

Clinical and cost effectiveness of services for early diagnosis and intervention in dementia

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SUMMARY

Background This paper analyses the costs and benefits of commissioning memory services for early diagnosis and intervention for dementia.

Method A model was developed to examine potential public and private savings associated with delayed admissions to care homes in England as a result of the commissioning of memory services.

Findings The new services would cost around £220 million extra per year nationally in England. The estimated savings if 10% of care home admissions were prevented would by year 10 be around £120 million in public expenditure (social care) and £125 million in private expenditure (service users and their families), a total of £245 million. Under a 20% reduction, the annual cost would within around 6 years be offset by the savings to public funds alone. In 10 years all people with dementia will have had the chance to be seen by the new services. A gain of between 0.01 and 0.02 QALYs per person year would be sufficient to render the service cost-effective (in terms of positive net present value). These relatively small improvements seem very likely to be achievable.

Interpretation These analyses suggest that the service need only achieve a modest increase in average quality of life of people with dementia, plus a 10% diversion of people with dementia from residential care, to be cost-effective. The net increase in public expenditure would then, on the assumptions discussed and from a societal perspective, be justified by the expected benefits. This modelling presents for debate support for the development of nationwide services for the early identification and treatment of dementia in terms of quality of life and overall cost-effectiveness. Copyright © 2009 John Wiley & Sons, Ltd.

KEY WORDS—modelling; dementia; Alzheimer's; disease; cost-effectiveness; quality of life; quality of care; service provision; invest to save; early intervention

INTRODUCTION

There can be no doubt of the current and future clinical and public health importance of dementia. Ferri *et al.* (2005) estimated there were 24.3 million people with dementia worldwide in 2005, rising to 81.1 million by 2040 while Brookmeyer *et al.* (2007) calculated 26.6 million people with Alzheimer's disease alone, rising to 106.8 million by 2050. In the UK there are currently

700,000 people with dementia rising to 1.4 million in just 30 years (Knapp *et al.*, 2007). The same report identifies that dementia costs the UK economy £17 billion per year; in the time that the numbers with dementia will double, the costs will treble to over £50 billion per year (Comas-Herrera *et al.*, 2007). This high societal cost is a worldwide phenomenon with the worldwide cost of dementia in 2005 estimated at £315.4 billion (Wimo *et al.*, 2007).

While the numbers and the costs are daunting the personal impacts on those with the illness and their families are also profound. Dementia results in progressive decline in multiple areas of function including: memory, reasoning, communication skills, and skills needed to carry out daily activities. Individuals may

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develop behavioural and psychological symptoms such as depression, psychosis, aggression and wandering which complicate care at any stage of the illness (Knapp *et al.*, 2007). Family carers of people with dementia are often old and frail spouses, with high levels of carer burden, depression, and decreased quality of life (Banerjee *et al.*, 2003). Dementia is a terminal disorder leading to death, but people may live with their dementia for 7–12 years after diagnosis.

THE CLINICAL CASE FOR EARLY DIAGNOSIS AND INTERVENTION

In terms of service provision one major issue is that in current systems less than a half of people with dementia have a formal diagnosis made, or contact with specialist services, at any time in their illness (National Audit Office, 2007). Such diagnosis and contact often only occurs late in the illness and in crisis when the opportunities for harm prevention are limited. If dementia is diagnosed, then the person with dementia and their family carers have the possibility of planning for their future or of availing themselves of the help, support and treatments (social and psychological, as well as pharmacological) which are available. Contrary to social misconceptions, there is a great deal that can be done to help people with dementia and their carers (NICE/SCIE, 2006). While there are undoubtedly potential negative reactions to diagnosis and well as positive outcomes (Iliffe *et al.*, 2004), the balance is very much in favour of diagnosis (Carpenter *et al.*, 2008) and the earlier in the illness the better. There is however a marked reluctance in primary care to be directly involved in diagnosing dementia for reasons that include: therapeutic nihilism; risk avoidance; concerns about competency; and resources (Iliffe *et al.*, 2006). The current focus of specialist mental health services for older people is on the severe and complex end of the spectrum leaving early diagnosis and intervention largely unaddressed.

The literature points strongly to the value of early diagnosis and intervention in delaying or preventing transitions into care homes. Care home placement costs the UK £7 billion per year with two-thirds paid by social services and one-third by older people and their families themselves (Knapp *et al.*, 2007). Behavioural disturbance, hallucinations and depression in dementia are three of the four most important factors in predicting institutionalisation (Gilley *et al.*, 2004) and older people's mental health services can treat these symptoms. In a meta-analysis of psychosocial interventions for caregivers of people with dementia up to 2001 Brodaty *et al.* (2003) reported

seven studies including care home placement as an outcome, of which five reported delays in the intervention group between 53 and 329 days and a further study a statistically significant decrease in permanent placement. More recently, a brief programme of carer support and counselling at diagnosis alone has been demonstrated to reduce care home placement by 28%, with a median delay to placement of 557 days compared with those not receiving the intervention (Mittleman *et al.*, 2006). Reductions of 6%, even in more severe cases with a highly active intervention in the control group, have been reported for case management (Challis *et al.*, 2002).

So, the service structures to provide early diagnosis and intervention for people with dementia and family carers are increasingly understood but have not been delivered by policy and commissioning guidance to date (Department of Health, 2005; Royal College of Psychiatrists, 2006). One of the reasons for this is a lack of data on the possible costs and benefits of investment. To provide evidence-based guidance in this area, here we model the impact of commissioning a new service to work in a complementary way with existing primary and secondary care services in England to deliver nationwide early diagnosis and intervention in dementia.

METHOD

The intervention

The model of service delivery considered here is based on the Croydon Memory Service Model, which is described elsewhere (Banerjee *et al.*, 2007). This is a multi-disciplinary and interagency team to generate early diagnosis in a timely manner, enabling choice and forward planning while people have capacity. It is designed to assess all incident cases in a given population. As well as diagnosis they provide information, and direct medical, psychological and social help to people with dementia and their family carers. They aim to prevent future crises by encouraging more effective and earlier help seeking and so reduce unwanted transition into care homes. The Department of Health has piloted this service model with positive results (Banerjee *et al.*, 2007; Willis *et al.*, 2008). Such services could be provided by old age psychiatrists, geriatricians, neurologists or GPs with a special interest.

Service costs

The service costs presented here include all staff costs and Trust overheads. They do not cover the direct costs

of extra investigations and medication or other need for health and social care which might be uncovered by the diagnostic process and early treatment. They do cover all costs (other than investigations) for the process of diagnosis, explaining that diagnosis to the family, and the care and the support needed following diagnosis by the team. They also cover the extra work for existing community mental health teams and social care services for older people with mental health problems. Together they provide the downstream methods for dealing with those with more severe and complex problems and are part of the whole system of prevention of institutionalisation enabling more intensive case management.

Additional costs for investigations and drugs have been considered in the relevant NICE/SCIE (2006) clinical guideline on dementia and NICE Technology Appraisal Guidance (2003) and may be offset by savings to health services not considered in the modelling. In calculating benefits no estimate is made of the savings from early diagnosis in terms of reduced use of acute hospital beds, prevention of admission and facilitation of discharge, or decreased use of community social care by the early provision of advice, treatment and support. Only savings from prevention of institutionalisation are modelled. The further direct health service saving may be extensive, with the National Audit Office estimating that re-engineering systems for dementia could yield £6.5 million of acute trust savings per year in a single area (National Audit Office, 2007).

Care home costs

Our best estimate is that are 215,000 people with dementia resident in care homes in England including both publicly and privately funded residents (Knapp *et al.*, 2007). The flow of people with dementia into care homes totals around 85,000 per year (on the assumption they spend on average 2.5 years in care homes). These numbers could be expected, in the absence of other changes, to rise by around 1.5% per year due to demographic pressures. The reduction of care home admissions is assumed to start in the 4th year after the start of a new early diagnosis service, with the resulting cost savings accruing from that year onwards. A 2% annual real rise in care costs has been incorporated into the model to allow for anticipated real rises in social care pay and prices.

We calculated the impact in monetary terms of delaying or reducing admissions to care homes in terms of the savings to public funding and privately-funded individuals. These savings are partially offset

by the need for councils to provide home care to those eligible for publicly funded home care, individual user contribution to home care costs (£15 per week has been assumed), and private home care costs for those not eligible for publicly funded home care. They are further offset by the general living costs of people cared for in the community, for which £150 per week has been assumed. There would also be costs to informal carers (opportunity costs) but these have not been quantified. The estimates take account of demographic pressures and of estimated real rises of care costs of 2% per year. As for all economic projections, the results derived should be treated with caution.

RESULTS

Costs of intervention

The memory service costs were estimated on the basis of 10.0 WTE multidisciplinary team members for a population of 50,000 over 65s (indicative content: 1.5 WTE doctors, 3.0 WTE nurses, 1.0 WTE psychologist, 2.0 WTE care managers, 1.0 WTE occupational therapist, and 1.5 WTE administrators) generating a team working five days a work with flexible hours, processing 600 to 800 referrals per year, providing diagnoses and direct care and support to those diagnosed with dementia and their family carers. Estimated cost for an average Primary Care Trust (PCT) serving a population of 50,000 older people was £600,000 per year, equating to £95 million pa nationally.

The extra support for existing community mental health teams for older people was costed at recruiting a further 7.5 WTE multidisciplinary team members into teams serving 50,000 over 65s with skill mix determined by existing team composition (indicative content: 0.5 WTE doctors, 2.0 WTE nurses, 1.0 WTE psychologist, 2.0 WTE care managers, 1.0 WTE occupational therapist, and 1.0 WTE administrator). Estimated cost for an average PCT £460,000 pa equating to £70 million pa nationally. Finally we estimate that the enhancement of social care services would require the equivalent of 7.0 WTE care managers per average PCT population. Estimated cost for an average local authority with adult social services responsibilities £360,000 pa, equating to £55 million pa nationally.

Effect of intervention on the numbers in care homes

A reduction of 6% in care home bed days for people with dementia entering care homes, as a result of investment in early diagnosis and treatment services,

would translate in time into a reduction of 15,000 care home residents below those otherwise expected taking account of demographic pressures. This can be considered as a 6% reduction in average length of stay through delaying admissions or a 6% reduction in numbers of admissions through complete prevention of admissions or (most likely) a combination of these two scenarios. A reduction of 10% or 20% would result in a reduction of 25,000 and 35,000 people respectively.

Savings for publicly funded care home clients

Publicly-funded clients form two-thirds of older people in care homes. Delayed or reduced admissions to care homes would result in substantial cost savings to public funds. These savings are only partially offset by the need for councils to provide home care support to those eligible for publicly funded home care. Figure 1 illustrates the potential net savings to councils in Year 4 and Year 10 with comparisons made between a 6%, 10% and 20% reduction in care home numbers. A 6% reduction in the number of people with dementia entering care homes translates into cost savings of around £25 m in Year 4 which increase to around £75 m in Year 10. A 10% reduction translates into cost savings of around £45 m in Year 4

rising to £120 m in Year 10. A 20% reduction translates into cost savings of around £95 m in Year 4 and £245 m in Year 10.

Savings for privately funded care home clients

The remaining one-third of admissions and residents in care homes are privately funded by themselves or their families. Figure 2 illustrates the potential net savings to individuals and families in Year 4 and Year 10 with comparisons made between a 6%, 10% and 20% reduction in admissions to care homes. A 6% reduction in the number of people with dementia entering care homes translates into cost savings of around £25 m in Year 4 which increase to around £75 m in Year 10. A 10% reduction translates into cost savings of around £45 m in Year 4 which rises to around £125 m in Year 10. A 20% reduction translates into cost savings of around £95 m in Year 4 which rises to around £250 m in Year 10.

Overall savings to society

Overall, savings accruing to public funds and private individuals are shared fairly evenly between both parties. These savings increase as the numbers of

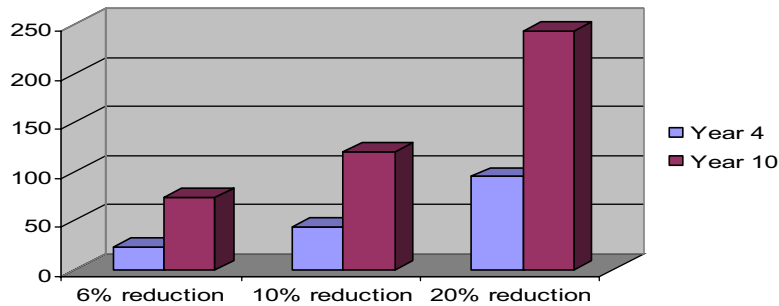


Figure 1. Potential public savings from reducing admissions (£ millions).

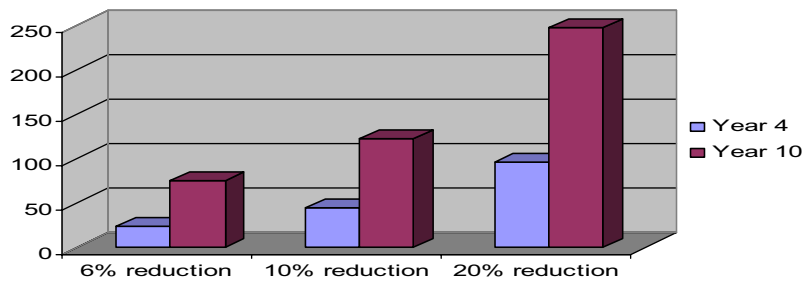


Figure 2. Potential family savings from reducing admissions (£ millions).

COST EFFECTIVENESS OF EARLY INTERVENTION

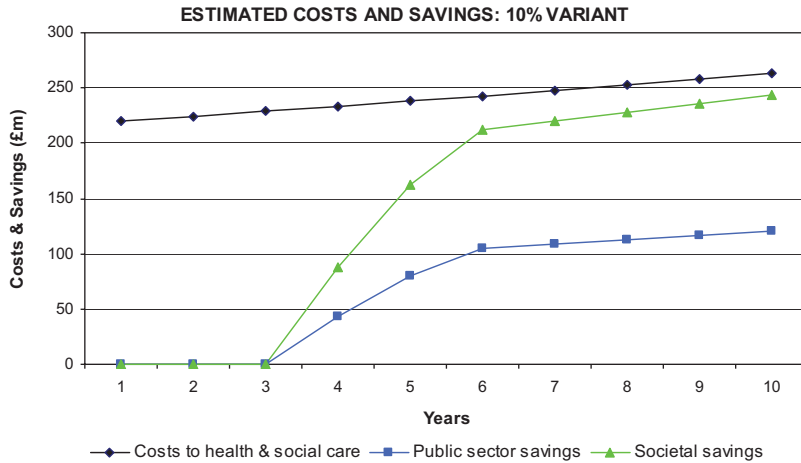


Figure 3. Potential costs of early diagnosis and intervention services for dementia and savings from reduced care home admissions.

people prevented from entering care homes increases over the 10-year period. Total annual savings to society from a 6%, 10% and 20% reduction in the numbers of people with dementia entering care homes amount to around £150 m, £245 m and £490 m respectively by year 10 from the nationwide introduction of the early diagnosis and intervention service. Estimated costs and savings over time are summarised below in Figures 3 and 4 based upon a 10% and a 20% prevention of transitions into care homes. The three lines in the Figures represent the costs to public funds of enhanced services, the savings to public funds from reduced use of residential care, and the savings to society from reduced use of residential care. The costs

and savings to public funds are estimated to balance under the 20% variant, while the costs and savings to society are estimated almost to balance under the 10% variant.

Cost-effectiveness

In the 10th year of the service's operation its estimated cost would be around £265 million (in 2007/8 prices) taking account of real rises in care costs. The estimated savings under the 10% scenario would be £120 million in public expenditure (health and social care) and £125 million in private expenditure (service users), a total of £245 million to society. This means

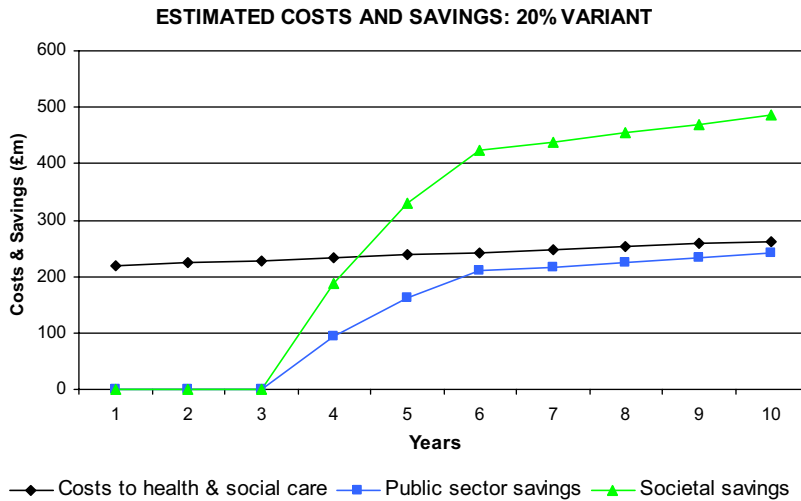


Figure 4. Potential costs of early diagnosis and intervention services for dementia and savings from reduced care home admissions.

that under a 10% reduction in residential care the annual cost would be almost offset by the estimated saving to society.

The estimated Net Present Value (NPV) over 10 years of the costs and savings to society of the 10% scenario, with 3.5% discount rate, would be around (minus) £950 million. This analysis, however, takes no account of the value of the increase in quality of life expected from the services. The evaluation of the DH national early intervention in dementia pilot (the Croydon Memory Service) found that at 6 month follow-up there were statistically significant improvements in both self-rated and proxy-rated quality of life using the DEMQOL quality of life instrument for dementia (Banerjee *et al.*, 2007). The improvement represents around 4% of the interval between the lowest and highest states on the DEMQOL instrument (Smith *et al.*, 2007). It should be recognised that the evaluation did not include a control group.

The NPV would be positive if benefits, in terms of improved quality of life, could be achieved whose monetary value rose linearly from nil in the first year to around £250 million in the tenth year. This would be a gain of around 6,250 QALYs in the tenth year, where a QALY is valued at £40,000, or 12,500 QALYs if a QALY is valued at only £20,000. The service change proposed would mean that, by the tenth year of the service, all 600,000 people in England then alive with dementia would have been seen by the service if they wish to be. The Croydon service sees around 400–500 new patients per year. This suggests that some 60,000–75,000 new patients could be seen each year nationally if a service was established in each area. This is similar to the estimated national annual incidence of new cases of dementia.

If all 600,000 people in England with dementia had been seen by the service, a gain of 6,250 QALYs per year would amount to only around 0.01 QALYs per person year. A gain of 12,500 QALYs would amount to only around 0.02 QALYs per person year. These relative small improvements seem very likely to be achievable with ease in view of the rise of 4% achieved using DEMQOL, although some caution is required in comparing gains on DEMQOL with EuroQoL. This intervention would therefore meet accepted definitions of cost-effectiveness (NICE, 2004; Rawlins and Culyer, 2004).

DISCUSSION

This modelling, based on the best available evidence, presents for debate a clear evidenced case for the development of nationwide services for early diag-

nosis and intervention in dementia. The financial case is strong if a strategic view of between 4 and 10 years is adopted. This analysis suggests that the service need achieve only a modest increase in the average quality of life of people with dementia, plus a 10% diversion of people with dementia from residential care, to be deemed cost-effective using accepted definitions. The net increase in public expenditure would then, on the assumptions discussed in this paper, be justified by the expected benefits.

Limitations

There are important limitations to this modelling. As is common in such service development the large cluster randomised trials of the intervention that would be necessary to give a direct measurement of the costs and benefits of the service change have not been conducted. This approach relies on the evidence base and there are limitations to it in estimating all elements of the model from the costs of intervention, the prevention of transition into care homes and the quality of life impacts of intervention. The data used are for England and so direct generalisation to other health and social care economies will be limited, but the model generated would allow for the introduction of unit costs and other parameter estimates from different countries allowing for the generation of country-specific assessments.

However, there are also strengths to the approach taken here. We used the best available evidence and have been clear about limitations identified and assumptions made. We have followed best practice in the development of such work and we offer this as the start of a process of discussion of the cost effectiveness of early intervention services for dementia rather than a definitive final statement on the issue. We have not taken the highest estimates of effect from research studies but have modelled using attenuated effects. The cost-effectiveness case presented is based on a 10% reduction in care home use. Given the clear dysfunction of the current system, it beggars belief to suggest that such an effect is not possible with concerted action such as that proposed here.

Quality improvement

We have largely focussed on costs in this paper but there is also a strong quality argument for the provision of such services and the prevention of institutionalisation; people with dementia and their carers generally want them to stay in their own homes and their quality of life is higher at home than in care homes. Early intervention has been shown to have

positive effects on the quality of life of people with dementia (Banerjee *et al.*, 2007) and their family carers (Mittleman *et al.*, 2007).

The ultimate aim of this paper is to be of practical use. This modelling is designed to be of direct relevance to those providing, planning, and commissioning dementia services. It summarises the data available on early intervention and potential costs and benefits to inform strategic decision-making at a local, regional and national basis. As discussed above, the challenges posed by dementia to health and social care systems of whatever configuration are immense and set to grow markedly in the next thirty years. The need for strategic thinking is as important in the developing world as it is in developed economies. The solutions may differ but the challenges are very similar. One set of solutions involve the potential for prevention of harm and cost by early diagnosis and intervention. The data presented here are designed to inform the debate in this area.

CONFLICTS OF INTEREST

None known.

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Both authors participated in all stages of preparation of this paper, SB took the lead with the clinical elements of the paper and RW on the economic elements, SB wrote the first draft of the paper, we both saw and approved the final version. SB is the guarantor of the publication.

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