

Using Telecare

Exploring Technologies for Independent Living for Older People

Jeremy Porteus and Simon Brownsell

A report on the Anchor Trust/BT Telecare Research Project

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Anchor Trust
Fountain Court
Oxford Spires Business Park
Kidlington
Oxon OX5 1NZ

Tel: 01865 854000

Fax: 01865 854005

Email: cavema@anchor.org.uk

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About the Authors

Jeremy Porteus is the Corporate Strategy Manager at Anchor Trust. He has worked in housing for over fifteen years. Prior to joining Anchor in 1997, he managed the Royal National Institute for the Blind's housing service. At Anchor, Jeremy contributes to the development of housing, health and community care policies and managing research and innovative projects on preventive services and the use of new technology in the home to take these forward. For the past two years, Jeremy has project managed the Anchor telecare research project, in conjunction with BT. He also chairs the Department of Trade and Industry's Task Force on Design for Daily Living under the Foresight Programme's Ageing Population Panel.

Simon Brownsell is currently conducting his doctoral research at the University of Abertay, Dundee where he is investigating several aspects of the telematics field. He is author of a number of published research papers and has a particular interest in the development of telecare systems for older people. Based on research with community alarm users his recent work has been concentrating on developing telecare models. His research has indicated that there is a demand for telecare services by today's community alarm users and that telecare is sustainable, both financially and from a service delivery viewpoint.

Simon Brownsell gratefully acknowledges the support of his research sponsors and supervisor in enabling him to contribute to this work.

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Chapter Summaries

This report is written in three clear sections. The first section introduces the concept of telecare and places telecare in the context of recent policy changes. The second section describes the system developed by Anchor Trust and British Telecom, concluding with the results of an actual field trial. The third section suggests what implications the widespread deployment of telecare may have and suggests what various organisations and individuals must do if telecare is to be successful in the future.

Section One

Chapter 1: The role of technology

There are a number of factors driving the development of new technology as a way of supporting independence. The main factors are discussed and the present technology, community alarms, described.

Chapter 2: The policy context for the development of telecare

The government recognises that there is an increasing demand on health, care and housing providers and that telecare has the potential to help prevent, reduce, delay and/or meet part or all of these demands. Recent government policy changes influencing the debate on telecare are highlighted.

Chapter 3: Understanding the technical concepts

As in any subject matter there are technical words and concepts that if not understood, confuse and bewilder. Definitions are given for the technical concepts commonly used together with examples of community care technologies and application areas.

Section Two

Chapter 4: The Anchor Trust/BT telecare project

The project partners are described along with the goals and objectives of the two-year project. Consideration is also given to the ethical and moral issues arising from a project of this nature.

Chapter 5: The lifestyle monitoring system trial

A description is given as to what the lifestyle monitoring system (LMS) actually did and how it compared daily activity patterns with a 'normal' profile in order to raise an alert call. Details are given of the implementation procedures followed and some of the issues arising from introducing such technology.

Chapter 6: Field trial results

The expectations before the field trial commenced and the experiences of those older people involved in the field trial are presented. In addition to the end users perspective (the older person) the opinions of the people actually responding to alert calls generated by the system are also presented.

Chapter 7: Biomedical monitoring

Monitoring medical parameters such as blood pressure, heart rate etc. from the home are increasingly being investigated. The purpose is to prevent or reduce illness and enable discharge from hospital to be earlier than presently possible. Two commercially available systems were described to participants and the responses to such monitoring and related technologies presented.

Section Three

Chapter 8: Framework for customer application

The research identified a number of key issues for Registered Social Landlords (RSLs) and other providers relating to the future developments of telecare. The chapter includes learning tips for organisations seeking to install telecare systems and presents the many valuable lessons learnt in a customer focused framework.

Chapter 9: Conclusions and recommendations

The final chapter demonstrates that the initial goals and objectives of the project have been met. Thought is also given to the cost-effectiveness of such systems, concluding with key recommendations for organisations and individuals if telecare is to continue to progress and be a welcome component of service delivery in the future.

Section One

Chapter 1

The role of technology

The Anchor Trust/BT telecare project was highly innovative and sought to increase the range of support offered to older people. Through the monitoring of a person's lifestyle in the home, the project sought to provide an automated and reliable way of providing assistance whenever a significant change in lifestyle was observed, such a change being indicative of a possible health or social problem.

It should be stated early on that it is not envisaged that technology will replace human contact, although the Japanese are currently developing robots to undertake some caring and rehabilitation tasks,¹ Technology cannot equate to the support a person can provide but technology can be used very effectively to provide monitoring when a carer cannot be present. Few people would choose to have a carer following their movements to ensure their well being 24 hours a day, 7 days a week. However, it is thought that providing this level of monitoring through technology would be more acceptable to users and provides the possibility of providing a high level of support to many potential users.

Telecare has many definitions but for the purposes of this document telecare is defined as:

The remote or enhanced delivery of health and social care services to people in their own home by means of telecommunications and computer-based systems.²

Why technology is being investigated

There are a number of factors that are driving the development of new technology as a way of supporting independence.

- **Older people are increasingly using technology to aid their independence.** There is evidence to suggest that older people, and in particular community alarm users, are increasingly encountering everyday technology, for example one survey of residents in sheltered housing revealed that 44% of residents had their own video machines and 45% their own

microwave ovens.³ The same survey also showed that when discussing new and emerging technologies, 77% would welcome the automatic detection of falls and 68% would welcome lifestyle monitoring (the detection of the changes in the pattern of behaviour). Take-up of technology by older people is not related solely to chronological age, however it is true that familiarity with a technology makes it easier to learn. With this in mind the Royal Commission for Long Term Care expects future older people to be as comfortable with computer controls as the present generation is with telephones.⁴ The view that older people do not want technology and cannot use it is becoming dated. Many older people are seeking the benefits of technology and if a direct benefit can be derived from its use then there does not appear to be an obstacle in acceptance. Indeed users can actually become drivers for the new technology.

- **Support needs to be given to people where required - namely in their own homes.**

The emphasis for supporting older people (and other groups) has moved away from institutions to the community. The model for the provision of care and support is changing: no longer are people being grouped together and support provided in one location. Increasingly steps are being taken to enable people to stay in their own homes for as long as possible and moves

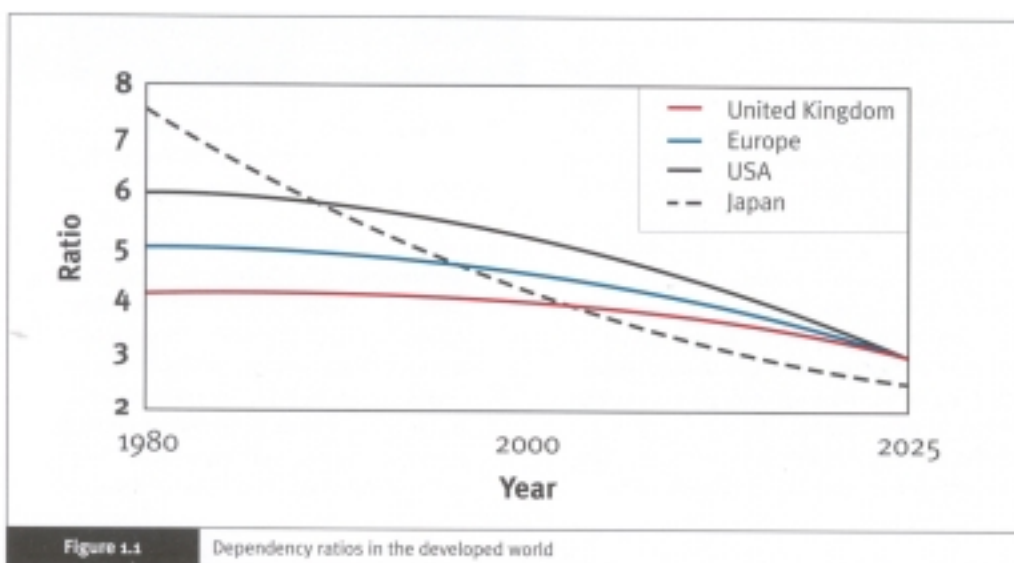
into residential and nursing care are increasingly only being used after other possibilities have been exhausted. Older people themselves are becoming more consumerist and seek choice and independence with the majority of them, around 80%, choosing to remain independent in their own homes for as long as possible.⁵ Many of those who choose to stay in their own homes foresee technology as a possible way of enabling their independence, security and well being.

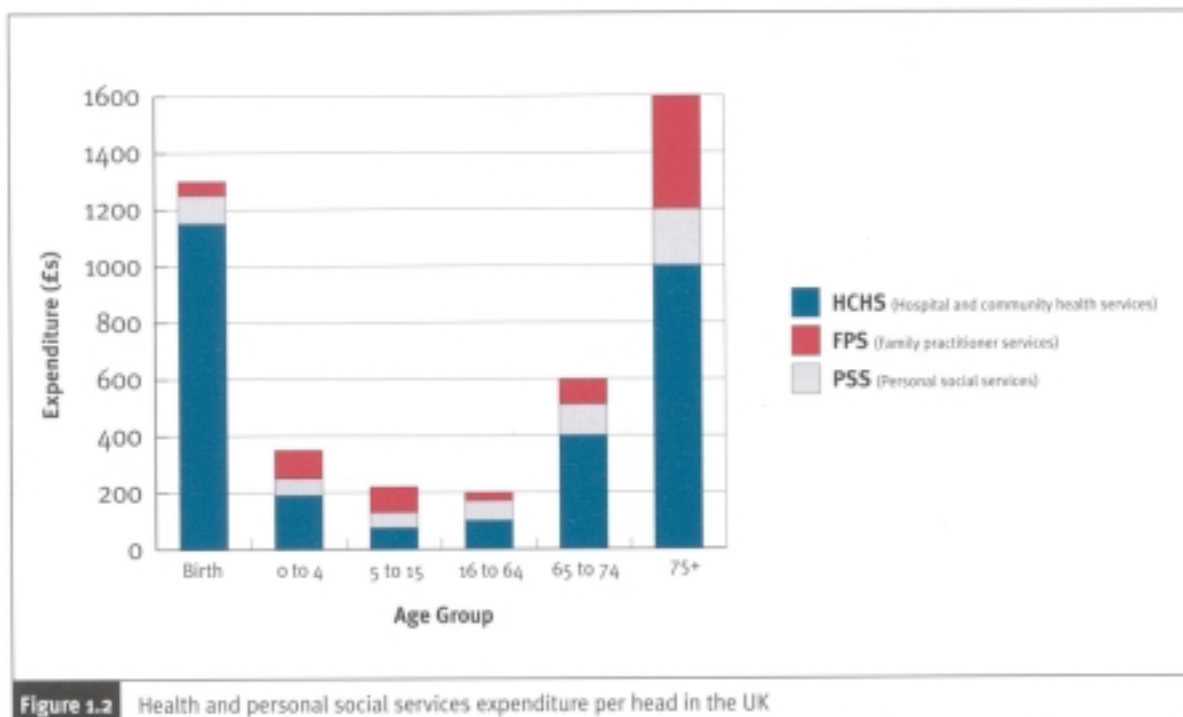
- **Technology can improve lifestyles.**

This was recognised by the aforementioned Royal Commission report. 'People constantly look to modern technology to improve their lifestyles. One of the ways in which life could improve for older people is in the harnessing of new technology in new, imaginative and profitable ways.⁴ For example through access to information, services and leisure pursuits.

- **An ageing society.**

It is well known that demographic change is resulting in an ageing society. In 1995 there were less than 9 million people aged over 65 in the UK; by 2030 there will be almost 50% more.⁶ The European Commission has predicted that between 1995 and 2025 the UK will see a 44% increase in the 60 and over age range.⁷ Whilst people are living longer than ever before, at the same time fertility rates are declining. The dependency ratio, expressed





as the ratio of the number of persons aged between 16 and 65 to those aged 65 and over, is expected to reduce from almost 4:1 in 1961 to 2:1 by 2040.⁸ This pattern is evident throughout much of the developed world and is highlighted in **Figure 1.1**.⁹ The cumulative result of this change may result in fewer people able to provide care, be that by formal or informal means, whilst simultaneously a smaller proportion of people in work will have to finance a growing number of older people.

- **Increasing healthcare costs as society ages.**

When the National Health Service began, life expectancy was around 50 years and 60% of the population was under 20.⁶ Today life expectancy is closer to 80 and soon 50% of the population will be over 50.⁶ This is a tremendous tribute to developments in medicine and to improved social conditions. However, the healthcare costs for older people are significantly higher than those of other age groups as indicated in **Figure 1.2**.⁹ By way of illustration, the proportion of 65s and over accounted for only 16% of the population in 1993, but more than half, £6.4 billion, of the annual expenditure on hospital and community health services.¹⁰

Those aged 85 and over are the heaviest consumers of all. The average per capita spending on services for this group is five

times that of the whole of the 50-64 age group¹¹ while the number of people aged 85 and over is the fastest growing cohort. In the 10 years from 1995 to 2005 there will be 400,000 more people over the age of 85.¹² It is therefore apparent that with an increase in the number of older people the healthcare costs will also increase. Through the greater use of technology it is believed that prevention can play a growing role. If potential difficulties can be observed at an earlier point then assistance can be provided and consequently we move from a reactive to a preventive system that should result in a reduction in healthcare costs per head.¹³

Technology could play an increasingly important role in the future as it provides the possibility of giving people more choice and independence. We have seen that people increasingly want to stay in their own homes and therefore care and support needs to be given in such locations. Technology could be employed to meet this requirement and increasingly older people are becoming aware of the benefits of technology. In the future they may in fact become drivers in its development. In addition, as society ages the growth in the number of older people and the related financial implications associated with this will inevitably lead to services being increasingly stretched. As indicated, technology could result in financial savings

as through its use situations could be observed and support provided earlier than at present. Therefore there is a demand for technology to be investigated, from both a user's and provider's perspective. Anchor Trust, as the leading supplier of care, support and housing services to older people in the UK, wanted to be at the forefront of any investigation.

Existing technology: its scope and limitations

Currently the technology employed to provide comfort and security to users is known as community alarms. It is estimated that there are in excess of 260 community alarm control centres in the UK¹⁴ serving a total of 1,160,000 users,¹⁵ which represents about 11% of people 65 and over.¹⁶ Community alarms are not new. They were first introduced in 1948 where residents on a sheltered housing scheme in Devon activated a bell that would sound in the warden's home. In the 1970s transportable speech systems became available.¹⁷ However, despite more recent improvements in reliability and speed of response, the basic mode of operation has not significantly changed in the last 15 years.¹⁸ In order to call for assistance users typically have a radio activated pendant which can be worn on the body or fixed pullcords

positioned throughout the home. Upon activation a control centre is contacted where the necessary support and assistance can be provided as represented in **Figure 1.3**.¹⁹

Community alarms are, and for the foreseeable future will continue to be, very successful. They provide cost-effective support to users 24 hours a day. Nevertheless there is a major limitation with the system; the user must initiate the call. Until the user activates the alarm call the warden or control centre is unaware of a problem and no assistance can be provided. There are two main reasons why a user may not activate an alarm call.

1. *They may be unable to activate the alarm.* If the user is unconscious then obviously an alarm call cannot be generated. But even if the user is in a state of consciousness they may still be unable to activate an alarm call. Both the pendant and pullcord methods suffer from limitations. The pendant has proved popular as it can be hidden under a jumper, and when worn, can summons assistance from anywhere in the dwelling. However, the portability of the pendant is also an area of concern where research has indicated that between 27%²⁰ and 40%²¹ of users 'never' or 'just occasionally' wear their pendants. If assistance is required and the pendant is not being worn then activating a call for help can be difficult if not impossible.

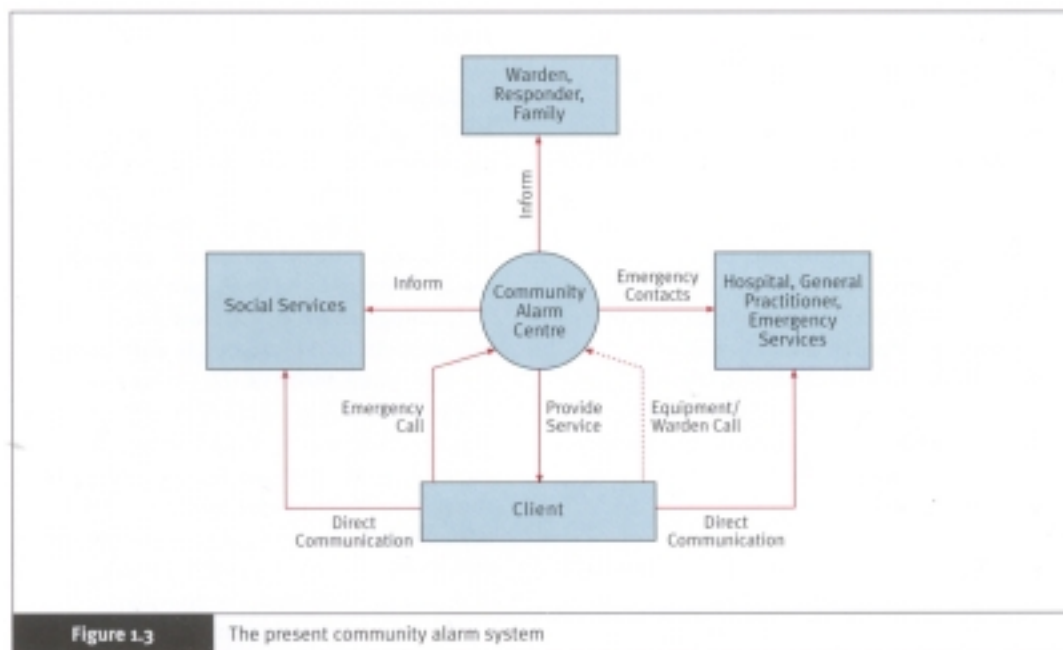


Figure 1.3 The present community alarm system

Pullcords provide a permanent location for alarm activation and thus do not suffer from the possibility of the user misplacing or not wearing their pendant. However, it is not uncommon to find users who have tied the pullcords up to the ceiling 'so they don't get in the way'. A survey of Anchor Trust tenants in 1984 discovered that 59% of tenants had at least one pullcord tied up.²² If a fall occurs in the room where a pullcord is tied up and the occupant is unable to regain their feet it may be impossible for them to raise the alarm. Even if the nearest pullcord is fully accessible the user may still have to physically move to it to raise an alarm.

2. *They may not consider themselves in need of assistance.*

Analysis of calls received at Anchor Trust's control centre, Anchorcall, reveals there are people who appear to be unsure whether or not they should have activated their alarm. There are many examples where the alarm has been activated and the caller is expecting the control centre operator to make a decision upon the appropriate cause of action. Whilst there are such people presenting themselves at the control centre, it would seem likely that there are also people who are not inclined to call for help. The present system is unable to help such people.

Community alarms are an active system, in so much as the user must take action for assistance and support to be provided. In addition to this active system it is believed that a passive system is required that can call for assistance without the need for the user to initiate the action. The limitations of the community alarm technology can then be minimised and assistance provided to people when they need it.

Conclusions

The factors highlighted are recognised by many housing and care organisations, and feature in the strategic options of many of them. For example The Housing Corporation states that 'the links between the ageing process and health and disability are well known. There are some areas where design and technological development can help older people deal with the effects of ageing.

Technological advances can contribute to the effective use and management of housing.²³

The challenge facing service providers and policy makers is to provide support when it is needed to people where they are located, namely in their homes. As more people continue to live for longer, providing support to everyone in the required amounts will prove increasingly difficult. Telecare technology could enable many people to be supported in their own homes by monitoring 24 hours a day, 7 days a week if necessary. Detecting situations as they occur will enable people to be treated before the situation worsens and consequently we move from a reactive to a preventive system that should result in a reduction in healthcare costs per head.

Summary points: Chapter 1

With over 1 million users in the UK, community alarms are, and will continue to be, very successful. However, they suffer from one major limitation in that the user must initiate the alarm call and for various reasons they may be unable or unwilling to do this.

Advanced technology is being investigated because:

- older people are increasingly using technology to aid their independence
- support and care needs to be provided to people where they require it. For the majority of people this will be in their own homes
- technology can improve the user's lifestyle and reduce costs by acting in a preventive role
- society is ageing: the percentage of people aged between 16 and 65 to those aged 65 and over is expected to reduce from 4:1 in 1961 to 2:1 by 2040. Consequently there may be difficulties in finding enough people to provide the necessary support and care
- as society ages healthcare costs will increase, especially with respect to those aged 85 and over who coincidentally are the fastest growing cohort. Technology could be used to reduce costs by acting in a preventive role.

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Chapter 2

The policy context for the development of telecare

Since the start of the Anchor Trust/BT telecare project in April 1997, there has been a significant change in government policy towards providing better-integrated service provision between health, social services and housing. The current government has sought to bring down the 'Berlin Wall' between government departments and, at a local level, statutory providers and their partners. This has seen the emergence of a number of policy proposals, to improve the mapping and assessment of need, to reform existing funding mechanisms, and to enable greater transparency and integration of service provision. These proposals will also enable users, including older people, to have more say and choice about the services delivered.

The government, through a number of initiatives outlined below, recognises that there is an increasing demand on health, care and housing providers, as it is actively seeking ways to help prevent, reduce, delay and/or meet part or all of these demands. Telecare has the potential to help prevent, reduce, delay and/or meet part or all of these demands.

Government Policies

An increasing emphasis on the greater participation of older people, the development of preventive strategies and partnerships between agencies has influenced a number of recent policy documents.

Better Government for Older People

This is a new national programme led by the Cabinet Office. The programme consists of 28 pilot projects to develop, test, monitor and evaluate integrated strategies for and with an ageing population to provide them with:

- clearer and more accessible information on their rights
- more say in the type of services they can get
- simplified access to services
- improved linkages between different agencies
- better opportunities to contribute actively in their local community.

The pilot projects are led by local authorities but involve a wide range of partnerships with central government and the voluntary and private sectors, as well as older people themselves. They cover a variety of themes from healthcare to lifelong learning, crime prevention to leisure activities. The use of telecare is not specific to the programme but there is evidence that the use of information and assisted technology is a tool that many older people are beginning to use to access information and their immediate environment. As technology develops and older people become more familiar with its use there will undoubtedly be improved communication flows and links between older people and service providers.

Preventive agenda

The preventive agenda is gaining momentum and clearer strategic plans are being made for the increasing percentage of older people in society. 1 Indeed prevention is now high on the political agenda and the government is increasingly seeking to identify preventive strategies and services for older people within national policy objectives, such as the recently published Department of Health White Paper *Saving Lives: Our Healthier Nation*².

It has been estimated that if morbidity rates can be reduced by 1% per annum, then publicly funded care costs can be reduced by 30%, or £6.3 billion, per annum by 2030.³ There is therefore a tremendous incentive to make prevention work. However, due to the tightening of eligibility criteria for community

care services, the trend has been that those older people in need of lower level services, such as home help, have seen their services cut at a time when they require a healthy and supportive home environment. With the support of a Housing Corporation Innovation and Good Practice Grant, Anchor Trust is currently undertaking a major study on the cost effectiveness of preventive strategies in a housing setting. This is expected to be published in 2000.

Within the context of health and social care, prevention has tended to be divided into three categories:⁴

- primary prevention or 'health promotion' and the prevention of disease
- secondary prevention or 'screening', being the identification and treatment of disease
- tertiary prevention, being the effective management of existing disease to limit its impact on life, or to slow down the rate of deterioration.

Depending on an individual's circumstances, telecare systems can fall into one or more of the preventive services. If telemedicine is included, where medical data is gathered remotely in a preventive way, then the delivery of health and social care to assist independent living can be regarded as a preventive package. This could enable many people to remain in their own homes, preventing the need to move on to access other costly services.

New Deal for Communities

In its report *Bringing Britain Together: A National Strategy for Neighbourhood Renewal*,⁵ the Social Exclusion Unit (SEU) identified information technology as one of the key action areas for tackling exclusion in deprived neighbourhoods. For many older people isolated in the community, information and communications technologies can improve their social activities both formally, ie with their carers and warden, and informally, ie with family and friends. Consequently, networks of contacts are vital for maintaining an older person's well being, in a social, physical and psychological sense. It must also be recognised that the development of information and communication technologies can have a negative impact. It can create

Percentage	Country
< 5	Denmark
5-9	Germany, Netherlands, UK
10-14	Belgium, France, Ireland, Luxembourg, Spain
15-19	Italy
20+	Portugal, Greece

Table 2.1 *older people Percentage of who are lonely in Europe*

further exclusion for those who choose not to, or who cannot, embrace such initiatives.

Social exclusion can be defined as loss of access to the most important life chances that a modern society offers, where those chances connect individuals to the mainstream of life in that society.⁶ In other words, the ability to participate effectively in economic, social, political and cultural life. Loneliness can result from exclusion and **Table 2.1** demonstrates that at any particular time throughout Europe there are varying proportions of older people who are feeling lonely.⁷ This is particularly important when appreciating that loneliness and isolation can lead to depression and poor health and may even result in mortality as there is some evidence suggesting a link between low levels of social contact and subsequent mortality.^{8,9}

There is a close link between tackling social exclusion and the adoption of preventive strategies. This is largely around the way future resources are likely to be allocated so that instead of providing curative services such as medicine, policing or cash benefits, there is earlier intervention to minimise the risks of social exclusion. New technology and the use of telecare services are able to assist in this process, whether in the delivery of primary care or in housing management. Furthermore, a significant factor will be the increasing opportunities for older people to use new computing and digital technologies to access information from the Internet, set the parameters for monitoring their lifestyles or control their immediate home environment.

Supporting People

In December 1998, the government published a new consultation document¹⁰ that proposes widespread changes to the funding of local

services to vulnerable people from April 2003, with a transitional period based on current spending levels of approximately £800m in the interim. It considers that the present funding streams are complicated, uncoordinated and overlapping.

The document proposes the bringing together of Housing Benefit paid for supported housing, including sheltered housing, and certain other funding streams (Housing Corporation Supported Housing Management Grant, Home Office Probation Accommodation Grant and DETR funding for Home Improvement Agencies) into a single 'corporate' pot. This will be distributed to local authorities to plan, commission and fund support services at a local level on the basis of individual need. The government's stated aim is 'to enable more flexible responses to the individual needs and housing preferences of vulnerable people'. It recognises the important interrelationship of housing and support, but wants to ensure that provision can be made in a broad range of accommodation settings. This would make it easier to respond to changes in individuals' support needs without requiring them to move. Moreover, by giving housing, social services and probation services a joint role in applying the resources, the government's proposals aim to provide an integrated strategy by promoting joint decision-making at the local level.

In the light of the above, it is highly likely that this will have an affect on the funding mechanism of telecare, both under the transitional arrangements from 2000 and in the longer term. At present, community alarm charges are regarded as an eligible cost for Housing Benefit purposes and are likely to remain so under the transitional arrangements. However, the case for the revenue funding of a telecare service under these arrangements, even if linked to a community alarm service, still needs to be made. Similarly, subject to eligibility criteria yet to be determined and the scope and financial threshold of a personal telecare service, the proposed future funding system requires clarification as to whether the costs of telecare, especially if delivered through an integrated housing, care and support service, will be met. This will be strengthened if telecare can demonstrate that it meets the

government's objectives, notably prevention, and can demonstrate that it is cost-effective. Clarification is therefore required from the relevant government departments (Department of the Environment, Transport and the Regions/Department of Health and Department of Social Security) and local government associations on whether telecare will be built into the scope of eligible support services under Supporting People. This will influence providers' future investment decisions.

Sheltered Housing

While sheltered housing is a key component of meeting the housing and care needs of older people, it must be remembered that it only consists of a small proportion of the accommodation older people occupy. Approximately 90% of older people live in ordinary accommodation either owned by themselves or rented, whilst only 5% live in sheltered housing with a resident warden and 5% live in some form of institutional care.¹¹ The Audit Commission's recent report on the role of housing in community care¹² suggests that (local authority) sheltered housing is failing to provide an effective alternative to either residential or nursing care, or 'staying put' in one's own home. It points to the lack of clarity of vision on the future role of predominantly local authority sheltered housing, a vision that should focus on prevention and enabling vulnerable people to remain in their own home with appropriate levels of care and support.

Assistive technologies, whether to monitor the lifestyle and well being of an individual, and thereby aid in the delivery of personal care services, or to assist personal mobility and functionality, will inevitably have a crucial role to play in reshaping sheltered housing. Sheltered housing could therefore become a more flexible provision able to adapt to the changing care needs of its users. In order to achieve this flexible provision existing sheltered housing and support networks need to be remodelled incorporating the new technology.

Conclusions

Over recent years there has been a significant change in government policy towards providing better-integrated service provision between health, social services and housing. Policy statements have been made to enable more people to be supported in the community and greater emphasis has been given to prevention. Particular reference has been made to reduce morbidity and loneliness levels, and telecare could have an important role to play in meeting these proposals. However, there is uncertainty over the funding of telecare systems but it would appear funding could be met, especially if delivered through an integrated housing, care and support service. The policy statements highlighted suggest that the government recognises the important role technology could play in the future.

Summary points: Chapter 2

Recent policy developments have influenced the debate on telecare and assistive technologies:

- Better Government for Older People - a central theme is to provide an ageing population with better services and more information. Technology, and in particular the Internet is well suited to such tasks
- New Deal for Communities: Social Exclusion and New Technology - the new Social Exclusion Unit has been established to improve government action to reduce social exclusion and technology could play a significant role through the Internet and teleconferencing
- Supporting People - the proposed reform of housing benefit with the separation of housing and care/support emphasises a shift to supporting people in the community according to their needs
- sheltered housing - The Audit Commission's recent report pointed to a lack of clarity of the vision for the future of sheltered housing. Assistive technologies have a crucial role to play in reshaping sheltered housing.

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Chapter 3

Understanding the technical concepts

In the areas of telecare and telemedicine there has been considerable financial investment over recent years in Europe and the UK, some details of which are provided in **Appendix 1**. Telecare encompasses many terms and concepts that could be investigated which have an impact on older people and service provision and thus would merit further investigation. Work carried out within the European Commission's (EC) Technology Initiative for Disabled and Elderly People (TIDE) programme perhaps gives the most comprehensive picture of community care technologies and the application areas are summarised in **Table 3.1**.¹²

However, the focus of this document is on telecare as it is thought this has the greatest potential to assist the people Anchor Trust serves. Definitions of telecare, related themes, and the development of new generations of telecare services are provided below.

Telemedicine

'Tele' derives from the Greek word for 'far' and, as the name suggests, telemedicine

involves linking together medical practitioners with each other or linking medical practitioners with patients. As such the geographical location of the two or more parties is irrelevant. For the purposes of this document telemedicine is defined as the practise of medical care using interactive audio-visual and data communications. This includes medical care delivery, diagnosis, consultation and treatment, as well as education and the transfer of medical data.³

Telecare

Telecare is a similar concept to telemedicine and at the beginning of this document we defined telecare as the remote or enhanced delivery of health and social care services to people in their own home by means of telecommunications and computer-based systems.⁴

Because telecare and telemedicine are similar concepts which both seek to deliver healthcare services at different locations using Information and Communications Technologies (ICTs), the two phrases are

Technology area	Applications
Supporting life at home	Smart house Multimedia environmental control Systems to support cognitively impaired people Assistive devices Aids for daily living 'Design for all' products
Remote care and services	Alarms/security Monitoring systems Telemedicine
Mobility and transport	Navigation systems within large buildings Accessibility information systems Advanced wheelchairs Road transport informatics
Control and manipulation	Compensatory devices Assessment tools
Restoration and enhancement of function	Optimised hearing instruments Portable communication equipment Rehabilitation systems Fitness devices
Interpersonal communication	Voice Text Video
Alternative media	Text interpretation Electronic newspapers Television text captions and audio description Multimedia translation systems Alternative interfaces
Access from a distance	Information access Teleshopping Telework Distance learning Entertainment and leisure
Table 3.1	Key areas of research and development in community care technologies

sometimes used interchangeably. The difference between them is that when one of the locations is the patient's home or other non-institutional setting this is referred to as telecare.⁵ Evidently when developing technology and services for older people in their own homes we are developing a telecare service.

Assistive Technology

This is an umbrella term for any device or system that allows an individual to perform a task they would otherwise be unable to do or increases the ease and safety with which the task can be performed.⁶ Examples vary from the technically simple, for example a walking stick, to complex technical aids such as

intelligent wheelchairs or electronic height-adjustable sink and kitchen units.

Smart home technologies, intelligent houses or domotics

This is the integration of services and technologies, applied to houses and apartments, with the purpose of automating and obtaining an increase in safety, security, comfort, communication and technical management.⁷ The emphasis of the Smart home is to assist the user in activities in their own homes,⁸ Recent demonstration sites by the Joseph Rowntree Trust⁹ and Edinvar Housing Association¹⁰ have indicated potential benefits. Keyless doorlocks, door and window opening mechanisms, intelligent

Service Group	Examples include			
Building - based on monitoring the performance of the building	Heating and energy efficiency	Gas/water supply	External and internal lighting	Fire alarm
Security - based on the safety and security of residents	Doors and window opening/closing/locking	Selective access control	Personal alarms	Intruder alarms
Home control - operated by the individual to facilitate independent living	Doors and window opening/closing	Opening/closing curtains	Turning on and off lights	Using equipment
Telecommunication - provide access to information and communication services	Information on recreation and local services	Library services	Shopping services	Meals services

Table 3.2 Examples of the range of services offered by Smart homes

bathroom controls and video entryphones are just some of the devices used. The Integer company also pioneers new technology systems alongside more efficient construction methods and green energy-saving techniques. The company estimates that its new homes, including some Smart home management, would cost around 15% more to build than traditional homes. Over 30 landlord organisations are sponsoring Integer, including The Housing Corporation.¹¹ The range of services offered by Smart homes is vast and some examples are given in **Table 3.2**.

Generations of telecare

It has been proposed that the community care technology available, and what is likely to appear in the future, falls into three distinct generations of development.¹²

1st generation systems

Community alarms are the technology currently in use today and have been referred to as a 1st generation system. Technically simple, they have proved themselves to be both reliable and welcomed by users. As previously indicated, despite their widespread use they suffer from a major limitation. The user must initiate the call for assistance, which they may be unable or unwilling to do. Such systems have no embedded intelligence and are solely reliant on the user activating a call for help.

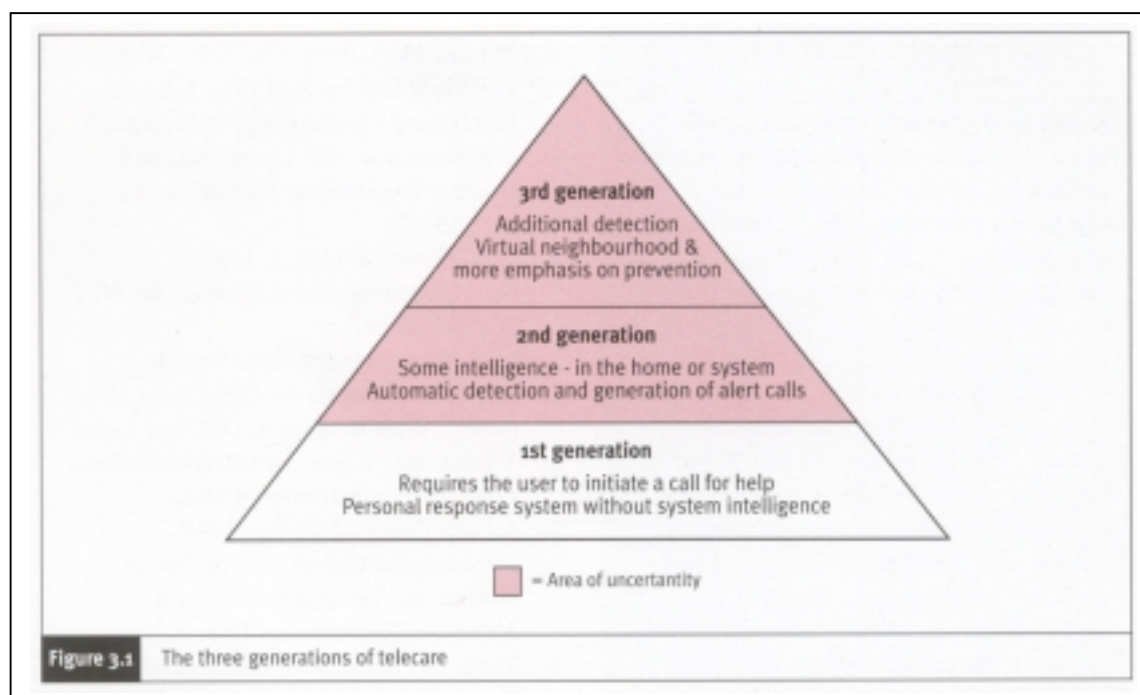
2nd generation systems

Despite the limitations of 1st generation systems it must be acknowledged that they are and will continue to be very successful, enabling support to be provided when the user requests it. Second generation systems may have all of the features of the 1st generation system but will provide some level of local intelligence in the home or dispersed in the system. For example, sensors might be positioned both on the user, or in the home, which can effectively detect alert situations and instigate a call for assistance if required. Second generation systems therefore move into pro-active systems that can generate alert calls if the user is unable to do so. The goal of the Anchor Trust /BT project was to develop such a 2nd generation system in order to address the limitations of the preceding system. This is outlined in Chapter 4.

3rd generation systems

Third generation systems are currently the ultimate goal of the technologists. They may encompass the detection parameters of the previous systems and indeed add additional detection capabilities, but they will also contribute to an improvement in the quality of the users life by using tele-services. The kinds of services that could be delivered remotely are numerous but could consist of:

- banking
- shopping



- interactive exercise
- medical diagnosis
- integration with other people
 - teleconferencing.

The 3rd generation system focuses around the widespread use of telecommunications and introduces the concept of virtual neighbourhoods.¹³ Here, irrespective of geographical location, people and organisations can be linked together and the social network of an individual extended to anyone connected to the system. Services can then be delivered directly into the home and greater efforts made to reduce loneliness and isolation.

The three generations of telecare are represented in **Figure 3.1**. It is important to note that both 2nd and 3rd generation systems are not commercially available at present and thus they represent an area of uncertainty. Community alarms have proved successful, but the implications of increasing the technology in people's homes to the levels prescribed by the 3rd generation system, in particular, need to be understood. Increasing the role of technology may provide more choice to users and aid independence but issues concerning the acceptability and intrusion of such systems need to be addressed, as does the implications for service delivery. It is not enough for the technology

simply to gather and transmit data from the home; the data must be interpreted, and sufficient services must be available to respond to the results obtained.

Conclusions

Community care technologies cover many areas of research and development, all of which have the potential to assist older people. However, by concentrating solely on telecare it is hoped more of the people Anchor Trust serves can be assisted and given the greater choice and independence the use of technology suggests.

The evaluation of the three generations of telecare provides a useful insight into potential developments in the future. Currently we are in between the 1st and 2nd generation systems and the implications on service delivery and the associated acceptance levels of the introduction of such technologies is not clearly understood. The preceding chapters have indicated that technology and telecare in particular merits further investigation and it is hoped by investigating 2nd generation systems Anchor Trust and other providers can learn whether or not technical advances are merited in the delivery of services to older people.

Summary points: Chapter 3

Of all the community care technologies that could be investigated, telecare appears to offer the greatest rewards to both users and service providers alike. Smart homes also show significant potential but considerable research has already taken place in this field.

The 1st generation telecare systems (community alarms) in use today are used by over 1 million people in the UK but have no system intelligence within them and only work after the user instigates a call for help. The 2nd generation system described incorporates a degree of intelligence so that alert situations can be automatically recognised and assistance provided without the user having to explicitly raise an alarm. Such 2nd generation systems are not commercially available and it is at this level that Anchor/BT sought to investigate the use of telecare systems.

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Section Two

Chapter 4

The Anchor Trust/BT telecare project

Over recent years, throughout Europe and the UK, technology and community alarm equipment has developed but it is still not possible to purchase a second generation telecare system. The majority of research and projects have tended to concentrate on specific key areas and, while very important, the benefits that could be offered to many people, and in particular community alarm users, has perhaps not been given the attention deserved. While the potential of new technologies to assist older people to live independently is acknowledged, there remains little convincing evidence about the way these systems impact upon the everyday lives of users.¹ It is also important that technological solutions are not 'technology driven' but are based on an understanding of the needs, requirements and preferences of potential users. It is against this backdrop that Anchor Trust felt it could make a valuable contribution to the field and more

importantly aid in the development of services for the older people it serves.

The project started in April 1997 with finance provided by British Telecom (BT) and The Housing Corporation via an Innovation and Good Practice Grant. The primary aim of the project was to:

Harness the application of new technology in a non intrusive way to service the needs and wishes of older or vulnerable people, central to which is that of maintaining independence and choice.

The stated objectives of the project were fivefold:

1. Develop and implement new technology to find out if such technology can reliably and automatically call for assistance if the user is unable to activate an alarm call themselves.

2. Test and evaluate the benefits/disadvantages of new technology in supporting older or vulnerable people in their own homes.
3. Explore, consider and assess the issues connected to or resulting from its use with older people themselves. In particular to investigate how intrusive such technologies are and whether or not users want them.
4. Explore the formal and informal networks of carers who support older people, so that services of this kind can meet the needs and wishes of both users and carers.
5. Investigate the hypothesis that greater use of technology can enable older people to stay in their own homes for longer in a cost-effective manner.

Project partners

In order to achieve the objectives of the project it was necessary to form a consortium. This consisted of the following organisations:

- **Anchor Trust**
Anchor Trust is the leading supplier of care, support and housing services to older people in the UK. With an extensive customer base in many forms of housing type and tenure it was uniquely placed to offer a wide range of trial sites.
- **British Telecom**
BT is the leading supplier of telecommunications products and services in the UK. Its technical abilities and history of developments in telemedicine and related fields could provide the technical requirements for such an innovative project.
- Other partners have also provided time, materials, equipment, expertise or resources and their contributions are gratefully acknowledged. They include:
 - Andover Controls
 - Initial Shorrocks Controls
 - Knowsley MBC
 - Nottingham City Council

Phases of the project

The project sought to investigate three distinct phases:

Phase 1 - Lifestyle monitoring.

Phase 2 - Biomedical monitoring.

Phase 3 - Information services.

Phase 1

This phase of the project concentrated on developing a lifestyle monitoring system. The purpose of this initial phase was to develop, implement and evaluate a system that could monitor the lifestyles of people in their own homes and look for deviations from a 'normal' pattern of behaviour. If these deviations were such that they could indicate that the user required assistance then an alert would be generated. If a situation needed investigating then a system was required that could provide the relevant information to the appropriate organisation. When the system had been implemented and trialed, the participants would be examined so as to understand their perception of the system and the possible merits of developing a system for the wider public. In total, an initial 20 residents were to be supplied with the system developed, increasing to 60 after any initial problems had been eliminated.

In order to achieve Phase 1, there was a requirement to investigate available and possible technology that could be used in the trial. As with any innovative project, understanding what the users and providers actually require was a key consideration, as was investigating what technology is available and what would be possible. It should be noted that at the commencement of this project no-one was fully aware of what users actually wanted from an advanced system and understanding what the system should do and how to achieve this was a key element of the initial phase.

Phase 2

Various trials have taken place with telemedicine throughout much of the world,² The purpose of Phase 2 was to build upon the initial phase and investigate the potential of telemedicine in respect to older people. Through the use of a series of biomedical sensors the potential for detecting illness at an earlier stage than presently possible was to be investigated. Examples of the parameters to

be investigated include heart rate, blood flow, blood oxygen levels, blood pressure, body temperature and blood glucose levels.

It was decided early on that this project would not investigate the potential for the implantation of sensors, where sensors are placed under the skin, but would rather concentrate on the user either wearing a bracelet-like device or using a stand-alone piece of equipment at prescribed intervals. Although implanted sensors have been developed at the Oak Ridge National Laboratory in Tennessee for example³, this trial was more interested in what the users views were towards medical monitoring and the feasibility of using results in the prevention of ill health.

Phase 3

By using voice messaging and/or the Internet the provision of information and entertainment would be investigated. The purpose of this phase of the project was to investigate how useful such technologies were to older people, what benefits they could derive from them and how easily they could use the technology. Access would be either by telephone to recorded messages (selected by pressing keys on the telephone in response to voice prompts) or by aid of a simple World Wide Web (WWW) browser such as the BT Easy Terminal. This facilitates WWW navigation using a teletext remote control. As an additional element to the Internet through the use of an intra-home network, sensors in the home could be controlled remotely. This would give either the user or their carer the capability to control the home environment, perhaps by being able to open or close doors remotely, turn lights on and off or use electrical appliances. The potential benefits were to be investigated with particular reference to the ability to respond to emergencies, perhaps by turning an appliance or the water off.

In addition to this, video conferencing or teleconferencing was to be included. Here people can both see and speak to one another remotely through information and communication technologies. The purpose was to discover if such systems could be used in reducing feelings of isolation and loneliness.

Implementation

Phase 1 was successfully completed and is described fully in Chapters 5 and 6. Phase 2 was also investigated and is described in Chapter 7. Phase 3 was the final phase of the project and was to be introduced after the initial phases. However, it became apparent that others were conducting similar research and therefore Phase 3 was not implemented. In particular SeniorWeb, which is based in Holland (<http://www.seniorweb.nl/gb/framez.html>) has very similar goals to Phase 3 of this project. Its stated objective as an independent organisation is to draw attention to what Information and Communication Technology (ICT) can offer to older people and those interested in what they are involved in. Twenty-five Internet cafes are to be opened across Holland in residential homes, with the first two being located in Eindhoven and Meppel. In a similar fashion to Phase 3 of the Anchor Trust project, researchers intend to conduct surveys to determine what influence the Internet has on the independence and well being of residents. The results are yet to be published but details of their current activities can be found at the web site address above.

Ethical Issues

There are clearly a number of ethical and moral issues that arise with a project of this nature. In order to progress in a sensitive and responsible way discussions were held with parties from Anchor Trust's staff, older people outside of Anchor Trust, the technologists, and representatives from social services and health organisations. Most importantly, however, focus groups were held with those older people involved in the trial. Throughout the project it was made clear that the participants' involvement was voluntary and at any time they could remove themselves from the project. The ethical issues arising from monitoring people through the use of technology include:

- avoiding the dangers of the use of technical jargon, whilst not assuming that older people do not wish to embrace new technology
- accepting that there is a gradual decline of activity in the home with increasing frailty,

and that we are not attempting to measure this decline in itself

- being sensitive to the roles of spouses, carers, neighbours and others in relation to the users
- respect of the privacy and dignity of individuals, and minimising personal intrusion both in the introducing and maintaining of equipment and the actual use of data gathered from the monitoring system
- enhancing a sense of safety for individuals, but accepting that there is a risk attached if this increases dependency. Users could become dependant on the system and consider themselves not at risk if the system does not call for assistance. This is particularly relevant with telemedicine where users may not seek medical attention because the technology does not deem that their condition requires it.

When the technologists discuss and demonstrate new technology to service providers and older people the important issue of intrusion almost inevitably arises. Fisk⁴ has argued that intelligent systems can be acceptable provided that some basic issues are addressed.

Attitude to technology - clients must not regard new hardware as an outward sign of dependency on external aids, ie a badge of disability.

Promotion and marketing - it is important that the positive aspects of new devices become the focus rather than the negative associations of fear, anxiety, falls, illness etc.

Aesthetic design - reducing the visibility of the equipment to the point where it blends into the background.

Client empowerment - ensuring that control over the transmission of data out of the home rests at the hands of the client.

Automatic operation - limiting the need for the client to interact with the equipment so that it appears less intrusive.

Throughout the project efforts have been made to try and minimise intrusion, although due to the very nature of a developmental project, this has at times proved difficult. For

example, early on in the project, after consultation and agreement with residents, repeated access to properties was required to install and reposition sensors in the home.

Summary points: Chapter 4

In collaboration with BT and other manufacturers, Anchor Trust set out to contribute to the development of telecare systems and to investigate this technology in respect to older people and service provision. The project's primary aim was to:

Harness the application of new technology in a non intrusive way to service the needs and wishes of older or vulnerable people, central to which is that of maintaining independence and choice.

The project had 3 clear phases, of which phases 1 and 2 have been implemented.

Phase 1 - lifestyle monitoring - monitoring patterns of movement in the home.

Phase 2 - biomedical monitoring - monitoring health parameters.

Phase 3 - information services - providing access to additional information sources.

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Chapter 5

The Lifestyle Monitoring System trial

If technology is to be used more in supporting people living independently there is a need to develop a system which overcomes the need for the user to instigate the call for assistance. In addition, both the current community alarm pendants and pullcords are limited with up to 40% of people not wearing their pendant, and users possibly unable to reach a pullcord when they require assistance. The purpose of the LMS (Lifestyle Monitoring System) was to assist users by the automatic activation of alert calls so that if support was required and the user had not already activated their community alarm, assistance would still be provided. The LMS was designed to work in parallel with the existing community alarm system but provide a backup when the existing system could not provide the support required. With people not wearing their pendants and the difficulties of reaching a pullcord one of the constraints

on the LMS was to enable the automatic detection of problems that did not require the user to wear a device.

The Lifestyle Monitoring System (LMS)

The home environment

With input from Anchor Trust, BT has developed a system that is capable of monitoring people's movements and looking for deviations from a 'normal' pattern of behaviour that may indicate a potential problem. In order to achieve this without the need for the user to physically wear a device sensors are required in each room. Several components are used to monitor a user's activity but the key component required in

each room is a passive infrared (PIR) movement detector. This technology used commonly with burglar alarms and security lights was familiar to participants and thus many did not consider the technology to be intrusive. It should be noted that a PIR only detects movement, it does not provide a picture or information about what a person is actually doing and at this stage it was felt this would be the least intrusive method of acquiring the required information. As well as PIRs, magnetic proximity switches were placed on the refrigerator and entry doors therefore allowing the system to monitor the occupancy within the home.

In addition to monitoring patterns of behaviour the LMS also sought to reduce the risks of hypothermia. In 1996/7 there were 4,800 excess winter deaths including 356 deaths from hypothermia amongst those aged 65 and over in England and Wales.¹ A temperature sensor was therefore placed in the main living area so that if the room temperature became unadvisedly low, leading to a risk of hypothermia, advice could be given.

The final piece of equipment in the user's home is a control box which receives data from all of the sensors in the home, stores the data locally and transmits the data through the telephone network for subsequent analysis. Throughout the project the data was sent to the BT laboratories in Martlesham Heath. The PIR's control box and fridge sensors used in the trial can be seen in **Figures 5.1, 5.2, and 5.3**. The LMS is capable of being installed in any dwelling type but for the purposes of demonstration a typical sheltered housing installation is shown in **Figure 5.4**².

For the majority of participants, in order to minimise disruption, wireless communication technologies were employed, enabling the sensors to be located throughout the home without the need for additional wiring or redecoration after installation. Obviously for new build the infrastructure and cabling can be incorporated into the shell of the building without any future disruption to the occupant(s).

In order to maintain user confidentiality each participant could turn off the system by dialling a designated telephone number. This is an important issue as the technology should

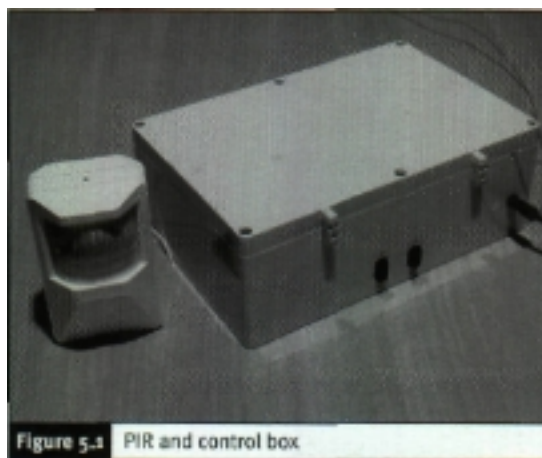
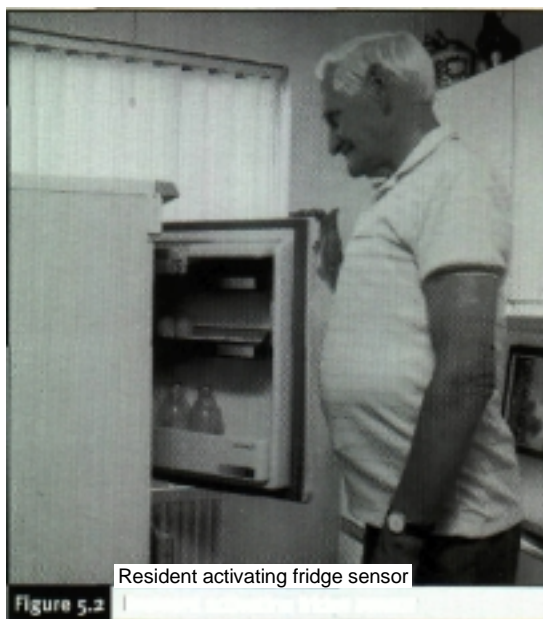


Figure 5.1 PIR and control box

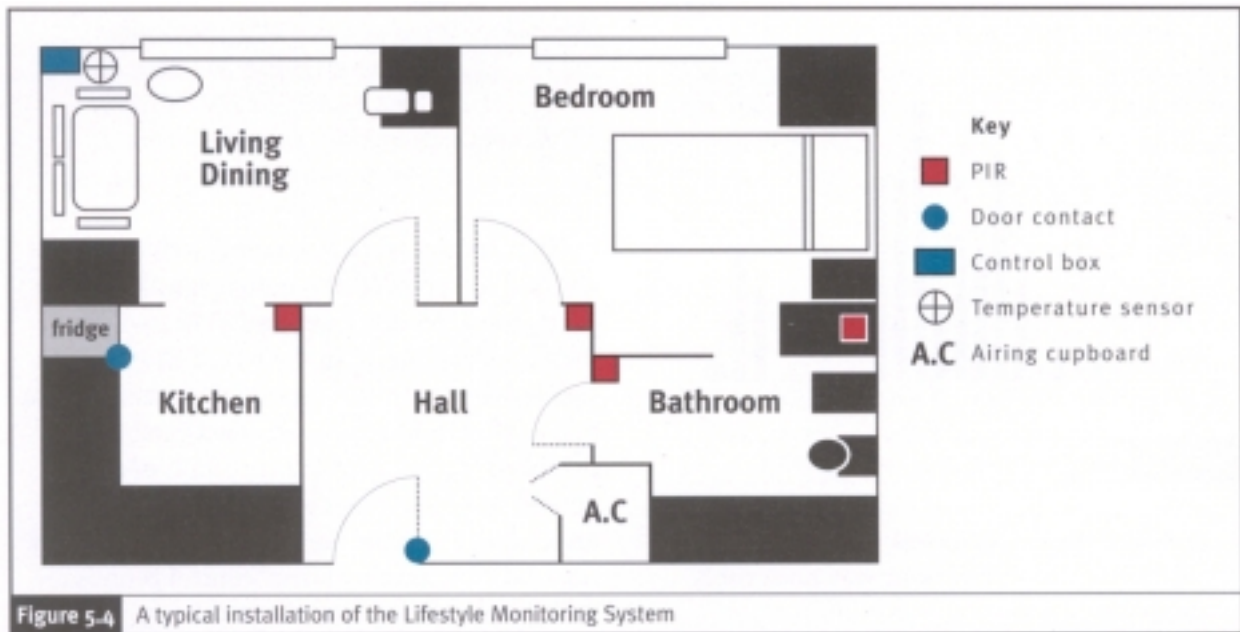


Resident activating fridge sensor

Figure 5.2



Figure 5.3 Fridge sensor



never impose living constraints on the user. Control of the system must always be in the hands of the person the technology is trying to help.

Data collection

Upon a sensor being activated this data is time stamped and stored at the control box until retrieved by the BT computer. Throughout the trial no processing was carried out in the participants home, instead all of the data was sent to the BT laboratories for processing. As such, three ways of transmitting the data were investigated.

- Transmit on event: when a sensor is activated the data is sent immediately to the BT computer. Effectively this is a continuous data stream and is demanding in terms of communications. However, it does allow the data to be processed with minimum delay.
- Call-out periodically: in this case the control box must store all of the data generated in a specific time period or event sequence and periodically transmit the data. The constraint imposed by this method is that the BT computer must be capable of processing this data when received, else blockages could result.
- Call-in periodically: the BT computer decides when it needs the data from the users home and will act to retrieve the data automatically. This method alleviates the potential blockage problems encountered by the call-out periodically method.

Throughout the field trials the 'call-in periodically' method was employed as this provided the most controlled way of gaining access to the data gathered in people's homes. Throughout the field trials a number of options for data collection were investigated and this ultimately resulted in an additional telephone line being installed solely for the control box, with data being retrieved at 30 minute intervals.

Data analysis

Over a relatively short period of time data gathered from a participant's home could be used to generate a 'normal' profile of their lifestyle. For example, many of the participants would both go to bed and get up at regular times. Likewise, the times that people went into the kitchen and used the refrigerator did not deviate significantly from one week to the next. Once a 'normal' profile has been generated, new data is compared to this profile to look for deviations. In a simplified state, this is depicted in **Figure 5.5**. Evidently from 15:00 hours activity would be expected, however in this example no activity is detected until 20:00. Between 15:00 and 20:00 an alert call would be generated as the activity profile is not comparable to the 'normal' profile. The exact time of the alert call depends on the level of sensitivity required.

In the trial, the following alert situations were searched for:

- the person was still in bed after the time that movement would normally be detected

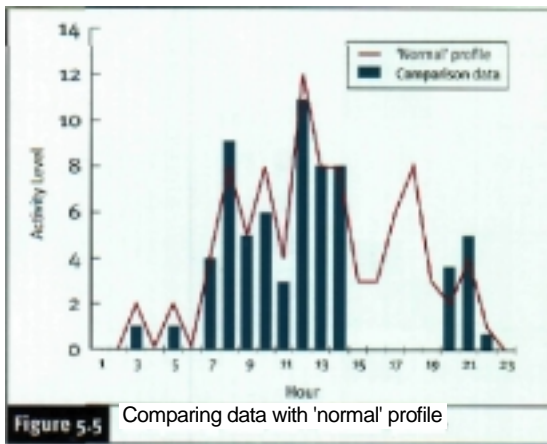


Figure 5.5 Comparing data with 'normal' profile

- less activity was detected than usual
- the use of the refrigerator was noticeably different
- the room temperature was too low
- a change in the pattern of movements within the dwelling.

Alert call

If a deviation exists between the received data and the 'normal' profile which is outside of the allowable parameters then an alert call would be generated. Providing an accurate description of the situation to the most appropriate person is equally as important as detecting the alert condition. Throughout the trial automated telephone messages were sent with information regarding the nature of the alert to people on the participants list. As the project was a trial, participants were encouraged to be the first point of contact. Therefore, if the call did not require attention, services would not be unnecessarily sent to their aid. The message system was developed by BT³ and upon a participant receiving a telephone alert call they would be provided with a description of the situation and asked to respond. For example:

"Hello. This is a care system call for Mr Jones. No activity has been detected in your home recently. If you are well and do not require assistance, press 1 or if you need help from your carer press 2."

If '1' was pressed on the participants telephone the call would be ended. If however '2' was pressed or the call was not answered then a nominated carer would be contacted with a message such as:

"Hello, This is a care system call for Mrs Smith. Mr Jones has not been active

since 4.30pm on the 20th November. The telephone number for Mr Jones is 01234 567890, that is 01234 567890. To take responsibility for the call press 1, to pass the call to another carer press 2."

This process would continue until all of the nominated carers on the participants list had been contacted or a carer had indicated that they could respond. In the trial if all of the carers were unable to respond no assistance was provided. Obviously this is unacceptable in practice because upon the detection of a possible problem there is a 'duty of care' to respond to this information and someone must respond. Community alarm control centres are well positioned to act either as the first port of call or as a default if no carer can respond. It should be noted that the project did not set out to create a finished, polished project, but rather to learn the issues that must be addressed if successful products are to be brought to market. This is one area that must be resolved before products of this nature are used more widely.

Overall system architecture

The elements described above constitute the full Lifestyle Monitoring System and this is represented in **Figure 5.6**.

Methodology

The trial was independently evaluated by Dr Andrew Sixsmith of the Institute of Human Ageing at Liverpool University. This evaluation aimed to provide key information on a range of issues such as quality of life outcomes and the ability to remain independent. A multi-method approach was utilised involving both qualitative and quantitative research in order to gain the maximum insight.

The evaluation was conducted in two phases.

Preliminary phase - this was performed prior to installation of the LMS in order to gain an appreciation of participants' expectations and comprised of workshops and focus groups.

Core phase - This investigated the LMS trial and the attitudes of participants after experiencing the system and comprised of

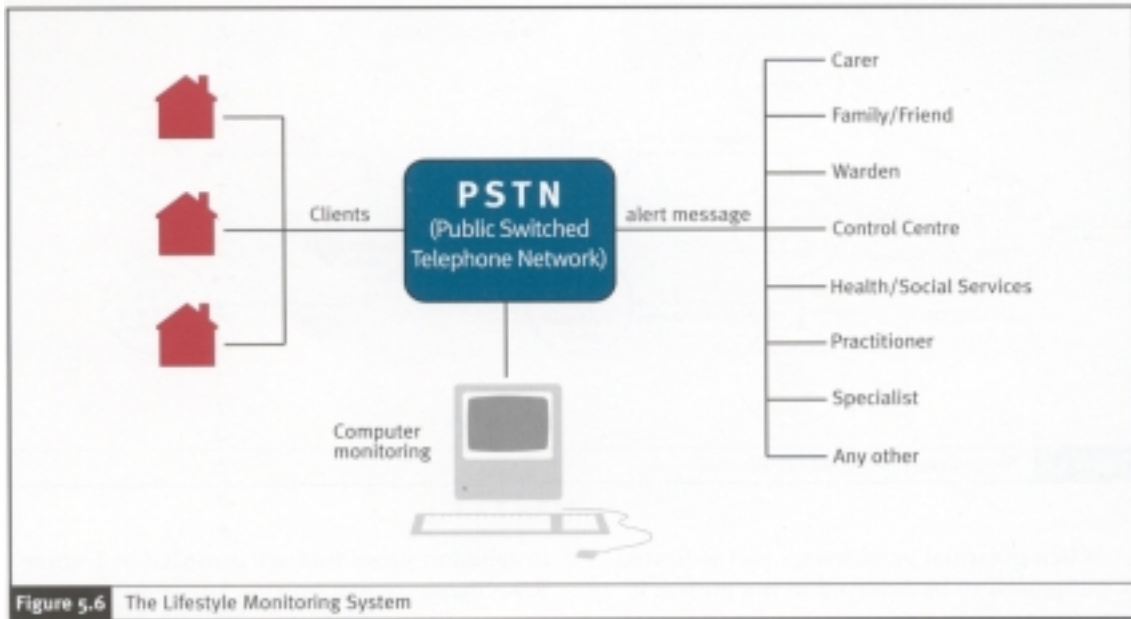


Figure 5.6 The Lifestyle Monitoring System

questionnaires with older people and carers, and follow up interviews.

- supplying and maintaining equipment
- installing the system
- operating the system.

Implementation of the trial

In the development and implementation of the LMS Anchor Trust had responsibility for:

- providing access to a range of older people living in different settings
- providing experience in housing, management, care and support activities
- technical and management support for the project
- organising the field trial.

BT had responsibility for:

- developing the hardware and software components of the system to be implemented

The overall structure of the project was clearly defined; Anchor Trust would work with users to understand the requirements of the Lifestyle Monitoring Systems and then work with BT to develop the system. When the system was ready for field trials Anchor Trust had responsibility for meeting and explaining the system to potential participants and agreeing on which participants to include in the trial. In consultation with participants BT would then install the necessary equipment and monitor its performance. An overview of the project structure is expressed in **Figure 5.7**. Issues for RSLs and other providers arising from this are discussed further in Chapter 8.

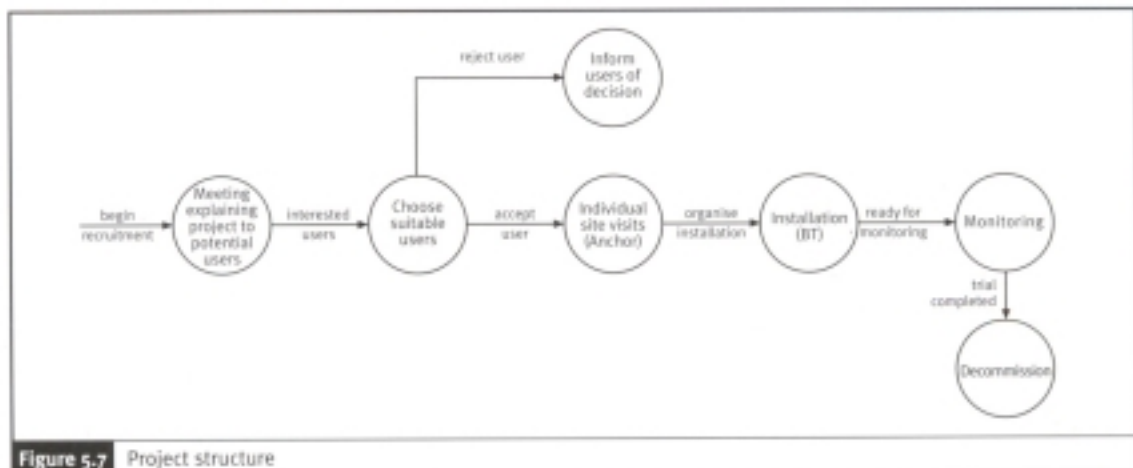


Figure 5.7 Project structure

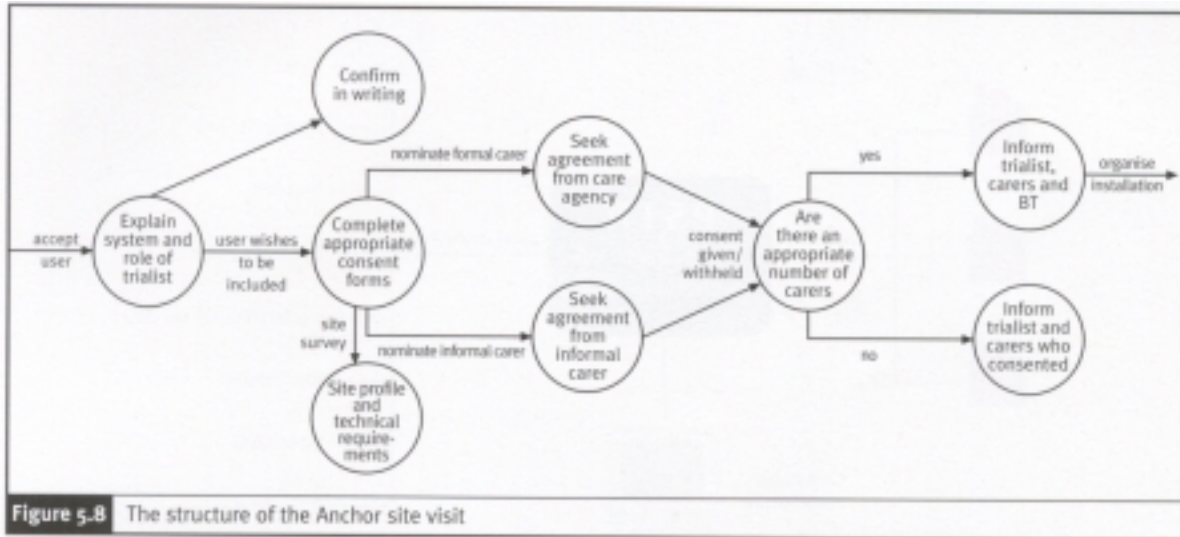


Figure 5.8 The structure of the Anchor site visit

When potential participants had indicated a willingness to be involved in the project it was important to carry out one-to-one discussions to ensure that they were aware of exactly what the project entailed and what their role would be. If after these discussions they wanted to be included in the trial then consent forms were signed and a technical evaluation of the site carried out. The purpose of this was to indicate the kinds and number of sensors required at the installation stage. It was also necessary to obtain details of carers, both formal and informal, who may be prepared to be contacted if the LMS detected situations that required further investigation. These carers were then informed about the trial and their details confirmed if they wished to be involved. Following consent from participants and their carers, BT would then organise an appropriate time for installation and commencement of the field trial. The process used is developed in **Figure 5.8**. Further implementation issues are highlighted in Chapter 8.

Following agreement from all parties, the next step was to install the equipment. BT had responsibility for this and details of the

installation procedure are provided in **Figure 5.9**. Chapter 8 will provide advice for organisations seeking to install telecare systems.

Implementation issues

The project was highly innovative bringing technology and a system to trial that had never before been tested. Consequently there were inevitably complications that needed to be addressed throughout the project and field trial.

Control box

Some of the technology supplied by the community alarm manufacturers was limited by the number of additional sensors that could be connected to them. When trialing the equipment it was evident that the limited number of sensors was a stumbling block and consequently it was not possible to generate a realistic picture of the participant's lifestyle. In order for the community alarm equipment to be enhanced sufficiently, considerable development costs would have to be incurred

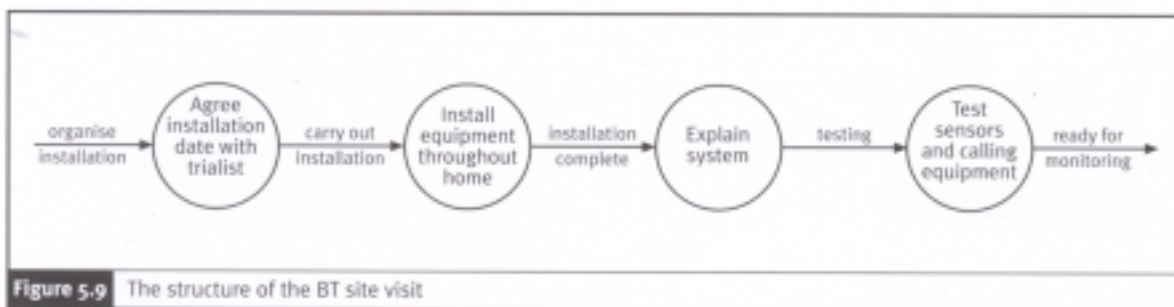


Figure 5.9 The structure of the BT site visit

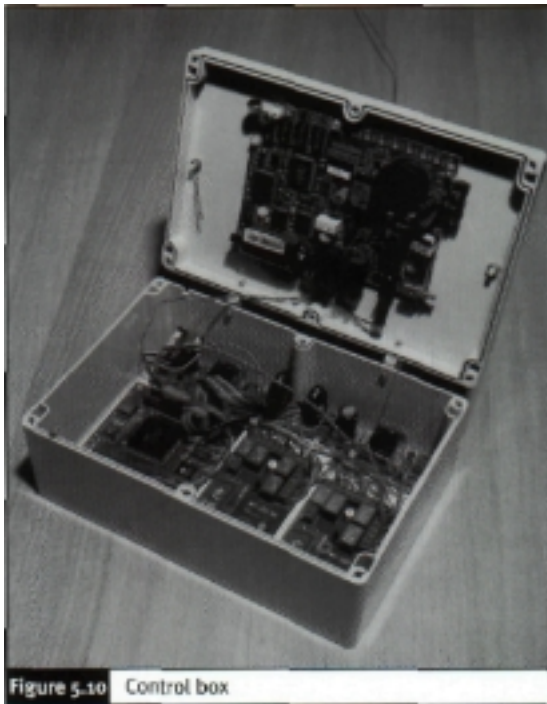


Figure 5.10 Control box

and therefore BT developed their own control box which had a similar function to the dispersed alarm, but had greater capacity. The 'box' developed and used in this trial was a prototype and is further highlighted in **Figure 5.10**. Future developments would result in the miniaturisation of the 'box' and the 'box' itself would become more appealing to the eye. Because during the trial time data was retrieved at 30-minute intervals it was felt necessary to add an additional telephone line to each dwelling, solely for the control box. It was also necessary to replace some participant's telephones as a 'tone' telephone was required to respond to the automatically generated messages.

Generating the user profile

Although people do tend to follow daily routines that indicate a 'normal' pattern of behaviour there was considerably more deviation than originally expected. For example, if a special event was on the television, perhaps late at night or at a time when the person might normally have an afternoon lie down, the pattern of behaviour would deviate from the 'normal' but this would not constitute the need to call for assistance. Finding the balance between detecting what is a deviation from the normal requiring an alert call and what does not was particularly difficult to solve. Over time, as more data was received on lifestyle patterns, this became easier to detect.

PIR conflicts

The positioning of the PIRs is particularly important as it is possible for two or more PIRs to be active at the same time. For example, depending on where an individual is in the dwelling and the locations of the PIRs, movements could be detected simultaneously by several PIRs. This is depicted in **Figure 5.11** where because of the locations of the PIRs in the bedroom and the hall, movements within the conflict zone will be recognised both by the bedroom and hall PIR. It is therefore necessary to develop practices and procedures that remove this conflict, either by the careful sitings of sensors or intelligent decision-making software. It was also discovered that when leaving windows open the wind could

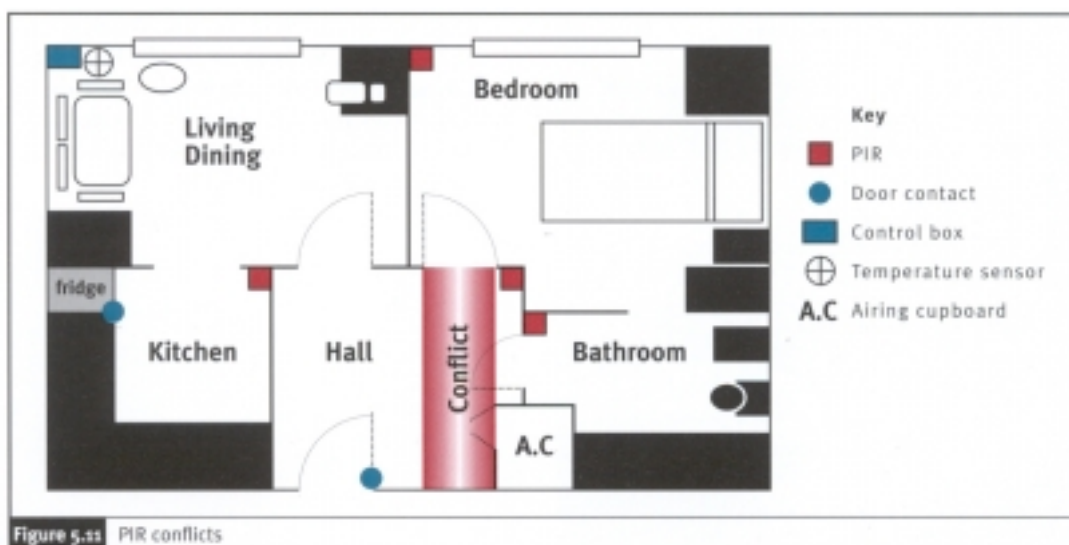


Figure 5.11 PIR conflicts

blow curtains or blinds and provide an additional conflict.

Recruitment of participants

Four sites were chosen to trial the LSM and there were therefore a limited number of people that could be used in the trial. Despite meetings being held on the purpose of the project and the role participants would play there were some difficulties in recruiting volunteers. It would appear that there were several reasons for this.

- Many prospective participants found it difficult to visualise the LSM system.
- People did not want to be used as 'guinea pigs' and would rather wait for the system to be developed and then participate in a trial. This project sought to develop and trial the system with the same people and there was some discomfort with this approach.
- The length of time needed to involve people. Although detailed information was provided to partner agencies, residents and wardens, and meetings held discussing the project it would appear that at times the project moved too fast for some. Finding the balance between development speed and the engagement of everyone is critical.
- While some prospective volunteers were willing to participate because it would "benefit future generations of older people", some informal carers, such as neighbours and relatives/family were unable to commit themselves.

Summary points: Chapter 5

The Lifestyle Monitoring System removes the constraint of the user having to wear a device and can generate alert calls without the user having to activate their alarm. It therefore moves from a 1st to a 2nd generation telecare system. Throughout the project Anchor Trust had responsibility for:

- providing access to a range of older people living in different settings
- providing experience in housing, management, care and support activities
- technical and management support for the project
- organising the field trial.

BT had responsibility for:

- developing the hardware and software components of the system to be implemented
- supplying and maintaining equipment
- installing the system
- operating the system.

With such an innovative project there were inevitably complications that had to be resolved. The practical complications were:

- recruitment of participants - there was some difficulty in recruiting people to trial the equipment.

While the technical complications were:

- control box - ensuring sufficient capacity for additional sensors
- generating the user profile - developing the algorithms to analyse the data gathered
- PIR conflict - the reliability of the LMS critically depends on the positioning of sensors.

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3. <http://innovate.bt.com/showcase/laureate>.

Chapter 6

Field trial results

In total 22 older people trialed the Lifestyle Monitoring System. While this number appears small, this is one of the largest social action telecare research projects conducted in England. The individuals involved in the trial were quite diverse, in order to test the system in a number of different circumstances. For example, the age of participants ranged from early 60s to over 85 with most, more than 80%, aged between 75 and 84. The locations of participants also differed as indicated by **Figure 6.1**.

There were an equal number of male and females and the majority of participants indicated they had some health difficulties. Eight suggested they had significant health problems and nine reported they had some minor health problems. In terms of the level

of assistance given to participants in the trial, eight people received home help services though 14 indicated that they needed help at least some of the time. Evidently the participants represented a broad spectrum of users which it was felt would effectively test the system in a number of circumstances.

Participant expectations before implementation

Evidence from the workshops and focus groups revealed that potential users thought the LMS was a system capable of providing assistance to a whole range of people. In particular it was thought that the system was particularly suitable for people:

Location/Participant	Newcastle	Ipswich	Nottingham	Knowsley
Anchor Trust resident	8	5	-	-
Local authority resident	-	-	-	5
Other eg owner occupier	-	-	4	-
Total	8	5	4	5

Figure 6.1 Participants by geographical location

- suffering from dementia
- who were inactive or had disabilities
- who may damage or hurt themselves ie were more prone to falls and accidents
- suffering from illness
- in the community in their own properties. One of the comments made was 'There are a lot of people living on their own now in their own property and they would be very vulnerable and would really benefit from something like this.'

The benefits of the proposed system revealed high expectations, in particular older people thought that the LMS would help them and other older people by:

- reducing anxiety, not just for them but also for their family
- enabling people to stay in their own home/avoid residential care
- helping to shorten the length of time in hospital
- providing a safety level for people who do not want to spend money on heating - referring to the temperature monitoring.

There were, however, some reservations. A few people thought that they might find the system intrusive, with a potential loss of privacy and the feeling of being watched. Also, some were concerned about what would happen at the end of the trial if the system proved very successful. For example, one person commented that if successful the system could be installed in everyone's house and if so who would pay for it.

There was also concern raised about the levels of technology being introduced and some people felt that the ultimate aim of the system was to remove the need for personal care and/or wardens. This was perceived as a bad thing and there was concern that technology could replace people. A further fear was that the aim of the project was to reduce costs and this could reduce care levels rather than investigating how new technology could enhance the delivery of care and support.

Field trial

At the end of the field trial more than 5,000 days of data had been gathered from 22

participants and 60 alert calls had been generated. When an unusual pattern of behaviour was detected an alert call would be generated in one of two different categories:

- an unusual pattern of behaviour is detected but the user does not require assistance
- the user's unusual pattern of behaviour is the result of an emergency and assistance is required.

The difficulty in recognising the difference between these two alert call categories is best illustrated by an example. Consider the situation where a person gets up during the night, say 3am, makes a cup of tea and sits in the lounge watching television for several hours. These actions can be detected but interpreting this data can be very difficult. The same data could represent two very different situations.

Scenario 1

The individual concerned could not sleep, so got up, had a cup of tea and watched television. After finishing their cup of tea they fell asleep on the sofa. As such, this unusual activity should be recognised by the system but, at this stage, there is no need to generate an alert call.

Scenario 2

The individual concerned had felt ill during most of the day, but during the night the situation worsened. By 3am the individual concerned felt they needed to call the doctor, but before doing so they thought they would have a cup of tea and see if that improved the situation. After sitting down in the lounge with their cup of tea a dizzy spell came over them and it would be some time before they could recover and raise the alarm. In this situation an alert call should be generated and assistance provided at the earliest possible opportunity.

Throughout the trial the alert calls fell into the first category. Unusual activity was detected but this was not considered as constituting an emergency where action was needed. This is not surprising because if assistance were to be needed by the people involved in the trial, in most situations they could use the telephone or their community alarm. Such methods of raising an alarm would in general be quicker than the Lifestyle

Monitoring System as the individual can make the decision and raise the alarm before the LMS can accurately analyse the actions and realise that it needs to take action on the users behalf. This does not mean that the LMS has no purpose, rather that the intent of the system is to act as a back up to conventional technologies when they are unable to assist.

In the trial two participants fell and the LMS had not raised an alert call. This was because in both cases the people who had fallen used their community alarms immediately, thus the LMS had insufficient time to recognise the problem. However, importantly, the results of the trial indicate that in these circumstances if the user had been unable to generate the alert call then the LMS would have detected this situation, contacted a carer and, as a consequence, the user would not have been left lying on the floor indefinitely.

Participant experiences

A successful system

Many service providers are aware of the benefits of enhancing the technology offered to older people but until users can have practical experience of these technologies no-one can fully appreciate both the benefits and limitations. At the end of the field trial evidence from qualitative and quantitative measures indicate that older people believe the system to be advantageous. Some of the views expressed by residents are provided below.

'I am quite impressed by the way it works. I think it is a very good idea... I would recommend it to anybody living on their own.'

'The push button system (community alarm) is excellent. I fell in the bathroom and I pushed the button on the pendant to Manchester Anchorcall headquarters. They got an ambulance to me within 15 minutes. It was very efficient I thought. But some people won't wear them. The AnchorBT system is not so immediate, but it is infallible, because the person

doesn't have to do anything... The thing I like is the certainty, never mind the button or warden. You would be certain to be picked up if there was anything wrong'

In terms of qualitative research, at the end of the trial 86% thought new technology was a good thing, while the remainder were unsure. It should be noted that no-one thought that new technology was a bad thing. Evidently the trial enthused those involved in it and satisfaction levels were high with 80% either very or fairly satisfied with the LMS. Consequently, participants thought the system was important with 46% deeming the LMS as either essential or very important as shown in **Table 6.2**.

	How important is the lifestyle monitoring system to you?
Essential	32%
Very important	14%
Fairly important	23%
No view	27%
Not important	4%

Table 6.2 Participants' satisfaction with the LMS

This is an important result that demonstrates that lifestyle monitoring should be available not only to those in assessed need, but to those who feel vulnerable. Removing fear is an essential foundation to enabling people to remain in their own homes, stimulating independence and assisting in preventive measures affecting well being.

As previously expressed, although it was a trial participants had high expectations of the system and there were some negative views, but these commonly centred around alerts that participants felt were not necessary. However, despite some residents being unhappy with the sensitivity of the system the majority, around 76%, thought the sensitivity was 'just right'. Some comments received were:

'It phoned up when I fell asleep on the settee, 4.30 to 5.00p.m. I don't usually go to sleep at that time of day. I think it

is a bit oversensitive. It doesn't bother me much... it's better than the button, if I fall over and can't reach the button, I would be lying there.'

'The lady near me had so many false calls. The warden was called and had to travel in at odd hours of the night... The lady felt that she was getting the blame for that, for all the false calls, that she was to blame for causing the alarms.'

Participants in the trial were asked if they thought the LMS was an improvement on the community alarm system. This is a difficult question to answer as the two systems are really complementary. Community alarms only work if the user activates them whilst the LMS works if the community alarm is not activated. Nevertheless, 67% thought that the LMS was an improvement with 28% preferring a community alarm, primarily because of the immediate response.

Confidence in the system

If more technology is to be used in the future to assist older people then the systems employed must be effective and users must have confidence in them. The system was developed and trialed on the same people but despite some people experiencing alerts they felt were unnecessary, there was still a very high confidence level in the system. Indeed, 58% felt the system made them feel more secure in their homes and only 11 % felt that the system provided no added feelings of security.

'It makes me feel safer. I am 90 and you never know when you are going to go. In the past I have had to use a pendant. I had a fall and once I went to bed and couldn 't get up in the morning.'

It was recognised that in such circumstances the LMS would generate an alert call and assistance would be called for them. **Table 6.3** indicates through various questions the confidence participants had in the system was consistently high.

The LMS has proved that monitoring of this nature is possible and that participants had a high degree of confidence in the system. Approximately 70% thought that if they needed help then the system would detect this and they would be given the assistance they required. As a consequence the LMS gave people more confidence. This is an important benefit because if people lose confidence then it may result in restricted activity and be a significant factor in the person moving to a less independent, more supervised environment, such as a residential home.¹ Obviously any developments that can help reduce the possibility of this will be welcomed by all.

Another key purpose of this system was to help users stay living at home.

'I wouldn't like sheltered accommodation. I am independent. I wouldn't like one of those homes. I do all my own cooking. I am independent. This (Anchor Trust/BT system) helps me to stay at home.'

In addition to enabling people to stay at home it was also recognised that the system could enable people to be discharged from hospital earlier than at present, for example one participant remarked:

'I had to go into hospital recently and I didn't like it very much. I think the system could help me to spend more time at home. The system is a good thing for me'

	I feel help will arrive if something happens	I feel more confident	It helps me stay living at home
Strongly agree	59%	47%	41%
Agree slightly	12%	7%	6%
Not sure	12%	13%	18%
Disagree slightly	12%	13%	18%
Strongly disagree	6%	20%	18%

Table 6.3 Participants' confidence in the system

	I feel I am being watched all the time	My home is less private now	It is intrusive
Strongly agree	6%	12%	-
Agree slightly	12%	12%	13%
Not sure	6%	12%	-
Disagree slightly	17%	17%	31%
Strongly disagree	59%	47%	56%

Table 6.4 How participants' felt about intrusion

As previously discussed the emphasis for supporting older people (and other groups) has moved away from institutions to the community and this is one of the reasons why technology is being investigated. **Table 6.3** shows that when participants were specifically asked if the LMS helped them to stay in their home, 47% indicated they thought it did. It should be remembered that the LMS was a trial system and not a finished product and that it is only an element of a 2nd generation system. If biomedical monitoring and information sources (Phases 2 and 3) were included a significantly higher figure would be anticipated.

Intrusion

Before the trial began potential users expressed concern that they may find the system and technology intrusive. However, by the end of the trial it would appear that these fears were not evident. Fisk² has stated that if clear benefits can be derived from the technology then intrusion can be reduced. It would appear that this has happened in this situation as indicated by **Table 6.4**.

When asked, is this intrusive? Only 13% of participants thought it was, and these only slightly, with 87% stating that the system was not intrusive to them. Unmistakably there is clear evidence that the system was not intrusive. Even so there were some people who thought the system was intrusive and this stems from alert calls they thought were unnecessary. By way of illustration one participant said 'I have had quite a few calls. The last ones were a nuisance. There's no privacy.' While this was a minority view the system was obviously intrusive to this person and if the system is to be beneficial to everyone the level of intrusion must be acceptable to almost every user. This target

can be met by agreeing on which alert situations should guarantee a call.

Who benefits?

As discussed, it would appear that the main benefactors of the system were the participants in the trial since 72% thought the system provided added security and 46% deemed the LMS as either essential or very important. Before the field trial commenced it was thought people living alone in the community would benefit the most from this system and after the trial this was still the case with 62% indicating that they believed the main benefactors would be such people. However 24% indicated all older people would benefit. Therefore, 86% of those involved in the trial thought that older people would benefit from the system. With the success of the trial and the benefits derived from its use there is strong evidence to suggest that such a system should be made available to many more users.

It is known that with the growing number of older people, services will increasingly be stretched to meet the required need. When community services are lacking this increases the stress on informal care givers and makes it more likely that an older individual, dependent on care, will end up in residential care.³ Evidence from the trial is that there is a reduction in anxiety, both for the older person and for the family and social networks. Therefore, not only will the system provide assistance when needed but it also reduces stress and may help enable people to stay in their own homes away from residential care. **Table 6.5** presents the evidence for this.

In addition to the results of the qualitative research, participants were aware of the comfort the system afforded.

The system gives peace of mind to my family		Does the system help the families of older people	
Strongly agree	56%	Yes, definitely	55%
Agree slightly	19%	Yes, possibly	20%
Not sure	6%	Not sure	10%
Disagree slightly	19%	Possibly not	10%
Strongly disagree	-	Definitely not	5%

Table 6.5 How the Lifestyle Monitoring System helps families

'It is a wonderful idea. I live on my own. My family is in Yorkshire. The feeling of security and peace of mind it gives you is wonderful. The system went off when I was out of the house at the resource centre. They phoned my niece first, but her boyfriend didn't know what to do, so then they phoned my son. He phoned the warden to check if anything was wrong and she said I was at the resource centre. It gave me a sense that they are on the ball and so quick in getting to you. It gives you a wonderful feeling of being secure. Oh my son was very pleased. He was absolutely thrilled that it picked it up.'

Carers' experiences

Older people's experiences of the system were very favourable and if such systems are to be used widely it is important that carers also receive a benefit. Generating an appropriate alert call is an improvement on the present community alarm but it is the response to this alert that is of more significance to the user. Carers are major stakeholders in this and similar systems as it is they who respond and actually provide the necessary care and support. For the purposes of this analysis 'carer' refers to anyone giving care, be that by formal or informal means, for example a social services contact, friend or family member. In total, over 20 carers were involved in the project of which 14 participated in follow-up questions.

From above, one of the benefits from the older person's perspective is that the system can reduce the anxiety of family members and

it would appear that carers would agree with this and many of the other themes expressed by participants.

A successful system

Carers were even more receptive to new technology than the older people with 93% believing that new technology was a good thing. This is an important result. As previously discussed, one of the fears of both users and carers was that technology would be used as a tool to replace wardens and provide cheaper services to people. It appears that these carers acknowledged that technology could be used to monitor people and draw their attention to difficulties earlier than presently possible, while, most importantly, recognising that the purpose of the technology is not to replace them or minimise their role.

Carers were asked how important the system was to them and similar results were obtained to those provided by the older people involved in the trial. Only 7% of carers deemed the LMS to be essential, but 36% thought it to be very important. Similar figures were obtained from the participants with 46% viewing the system as either essential or very important. However, while 23% of older people thought the system was fairly important, 50% of carers were of this opinion. Thus 93% of carers gave positive responses, further demonstrating the success of the trial and indicating that there is a demand for lifestyle monitoring.

There were more than 60 alert calls in the course of the trial and the majority of residents thought that the system sensitivity was at an optimum level, yet it is the carers

who must respond to alert calls and thus their requirements may be different. There was some evidence to suggest that the system was too sensitive with 18% of carers conveying this feeling, but the majority, 73%, indicated that the sensitivity was 'just right'. Since similar responses were obtained from both carers and participants it would appear that for approximately 75% of all participants, the system could effectively generate alert calls. However, for 25% the system was thought too sensitive. With such a diverse range of people involved in the trial these figures are encouraging but the system needs to be developed further so that all users and carers are content with the sensitivity of the monitoring.

Overall carers were very satisfied with the system, as expressed in **Table 6.6**, and when asked if the LMS was better than a community alarm, 64% believed that the LMS was in fact more effective. As already indicated, community alarms and the lifestyle monitoring system are really complementary systems and harnessing the benefits of both systems would seem to provide users and carers with the kind of system they are seeking.

	Overall, how Satisfied are you With the system?
Very satisfied	50%
Fairly satisfied	36%
Not very satisfied	7%
No View	7%

Table 6.6 Carer satisfaction with the LMS

Who benefits

In a similar fashion to older people, most carers - 64% - also thought that those benefiting the most from the LMS would be people living on their own. The remaining 36% thought all older people would benefit. Carers were asked to nominate the group of people who would benefit the most from the LMS, add a group of their own or indicate that no-one would derive a benefit from it. It is particularly interesting that 100% chose older people and this would suggest that the carers believed the system had a very real positive benefit.

In terms of benefiting families and carers and the reduction in anxiety that may result, positive results were again obtained. Everyone commented that the system helped families and carers with 64% indicating that this was definitely the case and 36% saying they thought that this would possibly be the result.

Summary points: Chapter 6

The evaluation of the Lifestyle Monitoring System highlighted a number of actual and potential benefits, which make a strong case for the implementation of lifestyle monitoring and similar technologies within the range of community care services available to older people. Generally the feedback from users was positive:

- 80% were either very or fairly satisfied with the lifestyle monitoring system
- 70% thought that if they needed help the lifestyle monitoring system would detect this and automatically call for help
- the system aids independence with one user commenting 'I wouldn't like sheltered accommodation. I am independent. I wouldn't like one of those homes. I do all my own cooking. I am independent. This (Anchor Trust/BT system) helps me to stay at home.'
- in addition to aiding independence it was also recognised that the system could enable early discharge from hospital. 'I had to go into hospital recently and I didn't like it very much. I think the system could help me to spend more time at home. The system is a good thing for me.'
- the system was generally not intrusive with only 13% indicating they found it 'slightly intrusive'.

The feedback from carers was also very positive:

- 86% were satisfied with the system
- 93% thought new technology was a good thing
- 64% believed that the LMS was more effective than present community alarms.

Overall the conclusions that can be drawn are:

- the system is generally acceptable. It increases the care choices available
- it enhances people's feelings of safety and security in the home, reducing their fears and apprehensions, eg of falling or becoming ill
- it supports and enhances the carers role.

Taken together, these are important factors that are likely to stimulate independence and help older people to remain living in their own homes.

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Chapter 7

Biomedical Monitoring

Unfortunately a full-scale field trial of biomedical monitoring was not possible. However, focus groups were undertaken to gain an appreciation of the range of views older people had on this kind of monitoring.

Background

Over recent years telemedicine has increasingly been investigated but telemedicine is not a new phenomenon. Some people say that it came about with the introduction of the telephone¹ and it was certainly practised by telegraph in the early 1900s² and by radio shortly afterwards. Offshore telemedicine started in the 1920s when several countries offered medical advice from hospitals to their fleets of trade ships using Morse Code.¹ Among the early telemedicine efforts was the research and development work into telemetry undertaken by the National Aeronautics and Space Administration (NASA) in the USA. Scientists at NASA demonstrated successfully that physicians on earth could monitor the physiological functions of an astronaut,¹ whilst in 1957 Dr Cecil Wittson established the first

interactive video link, between Nebraska Psychiatric Institute in Omaha and the Norfolk State Hospital, 112 miles away.³

There have been many examples of successful telemedicine projects throughout much of the developed world⁴⁻⁶, whilst in the UK the government is embracing new techniques in the provision of medical assistance. During 1998 the Department of Health began a trial of NHS Direct in which nurses provide 24-hour telephone health advice. The government aims to extend this service to cover the whole country by the end of 2000.⁷ User surveys have shown a high level of satisfaction from both men and women and also with older people who do not want to waste the doctor's time unnecessarily.⁸ Makinnon suggests that between 2003 and 2008 the accelerating development of computing and broadband networks will lead to a revolution in the ways in which healthcare is delivered. One of the consequences of these developments will be the facilitation of the delivery of a high standard of health care in the community.⁹ As such it is important to investigate what older people think of such initiatives.

Methodology

In addition to evaluation of the lifestyle monitoring system, Dr Andrew Sixsmith of the Institute of Human Ageing, Liverpool University, conducted the evaluation of the biomedical monitoring phase. In total there were three focus groups, comprised of participants from Anchor Trust sheltered housing schemes. Participation was open to anyone living in the Anchor Trust schemes in order to maximise the number of people in each group and to get a wider sample of users including those who might be both positively and negatively disposed to such technologies. The purpose of the focus groups was to:

Investigate the attitudes of older people to new technology in general and then investigate attitudes with respect to biomedical monitoring.

In order for those participating in the focus groups to gain an appreciation of the kinds of telemedicine equipment available, two systems were described in some detail. It should be noted that there is an ever-growing list of manufacturers and suppliers of telemedicine equipment but for the purposes of the focus groups the WristCare system from International Security Technology (IST) was made available and a video of Instromedix equipment shown.

The IST system

Details of the International Security Technology system can be found at <http://www.ist.cc/EN>. This system, developed in Finland, provides 24-hour monitoring of a person's health status using a portable wrist communicator. The communicator is worn on the wrist and looks similar to a wrist-operated pendant.

In addition to the panic button that a pendant consists of, sensors for monitoring physiological signals are also included. The WristCare contains a microprocessor that analyses its user's health condition and sends evaluation data as well as analytical results to a base unit. If anything out of the ordinary occurs the base unit transmits a call for help via the telephone network to a helper or control centre. As such, a change in the user's health condition following a fall or even

unconsciousness during sleep will trigger an alarm automatically whilst flu or a fever on the other hand will not usually trigger an alarm. The WristCare system's primary role is to call for assistance when the user is unable to or is not able to identify changes in their condition requiring investigation.

The system comprises:

- WristCare unit - to measure physiological parameters, and a 'panic button'
- MultiLink base unit - continuously receives data about your health condition from the WristCare unit and transmits a call for help via the telephone network if necessary
- alarm receiving centre or control centre - to respond to the call for help.

The Instromedix system -

Instromedix is an American company from Portland, Oregon, which specialises in cardiac event recording and pacemaker follow-up systems. Details of the company and products can be found at <http://www.instromedix.com>. The company specialises in the measurement of an electrocardiogram or ECG. This measurement is the most reliable method for diagnosing a cardiac arrhythmia and the single most useful investigation in the management of patients with acute chest pain.¹⁰

The system and technology described comprises:

- sensors - to be placed on the body to record blood pressure and ECG
- shuttle - to receive and store that data gathered from the sensors. It also prompts the user to send the data when necessary
- communications - linked to the user's telephone line to send data from the home to the control centre
- control centre - receives the data from users homes and presents this for analysis.

The system has three key aims:

- enable early discharge from hospital - by providing a high level of accurate monitoring at home patients can be discharged from hospital earlier in the knowledge that effective monitoring is taking place

- reduce the cost of care - by providing more efficient home care after a shorter stay in hospital
- manage care more efficiently - computerised access to patient profiles and records optimises communication within the health care network.

Focus groups

In total, 50 people aged from their mid 60s to early 90s attended the focus groups with the sessions comprised of the following elements:

- attitudes to new technology in general
- perceptions of the IST and Instromedix systems in terms of
 - general feelings towards each system
 - potential benefits of the equipment and system
 - potential problems associated with the equipment and system
 - who the target users would be.

Results

Attitudes to new technology in general

In order to understand people's reactions to specific technologies it is important to examine general attitudes towards the actual and potential role of technology in providing care and support to older people. Across the three focus groups a whole range of views were expressed, encompassing people who were negative and positive to the future role of technology. The general trend to new technology in general could be summarised as a welcome one but with a note of caution. Some of the reoccurring themes were:

- despite the limitations of the present community alarm system, users were very satisfied with this system
- those welcoming the automatic generation of alert calls would still require a system where they could call for assistance if they deemed it as necessary
- if technology is to be used more then the technology must work in the way they want it to work. Only if it meets their particular requirements would it be welcomed.

Residents knew what they wanted and would not accept anything less

- cost - those who would welcome more technology were concerned that they would have to pay for it and that costs were likely to be high whilst other people and organisations would make the savings. Those people unsure about whether or not they would welcome more technology were also concerned about the costs and this may have influenced their thinking.

The IST system

The overriding trend was that this system could play a positive role in the future with approximately two-thirds viewing this system in a positive light. Residents commented 'It sounds to good to be true', 'It's a good idea, it's infallible' or 'It sounds like a wonderful idea'. Discussions were often centred on operational issues reflecting the fact that they saw themselves using this equipment. Comments were made such as, 'would a powered wheelchair affect the system'. Some people thought that the IST system 'did the same thing as the Anchor Trust/BT system but without the sensors'. Residents were aware of the Anchor Trust/BT system with some of the residents involved in the trial. Since the Anchor Trust/BT equipment was already available some did not consider the IST system as important.

It was generally felt that the system offered by IST was very comprehensive and would benefit many older people, however there were some concerns. For example, the comment was made 'would it put people out of work?' It was apparent that behind this was a concern that if they accepted this technology then eventually they could be in a position where people were replaced with technology, for example their warden. However, there was also a concern that the acceptance of technology could result in fewer jobs for younger people and as such they did not want to add to the difficulties some young people have in securing employment.

An interesting comment was made that the IST system had the advantage of not having sensors distributed throughout the dwelling and therefore 'you were not exposed to the public gaze of the sensors'. Obviously this relates to the issue of intrusion with this

resident preferring to wear a device that they could hide under a jumper. However, the IST system requires the WristCare to be worn, which some may regard as more intrusive than having sensors dispersed throughout the dwelling.

In respect of who the intended users should be the simple answer was 'us'. It was felt that 'every older person' or 'person needing a little extra help' would benefit. However, it was also discussed that those who could potentially gain the most were 'people living on their own, without anybody to look after them.'

The Instromedix system

The overriding theme was that the system was a step too far, it was seen as 'too complicated' and 'just too much bother'. Some thought such monitoring would be welcome, but this was a minority view. The Instromedix system was seen as a replacement for human contact and residents therefore opposed this. 'The introduction of these kinds of system will eventually mean that they will do away with wardens and district nurses. Things will just be manned by machines.' People were aware that through systems like this discharge from hospital might be secured earlier and this was welcomed as long as any additional community care requirements were available at the time of discharge.

It was thought that the main benefits from this system were not for older people. Comments were made such as 'The main idea is to free up a hospital beds' or 'The doctor benefits most, not us.' While being discharged earlier from hospital was seen as a benefit there was a considerable amount of concern that people could be sent home earlier than they should be. It was also thought that the system could help keep you out of hospital and this may not be advantageous.

'It might identify little problems, but not pick up on the big ones. They may not pick up on possible problems you have if you are in your own home. I fell over and pressed the alarm button and the ambulance came. At the hospital they went through everything and found I had cancer of the kidney. I think that would only have been picked up in hospital.'

Conclusions

The IST and Instromedix systems are not dissimilar. Both aim to provide medical attention to people when they require it and enable early discharge from hospital yet the majority welcomed the IST system and opposed the Instromedix system. It would appear that the IST system was seen as a development of the present community alarm with a pendant-like panic alarm and additional features that could raise an alarm if physiological signals changed. The Instromedix was portrayed as a more medical solution and words such as ECG were used. In addition this technology required the user to be more involved with the placement of sensors or equipment on the body. People therefore became anxious that they may get this wrong and they became sceptical.

Throughout the various discussions and focus groups several issues were repeatedly raised.

- **Cost implications.**

Few people said they would be willing/able to pay for telemedicine equipment. There was also a feeling that the NHS should fund telemedicine equipment and any money saved should be reallocated into improving services.

- **Loss of personal touch.**

Concern was raised at how new technology could reduce the level of human contact in care and support services. In particular participants were concerned at the possibility of losing their warden.

- **Perception that technology was complicated.**

In particular the Instromedix system was perceived as being too complicated. While many were happy to use new technology, the level of user involvement with the Instromedix system was felt to be too high. The IST system did not require the user to do any more than wear the device and thus this was welcomed.

The research indicates that people would welcome some medical monitoring, but a reoccurring theme throughout the project is that technology would only be accepted if it met the user's requirements. In combination with the Lifestyle Monitoring System, telemedicine could become a key element of

the 2nd generation telecare system but there are obstacles that must be overcome. How the technology interacts with the user is critical and if telemedicine is to have a positive impact there is a requirement for collaborative working. Although housing has a key role to play, in as much as the equipment will be in the home, housing professionals must work with health and social services to provide the necessary support and information.

As sheltered housing is remodelled in the future, wardens could have a role to play in the facilitation of care with patients being discharged from hospital with telemedicine equipment. If the support of the warden is to be utilised then collaboration between all service providers is required and it would appear that this is not currently occurring. In a survey of sheltered housing staff attending the 1997 CIH sheltered housing conference, less than 10% of wardens indicated they were regularly informed about hospital discharge arrangements.¹¹ If telemedicine is to be successful in the future collaboration is a prerequisite.

Summary points: Chapter 7

Biomedical monitoring or telemedicine is a technology that can be used to monitor people's health at home. If deviations occur then medical attention can be provided earlier than at present. Two systems were shown to perspective users and the general response to biomedical monitoring was a welcome one but with a note of caution - participants welcomed one system and opposed another.

Participants commented that the system developed by IST was 'too good to be true'. This technology was familiar to residents as it acted as a pendant with some added features for health monitoring. The Instromedix system had a more medical focus and participants rejected this as they felt there was a choice between technology and human contact. There was a concern that the continued development of technology could reduce their interaction with people and this would be opposed. Nevertheless, if medical attention can be provided at an earlier juncture with new technology then this was generally welcomed.

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Section Three

Chapter 8

Framework for customer application

What are the implications of introducing telecare

Housing has long been considered the 'foundation of community care', a notion which is entirely compatible with agendas to empower older people and which break away from ageist frameworks of service provision. Technologies within the home can play a major part in achieving community care objectives and in helping to ensure that older people have greater control.¹ The research identified that housing and care providers, including Registered Social Landlords such as Anchor Trust, must develop cost-effective and coherent strategies for designing and implementing telecare systems and services. As such a number of key issues have emerged.

Access to information

It is important that information on LMS or telecare services is available to all. Information must be accessible to people with sensory impairments and available for those who do not speak/read English. It must also explain clearly what the telecare service is and what potential customers can expect. For example, when is an alert detected and a call generated to a nominated carer?

Key points

Telecare service providers should have a policy on access to information, and how users of the service can access this information, including its availability:

- in accessible formats such as large print, Braille or tape
- in other languages.

Promoting/marketing telecare

With the expected increasing demand for LMS type services as the number of frail older people increases and the resultant attempts to maintain independence, the promotion and marketing of LMS or telecare services will become increasingly refined. It will therefore be necessary for telecare agencies to produce a marketing or promotional strategy to ensure awareness of and access to its services.

Key points

The promoting/marketing strategy should include:

- how the service is provided
- who it is for
- the type of service to be provided
- how this will be customer orientated.

The strategy should also identify target audiences including customer groups eg older people, referral sources, other agencies and professionals.

Access to the service

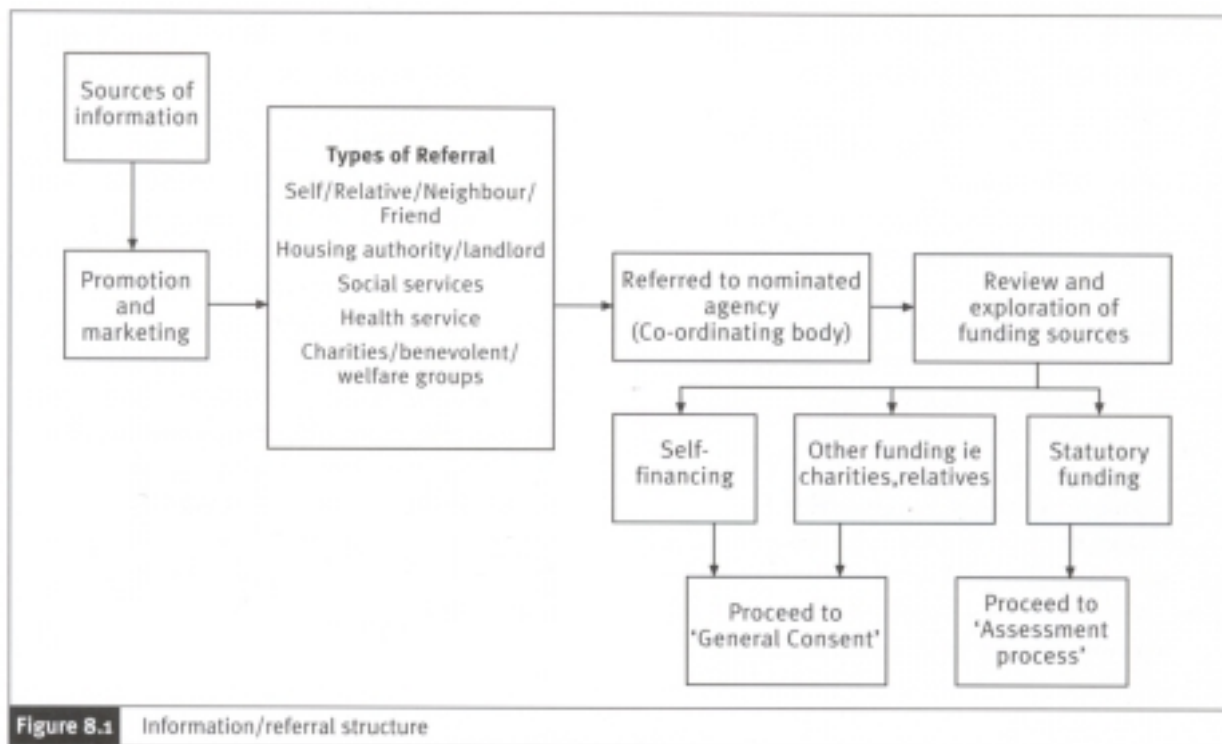
It is evident from the research undertaken that there is potentially a wide referral network. (This should be identified in your marketing and promotional strategy). The

types of referrals include self referral; by a neighbour, relative or friend; housing authority or landlord (such as an RSL); health and social services; non-statutory agencies (such as advice centres, Age Concern or other benevolent/charitable organisations); the commercial telecom and home security/safety sector. It is vital that by whichever route prospective customers access telecare services, it is easily understood and accessed. To achieve this there must be close co-operation between agencies on how and in what circumstances a referral should be made.

During the course of the research project, it was identified that there could be two distinct referral procedures subject to whether the prospective customer is a 'self payer' or likely to be in receipt of state support. The potential routes are illustrated in Figure 8.1 below.

Personal telecare plan (PTP)

Telecare systems must reflect the needs and preferences of users by way of careful assessment, ie personal telecare plans. Telecare systems of the future could include many features: the lifestyle monitoring system, community alarm panic buttons, telemedicine. Internet services etc. What one individual assesses as beneficial another may not. Providing the systems required to meet an individuals needs and circumstances is difficult but very important.



Assistive technologies could help in ensuring that the correct resources are provided to the people who require them. One of the difficulties of assessments are that they are 'snap shots' of that particular time. People have good and bad days and depending on when the assessment occurs the services required are accordingly provided. Through the use of telecare services more detailed information can be provided which is based on a longer time frame. Therefore if over time a decrease in the amount of movement is apparent then this information, aided by an assessment, may assist the assessor in providing the correct aids.

Irrespective of whether the customer is a self payer or requiring financial assistance or state benefits to meet costs, it is therefore of fundamental importance that a comprehensive Personal Telecare Plan (PTP) is completed. This will not only assess an individual's personal need for a LMS but also aid future installation and monitoring.

Key points

The checklist below gives a useful outline of what should be contained in a PTP. The key data requirements include:

- customer details (eg name, address and telephone number)
- customer profile (eg age, wellbeing/impairments, lifestyle and household composition)
- housing situation (eg dwelling and/or stock type, local authority area and site details)
- dwelling specifications (eg size, conditions, accessibility, other facilities including telephone)
- tenure type (plus name, address and contact of landlord where relevant)
- housing, care and support needs (eg dwelling related, age, health or impairment related, other circumstances)
- existing levels of care or support (eg meals, domestic help, personal care, nursing care)
- other options (eg warden, alarm, equipment or adaptation, move to other accommodation)
- carer details (both informal and formal eg relative, family, friend, neighbour or

- professional carer. Give name, address, telephone number and details if a key holder)
- medical practitioner and social care practitioner details (eg GP, hospital, social services, other)
- income details (eg employment, benefits, savings and financial commitments)
- customer technological preferences (eg type of LMS, other smart technologies etc).

Maintaining user confidentiality

User confidentiality has to be maintained at all stages of the process, from assessment to application, in order to maximise control and choice of services. The system has demonstrated that it can provide feelings of security and safety and give users a new confidence. As a result there is a greater choice available to users, both in terms of what technology elements to include in their personal system, and in terms of staying in their own home or moving into more institutional care.

The Lifestyle Monitoring System and telecare systems in general will give people a choice they presently do not have. There are clearly people who require some assistance and who choose to go into residential care, perhaps because they feel at risk and the level of safety they seek cannot be secured in their homes. Through the use of systems, such as that developed by Anchor Trust and BT, these people are given a choice. The monitoring many may seek can be provided in their own homes and therefore there is a real alternative to moving up the 'care ladder'. It should also be noted that for less dependent people the system provides considerable levels of comfort and security. Removing fear is an essential foundation to enabling people to remain in their own homes, stimulating independence and assisting in preventive measures affecting well being. However, due to the complexity and multiplicity of relationships between a customer and other parties in an LMS system, it is essential that there are effective policies, practices and procedures on confidentiality.

Key points
 The confidentiality procedures should clearly state:

- that the customer has the right to any information held and access to records
- that the information is fair and accurate
- what information can and cannot be passed on to other parties
- the procedures for customer redress.

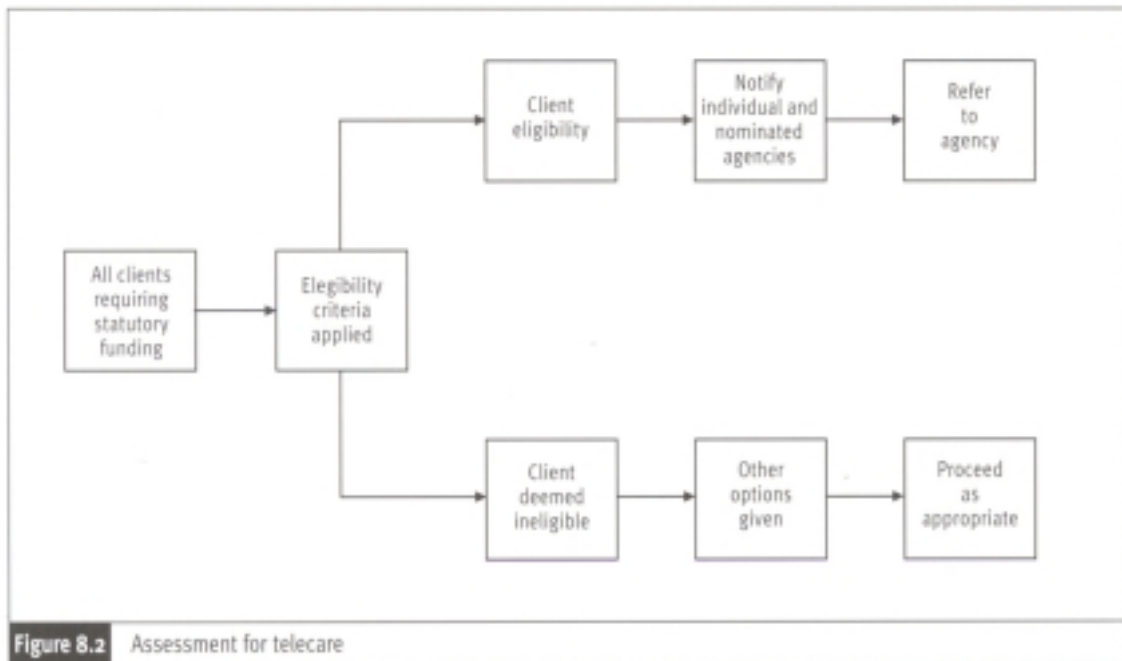
Assessing eligibility for telecare

The value of a PTP is that it provides a template for assessing an individual's needs and their LMS preferences. The detailed information collated will enable customers, both self-payers and those in receipt of state support, and relevant agencies to decide who would most benefit from an LMS. Where possible, assessments should be joint assessments between health, housing and social services.

Eligibility criteria in connection to LMS are still embryonic. However, PTPs play an important role in identifying those in greatest need and, in particular, in ensuring that statutory agencies across health, housing and care provision can plan, pool, commission and/or target their available resources. It is likely that eligibility criteria will draw on housing and community care assessment practice. This could result in the following scenarios.

PRIORITY	SCENARIO
Urgent requirement	Prevents admission to hospital, or enables early discharge from hospital or a move to more supportive care environment
Priority requirement	Maintains or promotes independence in the home as part of an overall care package
Moderate priority	Compliments existing care and support service
Low priority	Offers 'peace of mind' to the customer (most likely to be taken up by fee payers)

Whichever scenario is followed, it is also crucial that when making an assessment, the agreement of both formal and informal carers is obtained. While the PTP should be tailored to the individual's requirements, the nature of these other relationships can introduce unforeseen problems, such as the ability of the nominated carer to provide assistance 24 hours a day or the distance between the individual and the carer who may live out of the area. Nevertheless, the plan should offer other practical and realistic solutions to overcome these difficulties, and provide an action plan for meeting the individual's requirements. This is illustrated in **Figure 8.2**.



Installing telecare systems

Incorporating LMS systems in the design of new dwellings can enhance future care and support needs of residents. It will also bring down the cost of retrospective installation. As a result, the Housing Corporation should reflect this in its Scheme Development Standards for future new build programmes. In particular allowance should be made for the installation costs including:

- the infrastructure and cabling
- hardware and software equipment costs.

These costs should be included in the capital or remodelling cost and incorporated in applications for Social Housing Grant.

Key points

In following assessment procedures, the subsequent points should be adhered to:

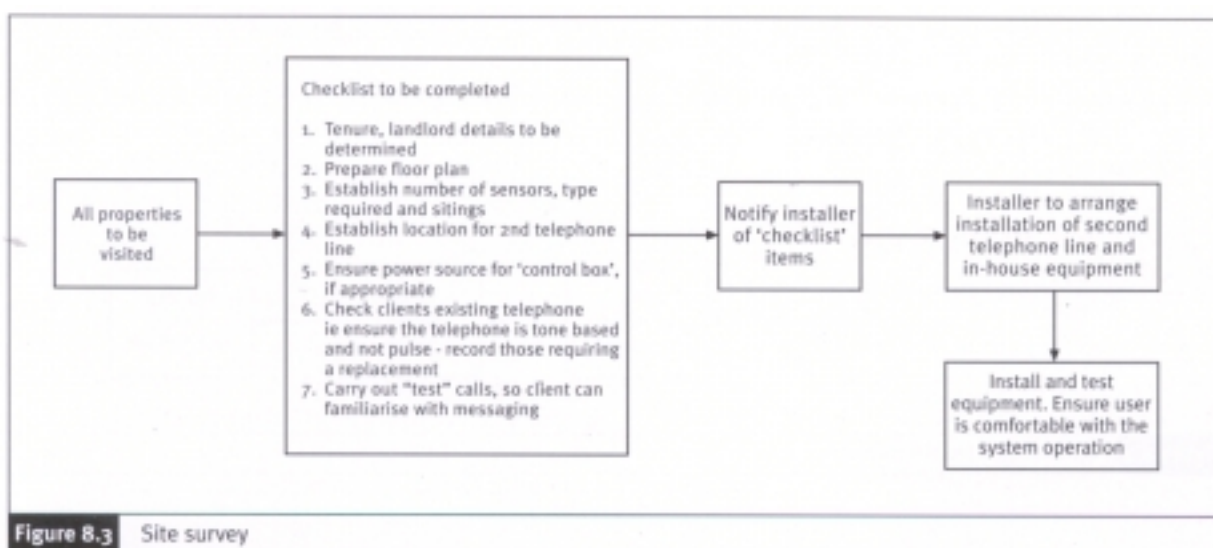
- no equipment should be installed unless an assessment of a prospective customer's needs and the appropriateness of the LMS has been carried out
- the assessments must be customer focused and 'signed off' by the customer
- consent must also be obtained from carers
- where an assessment results in ineligibility for LMS, reasons why must be given in writing
- customers should be advised of any complaint procedures if they are unhappy with the decision.

In addition, RSLs and other housing providers should incorporate into their design specification features specific to LMS. For example, the positioning of sensors, sockets, additional cabling for telecommunication purposes.

Similarly, in all remodelled housing or retrospective installations of individual customer dwellings, there is a need for detailed specification and minimum requirements for system installation. In particular, causing as little intrusion for customers as is possible. **Figure 8.3** highlights these requirements in relation to conducting a site visit, following a successful completion of the PTP.

The site survey must produce accurate specifications. As previously explained, the siting of the sensors is of critical importance. To ensure accurate data the correct type, number and placement of sensors must be defined. It must also be remembered that the LMS will be installed in a wide variety of dwelling types and sizes and this will result in a plethora of specifications against customer characteristics. Over time, this will make installation more effective and efficient, thereby reducing installation costs and the need to revisit sites to reposition sensors or modify software.

Installation must be undertaken by an approved contractor (use Housing Corporation, Care & Repair guidelines as appropriate). Home Improvement Agencies should be able to include Lifestyle Monitoring Systems within their work. These



schemes are ideally placed to monitor installation contracts in people's own homes. Consent must be obtained and the customer fully informed of date of installation, possible disruption and what is being done to avoid any misunderstanding. The latter should also include any 'making good' such as minor redecoration. Once the system is installed the customer and other parties must be notified when it is going 'live' for data retrieval and subsequent alert monitoring.

Key points

When installing LMS, there should be:

- a client-centred approach, respecting the individual's needs and property
- an approved contractors list of agencies with relevant skills
- a complete record maintained of work undertaken against the specification, LMS equipment installed and siting
- notification of the customer complaints procedure if a customer is unhappy with the installation.

Trouble-free system integration

The telecare system should allow for further system integration to enable the take up of additional services, when users require or wish them, ie advice and information, security, energy efficiency and entertainment systems. What is required is a number of services that can be prescribed when needed. For example, some telemedicine equipment may be provided upon discharge from hospital and then withdrawn at a later date. A modular approach is therefore suggested where elements can be added and removed with ease, utilising 'plug and play' technologies. These should be identified through the PTP process and any further review or reassessment, or ongoing maintenance procedures.

System management and maintenance

It is essential to ensure easy system management in new or existing dwellings, ie the installation and maintenance of the sensors, control units, telephones and software. The introduction of telecare systems almost inevitably requires some technology to

be present in every room in the home. Currently radio activated systems can be used so no additional cabling is required, however the life expectancy of batteries is a limitation on the system. The life expectancy of batteries is constantly increasing and more work needs to be done to find the correct battery technology so the disturbance of changing batteries can be minimised. It may also be beneficial to investigate other technologies.

Key points

Agencies involved in the management and maintenance of telecare systems must:

- have effective maintenance and repairing policies, practice and procedures
- arrange for annual review (or more frequently) subject to assessment requirements
- have the ability to repair, replace or remove telecare components within 24 hours (maximum)
- ensure that customers are advised of any complaints procedure if they are unhappy with the maintenance service
- ensure that where lines of responsibility are divided between a variety of agencies, customers are notified of key points of contact and protocol established between the agencies to clarify lead responsibilities.

Promoting independence

The independence of users must be promoted by minimising the risks of living at home or preventing and/or delaying the need to move on to more costly housing, care and support. The research conducted has proved that telecare systems could enable people to live at home in a more secure and safer environment with many residents believing such systems could delay or prevent a move up the 'care ladder'. However, more detailed work is required to understand the impact of assistive technologies on older people.

There is a risk that technology can do too much and may in fact advance a move up the 'care ladder'. Smart home technology in particular could lead to such a possibility where curtains and doors are opened and closed by remote control or automatically. Users could be in the position where they can

run their home from an armchair. However, although some of these tasks may be difficult the exercise and movement involved in carrying them out could be helping them to maintain their independence. Providing the technology required is critical and further work is required.

Promoting partnership

Telecare is clearly a housing and care initiative to promote independence. For the concept to move from research and development and into a robust product, housing providers and social services will need to collaborate. Through social services, health providers need to make a contribution as benefits such as preventive measures and early discharge are derived from the use of telecare. Social services commissioners will need increasingly to specify that a telecare environment is to be provided when tendering for care contracts for older people.

As previously stated, telecare needs to be seen as an essential part of a care plan, and for this to happen care and housing providers will need to co-operate. The introduction of telecare as part of the care package could help social services to deliver a cost-effective domiciliary care service, where older people feel more secure and independent and therefore need less formal care.

This partnership approach between housing and social services to introduce telecare could help in the current debate to refocus sheltered housing. The residents of sheltered housing could be supported, through telecare and domiciliary care, to remain in their own homes longer and not move to more expensive forms of care.

System usability

Providers must ensure that the system is easily understood by users and carers alike, and easy to use in terms of functionality of the operating systems and its accessibility to users, ie frailer older people or people with disabilities. The level of acceptance between the IST and Instromedix systems clearly demonstrates this point. Both systems could be used in similar ways but because one system required the user to be quite heavily involved in its use this system was rejected

whilst the more automated system was welcomed. The research has concluded that users are quite willing to be monitored and for the data to be subsequently analysed and stored but there is a point where users no longer wish to be monitored if they are too heavily involved in gathering the data.

The design and operation of the user interface is perhaps the primary way of ensuring that the user keeps control of the technology and their surroundings. Speech and vision are the most natural forms of communication and therefore are obvious targets for a user interface. Other forms of interface include Braille systems, push buttons, physical and optical pointers and joysticks. Whatever form of interface is chosen, it must be suited to the needs of the particular individual for which it is intended, and the social and psychological aspects associated with its use must not be overlooked.²

Reassurance of the technology role

Users need to be reassured of the role of existing staff, ie the wardens, and the reliability of back-up services such as community alarm systems. Throughout the trial it was evident that many saw the greater use of technology as a way of reducing or eliminating the role of wardens and other professionals. One of the purposes of the trial was to investigate if technology could be used to enable care and support to be provided earlier than presently possible. The purpose of the technology is to draw professionals' attention to situations that require further investigation, not to replace them.

The introduction of household burglar alarms into the mass market was not used as a means to reduce staffing levels within the police service; in a similar way telecare should never be positioned as a method of reducing the physical presence of staff. Telecare will enable a better, more informed care service, but it should not be used as a replacement for it.

Ensure the professionals role

Efforts need to be made to ensure that technology does not try to replace staff. Any freeing up of staff's time should result in additional housing management and support

tasks in a move to prevention. It is clear that technology cannot provide the support that people give but technology can indicate who perhaps requires a little more support, and assistance can then be targeted to these people.

The identity and role of sheltered housing is being redefined, and therefore the role of the warden also needs attention. As telecare becomes more widespread in sheltered housing the warden will need to be able to respond to alert situations and provide immediate assistance. Many older people value the traditional morning call of the warden either by a physical presence or by the community alarm voice system. Telecare should not be seen as a replacement for this personal contact, but rather an extension of it.

The telecare system itself will need checking and simple adjustment from time to time. The warden or care worker could, with training, perform many of these tasks. Consequently the updating of the skills and knowledge of new and existing staff must take into account the applicability of telecare systems.

Key points

To manage change, agencies must begin planning for the necessary skills needed to deliver effective services which may rely on telecare or similar applications. To achieve this, agencies must:

- take into account the numbers, posts, and quality of staff to deliver services
- set out the training required to meet the needs of the service
- identify any gaps in provision
- consult with staff about the role of new technology and personal development
- ensure staff receive training on age, cultural diversity and disability awareness
- provide customers with a basic understanding of how the telecare system works and how they can control it.

The future role of carers

It is clear from what has been said previously that formal carers will not be replaced by telecare. At its best telecare will restore

confidence to older people and stimulate them to do things for themselves. This may therefore slow down the need for additional care as time goes on. Carers will need to understand the potential and the limitation of telecare, and be comfortable to work alongside it.

All too frequently when an older person begins to receive formal care, eg domiciliary care, the informal care of family and friends recedes. With the demographic changes leading to an increase in the older population a way must be found of continuing to utilise the informal care system. Telecare can offer to friends, relatives and neighbours a cost-effective way of being alerted when the lifestyle pattern changes. This may encourage informal carers to continue in their role and work in partnership with more formal care.

Who should pay for the system

More evidence needs to be gathered to demonstrate the feasibility and affordability of the system and services, in particular, to those living on low incomes. The Lifestyle Monitoring System trialed has proved successful in many respects but the question of who should pay for such technologies remains unanswered. Such systems have the potential to save lives and increase security and independence, but the question of who should pay for these benefits is a difficult one.

It can be argued that the older person should pay as they are enabled to stay in their own homes, which many of them want. Equally, it could be argued that the NHS should pay because such technologies are used in a preventive way, enabling people to be maintained in the community instead of more costly hospital beds. It could be argued that social services should pay because it is their role to help people in the community, and if they should pay should the funding come from within the Supporting People proposals?

Finally, it can be argued that housing providers should fund the provision and installation of such systems as it could be viewed as an accommodation issue, especially for those who require additional help. Under The Housing Corporation's scheme development standards, in particular for

sheltered housing, telecare systems could be considered as an equally essential element as other services such as electricity, heating and a telephone point. The debate on who should pay is still to be resolved.

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Chapter 9

Conclusions & Recommendations

The Anchor Trust/BT project sought to investigate the feasibility of using technology to aid the independence of older people and to give them more choice. The recent Royal Commission on Long Term Care states:¹

"The thrust of the Commission's recommendations call for improvements in housing to make staying put a more practical option and for changes in financing to tilt where possible towards the individual in their own home rather than towards residential forms of care."

To enable people to have the security, safety and independence the Royal Commission suggests there is a requirement to have some form of monitoring in the home. Technology is one way in which this could be done but there are a number of other factors driving developments.

- Older people are increasingly using technology and benefiting from its use. They are therefore starting to demand new technologies and push for developments.
- The emphasis for supporting older people (and other groups) has moved away from institutions to the community and

technology enables a level of monitoring previously only possible in institutions.

- Technology can improve the user's lifestyle as recognised by the recent Royal Commission into long term care.
- Demographic change is resulting in an ageing society. The European Commission has predicted that between 1995 and 2025 the UK will see a 44% rise in the 60 and over age range.²
- Older people absorb the greatest finance. Those aged 85 and over are the heaviest consumers of all. The average per capita spending on services for this group is five times that of the whole of the 50-64 age group³ whilst the number of people aged 85 and over is the fastest growing cohort.

Against this backdrop technology is increasingly being investigated and used to assist older people in their own homes. The present technology, community alarms, has proved successful but it suffers from a major limitation - the user must initiate the call for assistance. Until the user activates the alarm call no assistance can be provided and a user may not activate their alarm because they are unable to, or they may be unaware that they need assistance. The Anchor Trust/BT project

sought to investigate the possibility of using technology to aid the independence of older people and to remove the limitation of the community alarm system. As stated the primary aim of the project was to:

Harness the application of new technology in a non-intrusive way to service the needs and wishes of older or vulnerable people, central to which is that of maintaining independence and choice.

Were the project objectives met?	
Objective	Comment
1. Develop and implement new technology to find out if such technology can reliably and automatically call for assistance if the user is unable to activate an alarm call themselves	The project has successfully demonstrated that technology can reliably detect situations that require further investigation and automatically call for assistance
2. Test and evaluate the benefits/disadvantages of new technology in supporting older or vulnerable people in their own homes.	The evaluation of the project indicates that users gained confidence from the system and consequently enabled them to be supported at home. The only disadvantages discovered centered on the possibility that technology could ultimately reduce or remove human contact. This was a major concern and is likely to impact upon the take-up of such systems. If potential users feel the system will replace human contact then the system or technology is likely to be rejected.
3. Explore, consider and assess the issues connected or resulting from its use with older people themselves. In particular to investigate how intrusive such technologies are and whether or not users want them.	There is clear evidence that the users in this trial were comfortable with the technology and intrusion was perceived to be very low. It is also very clear that the system has many positive aspects with 46% of participants deeming the system as either essential (32%) or very important (14%) with 23% suggesting the system was fairly important. Unmistakably there is clear demand for such technologies.
4. Explore the formal and informal networks of carers who support older people, so that services of this kind can meet the needs and wishes of both users and carers.	The Lifestyle Monitoring System met the wishes of users and carers. Carers were even more receptive than the older people with 93% of carers believing that new technology was a good thing and 93% of carers having positive feelings connected with the system trialed.
5. Investigate the hypothesis that greater use of technology can enable older people to stay in their own homes for longer in a cost effective manner.	As previously stated 47% of participants thought the system could enable them to stay living at home. In addition it was also thought that early discharge from hospital could be achieved as a result of the Life Monitoring System with one participant commenting 'I had to go into hospital recently and I didn't like it very much. I think the system could help me to spend more time at home.' As a result it would seem that telecare systems could be cost-effective, but more longitudinal research is required to clarify the situation.

At the end of the project this target has been met. The project has developed a system and proven that lifestyle monitoring is an effective tool in automatically recognising alert conditions. Potentially life-threatening situations, which previously could go undetected, can now be recognised and assistance provided.

Before the field trial began the system and technology were perceived to be intrusive by potential users and providers. However, when the trial concluded it was evident that intrusion was not as significant as initially believed. Those involved in the trial were asked 'is the system intrusive?' Only 13% agreed slightly with this question, while 87% stated the system was not intrusive to them. Other less direct questions aimed at this subject matter also revealed that the system was not intrusive with only 18% feeling they were being watched.

The Lifestyle Monitoring System aids independence with one user commenting:

'I wouldn't like sheltered accommodation. I am independent. I wouldn't like one of those homes. I do all my own cooking. I am independent. This (Anchor Trust/BT system) helps me to stay at home.'

In addition 47% of participants in the trial thought the system could enable them to stay living at home. The system therefore provides a greater degree of flexibility and choice. The participants believed that by having the system they could be enabled to stay in their own homes rather than move on to other care arrangements, therefore empowering the older person and providing greater choice.

The results of this trial suggest that lifestyle monitoring would be a welcome component in the future. People are enabled to stay in their own homes with greater independence, security and choice. It would also appear that similar results could be obtained with more dependent people. For people who require high levels of care and support, residential care is usually cheaper than a flexible domiciliary care package allowing them to stay at home. Most local authority social service departments have well-defined guidelines for prioritising clients and assigning a maximum spending limit on each case⁴ and

a domiciliary-based care package is only a real option under public funding as long as costs do not exceed the equivalent residential or nursing home costs. Where the dependency of the client is high, requiring intensive levels of care, then they are likely to be admitted to residential care. The 'dependency threshold', or the point where institutionalisation becomes necessary for the individual, is therefore not determined by considerations of care, but primarily by economic considerations. The use of new technology could play an important role moving this dependency threshold towards a higher level of need, extending the options available to people in these categories.

The capacity of telecare to proactively raise alarms, even when the person is unable to do so, will mean that living at home will become a safe and secure option for higher dependency clients. This is very much in line with current philosophies of long-term care of the elderly and disabled and provides a win-win situation. Older people gain as many of them choose to stay in their own homes and the technology can help facilitate this, whilst overall funding organisations gain, as providing people with what they want and preventing an unnecessary move would also appear to be financially the most cost-effective approach.

Cost-effectiveness

To prove the cost-effectiveness of this and other telecare systems more longitudinal research is required. However drawing on research lead by Professor David Bradley and conducted by the University of Abertay, Dundee, in association with Birmingham City Council Housing Department, there is evidence to suggest such systems can be provided in a cost-effective manner. This work compared a 2nd generation telecare system incorporating lifestyle monitoring and telemedicine with the present community alarm system and for 10,000 older people a saving of £5m over 10 years, was suggested.⁵ Even on a simplified example the economic benefits are evident. Approximately 5% of the older population live in some form of institutional care⁶, representing about 450,000 people in the UK. As a result of the Lifestyle Monitoring System 47% of participants

thought the system would enable them to stay living at home. Nevertheless, if it is assumed that only 5% are enabled to stay at home rather than enter institutions then 22,500 people can stay in the community instead of entering institutions.

In monetary terms if the cost of residential care is used, then at a cost of £265⁷ a week, for 22,500 people almost £6m a week is saved. This, however, does not represent an accurate figure. People in the position of possibly going into institutional care or being enabled to live at home with new technology must pay for the equipment they require and any additional community care they may require. Taking a conservative analysis, assuming an additional carer visit per day at £10⁸ and 3 nurse visits a week at £14 each, additional care costs equate to £112. Therefore, the actual saving is £153 per person per week or £3.5m for all 22,500 people on a weekly basis. Translating this to an annual sum reveals a saving of £179m with the only costs not included being related to the equipment.

In financial terms, the 22,500 people represent the people where the greatest monetary savings are observed. However, as demonstrated by this trial, telecare systems have the potential to benefit many people and in particular community alarm users. The results from the University of Abertay take into consideration many more of the operating costs and compare costs with all community alarm users having a telecare system. Expressing these results as representative of all community alarm users in the country reveals a potential saving of £58m a year.

Recommendations

The Lifestyle Monitoring System has clearly been shown to be a successful and welcome component of a new generation of community alarm systems. It is hoped that the growing evidence from various sources and the foundation laid by this trial can be further built upon to offer older people the choice, safety and independence so many of them are seeking. In order to achieve successful telecare systems various organisations must take a positive role in developing what older people

and service providers require. The recommendations that follow provide a framework for what could be done to build upon the work already carried out in this field.

- **Government** - needs to take a lead in bringing together health, housing and social services to deliver a holistic service aimed at increasing independence and choice for older people. Existing vertical funding systems are a blockage to joint working and to a user-focused service that uses a new technology platform to support people in the community.
- **Health Service** - could be a major benefactor. The growth in the number of older people means real savings are unlikely, but new technology can play a significant role in reducing demand for primary health care. Early discharge from hospital and prevention are key positive areas for further work. Lifestyle monitoring offers considerable potential.
- **Social services** - need to understand the value of new technology and value its preventive and 'peace of mind' contribution. Social services will need to take on board an assessment role if the equipment and its running costs are to be publicly funded.
- **Housing service providers - new** technology can benefit the delivery of housing management and support services to older people in their own home. It can also aid older people to gain access to repairs and maintenance services and to broader services such as advice and information about their housing and care choices.
- **Housing design** - there is a need to incorporate new technology into design specifications. New and refurbished or remodelled housing should be more flexible and able to accommodate new technology without causing major disruption to the dwelling. This should be reflected in The Housing Corporation's Scheme Development Standards and the government's modernisation programme.
- **Housing revenue** - it is essential that capital and revenue funding decisions are complementary in the light of the government's review of housing benefit and the funding of supported accommodation.

- **Housing investment funding** - should recognise the important role of new technology and provide capital funding for suitable equipment and its installation. This should be taken into account in The Housing Corporation's future investment strategies and use of its Approved Development Plan to fund new build and refurbishment.

- **Home improvement agencies** - should be able to include lifestyle monitoring systems within their work. These schemes are ideally placed to monitor installation contracts and ensure people who wish to remain in their own home have the technology infrastructure to be able to do so.

- **Technology providers** - need to form consortia to take forward the research ideas from this and other projects. Much of the basic equipment exists, but it is not brought together into affordable, practical products suitable for a wide market. Future systems need to be flexible, upgradable, reliable and customer friendly.

Older people themselves have clearly indicated, in this and other related work, that they want a fully integrated system. Therefore lifestyle monitoring, and other telecare initiatives, need to be integrated with the present community alarm technologies. This is not an unreasonable request and technology providers need to form consortia to bring suitable, affordable products to market.

- **Community alarm centres** - need to move away from their traditional role and be willing to provide a 'call centre' type service, more integrated with social services and health, and be able to respond to lifestyle monitoring systems.

- **Older people** - many are already using technology and increasingly wish to do so to maintain their independence and feeling of security. Older people need to be assisted to feel comfortable with new technology and be provided with the training and skills to make maximum use of it, which would be beneficial to them and to public finances.

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Appendix 1

European research and development programmes

A considerable amount of time and money has been invested, by both private and public sectors, in developing a range of telecare and related technologies. In recent years the majority of the large-scale projects have originated from the European Commission, in particular under the IV Framework programme and the Technology Initiative for Disabled and Elderly people (TIDE) programme. The scope of this latter programme included research and development into products and services targeted to the general market which can assist older people and people with disabilities to fulfil their needs and maintain their independence.¹ The TIDE programme started in 1991 with a pilot phase of 21 technology development projects and a major study of rehabilitation technology in Europe. In 1993 an additional phase of TIDE² was introduced to provide a bridge between the pilot phase and the IV Framework programme. This had a budget of 42 MECU¹ (£29m).

The IV Framework programme operated from 1994 to 1998 and in total funded research and development across all its themes to a total of 13,215 MECU (£9,170m). Details of the IV Framework and its programmes can be found at http://www.cordis.lu/src/i_006_en.htm. Funding was provided for a range of themes including Information and Communication Technologies, Life Sciences and Technologies and Transport. Of particular interest to Anchor Trust and the development of services for older people was the Telematics for Disabled and Elderly People theme under the Telematics Applications Programme (TAP). For research and development in this area a total of 69 MECU (£48m) was made available with the purpose of developing applications which provide support for independent living, autonomy and social integration opportunities.³ It is not the purpose of this document to provide details of all the telecare and related projects, however projects funded by the EU in this area can be found at <http://www2.echo.lu/telematics/disabl/disabl-proj.html>.

As the IV Framework programme ended, the V Framework programme began and it will end in 2002. The total budget for V Framework programmes has increased to 13,700 MECU⁴ (£9,507m), of which 483 MECU (£335m) has been made available through the The Ageing Population and Disabilities section of Improving the Quality of Life and Management of Living Resources.⁵

United Kingdom research and development

Collaboration between academic institutions and commercial enterprises has been facilitated in recent years by the Technology Foresight programme of the UK Office of Science and Technology. The health and life sciences panel of the Office of Science and Technology has funded the AgeNet project <http://www.agenet.ac.uk> with the aim of stimulating multidisciplinary and multisector research partnerships relevant to academia, industry and the National Health Service.

The Engineering and Physical Sciences Research Council (EPSRC) (<http://www.epsrc.ac.uk>) has been particularly concerned with developing new technologies to help disadvantaged groups such as frail older people and disabled people. In 1997, the EQUAL (Extending Quality of Life in the Built Environment) programme was launched to help people remain independent and active for as long as possible. This clearly recognises the significance of population ageing. In 1998, EPSRC launched a second call for proposals under the Health Informatics programme. Of particular relevance to older people were two information technology themes to support patient care, and technologies to support rehabilitation and enablement.

In respect of projects and developments in the UK, the Research and Development Division of the Department of Health has commissioned a database to be compiled providing a list of current research and suppliers of telemedicine equipment in the UK. Details of projects including the Anchor Trust/BT trial and a list of suppliers can be found at <http://www.dis.port.ac.uk/ndtm>.

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Exploring Technologies for Independent Living for Older People

This report is concerned with the potential of telecare services for older people.

It explores the link between new and developing technologies and the emerging policy agenda on older people; reports the findings of the Lifestyle Monitoring trial and bio-medical monitoring from a user's perspective; considers the requirements for the delivery and design of telecare services and makes a number of recommendations to the Housing Corporation, Registered Social Landlords and other housing, care and support providers, including health and social service providers.

Those who will find the report of interest include not only community alarm and system designers but also policy makers, the purchasers and providers of housing, care and support to older people, and those involved in the planning of future services for older people. Furthermore, older people will find the experiences and expectations of others particularly relevant to them.

About Anchor Trust

With nearly 30 years of experience and innovation, Anchor Trust is a charity which provides a unique range of housing, support and care services for older people throughout England. Anchor Trust provides services through Anchor Retirement Housing, Guardian Retirement Housing, Anchor Homes, Anchor Care Alternatives, Anchor Staying Put and Anchorcall, helping around 50,000 older people a year. Anchor Trust also speaks out for older people through research, library and information services, influencing and parliamentary work.

Anchor Trust
Fountain Court
Oxford Spires Business Park
Kidlington
Oxon OX5 1NZ
Tel: 01865 854000
Registered Charity No. 1052183
Company No. 3147851

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