RESEARCH ARTICLE

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The cost-effectiveness of grip on challenging behaviour: an economic evaluation of a care programme for managing challenging behaviour

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Objective: The objective of the study was to evaluate the cost-effectiveness of implementing the Grip on Challenging Behaviour care programme (GRIP) on dementia special care units in comparison with usual care.

Methods: A stepped wedge design was used. Challenging behaviour and quality of life were measured using the Cohen Mansfield Agitation Inventory (CMAI) and the QUALIDEM. Quality-adjusted life years (QALYs) were calculated using the EuroQol-5D. Psychoactive medication use (range 0–5 per measurement) and sick leave were registered. Costs included medication, time spent on challenging behaviour and education. Costs and effects were analysed using linear multilevel regression. Incremental cost-effectiveness ratios were calculated. Statistical uncertainty was estimated using bootstrapping.

Results: Seventeen dementia special care units participated. GRIP led to improvement on the QUALIDEM subscale social relations (1.6; 95% CI 0.18 to 3.4) and on the use of psychoactive medication (−0.73; 95% CI −1.1 to −0.46) and to a decrease in QALYs (−0.02; 95% CI −0.06 to −0.003). No significant effects on CMAI, sick leave and other QUALIDEM subscales were found. The intervention was not cost-effective in comparison with usual care with regard to CMAI score, QALYs and sick leave. The willingness to pay should be 320€/point improvement on the QUALIDEM subscale social relations and 370€/psychoactive medication less to reach a 0.95 probability of cost-effectiveness.

Conclusion: It depends on how much society is willing to pay whether GRIP can be considered cost-effective. Because the appropriateness of the current methods for analysing cost-effectiveness in this specific population is uncertain, the positive effects on behaviour, medication and job satisfactions should also be taken in account in the decision making. Copyright © 2015 John Wiley & Sons, Ltd.

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Background

In developed countries worldwide, dementia is increasingly becoming both a health and a financial challenge (Drame *et al.*, 2012). Currently, 260,000 people in the Netherlands live with dementia, and in 2011, more than 5.5 billion US dollars were spent on Dutch dementia care (Rijksinstituut voor Volksgezondheid en Milieu, 2011; Alzheimer Nederland, 2014). As the disease progresses, many people with dementia come

to live in a nursing home in the last phase of their lives (van der Steen and Ribbe, 2007). This has profound financial consequences for society as a whole.

Challenging behaviour of people with dementia increases the probability of nursing home admission (Gaugler *et al.*, 2009), and hence, it is highly prevalent in dementia special care units (DSCUs) (Zuidema *et al.*, 2007). The presence of challenging behaviour diminishes residents' quality of life (QOL) and is associated with burnout in care staff, which in turn increases costs because of sickness absence (Drame *et al.*, 2012; van de Ven-Vakhteeva *et al.*, 2013; Zwijsen *et al.*, 2014b). Caring for residents with challenging behaviour also indirectly increases societal costs, as they require more caregiving hours than residents without challenging behaviour (Mauskopf *et al.*, 2010).

Guidelines recommend multidisciplinary analysis of challenging behaviour and state that psychoactive drug use should be a last resort option. In the Netherlands, nursing homes have care teams consisting of various disciplines, for example elderly care physicians (Koopmans *et al.*, 2010), psychologists, recreational therapists and (enrolled) nurses. Yet, protocols specifying how the different disciplines should work together in cases of challenging behaviour are often lacking. Also, psychoactive drugs are prescribed to almost two-thirds of residents in DSCUs (Wetzels *et al.*, 2011).

The Grip on Challenging Behaviour care programme (GRIP) was developed in collaboration with care staff, psychologists and physicians working in long-term dementia care (Zwijsen *et al.*, 2014a). GRIP is based on current guidelines and consists of an education package and of several worksheets. The education package consists of training sessions on challenging behaviour and the benefits of approaching challenging behaviour methodically and multidisciplinary. GRIP has been shown to be effective in reducing neuropsychiatric symptoms and psychoactive medication use (Zwijsen *et al.*, 2014c). It also improved nurses' job satisfaction whilst the job demands stay the same (Zwijsen *et al.*, 2015).

In a financially constrained environment such as a nursing home, it is important to acquire insight into potential changes in costs. GRIP may lead to fewer costs because of more efficient time use and a reduction in challenging behaviour and psychoactive drugs use. Changing working routines and analysing behaviour thoroughly could also lead to more time investment from several disciplines. Therefore, the aim of this paper was to evaluate the cost-effectiveness of implementing GRIP compared with usual care with regard to challenging behaviour, quality-adjusted life years (QALY), QOL, psychoactive medication use and sick leave.

Methods

Design

The economic evaluation was performed from a societal perspective alongside a cluster-randomised controlled trial using a stepped-wedge design, the details of which are described elsewhere (Zwijsen *et al.*, 2011). A stepped wedge design is a type of cross over design in which different clusters cross over (Hussey and Hughes, 2007). Using this design meant that the 17 participating DSCUs were divided across five groups using random allocation software (Saghaei, 2006). Each group of DSCUs started using GRIP at different time points. On five different occasions, each 4 months apart, challenging behaviour and QOL of residents was assessed at all DSCUs. After these assessments, a new group of DSCUs received training after which they started working according to the care programme. The study protocol was approved by the VU University Medical Centre Medical Ethics Review Committee. Each (legal representative of the) resident was informed about the study through a flyer and letter provided by the unit team leader. At any given time, (legal representatives of the) residents could object to their information being used for research purposes.

Participants

Nursing home care in the Netherlands distinguishes between people with predominantly somatic illnesses and people with dementia (who live on DSCUs). For this study, only DSCUs were included. All residents on the participating DSCUs, who had a diagnosis of dementia, were included in the study. If a resident died or moved from the unit, the new resident taking the place of that resident was included in the study.

Intervention

Details of GRIP are described elsewhere (Zwijsen *et al.*, 2014a). GRIP consists of an education package and a work package with the following four steps to manage challenging behaviour: detection, analysis, treatment and evaluation. The education package consists of

two training sessions about the multidisciplinary approach to challenging behaviour. The DSCUs start using the work package following the training sessions. Using the work package care staff identifies challenging behaviour arising spontaneously in daily care or through using the screening instrument completed every 6 months for every resident. After this, care staff completes an analysis form and inform either the DSCU elderly care physician or psychologist, who use their own analysis forms for analysing the behaviour. The analysis and proposed treatment are discussed multidisciplinary, and a clear treatment goal is recorded on the treatment form as well as the treatment outline and evaluation date. The treatment goal is evaluated on the evaluation date during a multidisciplinary meeting using the flow chart on the evaluation form.

Usual care

Residents in the usual care group continued to receive usual care on the DSCU. In the Netherlands, this means that residents' care plans are discussed half-annually in a multidisciplinary meeting. The elderly care physician frequently visits the DSCU for most units, but the psychologist only gets involved when he/she is explicitly consulted by care staff and/or the physician.

Effect outcomes

Challenging behaviour was measured using the 29-item Cohen Mansfield Agitation Inventory (CMAI) (Cohen-Mansfield *et al.*, 1989). Each item is scored from 1 (never occurs) to 7 (occurs multiple times per hour). Higher scores indicate more severe agitated behaviour levels. The Dutch version of the CMAI is considered a reliable instrument (Zuidema *et al.*, 2011).

The EuroQol-5D (EQ-5D) was used to assess health-related QOL (EuroQol group, 1990). Utilities were estimated with the Dutch EQ-5D tariff (Lamers *et al.*, 2005). Quality-adjusted life years (QALYs) were calculated using the area-under-the-curve method. Transitions between health states were linearly interpolated.

The Dutch QUALIDEM is a reliable dementia-specific QOL instrument enabling nursing staff to rate residents' QOL of based on observations of the resident over the last week (Ettema *et al.*, 2007a, 2007b; Bouman *et al.*, 2011). Observations such as 'is in a good mood' can be scored from 'never' (0 points) to 'almost daily' (4 points). The subscales 'care relationship' (7 items, range 0–21), 'positive affect' (6 items, range 0–18), 'negative affect' (3 items, range 0–9), 'restlessness tense behaviour' (3 items, range 0–9) and 'social relations' (6 items, range 0–18) were used.

Both challenging behaviour and QOL were assessed by trained interview assistants who were blinded to the unit's research group. The care staff member who was most closely involved in the residents' daily care acted as a proxy for the resident.

To adhere to the methods that were used for the effect analysis that we published earlier (Zwijsen *et al.*, 2014c), we divided the psychoactive medication into five Anatomical Therapeutic Chemical (ATC) categories and dichotomised the scores per category (because only very few people had more than one prescription of the same category). The psychoactive medication prescription rates were derived from medication records on the unit and classified according to the ATC classification system (World Health Organisation Collaborating Centre for Drug Statistics Methodology, 1997). For analysis, the separate use of antipsychotics (ATC code N05A), antidepressants (ATC code N06A), anxiolytics/hypnotics (ATC code N05B and N05C), antiepileptics (ATC code N03) and antidementia drugs (ATC code N06D) were scored per prescription per measurement. These prescriptions were then summed to create a single medication score for each resident per measurement (range 0–5).

Monthly registration of care staff sick leave percentages were provided by the respective administrative departments.

Costs

The costs of psychoactive drug use were calculated based on prices charged by the Royal Dutch Society for Pharmacy (Z-index, 2006).

Costs of involvement of physicians and psychologists at DSCUs were estimated using prospective 1-month diaries provided to each professional once before the start of the implementation (before T0) and once after the implementation of the intervention (after T5) to register the amount of 'challenging behaviour'-related time they spent on a resident. The average time per resident on a unit was multiplied by the mean physician/psychologist cost working in nursing home care and extrapolated over all residents on the unit in the dataset. Missing costs were imputed using the median costs in both study conditions.

The initial implementation costs for GRIP were calculated based on the time care staff/psychologists/physicians had to spend on the training sessions preceding the implementation. The mean salary costs per hour per discipline were multiplied by 5 h (total training time) and divided by the number of residents on the unit.

Analysis

Costs were summed per resident and per condition. The total costs per resident per research condition (usual care and intervention) were calculated by summing the medication costs, costs of time spent on challenging behaviour and education costs per resident. Analyses were restricted to participants with at least two assessments. QALYs were calculated per resident and per condition; prescriptions rates, CMAI and QUALIDEM total scores were also summed per resident and per condition. As a result of the stepped-wedge design, residents spent different amounts of time in both the usual care and the intervention condition. Therefore, all analyses were corrected for the amount of time a resident had spent in each of the conditions, and the costs of the one-time educational sessions were left out of the calculations. Consequently, the effects may be interpreted as the mean differences over mean time spent in both the intervention and usual care condition.

The mean sick leave percentages for the usual care condition and the intervention condition were calculated per DSCU. Costs per resident were summed per DSCU to calculate costs per DSCU. Analyses were corrected for the total amount of time residents had spent in both conditions.

Differences in costs and effects were analysed using linear multilevel regression analyses adjusted for time to account for the trial stepped wedge design (Gomes *et al.*, 2012). Clustering at levels of institution and residents was included in these multilevel models. To estimate statistical uncertainty, 95% confidence intervals (CIs) around cost and effect differences were estimated using bias-corrected (BC) bootstrapping with 5000 replications. To account for the clustering of data, bootstrap replications were stratified for institution (van der Leeden, 2008). Incremental cost-effectiveness ratios (ICERs) were calculated by dividing the cost differences by the differences in effects. Statistical uncertainty surrounding the ICERs was also estimated using bias-corrected bootstrapping. A summary measure of the joint uncertainty of costs and effects was presented using cost-effectiveness acceptability curves (CEACs), which show the probability that the GRIP is cost-effective in comparison with usual care at different ceiling ratios (i.e. the maximum amount of money decision-makers are willing to pay per unit of effect (CMAI point, prescription of medication, etc.) (Fenwick *et al.*, 2004).

Results

In total, 652 residents were present at the DSCU for at least two subsequent assessments and 214 residents were present at all five assessments. Of the residents, 70% was women, and the mean duration of admission at the first assessment was 20 months (Zwijsen *et al.*, 2014c).

Effectiveness. The effect outcomes are shown in Table 1.The difference in CMAI score between intervention and usual care was not statistically significant (mean

Table 1 Outcomes of the analysis on CMAI, QALY and QUALIDEM

Outcome	N	Cost difference (95% CI)	Effect difference (95% CI)	ICER
CMAI	635	92 (56;159)	−1.2 (−11.1; 4.3)	−77
QALY	637	82 (36;147)	−0.02 (−0.06; −0.003)	−3353
QUALIDEM				
Care relationship	634	79 (40;149)	0.57 (−0.57; 2.7)	140
Positive affect	636	82 (44;158)	−0.32 (−1.5; 1.9)	−256
Negative affect	638	82 (44;158)	0.16 (−0.56; 1.2)	531
Restless tense behaviour	638	83 (44;169)	−1.1 (−2.0; 0.44)	−74
Social Relations	632	79 (49;161)	1.6 (0.18; 3.4)	50
Sickness absence	26	−741 (-35325;1605)	−0.11 (−1.4; 1.6)	6738
Number of medications	648	160 (149;176)	−0.73 (−1.1; −0.46)	−219

The onetime investment for training on Grip was not incorporated in the analysis. *Note that a lower CMAI score means less challenging behaviour. Number of medications ranges from 0 to 5 per measurement. For all other scales, a higher score means better quality of life.*

difference: −1.2; 95% CI −11.1 to 4.3). The number of QALYs in the intervention group was significantly lower than in the usual care group, but the difference between the groups was very small (−0.02; 95% CI −0.06 to −0.003). The difference in QUALIDEM subscale 'social relations' was significant in favour of the intervention group (1.6; 95% CI 0.18 to 3.4), but none of the other QUALIDEM subscales showed a significant difference between the treatment groups. Significantly less psychoactive medication was used in the intervention group (−0.73; 95% CI −1.1 to −0.46) than in the usual care group. No significant effect for the intervention in comparison with usual care on sick leave was found.

Costs. Implementing GRIP resulted in a onetime investment of €190 (US$260) per resident.

Table 2 shows that total costs in the intervention group were significantly higher than in the usual care group (€276 (US$341), 95% CI €237 to €349). The extra costs resulted from an increased involvement of the psychologist and physician on the unit. GRIP significantly reduced the costs of psychoactive medication in comparison with usual care (Table 2).

Cost-effectiveness. The ICER for the CMAI was −77, indicating that per point improvement in CMAI score an investment of €77 needs to be made (Table 1). The CEAC shows that the probability of GRIP being cost-effective in comparison with usual care is 0 at a ceiling ratio of 0€/point improvement in CMAI score and increases to a probability of 0.38 at a ceiling ratio of 3000 €/point improvement in CMAI score (Figure 1).

The ICER for QALYs was −3353, indicating that €3353 should be invested per QALY lost for GRIP versus usual care (Table 1). The CEA curve for the QALY analysis showed that the probability of GRIP being cost-effective in comparison with usual care was zero for all possible ceiling ratios.

Table 2 Mean costs and adjusted mean differences in costs

Cost category	Intervention ($n = 325$)	Usual care ($n = 327$)	Mean Difference (95% CI)
Medication	141 (311)	168 (455)	−69 (−136; −25)
Physician time	288 (141)	136 (131)	101 (89; 106)
Psychologist time	312 (258)	178 (196)	59 (51; 75)
Training costs	190 (0)	0 (0)	—
Total costs	931 (482)	483 (570)	276 (237; 349)

Costs are per resident per condition for the different cost categories and total costs. Because of the stepped wedge design, costs differences were adjusted for the amount of time a resident spent in a particular condition and clustering at the level of care institution.

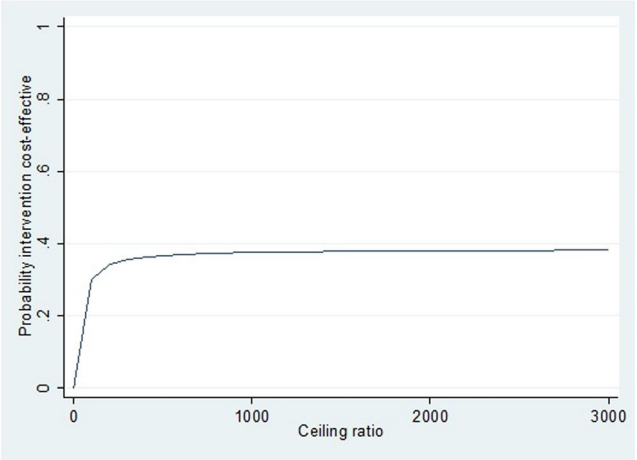

Figure 1 Cost-effectiveness acceptability curve showing the probability of the GRIP being cost-effective in comparison with usual care with regard to CMAI score.

For the QUALIDEM subscales, positive affect and restlessness and tense behaviour, GRIP was less effective and more expensive than usual care. This is also reflected in the CEA curves that showed the maximum probability of GRIP being cost-effective was 0.35 and 0.04 for the subscales positive affect and restlessness and tense behaviour respectively.

For the QUALIDEM subscales, care relationship, negative affect and social relations, GRIP was more effective and more expensive than usual care. The CEA curve for the subscale social relations shows that the probability of GRIP being cost-effective in comparison with usual care was 0.95 at a ceiling ratio of 320 €/point improvement. For the subscale care relation, the maximum probability of GRIP being cost-effective was 0.73 at a ceiling ratio of 3900 €/point improvement. For negative affect, positive affect and restless behaviour the probabilities of GRIP being cost-effective at a ceiling ratio of 5000 €/point improvement were 0.62, 0.34 and 0.03 respectively (Figure 2).

The ICER for number of different psychoactive medications used was −219, which means that €219 has to be invested to decrease the number of different psychoactive medications prescribed to a resident by one. The CEAC for medication shows that at a ceiling ratio of 370€/prescription of psychotropic medication type the probability of GRIP being cost effective in comparison with usual care is 0.95 (Figure 3).

The ICERs for sickness absence was −6738, indicating that an investment of €6738 is associated with 1% point sickness absence less for GRIP versus usual care. The CEAC shows that the probability that GRIP was cost effective in comparison with usual care was around 0.5 for all ceiling ratios.

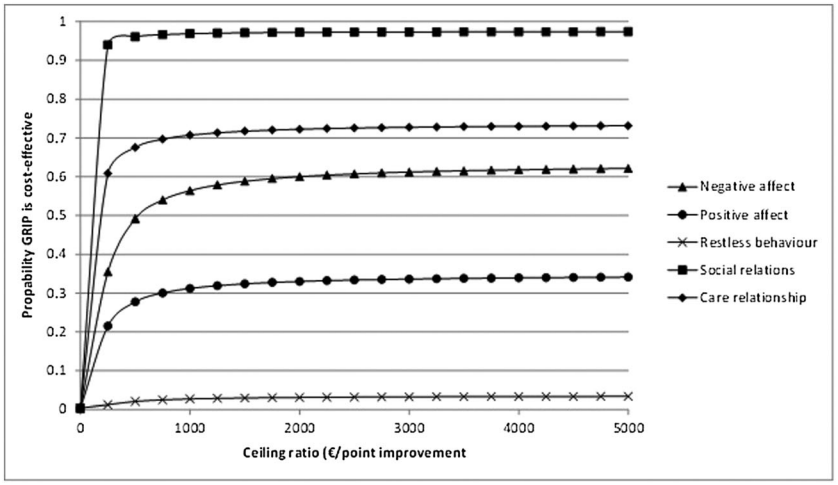

Figure 2 Probability of the intervention being cost-effective on QUALIDEM subscales.

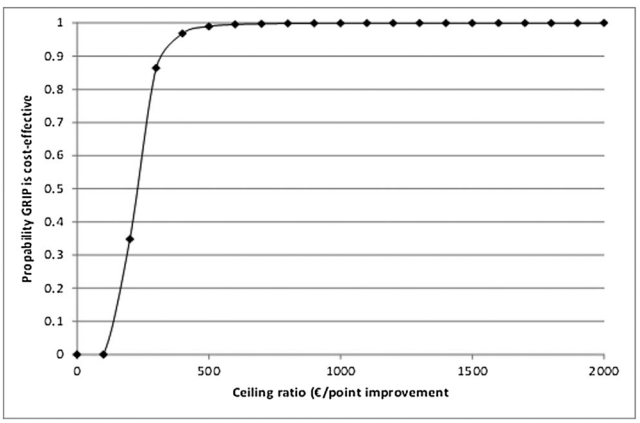

Figure 3 Cost-effectiveness acceptability curve showing the Probability of the GRIP being cost-effective in comparison with usual care with regard to prescription of psychoactive drugs.

Discussion

The aim of this paper was to evaluate the cost-effectiveness of implementing GRIP in comparison with usual care with regard to challenging behaviour, QALYs, QOL, psychoactive medication use and sick leave.

Total costs in the GRIP group were significantly higher than in the usual care group. From a societal perspective GRIP was not considered cost-effective in comparison with usual care with regard to challenging behaviour, sickness absence, QALYs or all but one QUALIDEM subscale. Apart from a very small difference in QALYs, no significant effect was found on these measurements. Earlier, a small but significant effect on CMAI difference scores was found, but because of a difference in the analysis (sum scores instead of difference scores) this result was not found in the current analysis. With regard to the QUALIDEM subscale social relations and psychoactive medication use, GRIP can be considered cost-effective in comparison with usual care. However, the willingness to pay should be fairly high, that is around €350 per point of improvement.

It is difficult to compare our study to others as cost-effectiveness analyses in dementia long-term care settings are scarce. Furthermore, the costs in dementia long-term care are highly dependent on local resources and regulations, which makes it difficult to compare studies between different countries. One other Dutch study compared the usual dementia care costs with the costs of a dementia care mapping intervention but did not calculate ICERs (van de Ven *et al.*, 2014). In that study, no significant differences in costs or effects were found.

The absence of economic evaluations of new interventions implemented in nursing homes is hard to explain in the current politico-economic climate. During the current project, however, several methodological considerations arose which might partly explain the hesitation to undertake economic evaluations in this setting. The first problem arose in calculating the (additional) money spent in the intervention group. In long-term dementia care in the Netherlands budgets are fixed per resident. These budgets cover daily living requirements (food and housing), administration, medication and costs of care staff and medical, psychological/paramedical care. When calculating the costs of a specific intervention, it seems appropriate to calculate the time these disciplines spend on the particular behaviour at which the intervention is aimed. However, it is impossible for care staff to distinguish between time spent on

'normal' care and extra time spent because of challenging behaviour. Nursing staff simply have their shift hours available, in which they have to care for residents regardless what kind of behaviour exhibited. Similarly, psychologists or physicians have a fixed number of hours available for all the units they are assigned to. When the management of challenging behaviour becomes more effective and efficient, this will not result in less time investment (costs) of physicians or psychologists, but rather in a shift towards other residents or tasks. Indeed, although in the GRIP study, nursing staff had to invest some time becoming familiar with the new working method, this did not lead to a significantly increased workload as using GRIP saved time. Furthermore, nursing staff experienced more job satisfaction after using GRIP (Zwijsen *et al.*, 2015). Positive effects of GRIP on available resources will, therefore, in the long run, more likely be visible in diminished workloads or in re-shifting available hours across responsibilities and residents. Considering the time and money constraint environment, this could nevertheless be an important finding.

The second problem arose when calculating QALYs. The use of QALYs is a widespread method to combine increases in life expectancy with QOL into a generic outcome measure. This enables comparisons across different interventions, and relating this to a pre-defined cost level society is willing to pay to gain 1 QALY. For example, in the Netherlands, an intervention costing less than €20,000 per QALY is generally considered to be cost-effective (Rijksinstituut voor Volkgezondheid en Milieu, 2013). A general QOL questionnaire (the EQ-5D) is used to calculate QALYs. However, in dementia patients on DSCUs there is very little diversity in scores on items like 'self-care' and 'usual activities', and improvements in these dimensions are unlikely, which makes the instrument insensitive to population-specific changes. What is more, because of the life expectancy of the population, which is low because they are in the end stages of dementia, a method based on calculating 'years gained' seems less appropriate. Consequently, the odds of any intervention in dementia long-term care being cost-effective with regard to QALYs are minimal. Indeed, in this study, a very small and even negative effect was found on QALYs. This is in contrast with several other findings on QOL, challenging behaviour and psychoactive drugs. The QALY method might be measuring factors that are generally important to society, but for the population having severe dementia, other aspects than health alone are often more important.

When advocating the view that challenging behaviour stems from an underlying problem, the usefulness of an intervention lies in the ability to discover and resolve that problem. This will result in a larger time investment than, for instance, prescribing psychoactive medication. Hence, it is plausible that prescribing psychoactive medication to treat challenging behaviour is associated with lower costs than using a multidisciplinary care programme. However, psychoactive medication is also associated with negative side effects such as an increased risk of falling and cardiovascular diseases (Schneider *et al.*, 2006; Zuidema *et al.*, 2006; van de Ven-Vakhteeva *et al.*, 2013), and most countries have an active police to reduce the use this type of medication. In this study, implementation of GRIP is associated with increased costs, but also with positive effects on psychoactive medication use. Economic evaluations provide insight into this trade-off between costs and effects for different interventions in long-term dementia care. However, to make a decision about the cost-effectiveness of interventions in dementia care, future research should determine how much money society is willing to invest to improve quality of care for dementia patients.

This study was one of the first to evaluate the cost-effectiveness of an intervention in long-term care for dementia and the first study calculating cost-effectiveness of a trial using a stepped-wedge design. The stepped-wedge design has very appealing benefits with regard to power and practicality, although the analysis of both effects and costs is complicated because of the changing intervention and usual care group. By providing a method for cost-effectiveness analyses within a stepped-wedge design, this study contributes to the feasibility of using this design.

The results of the current study show that it depends on how much society is willing to pay whether GRIP can be considered cost-effective in comparison with usual care. However, because the appropriateness of the current methods for analysing cost-effectiveness in this specific population has not yet been established, the positive results that were found earlier on challenging behaviour, medication use and job satisfaction should count heavily in the decision whether to use GRIP.

Conflict of interest

None. ZonMw did not have any role in the study design, in the collection, analysis and interpretation of data, in the writing of the report and in the decision to submit the report for publication.

Key points

- The care programme Grip on Challenging Behaviour may help care professionals to approach challenging behaviour in dementia methodically and multidisciplinary.
- It depends on how much society is willing to pay whether the care programme Grip on Challenging Behaviour can be considered cost-effective.
- It is doubtful whether the current methods for analysing cost-effectiveness are appropriate for the specific population of patients with dementia living in nursing homes.

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