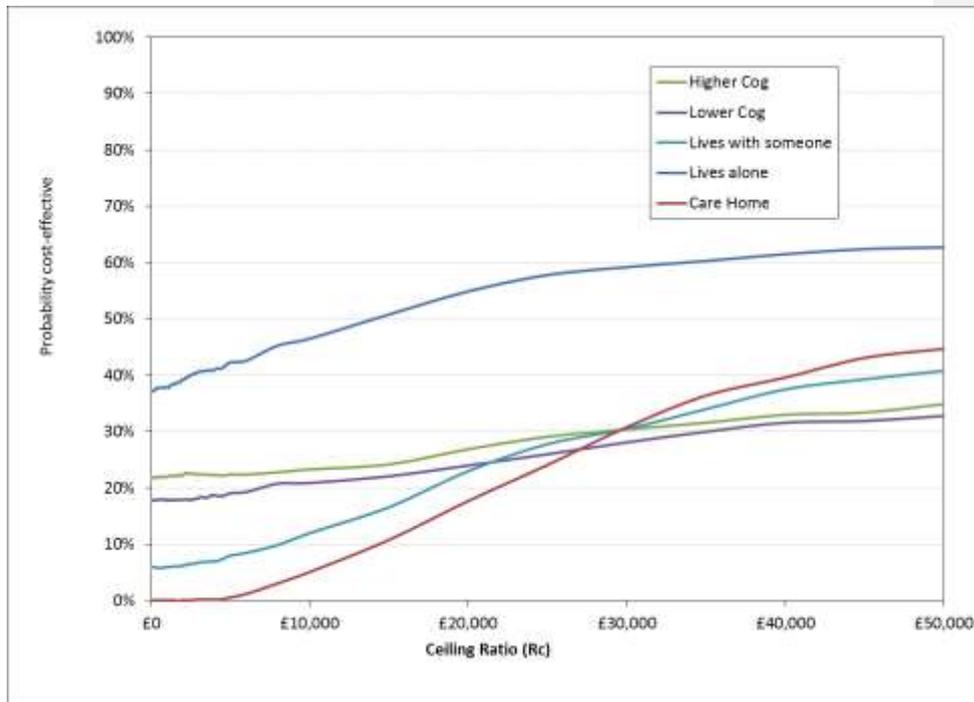


Figure 2: Expected Value of Sample Information

