King's Fund

Background Paper

Download full report, *Securing Good Care for Older People*, from www.kingsfund.org.uk/publications

Author

TERESA POOLE

Date

2006

wanless social care review

Telecare and Older People

KING'S FUND
11–13 CAVENDISH SQUARE
LONDON W1G 0AN
Telephone 020 7307 2400
www.kingsfund.org.uk

wanless
social
care
review

TELECARE AND OLDER PEOPLE

Teresa Poole

King's Fund

This is one of a series of appendices to *Securing Good Care for Older People*. Download full report from www.kingsfund.org.uk/publications

First published 2006 by the King's Fund

Charity registration number: 207401

www.kingsfund.org.uk/publications

Typeset by Andrew Haig and Associates
Front cover image by Sara Hannant www.sarahannant.com

The role of telecare

'Telecare' describes any service that brings health and social care directly to a user, generally in their own homes, supported by information and communication technology (Audit Commission 2004). In most cases, data is collected through sensors, fed into a home hub and sent electronically to a call or monitoring centre. Existing basic telecare units include fall alarms, safety sensors for risks such as gas leaks and bath floods, and 'wander' monitors for people with dementia. In the United Kingdom, around 1.5 million elderly people already use community alarms to contact a central control centre that can summon help; this is often the basis for the introduction of telecare. More advanced 'intelligent' systems are designed to recognise changes in activity levels, such as visits to the toilet or fridge, which may indicate that a person's condition is deteriorating. Early targeted interventions can then be implemented, with the emphasis on prevention. Separately, 'telehealth' can be defined as the remote monitoring of vital signs such as temperature and blood pressure that can be used by medical professionals for diagnosis, assessment and prevention.

This paper provides some further background information on issues addressed in the 'Telecare and related technology' section of Chapter 9 ('New influences on care') of this Review, including references to studies that have been published on these subjects.

The government believes that telecare can increase independence and choice by helping older people remain in their own homes longer. It can also 'give carers more personal freedom and more time to concentrate on the human aspects of care and support and will make a contribution to meeting potential shortfalls in the workforce' (Department of Health 2005b), while 'using technology appropriately can re-balance the all-or-nothing approach to care and independence, where people either have daily visits by a care worker, or nothing at all' (Ladyman 2005). But a House of Lords review of the scientific aspect of ageing (House of Lords Science and Technology Committee 2005) found a gap between the political intention and reality. It said it 'cannot understand' why the so-called third-generation 'intelligent' alarms were not already widely in use, given their 'self-evident' advantages, and recommended central government funds be made available to local authorities to set up the infrastructure needed for these types of alarms.

The Department of Health's Preventative Technology Grant is paying out £80 million over two years from April 2006 to promote the use of new technology as a way of reducing avoidable admissions to hospital and residential care. The money is not ring-fenced, but the government expects councils to invest in telecare with the goal of helping an additional 160,000 older people to live at home (equating to £500 for each of those people). Looking further ahead, the recent White Paper promotes telecare as a means of enabling people 'to feel constantly supported at home, rather than left alone, reliant on occasional home visits or their capacity to access local services' and plans 'intensive use

of assistive and home monitoring technologies'. The Department's own IT targets aim to provide telecare in 20 per cent of the homes requiring it by the end of 2007, and in all homes requiring it by the end of 2010. These levels look very ambitious unless a low definition of telecare need and service is used.

In early April 2006, responding to the publication of the Wanless Social Care Review, Lord Warner confirmed that the Department of Health intended to 'make progress quickly' on a large-scale demonstration of telecare 'in a population area of 1 million people' (Warner 2006). 'It will use telecare and other technology, but will combine this with new ways of working such as case management, disease management, self care and integrated teams,' he said. Information from industry sources suggests that there will be three demonstrator areas, each with populations receiving telecare of at least 300,000. Provision will focus on adults over 16 with multiple, complex health and social care needs. The demonstration sites will commence before the end of 2006 and will be evaluated each year over three years. The core aims are to deliver care that:

- promotes individuals' long-term independence
- improves individuals' and their carers' quality of life
- improves the working lives of staff
- is more cost effective
- is more clinically effective
- provides an evidence base for future care and business models.

As noted above, the proposed 'new ways of working' are said to include dedicated case management, evidence-based chronic disease management, joint health and social care teams, 24/7 service contact involving NHS Direct partners, and intensive home assistive technology including telecare.

Since loneliness is a big issue in old age, it might seem perverse to promote technology that could reduce interaction with carer workers. Personal relationships between care workers and older people are often valued highly, and telecare is unlikely to be welcomed if it is seen as a threat to that relationship. But proponents of telecare argue that it can allow a redeployment of worker and carer time, with a shift of resources towards more meaningful interactions.

> *Technology can help in managing risk by providing security and offer alerting capacity well beyond that provided by human supervision. What it cannot do is deliver care. Care delivery requires a combination of functional and emotional inputs best provided by a human carer. What technology can do, by dealing with those monitoring, alerting and measuring functions, is to free human carers to make better quality interventions. Instead of entering the room of someone with severe dementia at hourly intervals through the night to check that they are still in bed and asleep, the care staff can entrust the equivalent function (through bed occupancy and movement detectors) to the technology, and spend time with the person who is wandering or has fallen.*
> (Appleton 2005)

Given that an 'intensive' care package is usually defined as domiciliary care of more than 10 hours a week, that leaves many hours when telecare can complement formal care rather than substitute for it. A large element of domiciliary care is personal care, and technology cannot replace many of these physical care tasks.

Based on technology that is already readily available, there are several ways in which telecare can enhance an elderly person's quality of life.

- It can enable an older person to remain living at home if that is their preference, although there will always be some trade-off between meeting the desired sense of independence and a residual element of risk in living at home.
- It can ease the challenges of daily living caused by age or long-term health conditions, and improve an older person's sense of security and self-confidence.
- The level of telecare provision can be increased as new problems emerge with activities of daily living or any new health problems develop.
- It can relieve some of the burdens and pressures that affect informal carers, improving their quality of lives too. This can encourage family members to carry on caring for longer, which can avoid the older person moving into a care home.
- Specific telecare technologies are available to help care for older people suffering from long-term chronic conditions such as diabetes, asthma and high blood pressure. This can encourage older people with these conditions to remain living at home, while also monitoring any further deterioration in their condition.

Telecare also has the potential to be cost-effective.

- It can avoid or defer an elderly person's move into a care home or hospital. (Although, in some cases, the level of care necessary to keep someone at home can make a move into a care home the cheaper option.)
- It can reduce or replace some of the routine input needed from carers, formal and/or informal, in the home setting, permitting them to be more effectively deployed.
- It can speed up an elderly person's discharge from hospital by providing added support in their own home or in another intermediate care setting, thus freeing up hospital beds.
- It can help someone maintain a healthier lifestyle, thereby reducing or delaying future needs.
- It can improve efficiency within a care home and help keep down costs.
- Using wireless technology, much of the available equipment can be installed in existing homes and removed when no longer needed.

The potential beneficiaries of telecare equipment extend far beyond those who seek a local authority needs assessment, let alone those who qualify for state-funded social care. Many manufacturers are already targeting this private market as they invest in the development of increasingly sophisticated devices. These self-funding purchasers will require a reliable source of information about the types of equipment that are available, as well as quality standards for the products and services that are on offer, if the market is to develop its potential.

All that said, the evidence base for the impact and cost-efficiency of telecare is limited, and many policy questions remain unresolved. Should telecare automatically be an element of any care package after a needs assessment, on a par with existing services? Who will have the professional expertise to recommend the various technology options, and is there an expanded role for occupational therapists in this? Should eligibility for telecare be governed by national guidelines, or left to individual local authorities to develop their own regimes? Should telecare be targeted at niche high-needs groups or offered on a universal basis in order to maximise its potential preventative role? There are clear parallels with the long-standing debate about equipment and aids for disabled people in which users have argued that they should have the right to live in an environment enabled by equipment, even if it is relatively expensive. The rest of this paper looks at some issues that have an impact on the answers to all these questions.

The technology on offer

Telecare equipment and services offer the opportunity to react to hazardous events (a fall or a running bath tap left unattended) and also to prevent the further deterioration of a person's ability to care for themselves (by identifying changes in a person's daily habits) or their health (through vital signs monitoring). All this technology already exists, with wireless units and miniaturisation offering increasingly unintrusive hardware. The potential different levels of service can be ranked according to the type of information that is provided or collected. The following classification draws heavily on work by the Audit Commission (Audit Commission 2004).

- **Information** Health advice, self-help groups and web-based information systems that can be accessed through a laptop computer or an interactive television. As well as offering peace of mind on minor health issues, the older person can access a diary of local events for pensioners in the area run by social services, voluntary organisations or private companies. A telephone or internet shopping service could be incorporated into the system, with more attractive payment and delivery options than are offered by private suppliers.
- **Electronic assistive technology** A variety of modern aids and adaptations for the home including, for instance, intelligent heating controls, automatic doors, stair-lifts, automatic beds, and electronic prompts/memory aids to ensure medication is taken correctly. A video-telephone may be included in this category.
- **Safety and security monitoring** A collection of sensors that transmit signals to a central receiver hub using wireless technology. These monitor bath floods, gas leaks, unlocked doors, fire, carbon monoxide and various other basic safety indicators in the home environment. In the case of an emergency, an alarm signal rings in the home and is also immediately transmitted to a central alarm centre where the staff will alert the necessary reaction teams.
- **Personal monitoring** These fall into three categories. At the basic level would be an automatic fall detector, which alerts the alarm centre in the case of a fall, or a 'wander' monitor, which checks that someone with dementia does not drift too far from the home. Systems with a higher level of inbuilt intelligence can also be fitted to detect 'abnormal' activity levels for such indicators as movement within the flat, toilet flushing, or overnight absence from a bed. A change in the normal pattern prompts an alarm signal to be sent to the call centre.
- **Vital signs monitoring** As a third level of personal monitoring, these systems can regularly record information about weight, temperature, blood pressure and other physiological signs. The data can be accessed by medical professionals who are treating the older person for any ongoing medical condition and should alert them to any change in well-being. Automatic alerts can be programmed as an early warning system for any deterioration or sudden change in levels. The information could also potentially be relayed to a data storage centre where a health record would be built up. Such data would then be available at a future date if an elderly person's health deteriorated.

Costs per individual can be modest. For example a basic Home Safety and Security package of equipment typically costs £360, plus monitoring costs of £5 a week; additional sensors are around £80 each, and an extra £1 per week per sensor (Department of Health 2005d). Home health monitoring packages tend to be more expensive, at around £700 for an initial package, and £10 a week monitoring costs. Government guidelines for the Preventative Technology Grant state that, if telecare equipment is provided after a community care assessment as an aid to assist with nursing at home or daily living, it should be provided free of charge. The local authority's normal means-testing regime can be used for the service elements, that is, the weekly charges. A charge can also be made for equipment installed for preventive reasons (Department of Health 2005a).

The use of technology in the delivery of social care clearly has significant implications for the deployment of care staff and the training and skills that are required in the workforce. Older people need to be coached about the technology that is on offer, and those conducting assessments need to be able to decide what equipment would be appropriate for each user. The telecare system then needs to be installed, the older person trained to use it, and the system maintained. At the response centre, staff will be needed to run and monitor interventions. Overall, as part of a whole systems approach, there will need to be appropriate management structures including some new models of working that need to be devised and implemented. This can include building up existing structures for the provision of adaptations, by both occupational therapists and housing services.

On a 20-year horizon, technical aids are very likely to become far more sophisticated. A futuristic view of telecare is given by so-called 'smart homes'. These use a single network to connect a myriad of devices that can be controlled centrally. They work by connecting a number of computerised systems together, creating an integrated control system. The Joseph Rowntree Foundation demonstration smart home at New Earswick has illustrated what technology can already provide, if cost is no object: the home's systems can be controlled remotely by telephoning into the house; the home security system communicates with other machines such as window closing devices; the gas will be turned off at the mains if a leak is detected; cupboards and sinks can be raised and lowered for those in a wheelchair; and a single bedside control can turn on the lights and the television, open the curtains, and start running the bath. At the moment, such an extensive package of smart home technology is usually practical only for newly built homes. With the housing stock being replaced at a rate of about 1 per cent a year, the most likely setting for smart home technology would probably be in the development of new-build extra care housing for older people, or properties under very extensive renovation.

The evidence base

Various pilot studies are beginning to offer evidence that providing an early, limited package of telecare to someone in a low-needs category can delay a move into a higher-needs service band. There are certain categories of vulnerable older people for whom this may be particularly relevant. Many older people go into a care home because they feel unsafe and vulnerable in the community, and an inexpensive package of telecare can deal with security issues very effectively, and far more cheaply than the cost of a care home place. A more complex telecare package can be aimed at people in the early and middle stages of dementia, including 'wander' alarms and safety sensors and medication reminders, all of which can enable someone to remain living in their own home for longer. In most cases, the technology is straightforward and the greatest challenge can be developing the associated organisational infrastructure. Telecare needs to be integrated into the wider social care, housing and health frameworks, raising a number of administrative and funding questions.

The large number of pilot studies into the implementation of the technology has led to jokes that telecare 'has more pilots than British Airways'. Many of these studies are small, and it would be wrong to extrapolate their results up to the national level. But all provide useful experience of the challenges of using telecare with older people. A small selection of pilot projects is included below, starting with the UK's one large-scale implementation.

West Lothian: 'Opening Doors for Older People'

The UK's biggest telecare pilot study is the 'Opening Doors for Older People' project in West Lothian, launched in 1999. The council is rolling out technology packages for its Home Safety Service to everyone in the district aged 60 and over (about 10,000 households). The aim is to increase the level of care as needs increase, rather than moving the person into increasingly intensive care settings. There are a number of associated initiatives. Self-assessment has been introduced for simple personal aids, and new meals and shopping delivery services have been introduced to free up personal care staff time for other duties.

Separately, smart technology is being used in newly built housing developments designed to offer Housing with Care with an onsite staff team for those who really cannot manage in their own homes. This represents a significant shift in the balance of care. As part of the telecare strategy, West Lothian demolished four residential homes, built two new care homes with health services, and five new Housing with Care units offering 200 tenancies with advanced smart housing options. The units consist of flats or cottages with smart technology installed, built around community resource facilities that are available to tenants as well as local community members.

By February 2006, there were 1,950 households with a Home Safety Service package consisting of:

- a 'lifeline' unit, which links sensors to the call centre when triggered
- two passive infra-red (PIR) detectors to monitor activity and potential intruders
- two flood detectors, activated by leaking pipes, overflowing baths, etc
- one heat sensor, sensitive to both high and low temperatures
- one smoke detector.

About 10 per cent of participating households had additional technology such as falls detectors, falls alarms, wandering detectors, incontinence detectors, video door entry, medication reminders and bed/chair occupancy monitors. These additional technology aids can be added to an older person's telecare package as their needs increase. The whole project is supported by a care team of staff from a range of backgrounds who have been given intensive training to identify the appropriate technology for a user. In an interim evaluation (Bowes and McColgan 2005), nearly all the respondents reported the positive impact of the smart technology, which had been important in relieving worries about falling and about home security.

Preliminary analysis of costs suggests that cost savings can be achieved from the new services, when compared to the cost of an institutional care place. The gross costs of the various care options in West Lothian in February 2005 are:

- a care home place at £21,840 a year
- a Housing with Care tenancy at £16,400 a year, including a technology package
- personal care and housing support
- support in the community, including the Home Safety Service technology package and 10 hours of formal care a week, at £7,121 a year (Bowes and McColgan 2005).

David Kelly, the director of the council's Community Health and Care Partnership, estimates that the cost of a package of telecare equipment amortised over five years plus the staffing costs to support the scheme works out at around £7 a week in total (Kelly 2005). Until January 2006, the weekly fee to a user for the Home Safety Service package was a means-tested £4.87 per week. But that was discontinued because it was reducing take-up, even though most people after means-testing did not have to pay. In the two months after the fee was abandoned, demand for the service tripled.

Any cost-benefit analysis of telecare is highly sensitive to whether potential NHS costs are included in the calculation. In West Lothian, the average length of stay in a care home has dropped from around three years in 2000 to around 16 months in 2005. As of April 2005, the proportion of people over the age of 65 experiencing delayed discharge from hospital in West Lothian was 1.4 per 1,000, compared with an average in Scotland of 2.7 and a Lothian average of more than 4. The mean length of stay of someone delayed in hospital is 30 days, compared with a Scottish average of 112 days (Kelly 2005). A full analysis of the cost-benefits of the telecare project will be published in a forthcoming final evaluation by Bowes and colleagues.

David Kelly has stressed the importance of 'a major culture change and a re-engineering of the business' as being a key aspect of bringing telecare into the mainstream of social care service provision. The council's decision to bring primary care and social work together under a Community Health and Care Partnership is part of that restructuring. Mr Kelly now

manages the budget for both primary care and all social work. His analysis of West Lothian's experience over the past five years offers a number of conclusions (D Kelly, personal communication):

- implementing telecare on its own without wider system improvements is a wasted opportunity
- telecare 'is not a cut-price alternative to personal service, but sits alongside it'
- a technology-driven approach does not work
- a focus on cost-saving/shunting 'is counter-productive'
- a high level of commitment, particularly at senior levels, is required
- West Lothian has found 'minimal interest' from the local NHS in telecare/telemedicine possibilities.

Northamptonshire: 'Safe at Home'

The Northamptonshire 'Safe at Home' project is the biggest telecare pilot scheme (with 233 users) aimed specifically at people with dementia. A comparator group in Essex was used to investigate the impact of the telecare provision. An evaluation in April 2005 found that telecare appeared to enable people with dementia to remain living longer independently. Some 28 per cent of the Safe at Home group was admitted to live in residential care during the 21-month period, compared with 54 per cent in the comparator group in Essex. The proportion that died over the pilot period was also less, at 12 per cent compared with 21 per cent. An analysis of the care packages showed that Safe at Home users received fewer services, visits and hours of service than the Essex group, both at the point of referral and at the end of the project, or when they left the community. However, the designers of the Northamptonshire project argue strongly that technology should not be seen primarily as a way to reduce formal carer costs as the cost benefits will in any case flow because of the potential for reduced hospital and care home admissions (Woolham 2005).

The cost-benefit analysis covered the total costs of the Safe at Home project and the costs of residential, nursing and hospital care for the two groups of people with dementia over the 21-month period. It did not, however, include the cost of the community-based care packages, mostly because of shortcomings in the data. The net saving over 21 months emerged as £3,690 per person for each of the 233 people who received help from the project. The true savings would have been less because those who remained living in the community would have been receiving care packages at home. However, the evaluation concluded that, even after a significant adjustment for this expenditure, there would still be considerable cost savings.

Durham: 'People at Home and In Touch'

Durham's 'People at Home and In Touch' project was a six-month pilot (December 2003–July 2004) to develop a model for the delivery of a telecare service that could be rolled out countywide in County Durham and integrated into mainstream services. All 148 clients were given telecare or assistive technologies. The equipment used included door entry systems, wandering devices, falls detectors, carbon monoxide detectors, smoke alarms, pressure mats, flashing lights/vibrating pillows, and 'keySafes' (a secure place for an older person to store a set of home keys outside the home, allowing visiting care staff access).

Overall, it was estimated that by using telecare with the 148 clients, around 1,783 residential day beds were saved, amounting to a net saving of over £66,000, more than double the sum invested. Full details of the study are available in the evaluation report (Durham County Council 2004).

Surrey: 'Columba' project

Part of the challenge of introducing telecare is to build up the confidence of the older person about using the technology. The 'Columba' project in Runnymede, Surrey gave people who would otherwise move into a care home a period of about six weeks' 're-ablement' in a small unit (Brockhurst) where they were introduced to telecare systems before being returned to their own homes or sheltered housing, with a telecare package. The system was designed with discharged hospital patients in mind, although not all participants fell into this category. One of the findings of the project was that it was quite difficult to find suitable candidates in hospital. The most recent figures indicate that about two-thirds of the Brockhurst residents were successfully resettled in their own homes. On average, this period back at home lasted about 10 weeks and then they moved into care. However, this was an average, and different users had very different experiences. Additionally, even a 10-week average also marks an achievement. All these people would previously have gone straight from hospital into a nursing home. Instead, they were able to spend some time at home sorting out their affairs and either they or social services – depending on their savings – would have benefited financially because they were not in an expensive hospital or residential care bed during that time.

Telecare technology is only one component of the Columba care package, but the evaluation found it was 'key to risk management in returning people to the community to live independently'. According to a June 2004 evaluation of Columba, a popular package, costing £491, consisted of a base unit, pendant trigger and a bed occupancy sensor. Other sensors (flood detector, temperature, falls monitor and so on) could be added if necessary. The bed occupancy sensor provided two benefits: the call sensor could telephone if the person left their bed at night and did not return beyond a fixed time, and the sensor could cause a light to go on when the person got up, thus reducing the fear of falling. Without a bed sensor, the cost of the package was just £191. Runnymede Careline, which runs the existing community alarm system, estimated that there was a threefold increase in their workload when looking after ex-Brockhurst residents, compared with the usual Careline clients. This was partly due to both the greater complexity of the equipment and the increased volume of calls. Careline has successfully alerted other services to increased calls from particular clients, so that quick interventions could be made.

Cumbria's 'virtual' care village model

Cumbria is a rural area, and this has presented particular challenges for delivering care services to communities. In response, the social services department is developing a 'virtual' care village model (Housing Learning and Improvement Network 2005). This attempts to link the introduction of telecare with the commissioning and delivery of domiciliary care and the development of extra care housing for those older people who choose, or need, to move into more supportive accommodation. The low density of population in Cumbria means that existing extra care schemes are small, resulting in high unit costs and care teams that do not have the ability to reach out into the community. For older people living in their own homes, there is a need to develop appropriate risk

management strategies. Telecare provides a tool that can be used to meet both these challenges, by viewing dispersed communities as a virtual village, meshed together by telecare-enabled care services.

The various elements in the new model include the use of telecare to manage risk and target services in the case of an emergency; mobile handsets and the telecare database to enable care workers to be contacted by the alarm provider and to provide secure access to the client's health and care data; and telemedicine services, purchased by the local PCT, for monitoring people's vital signs from home as part of the strategy of managing long-term conditions. The village thus encompasses accommodation in the community and the extra care units, with the community support network working across these sites.

Initially, the telecare service is being targeted at people with medium to high care needs as part of packages designed to offer an alternative to residential care. The model is being piloted in Carlisle. Data collected routinely by the control centre, such as the frequency and timing of alarm activation, is intended to be used to assist in the regular review of an individual's care needs. The cost of the equipment and fitting is borne by the local authority, while a charge of £8.22 a week is made by the community alarm provider to cover a standard telecare package of six sensors.

Kent's Active Living Project

In Kent the Active Living Project uses telecare to help older people manage security, environmental and other risks of independent living. The authority set up three pilot sites, and by the end of 2005 around 323 telecare installations had been completed (although some recipients subsequently died or moved into care) (Active Living Telecare Project 2005). Feedback from users and carers has been very positive, and the greatest challenge has been establishing a diverse, multi-agency infrastructure for implementation. The cost benefits have been hard to specify, because telecare is one of a range of preventive measures in Kent aimed at reducing emergency hospital admissions for the over 75s. Further details of the project are available at the website (Kent County Council 2006).

Hampshire: the WristCare pilot

In August 2004 a pilot project was started by Hampshire County Council using a device similar to a wristwatch worn all the time to gather activity information about the wearer (Department of Health 2005c). Detailed information on movement and sleep patterns is collected over a 24-hour period, allowing interventions to be made if the user falls or shows other signs of distress. The aim is to reduce emergency hospital admissions. The Vivatec WristCare system costs around £1,200, with a five-year life, and has both manual and automatic alarms. The device is also suitable for people with dementia, in that people have the freedom to move around outside and activate an alarm only if they exceed some maximum distance from the base station.

There are many other important pilot studies. Details of some of them are available on the website of Integrating Community Equipment Services (ICES) (http://www.icesdoh.org/doc_cat.asp?ID=25).

The results of small- and medium-sized pilot trials are often encouraging but limited because of their size. Quality of life improvements are usually easier to demonstrate than cost benefits, and for the latter it is inappropriate to extrapolate from small-scale studies into the general population as a whole. In some cases, the cost analyses also suffer from not including all the relevant costs or not having a comparator control group. However, there does appear to be a consensus that even low-level telecare can reduce the demand for care home and hospital beds. For example, a review more than a decade ago of more than 100 community alarm service users, found a 25 per cent reduction in the number of hospital admissions and a decline in average hospital in-patient days from 9.2 to 5.7 days (Roush *et al* 1995). The mistake is to see telecare as some catch-all 'magic bullet' solution.

Many implementation difficulties arise not because of the technology but from the organisational and structural conditions within which telecare is deployed (Barlow *et al* 2005). There is an inherent challenge in setting up the structures to monitor large numbers of people over a long period of time, and the need for many people to be involved from different services (health and social care, housing, and voluntary organisations). This also creates problems for rigorous evaluations, because of the practical challenge of running a big enough pilot study over a long enough timescale.

Modelling the impact of telecare services

As mentioned above, there is a lack of rigorous data on the cost implications of telecare due to the mostly small-scale, short-term nature of trials (Barlow *et al* 2005). There has also been only a handful of attempts to model the potential cost-effectiveness of the introduction of telecare on a very large, or national, scale. One theoretical cost model for a city-based advanced telecare scheme (based on Birmingham) involving 11,618 community alarm users (Brownsell *et al* 2001) found that it would be possible to achieve a return on the necessary investment after 10 years. The main predicted savings in the model arose from a reduction in the time spent in hospital and residential care, and it takes several years for this effect to have a full impact. If the results were extrapolated for the whole of the United Kingdom, assuming 1.6 million community alarm users, there would be net savings in excess of £1 billion over the first 10-year period (Brownsell and Bradley 2003). Over the following 10 years, telecare could produce even greater savings as the infrastructure would already be in place.

But who should pay for the necessary investment? Several pilot studies have concluded that telecare will divert and shift people from residential care and possibly from hospital, and that by doing so the costs and benefits will be redistributed around the system. The Brownsell model suggested that the financial benefits from the advanced telecare system would be split as follows: local authority housing (4 per cent of savings), NHS (43 per cent) and residential care provision (53 per cent). To encourage investment, it might therefore be necessary to find a way to apportion the costs in line with the potential benefits. Without this there may be little incentive to fund innovation and development if, for instance, the local authority was making the investment, but the NHS was reaping a significant slice of the financial benefit.

The time-lag effect shown by Brownsell was also seen in a separate model (Bayer *et al* 2005) which explored the effect of the introduction of telecare under different scenarios. In particular, the model examined the effect on the number of clients in institutional care and the overall cost. Under the most optimistic combination of assumptions, the institutional care population after five years dropped by 11 per cent compared to the non-telecare case: under the most pessimistic assumptions, the decrease was less than 1 per cent. The effect of telecare on the care home population is small in the short term because it is too late to have much impact with those who are already very frail or already in care homes. The reduction in the care home population is seen in the longer term – more than 20 years – when the provision of telecare to those with mild or medium needs produces an extended period of independence at home. A simulation over 20 years showed a very substantial drop in the institutional population, albeit with a large funnel of doubt. The model thus supported the view that telecare development should be focused on those in the middle, rather than high frailty groups, in order to have the greatest impact on moves into care homes. The potential for social care cost savings was also highly dependent on timescale, because of the delayed impact of introducing telecare.

In July 2005, the Department of Health made available two separate – but related – telecare models to assist local authorities in designing cost-effective projects under the £80 million 2006/08 Preventative Technology Grant. These are covered in the Annex (*see* pp 19–23).

A rigorous business case for the long-term benefits of making telecare a mainstream feature of social care is complex and has to rely on many assumptions. There is also the uncertainty of how technology will evolve, and how prices will change, over 20 years. To get the true, overall picture, social care costs, NHS costs, and costs of the state benefits system all need to be included, as well as the impact on the economy of any improvement in the earnings potential of informal carers.

Research into how far, and at what cost, the housing stock can be modified to accommodate different types of assistive technology has been carried out by King's College, London and the University of Reading, with a focus on social rented housing. Telecare was only one aspect of the assistive technology that was considered, but the results concerning the feasibility of assistive technology adaptations such as stair-lifts were relevant. Not all properties can be adapted to meet the needs of residents with high level of needs; many properties, for example, cannot be made accessible for wheelchairs. There is clearly a big difference between adapting an easy-access modern bungalow for an older person and converting a multi-level flat in a converted Victorian house.

Thus, while the type of wireless telecare devices that are being used in many telecare pilots can usually be fitted to any home, the home itself may not be adaptable if someone can no longer gain access.

> *Encouraged by the many positive developments with smart home and alarm technologies, there is a danger of these being seen as separate rather than as part of a whole range of technology that can help people stay in their own homes. Yet often basic adaptations to a home and traditional assistive technology can cost far more than novel technology, which usually meets only part of an individual's needs.*
> (Lansley *et al* 2004)

Technology may be able to keep an elderly person out of a care home, but in some cases the person may have to move to new accommodation that is easier and more cost-efficient to adapt as they grow older (a not uncommon choice already, with older people swapping multi-level homes for bungalows or ground floor flats).

The acceptability of telecare to older people

Can accessible information about telecare break down some of the barriers to take-up of the technology by older people? Are there in fact any serious barriers? All too often it is suggested that older people are resistant to using new technology, or even techno-phobic. Evidence does not always bear this out. A study into the acceptability of upgraded technological community alarms asked 176 users of community alarms with an average age of 76 for their views on four potential enhancements: automatic falls detection, lifestyle monitoring, telemedicine (monitoring of vital signs including blood pressure and heart rate) and video-conferencing (Brownsell *et al* 2000). Only 11 per cent of those interviewed did not want any of the enhancements. The level of interest varied with the four different proposed technologies, but was generally high: automatic fall detection (68 per cent of those questioned were interested), lifestyle monitoring (68 per cent), telemedicine (57 per cent), and video-conferencing (46 per cent). That said, this group was a biased sample, in that they were already users of community alarms.

Improved education and experience in the workplace will also mean that the next generation of pensioners will be more techno-savvy. On a 20-year horizon, a large proportion of people reaching retirement will have interacted with IT and computer equipment in some way during their working or leisure lives. And the more widespread the technology's provision, the less it will be seen as a mark of disability. Good design will also play a role in the voluntary adoption of telecare.

If telecare is to become part of mainstream social care of older people, a much greater level of awareness among users, the wider care workforce and carers will be necessary. A small-scale study in South Yorkshire into whether automatic falls detectors reduced the fear of falling (Brownsell and Hawley 2004) found that users and providers were often unaware of the technology available and that they were rarely considered as part of the care package. And this was for a relatively simple piece of technology that would be relevant for a number of elderly people. Even the fear of falling, never mind an actual fall, can make an elderly person reluctant to leave the home, which both reduces quality of life and adds to the burden on carers. Falls and the fear of falling also contribute to avoidable care home admissions. The level of false alerts from automatic falls detectors caused some concern to users, but the trials in this study suggested that the fear of falling might be reduced for those who wore the falls detector correctly.

The invasion of privacy is an issue that looms large among some of those asked about the acceptability of telecare technology, with lifestyle monitoring being seen as too intrusive by several elderly people. One comment from a focus group (Brownsell and Hawley 2004) was typical: 'It's Big Brother is watching you, that's what it is.' There are further clear ethical questions that arise when considering the installation of monitoring equipment for people with dementia, who may not be in a position to give informed consent. Such issues

need to be debated openly. Finally, there are both practical and ethical considerations when deciding if users should be able to turn the equipment off, or whether this would represent an unacceptably high level of risk to the older person. Implicit in the latter point is the issue about older people's right to take risks, if they choose to do so.

Discussion

The majority of older people overwhelmingly express a preference for staying in their own homes if at all possible, and technology is very likely to play an increasing role in promoting such independence. However, telecare needs to be part of a 'whole systems' integrated approach, with the goal of improving quality of care rather than cutting hours of home care. Telecare is an adjunct to the system, not a substitute for care.

It is the infrastructure behind telecare that makes it viable, including the call centres and the rapid reaction units. Many different players need to be involved in activating the appropriate response. In many cases, this response will involve the same teams that are already on the ground for people with service needs, but ways of working will need to change. Implementing this on a large scale is challenging in terms of which agency will plan and commission the telecare infrastructure and services. When more advanced telecare systems are used, some re-organisation and integration of services will eventually be necessary to utilise the vast amounts of data on vital signs that it can potentially collect. There are also several legal issues that need to be resolved, covering the possibility of equipment failure or inappropriate response by the alarm centre.

The technology is relatively straightforward, and acceptance among older people is likely to come about through better information and the greater technical sophistication of the next generation of pensioners. The biggest challenges in bringing telecare into the mainstream will be creating the organisational structures for implementation, retraining staff, deciding how to apportion costs, and determining eligibility.

If there is going to be a shift of emphasis in state-funded social care towards preventive measures, as the Green Paper on adult social care proposes, then this will encourage telecare. But research already indicates that it is those with relatively low care needs for whom the provision of telecare is likely to produce the greatest cost benefits in the long term. Evidence suggests that telecare development should be focused on those in the lower and middle, rather than high, frailty groups, in order to have the greatest impact on subsequent moves into care homes. However, these are the very people whose needs fall into eligibility bands that are less likely to qualify for any state-funded social care under the individual policies of autonomous local authorities. The potential of telecare does not sit well with the current reality that most social care resources are focused on the most dependent older people.

Thus a key issue will be to decide who is offered telecare, and what level of sophistication the equipment provided should offer. Are there priority groups who should receive telecare first, such as those with diabetes or people with dementia? Should national standards be set for such decisions, or will local authorities implement their own telecare eligibility regimes? A related question will be the level of free provision and means-testing of

telecare services for older people. These issues will shape the evolution of telecare in England. Lord Warner, in his response to the Wanless Social Care Review (Warner 2006), said:

> *One area that I would like to see debated more fully is the issue of who pays for what regarding technology and equipment to keep people in their own home. For instance, I think we need to consider how funding for telecare, hearing aids and wheelchairs should work. There may be more scope here to have a partnership between individuals and the state that benefits more people. A question to be asked, I would suggest, is whether state purchasing power of some items could benefit more individuals even if they were paying for them, either in whole or in part.*

If the preventive potential of telecare is to be realised fully without greatly relaxing eligibility criteria then the market for self-funded telecare will need to be encouraged so that it is adopted at an early stage of dependency. Measures to stimulate the private market for telecare will need to include the provision of reliable information about products and services and the availability of good-quality, affordable services.

Telecare should be seen as a useful tool, and not as the answer to all social care problems. Telecare is not a panacea, and its efficacy will depend on housing and other living environment issues. There is, for instance, no point in fitting fancy heating controls to a home that has draughty windows and an unreliable boiler. And there seems little sense in installing a range of sophisticated electronic sensors in an apartment if the technology that would most encourage the older person to continue living at home is a washing machine or dishwasher.

It is difficult to judge what overall impact telecare will have on total costs. There has been a large number of relatively small pilot studies, plus the much more extensive introduction of telecare in West Lothian. Most studies have provided positive results, but there has been no consensus framework for the cost assessments, so it is difficult to model the future financial impact of telecare if implemented nationally. Nevertheless, enough lessons have been learned from the pilot studies to ensure that the emphasis should now shift to moving telecare into the mainstream. Ideally, telecare should become an automatic consideration in any care package after a needs assessment.

If the aim is to improve quality of care, then technology may not actually reduce the amount of care worker hours needed because of the demands of older people who remain in their own homes for longer. But the technology can reduce the hours spent on routine tasks, enabling workforce time to be redirected towards the tasks that are most highly valued by older people. Domiciliary care supported by telecare can in many cases be a cheaper option eventually than residential care. But the time-lag for potential savings is such that an investment to bring telecare into the mainstream might not be seen as attractive in the short term by hard-pressed social care departments.

Telecare's role in postponing and diverting older people from moving into residential care and possibly hospital will redistribute costs and benefits around the system. The costs of introducing telecare therefore need to be apportioned in line with the likely financial benefits for the various organisations including the NHS. In order to build a financial case for telecare, this calculation probably needs to include the potential reduction in NHS hospital bed days taken by older people, although in practice those beds will be switched

to provide other (possibly more costly) services to other patients. Overall, in any cost analysis it is important to make like-with-like comparisons. Often the full costs of residential care (that is, including the 'hotel' element) are compared with the personal care costs of home care. This comparison stems from an artefact of the current funding system. In other funding systems, the housing costs of care homes could be made much more distinct. After all, when someone moves into a care home, they free up the housing stock from where they moved and possibly release capital.

Advances in technology over the next 20 years will play an important role in long-term care. It would be unfortunate if short-term cost factors became the deciding factor in implementation, given the potential benefits to older people's quality of life that telecare appears to offer.

Annex. Modelling the Preventative Technology Grant

In July 2005, the Department of Health made available two separate, but related, telecare models to assist local authorities in designing suitable projects under the £80 million 2006/08 Preventative Technology Grant. The grant aims to increase by 160,000 the number of people benefiting from telecare, with a focus exclusively on older people.

The Balance of Care model illustrates, at a strategic level, the potential shift in service provision that might be feasible if telecare were introduced, and the resulting impact on the gross cost profile. The assumptions underpinning the model are based on experience of telecare project evaluations, and of surveys of care home residents and hospital inpatients (Department of Health 2005e).

Three scenarios were used: baseline (no telecare), low invest (introduction of telecare services for the more dependent older population only), and extended (wider rollout of telecare to lower dependency older people). The scenarios were applied to 'Telecare Valley', which represents an imaginary 'average' council whose population and service levels are the current England totals divided by 150 (the number of councils). The focus of the scenarios was primarily on social services although some key health service elements were also included. Thus domiciliary care, care homes, telecare equipment, and acute hospital beds were included, while geriatricians, rehabilitation assistants, community hospital beds, and day care places were not.

The service shifts assumed by the low invest scenario suggest that the following new care package profiles might be possible. The percentage changes in the balance of care (shown below) give some illustration of what an initial investment in telecare might achieve. (The scenarios in the Balance of Care model are illustrative; the intention is to provide local councils with a modelling framework into which they can map their own strategic planning scenarios based on local circumstances and data.)

Care home residents – not elderly mental health (EMH)		
Baseline –	100% in care home	
Low invest –	70% in care home	Unit cost: £18,928
	15% extra care with telecare	Unit cost: £18,983
	15% home care with telecare	Unit cost: £16,235
Care home residents – EMH		
Baseline –	100% in care home	
Low invest –	85% in care home	Unit cost: £21,320
	10% extra care with telecare	Unit cost: £19,583
	5% home care with telecare	Unit cost: £16,835
Care at home – more than 10 hours a week		
Baseline –	100% at home, no telecare	

Low invest –	50% at home, no telecare	Unit cost: £24,780
	40% at home, with telecare	Unit cost: £20,658
	10% at home, with telecare, and no hospital admissions	Unit cost: £12,258
Care at home – 5 to 10 hours a week		
Baseline –	100% at home, no telecare	
Low invest –	60% at home, no telecare	Unit cost: £5,352
	40% at home, with telecare	Unit cost: £4,678
Care at home – less than 5 hours a week		
Baseline –	100% at home, no telecare	
Low invest –	100% at home, no telecare	Unit cost: £1,730
Unsupported at home – no social care		

Source: Department of Health (2005e)
Figures generated by author from source.

The model suggests that by introducing telecare – under both the low invest and extended scenarios – there is potential for a considerable shift in the balance of care (*see* Table 1 below). The biggest impact is a decline in the number of care home places, a significant role for extra care housing, and an increase in the need for care assistants to attend to people who are no longer admitted to residential care. (Telecare equipment packages are obviously also a new feature.) The model thus illustrates how telecare may have an important role to play in enabling many more people to continue living in their own homes.

The overall impact on costs is less dramatic (*see* Table 2 opposite), although there is a significant redistribution in terms of where the costs fall (*see* Table 3, p 22) in line with the shift in service provision. The £42.47 million annual total for the low invest scenario was

TABLE 1: TOTAL SERVICE USAGE FOR TELECARE VALLEY, BY SCENARIO

Service	Annual units	Service usage		
		Baseline	Low invest	Extended
Community nurse	WTE	18	19	19
Physiotherapist	WTE	0	0	0
Care assistant	WTE	644	785	750
Occupational therapist	WTE	4	8	8
Geriatrician	WTE	0	0	0
Rehabilitation assistant	WTE	0	0	0
Care home (EMH)	Places	218	186	186
Care home (non-EMH)	Places	1,124	787	787
Acute bed	Beds	32	28	28
Community hospital bed	Beds	0	0	0
Telecare	Packages	0	865	1,570
Community psychiatric nurse	WTE	0	0	0
Night sitter	WTE	0	2	2
Extra care housing	Places	0	190	190
Day care	Places	0	0	0

Source: Department of Health 2005d
Note: EMH = elderly mental health; WTE = whole time equivalent.

only around 5 per cent cheaper than the baseline scenario, while the extended scenario was 5.5 per cent cheaper. This was despite both these figures including estimated savings on acute bed costs for some older people receiving more than 10 hours of care a week.

The model thus introduces a note of caution about claims of very large financial savings from telecare. As has been described earlier in this background paper, the cost-benefit analyses from many telecare pilot projects have suggested much bigger cost savings. As illustrated earlier in this paper, some of those pilot projects have been small, and some have not included all the relevant costs. The three scenarios in the Balance of Care model demonstrate the significance of other care costs in realising financial benefits. In particular, the levels of care assistant hours assumed in the scenarios remain high. However, these costs could be reduced substantially if telecare helped to prevent people from moving into residential care for reasons other than personal care needs (for example, concerns over risks or security that are not otherwise addressed by personal care). Financial gains from telecare are reliant on co-ordinated changes in care practices.

The scenarios in the Balance of Care model are illustrative; the intention is to provide local councils with a modelling framework into which they can map their own strategic planning scenarios based on local circumstances and data.

The Balance of Care model did not address the process of investing in telecare. Therefore, the sister Business Case Model provides a 10-year view of the potential impact in Telecare Valley of investment in telecare using the Preventative Technology Grant money in 2006–08. It thus shows only the possible effect of giving telecare to a relatively small number of people with immediate needs for telecare, and does not model a more strategic

TABLE 2: TOTAL SERVICE COSTS FOR TELECARE VALLEY, BY SCENARIO

Service	Service costs (£)		
	Baseline	Low invest	Extended
Community nurse	673,750	694,375	694,375
Physiotherapist	0	6,875	6,875
Care assistant	13,362,520	16,297,393	15,560,759
Occupational therapist	165,000	289,717	289,717
Geriatrician	0	0	0
Rehabilitation assistant	0	0	0
Care home (EMH)	4,654,867	3,956,637	3,956,637
Care home (non-EMH)	21,271,286	14,889,900	14,889,900
Acute bed	4,620,000	4,158,000	4,158,000
Community hospital bed	0	0	0
Telecare	0	674,614	1,224,514
Community psychiatric nurse	0	0	0
Night sitter	0	19,650	19,650
Extra care housing	0	1,485,146	1,485,146
Day care	0	0	0
Total	**44,747,423**	**42,472,307**	**42,285,573**

Source: Department of Health 2005d
Note: EMH = elderly mental health.

TABLE 3: TOTAL SERVICE GROUP COSTS FOR TELECARE VALLEY, BY SCENARIO

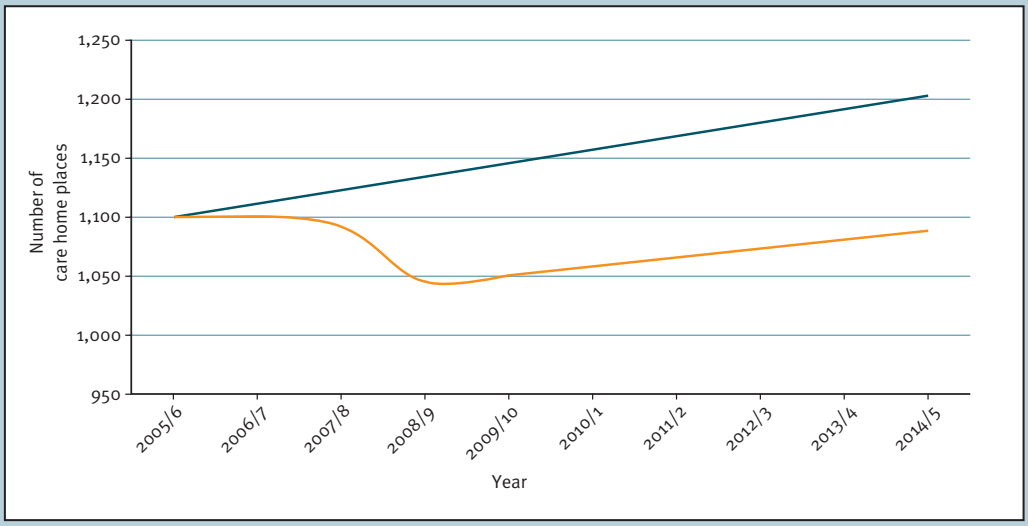
Service group	Service group costs (£)		
	Baseline	Low invest	Extended
Social care	13,527,520	18,091,906	17,355,272
Community health	673,750	701,250	701,250
Acute health	4,620,000	4,158,000	4,158,000
Telecare	0	674,614	1,224,514
Care home	25,926,153	18,846,537	18,846,537
Total	**44,747,423**	**42,472,307**	**42,285,573**

Source: Department of Health 2005d

decision to invest in telecare on a long-term basis. As with the Balance of Care model, illustrative data has been entered for Telecare Valley based on the modellers' experience of telecare. The model is able to demonstrate the evolution over 10 years of some of the service shifts, and demonstrate how initial workforce and financial costs are high and benefits can take a few years to become evident.

Telecare has the potential to delay an older person's need to move into a care home, or to avoid such a move altogether. If a person has already reached the stage of needing a care home, then it may well be too late to expect telecare to have the desired effect. So the provision of telecare is likely to be more effectively targeted at older people who can still cope at home but who are becoming more frail. Forecasts of the total requirement for care home places (for existing and new users) confirm that the decline becomes evident only after a time-lag of a few years (*see* Figure 1), when telecare recipients are able to remain in

1 **IMPACT OF TELECARE ON THE NEED FOR CARE HOME PLACES,* 2005/6 TO 2014/5**

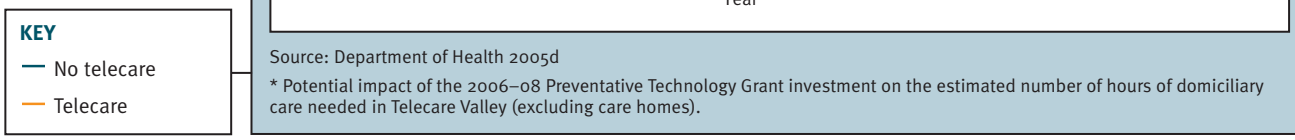


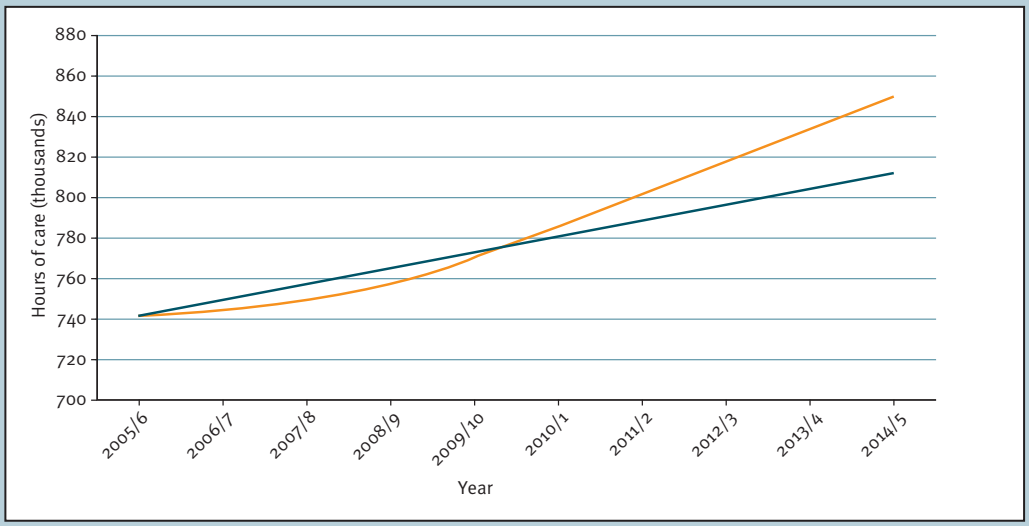
KEY
— No telecare
— Telecare

Source: Department of Health 2005d

* Potential impact of the 2006–08 Preventative Technology Grant investment on the estimated future requirement for care home places in Telecare Valley.

2 **IMPACT OF TELECARE ON THE NEED FOR DOMICILIARY CARE,* 2005/6 TO 2014/5**





Source: Department of Health 2005d

* Potential impact of the 2006–08 Preventative Technology Grant investment on the estimated number of hours of domiciliary care needed in Telecare Valley (excluding care homes).

their own homes for longer. In this model, it is the expected delay in entry to a care home that has the main impact on the total estimated requirement for care home places in future years.

With more people able to remain in their own homes longer, there is a commensurate increase in the numbers of visits and hours of home care (including both personal care and practical help) (*see* Figure 2). The introduction of telecare changes the total care package, and in the medium and long term an older person who continues to live at home rather than moving into residential care will increase the overall demand for domiciliary care. As with both these graphs, the model looked only at the impact of the telecare investment relating to the two-year Preventative Technology Grant.

The provision of telecare has an immediate impact on total staffing levels. When assessing staffing, it is not only formal carers who need to be included, but also the call centre staff and response teams on which telecare networks crucially depend. The demand for staff is particularly high at the beginning of a telecare investment project when this human infrastructure needs to be set up, the telecare equipment installed and everyone trained to use it. The two years of the grant period (2006–08) are forecast by the model to see a big increase in staffing levels and it is only later (2010–11) that the staffing benefits start to emerge. Better productivity results in more visits for the same staffing levels, and people can be managed at lower levels of dependency for longer periods of time. These sorts of productivity benefits depend on changes in working practice as well as telecare, so staffing level profiles will depend on the way each local authority decides to integrate telecare into their systems.

The initial staffing 'hump' is mirrored by the early investment cost of setting up a telecare programme. This will be particularly true for more advanced telecare networks, which need sophisticated data management systems to analyse the mass of data that is produced (particularly if vital signs monitoring is included) and structural changes in the way care is delivered.

Bibliography

Active Living Telecare Project (2005). *Active Living Telecare Project Newsletter Issue 5*. Available online at: http://www.kent.gov.uk/NR/rdonlyres/4D1073C8-7E09-442D-92D0-B3CB5C352FF2/3051/newsletterdec05.pdf (accessed on 10 April 2006).

Appleton N (2005). 'Concept before construction' in *Futurecare@home: A collection of papers for the Housing Learning & Improvement Network,* Porteus J ed. London: Department of Health. Available online at: http://www.changeagentteam.org.uk/_library/docs/Housing/Futurecare_at_home.pdf (accessed on 20 April 2006).

Audit Commission (2004). *Older People: Implementing telecare.* London: Audit Commission.

Balas E, Iakovidis I (1999). 'Distance technologies for patient monitoring'. *British Medical Journal,* vol 319, p 1309.

Barlow J, Bayer S, Castleton B, Curry R (2005). 'Meeting government objectives for telecare in moving from local implementation to mainstream services.' *Journal of Telemedicine and Telecare* 2005, vol 11, suppl 1, pp 49–51.

Barlow J, Bayer S, Curry R (2003a). *New Care Delivery Models and the Deployment of Telecare.* London: Imperial College London. Paper delivered at 3rd International Conference on the Management of Healthcare & Medical Technology, Warwick.

Barlow J, Bayer S, Curry R (2003b). 'Flexible homes, flexible care, inflexible attitudes? The role of telecare in supporting independence'. *Housing Studies*, vol 20, no 3, pp 441–56.

Bayer S, Barlow J, Curry R (2005). *Assessing the Impact of a Care Innovation: Telecare.* London: Imperial College.

Bowes A, McColgan G (2005). *Smart Technology at Home: Users' and carers' perspectives. Interim report.* Stirling: West Lothian Council and the University of Stirling.

Brownsell S, Bradley D (2003). *Assistive Technology and Telecare: Forging solutions for independent living.* Bristol: The Policy Press.

Brownsell S, Hawley M (2004). 'Fall detectors: do they work or reduce the fear of falling?' *Housing, Care and Support*, vol 7, no 1, pp 18–24.

Brownsell S, Bradley D, Bragg R, Catling P, Carlier J (2001). 'An attributable cost model for a telecare system using advanced community alarms'. *Journal of Telemedicine and Telecare*, vol 7, pp 63–72.

Brownsell S, Bradley D, Bragg R, Catlin P, Carlier J (2000). 'Do community alarm users want telecare?' *Journal of Telemedicine and Telecare,* vol 6, pp 199–204.

Curry R, Trejo-Tinoco M, Wardle D (2003). *The Use of Information and Communication Technology to Support Independent Living for Older and Disabled People*. London: Department of Health.

Department of Health (2005a). *Building Telecare in England*. London: Department of Health. Available online at: www.dh.gov.uk/assetRoot/04/11/56/44/04115644.pdf (accessed on 9 November 2005).

Department of Health (2005b). *Independence, Well-being and Choice: Our vision for the future of social care for adults in England,* Cmnd 6499. London: The Stationery Office.

Department of Health (2005c). *Research and Development Work Relating to Assistive Technology 2004–05*. London: Department of Health. Available online at: http://www.dh.gov.uk/assetRoot/04/12/18/70/04121870.pdf (accessed on 10 April 2006).

Department of Health (2005d). *Strategic Business Case: Models for telecare*. London: Department of Health. Available online at: www.dh.gov.uk/assetRoot/04/11/56/65/04115665.pdf (accessed on 9 November 2005).

Department of Health (2005e). Webpage on *Building telecare in England*. Available online at: http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4115303&chk=AZNQjz (accessed on 1 February 2006).

Durham County Council (2004). *Telecare Service Model Pilot, People at Home and in Touch. Evaluation report.* Available online at: http://www.icesdoh.org/downloads/Service-Model-Report.pdf (accessed on 10 April 2006).

House of Lords Science and Technology Committee (2005). *Ageing: Scientific aspects*. London: The Stationery Office.

Housing Learning and Improvement Network (2005). *A Virtual Care Village Model*. Available online at: http://www.changeagentteam.org.uk/_library/docs/Housing/Case_study_17.pdf (accessed on 5 April 2006).

Kelly D (2005). 'Smart support at home: The integration of telecare technology with primary and community care systems'. *British Journal of Healthcare Computing & Information Management*, vol 22, no 3.

Kent County Council (2006). Telecare webpage. Available online at: http://www.kent.gov.uk/SocialCare/health-and-wellbeing/telecare/ (accessed on 10 April 2006).

Ladyman S (2005). *Technology and Delivery of Care for Older People*. Speech to DTI: Global Watch Mission seminar. Available online at: www.dh.gov.uk/NewsHome/Speeches/SpeechesList/SpeechesArticle/fs/en?CONTENT_ID=4105328&chk=aQeR3x (accessed on 10 November 2005).

Lansley P, McCreadie C, Tinker A, Flanagan S, Goodacre K, Turner-Smith A (2004). 'Adapting the homes of older people: a case study of costs and savings'. *Building Research & Information*, vol 32, no 6, pp 468–83.

NHS Purchasing and Supply Agency (2005). *Telecare, Getting Started.* Available online at: http://www.pasa.nhs.uk/eat/telecare.stm (accessed on 9 November 2005).

Roush R, Teasdale T, Murphy J, Kirk, M (1995). 'Impact of a personal emergency response system on hospital utilisation by community residing elders'. *Southern Medical Journal,* vol 88, no 9, pp 917–22.

Warner Lord (2006). 'Future options for older people'. Presentation to conference on Wanless Social Care Review, 4 April.

Woolham J (2005). *The Effectiveness of Assistive Technology in Supporting the Independence of People with Dementia: The Safe at Home project*. London: Hawker Publications.