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How does the provision of advanced, predictive telecare and smart home technology for older people affect its outcomes?

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1. Executive summary

This report contains evidence about the provision of advanced, predictive telecare and smart home technology for older people. It looks specifically at how advanced telecare services are coordinated and how this might impact on the benefits that such technology can offer. This evidence raises important issues for service providers such as local authorities and policymakers involved in the telecare industry to consider when seeking to provide telecare and smart home technology for older people.

The research entailed the collection of primary data in order to unearth new insights about how the coordination of advanced, predictive telecare services works in practice. Interviews were conducted with those involved in the design and delivery of smart assistive technology in England: suppliers of advanced telecare technology; housing, health and social care providers; local authorities at the centre of care provision; and other stakeholders, both public and private sector, otherwise involved in providing, catalysing or assessing access to predictive telecare technologies. Interviews were also conducted with a small number of older people. A second, connected piece of research is being conducted with older people using predictive home technology in order to learn more about their experiences.

The central research questions informing interviews were:

1) What are the dynamics and challenges experienced by those involved in the coordination and provision of advanced telecare technology for older people?

2) How do these affect the outcomes of digital telecare provision for older people?

3) How might coordination be improved to further develop positive outcomes for older people?

Analysis of interview data raised four central themes that are addressed in turn in this report:

1) What is advanced telecare technology for, and how does it work?

2) How are advanced telecare services coordinated?

3) How does the broader national and local institutional landscape affect the outcomes of advanced telecare provision?

4) How does the network of responders that contribute to predictive telecare use affect its outcomes?

1.1 Summary of key findings

1.1.1 What is advanced telecare technology for and how does it work?

Advanced, predictive telecare has multiple functions and uses for older people and within the health and social care system. Firstly, it can be seen as an update of older telecare technology. Older analogue and 'first-generation' telecare was primarily used by older people to alert others in the case of possible emergencies, and digital advances in telecare technology then meant that others could be alerted automatically. New advances in passive sensor technology have led to the creation of predictive telecare platforms, meaning that certain health problems can be identified in advance, without the need for users to have identified these problems or to raise an alarm themselves.

Respondents to this study identified three potential benefits to this technology. Firstly, by predicting certain conditions, advanced telecare technology may be able to prevent the need for people to move into residential care. This preventative capacity has been framed as a way to promote 'independent living' or 'ageing in place', allowing people to live in their own homes for longer. A second function reported by respondents to this study is the capacity to deliver cost efficiencies in the provision of care, by streamlining in-person care. A third function, and a factor motivating housing providers to engage in the provision of advanced telecare, is its digital functionality, thereby making use possible after the analogue 'switch-off' in 2025.

However, this report identifies various tensions between these different functions. Different actors and agencies involved in coordinating provision can have different priorities, different interpretations as to what advanced telecare technology is *for*, and emphasise different aspects in product or service design and delivery. There may be trade-offs between the preventative capacity and cost-cutting potential of telecare. For example, predictive analytics may lead to more in-person care being requested and required by older people, their family members, or those caring for them. The understanding that telecare can be used to save funds may turn out to be an over-simplification (Mort et al 2013).

1.1.2 How are advanced telecare services coordinated?

The provision of digital telecare technology is a collaborative effort between technology manufacturers and suppliers, housing and care providers, local authority social workers and care professionals, call centre operators, medical professionals, family members and users of technology themselves.

The nature of coordination between the actors and agencies involved in provision can affect the nature of telecare services. It is therefore important to note the dynamics and challenges associated with coordination of these services, which is not always straightforward: different types of organisation face different constraints and priorities. According to the analysis presented here, these various constraints can act as an obstacle to effective coordination. For example, commercial manufacturers and suppliers face challenges in achieving market penetration, while publicly funded service providers often operate under the pressure of rising demand and strained resources. These very different constraints, and the relative capacities of different actors, can mean that those responsible for delivering adult social care services are left unable to define the terms of the advanced telecare services they offer. This can undermine the policy goals of preventative, cost-effective service design.

Technology trials can be very useful for making advanced telecare available to local authorities and within the homes of service users. However, as a means of coordinating provision, this mechanism produces certain challenges. Ideally individuals' specific needs should be assessed in advance of any telecare procurement, and tailored solutions for individuals found. When telecare is procured through a trial, devices are often purchased in bulk. This limits the range of products on offer, meaning that the right fit may not always be available. Technology trials can focus on asking what technology is available and what it does, rather than starting with the specific needs of older people and asking what might be required to meet those needs. Creating user-centred telecare services through trials can be difficult. This could stand in the way of positive outcomes and the preventative capacity of advanced telecare provision.

1.1.3 How does the broader national and local institutional landscape affect the outcomes of advanced telecare provision?

In the UK, the policy drive for digital telecare is based in part on a 'preventative agenda', moving on from the reactive telecare of the analogue age. One of the fundamental aims is to promote individuals' independence by monitoring their changing behaviour and identifying problems such as frailty or urinary tract infections (UTIs) before individuals themselves become aware of them. But exploiting this preventative capacity of advanced telecare requires the development of infrastructure for the creation and maintenance of services (Woolham and Frisby 2002). This will also be necessary in order to draw investment into the industry.

However, telecare has also been framed as a solution that will allow spending on adult social care to be reduced and made more efficient. Pressure on local budgets for adult social care services means that local authorities can lack the funding and additional capacity for building the infrastructure that is required. The different actors involved in advanced telecare provision rely on one another but must also pursue their own separate agendas for survival in a relatively

new, volatile market. This may inhibit the streamlined, integrated delivery of services. This institutional context is therefore pertinent to whether the industry is able to offer effective and cost-efficient preventative products and services to older people, as well as to whether investment can be drawn into the industry in the future.

1.1.4 How does the network of responders that contribute to advanced telecare use affect its outcomes?

Rather than being a simple technical intervention, telecare interacts with users' lives and is embedded in social relationships (Mort et al 2013). It often involves the engagement of others (whether friends, family, residential professionals or call centres). This has the potential to impact on the quality of outcomes experienced by older users of telecare. Friends and family members are not always available to act as responders for older people. Where they are available, they may need support in order to understand and cope with their role. Professional responders similarly need support. The readiness of industry players to engage with smart, digital telecare systems is at different stages. Some housing providers and call centres do not have the capacity required to make use of the advanced functionality of digital interfaces. Where family members do act as responders, their preferences and requirements can influence how digital telecare systems are used. The provision of additional in-person care may be required on account of digital monitoring by family members. The network of responders therefore creates complexity in advanced telecare provision, and should be considered in service design.

Design and evaluation of telecare products should be accompanied by design and evaluation of entire telecare services, starting with individuals' initial needs assessments and finishing with the network of responders in contact with individual users (Woolham and Frisby 2002). Our findings suggest that this is often an aspiration but is not always a reality for advanced telecare service coordination in practice. The training that is available for families in order to deal with emergencies, the digital readiness of call centres, and the capacity of local housing and care teams are all variables that might impact on the efficacy and cost efficiency of advanced telecare.

1.2 Recommendations

1.2.1 Recommendations at the national level

- At the national housing, health and industrial policy level, there needs to be greater clarity on the purpose of advanced telecare technology;

- Greater clarity about the role of advanced telecare in adult social care can be achieved through the creation of a national level strategic vision for advanced telecare provision and use. This should generate a clear policy, legal and funding framework for the design of telecare products and services, and for coordination between industrial actors;

- If the success of digital telecare rests on the benefits felt by users, it should be recognised that this may be at odds with the search for cost efficiencies in care; and

- Given the lack of funding available for small telecare manufacturers and suppliers to trial their technology, seed funding should be made available by government for this purpose.

1.2.2 Recommendations at the regional and local level

- Measures should be taken to ensure that effective coordination can be built and maintained between those involved in the provision of local telecare services;

- Efforts for greater coordination, in the form of business accelerators and industry networks, are vital for better industrial coordination;

- Local authorities play a central role in coordinating advanced telecare delivery. Their capacity to play this role should be extended in order to achieve stronger coordination of services at the local level;

- The technical capacity of local authority teams involved in telecare provision should also be advanced so that public care services can maintain strategic oversight of telecare design and delivery, rather than relying on the capacities of telecare manufacturers. Local authority care teams should be supported in their ability to develop knowledge and maintain institutional memory on the subject of advanced telecare;

- Dedicated contact points should be established within local authorities, so that industry representatives can easily identify the individuals they should liaise with; and

- Integration is required for local policy making that impacts on the provision of telecare. Liaison is required between local housing, planning, health, social care and economic development policy teams, in order to ensure that all aspects of telecare provision are aligned towards a consistent vision for service delivery.

1.2.3   Recommendations at the level of specific services within local adult social care

- Advanced telecare product design and service delivery should be accompanied by service design extending beyond the consideration of the products on offer and their functionality. Service design requires consideration of all stages of telecare provision and access, from manufacturing and the role of industry players, to the role of telecare respondents and their relative capacities;

- Service design should take place at the local level, through coalitions of interest groups including housing and care providers;

- Training and support should be extended to family members and other informal responders responsible for monitoring older users of advanced telecare;

- Capacity should be built amongst call centres and other formal telecare responders, so that they are equipped to monitor and respond to users of advanced telecare, in order to provide a level of service that is aligned with the advanced functionality of digital telecare platforms; and

- If the preventative capacity of advanced telecare is to be optimised, this will require that pressures are removed from funding for in-person care.

2. Introduction

2.1 What is advanced telecare technology?

ICT-enabled care, telecare, assistive technology, remote care, and environmental interventions: these are all names for technologies that can be used by older people to help with their care needs in later life. These technologies are also used by people living with certain disabilities, but there are numerous products designed specifically for older people. Ageing can contribute to specific vulnerabilities (Alden 2015) such as frailty or dementia, which are clear issues for those wanting to live at home as they age.

'Telecare' comprises a range of different kinds of product, often divided into three categories or 'generations' (see Table 1). It can include personal alarms, used to signal for assistance, either automatically or when activated by users. These might come in the form of pendants or wrist straps linked via telephone lines to a call centre. It can also include sensors used to automatically detect movement or use of appliances within the home. These can also include medication management systems or smoke, gas and carbon monoxide detectors (LGA 2015). More recent iterations include video links and passive sensor technology, which can track motion and record daily patterns of activity in the home. This can be used to identify lifestyle patterns, and deviation from those patterns, in order to indicate potential health conditions. This means that advanced, predictive telecare technology stands apart from previous generations of telecare. Its preventative capacity can be seen as an explicit goal of technology use, and an incentive for local authorities to invest in these kinds of services.

Table 1: The three 'generations' of telecare (Burgess and Muir 2018)

	Features
First generation	User-activated devices such as push buttons and pendants: in an emergency, the user pushes a button which alerts a monitoring service, who then contacts a relative or informal care giver. These technologies are widely used in the UK. The significant limitation of these 'first generation' products is that they require the user to take action in order to create a response.
Second generation	Devices which gather and transfer information automatically to monitoring centres, which then prompt attention from carers if needed.
Third generation	Third generation systems which include lifestyle monitoring, meaning sensor-based technologies – sometimes called Ambient Assisted Living (AAL) technologies – collect data on patterns of behaviour and analyse it to

	monitor wellbeing and assess the need for help and support. Some also offer interaction through video, and support groups.

Telecare services can be accessed through various channels and from various different types of provider. Telecare products and services are often offered by housing associations and other housing providers within sheltered accommodation or extra care schemes. They can also be offered directly to users living at home by the local authority. Third-sector, private and local authority organisations often work together to coordinate the provision of telecare services (Hamblin et al 2017).

The development of telecare and other home technologies for health and care have become part of a nationwide policy to promote 'independent living' or 'ageing in place' (Fausset et al 2011; Hamblin 2016; Coleman 2016). 'Ageing in place' has been defined as 'the ability to live in one's own home and community safely, independently and comfortably, regardless of age, income, or ability level' (Centers for Disease Control and Prevention 2013; Lee et al 2019). 'Ageing in place' policies are supported by evidence that most people prefer to remain in their own homes, rather than moving to residential care institutions, for as long as possible (Paganini-Hill 2013). However, 'ageing in place' policies have also been critiqued as a vehicle for public funding cuts (Sorell and Draper 2012; Martens 2018).

There are still many questions about this technology, how it works and how it might help to secure beneficial outcomes, whether for older people, their carers and families, the health and care system, or our ageing society. In theory, advances in telecare make it simpler to use and more accessible, generating positive outcomes by allowing even more people to choose to 'age in place'. However, there is a lack of evidence about these technologies and how they can be used to help to secure positive outcomes for older people. This also means that a case for large scale investment into the industry has not yet been established.

This report contributes to this field of enquiry, reporting specifically on the issues that those involved in coordinating the provision of advanced telecare should consider. Our findings suggest that the benefits achieved by this technology are dependent on the nature of coordination between industrial partners such as local authorities, technology manufacturers and care providers. This report presents evidence on this landscape of provision and makes recommendations about how it might be improved.

3. Review of existing evidence

3.1 Significant issues for consideration by providers of advanced telecare

This section outlines recent research in the field of telecare and advanced home technologies for older people. The evidence points to several issues that are important for suppliers and providers of telecare to consider.

Evidence shows:

1) Small scale reports on the outcomes of telecare use by older people are often positive; nevertheless the evidence to support these claims is lacking and is often contested;

2) The attributes of telecare, of telecare services, and of individual's own circumstances are all important determinants of service outcomes; and

3) The broader institutional context, including national and local policy frameworks and governance structures, are important for the success of local telecare services.

These topics are addressed in turn below.

3.2 Small scale reports on the outcomes of telecare use by older people are often positive; nevertheless the evidence to support these claims is lacking and is often contested

Small scale studies on the outcomes of telecare use by older people have often reported positive results (Woolham et al 2017). Encouraged by promising reports, in 2007 the Department of Health (DoH) launched and funded the Whole System Demonstrator project (WSD), a large-scale, randomised controlled clinical trial that was designed to look into the clinical effectiveness and cost efficiency of telecare, as well as organisational issues, workforce issues, and the effects that the use of technology had on carers (Clark and Goodwin 2010). The results were expected to be positive. In 2011, the DoH reported that telecare had the potential to reduce A&E visits, emergency admissions, elective admissions, bed days and mortality rates, all indicating its 'huge potential' (3 Million Lives n.d.). The 'Three Million Lives' campaign to improve access to telecare was launched on the back of these potential benefits, and the DoH committed to work with the technology industry to better the lives of at least three million

people. The project aimed to 'promote the benefits that telehealth and telecare services can provide people in managing their health and care' (3 Million Lives n.d.).

However, this policy development was not supported by the final results of the WSD. No evidence was found that telecare is more cost-effective compared to 'ordinary care' (Henderson et al 2014). In addition, no evidence was found that telecare users experienced better outcomes in terms of health service use, social care service use, or mortality (Woolham et al 2019). This has, unsurprisingly, created a 'policy problem' (Woolham et al 2017), with policy designed to expand the use of telecare unsupported by the existing evidence, something that affects all stakeholders engaged in provision, users, and carers as well as central government.

It is important to be careful about the claims that can be made about telecare due to the WSD results. Randomised controlled trials are designed to produce generalisable results. They look at pre-established variables (such as mortality rates), but not at the qualitative details of individuals' specific experiences, or the social context of interventions as complex as telecare service delivery and use. What this means is that the WSD does not necessarily tell us that telecare *doesn't* work; it tells us that it *didn't* work when used in the ways that it was used during the WSD trial. As Woolham et al (2019: 11) observe:

> *It is perfectly possible to accept the findings of the WSD without abandoning telecare [...] Developing a more nuanced understanding of for whom telecare works, when, and under what circumstances, would be a legitimate response.*

Woolham et al (2019) draw attention to various aspects of the trial that could have impacted its results, such as the length of follow-up and whether this was sufficient to allow for measurably different outcomes. Since telecare is a complex technical and social intervention, the reasons it may have worked better in some circumstances and less well in others are various. This warrants further investigation into why telecare may not have worked according to the parameters of the WSD.

3.3 The attributes of telecare, of telecare services, and of individual's own circumstances are all important determinants of service outcomes

3.3.1 The particular attributes of telecare technology can affect whether and how it is used, but this can only be understood in its specific social context

A great deal of research deals with the attributes of technology that influence its uptake, use and acceptance (Saeed et al 2019; Chen and Chan 2014; Siren and Knudsen 2017; Arthanat et al 2018; Fang et al 2018). Telecare technology can be intrusive (Mort et al 2013), but in order to be effective, it needs to be accepted and used. Hamblin (2016) found that obtrusiveness, feelings of control over social care arrangements, and information and support were important variables that determined the acceptance of telecare. Obtrusiveness was found to consist of no less than eight categories that should be considered within the design of technology: physical obtrusiveness (including noise and aesthetics); poor usability; obtrusiveness to privacy; poor functionality; having a detrimental impact on human interactions; symbolic obtrusiveness or embarrassment; interference with routine; and sustainability (with regard to affordability and future needs) (Hamblin 2016; see Table 2). These kinds of obtrusiveness may impact uptake and subsequent usage of telecare, and therefore the kinds of outcomes experienced by users.

Table 2: The attributes of 'obtrusiveness', categorised by Hamblin (2016), according to Hansel et al's (2006) obtrusiveness model

Type of obtrusiveness	Features
Physical	Functional dependence / discomfort / excessive noise / obstruction / aesthetic incongruence
Usability	Lack of user friendliness and accessibility / additional demands on time and effort
Privacy	Invasion of personal information / violation of the personal space of the home
Function	Malfunction/suboptimal performance / inaccurate measurement / restricted distance or time away from home / perceived lack of usefulness
Human interaction	Threat to replace in-person visits / lack of human response in emergencies / negative effects on relationships
Self-concept	Symbol of loss of independence / cause of embarrassment
Routine	Interference with daily activities / acquisition of new rituals
Sustainability	Affordability concerns / concern about future needs

Existing evidence tells us that, far from being a technical intervention, telecare is a complex *social* intervention. The use of telecare is embedded in the social context of each user, and in networks of relations and responsibilities (Mort et al 2013). These relations are not only between people; Pols and Willems (2011: 485) observe that the nature of telecare use, and any qualitative outcomes experienced, can also depend on the relationship that users develop with telecare devices: 'the way that technologies and their users will behave turns out to be very hard to predict'.

This point is illustrated by studies that observe the way telecare users both use and 'misuse' their devices (Pols and Willems 2011; Mort et al 2012, 2013). It is through creative engagement with technology, and adaptation by users, that telecare technologies come to life. Telecare users might refuse to use certain devices, fail to fully understand their functionality, or 'over-use' them in order to have social contact with monitoring centre operators (Mort et al 2013: 446). What this evidence shows is that individual's own practices are a part of the way that telecare technology works. The effects of telecare are 'co-produced' or 'co-created', rather than being straightforward technological features (Pols and Willems 2011). Assessing the outcomes of telecare technology therefore requires understanding the social practices of each user. Pols and Willems (2011) conceptualise the co-production of telecare outcomes by distinguishing between the 'policy goals' of telecare ('notions of "dealing with an ageing population" and "reducing caregiver-patient visits"' (p488), and the emergent, practical, 'local goals' ascribed to telecare by individual users, carers and clinicians (such as increasing levels of social contact).

Since telecare technologies are not only technical but also social, relationships between people are potential variables to the outcomes felt (Milligan et al 2011). Telecare devices are embedded in the social dynamics between users, clinicians, carers, residential staff and monitoring centre staff, as well as individuals' own family members. There is evidence to show that family members can pressure telecare users into relationships with devices that they do not understand or want (Mort et al 2013: 441). This makes family relationships significant for the analysis of telecare services and their outcomes. In addition, telecare 'can result in a downward cascade of care-work and responsibilities' (Milligan et al 2011): with family members, monitoring centre staff and telecare users themselves all taking on roles previously ascribed to nurses and doctors.

3.3.2   Telecare strategies should be tailored to individual users' specific needs

Bowes and McColgan (2013) ask about the benefits and limitations of telecare for older people, focussing on independence, participation and identity as key areas that might be impacted by telecare. They found that while telecare did help older people to achieve these goals, there are 'limits', because 'the interactions of technical innovations with human relations must be a central concern' (33-46). Technological interventions will not help users to participate if 'participation' is treated uniformly. Rather, it is necessary first to learn what participation means to each individual, and what activities are associated with it. Hammel (2000) also argues that the benefits of assistive technology for ageing adults must be considered and evaluated within a broader context: 'Assistive technology and environmental interventions (AT-EI) can serve as potential mediators in delaying or preventing functional decline, health conditions, and dependent care placements only if they are considered within the dynamic interaction of the

person, activities, and the facilitators and barriers within the social and physical environment' (37).

The details of individuals' specific needs and preferences should be accounted for in needs assessments, provision and evaluation. This is the perspective taken in an evaluation of telecare use by Berge (2017), who emphasises contextual questions: what is it about telecare that works for whom, why, how and in which circumstances? In testing the hypothesis that 'When people have properly adjusted telecare that matches their need and abilities, they feel safer and may be able to remain in their own homes for longer', Berge found that 'differences in people's contexts influence their reasoning about possible benefits' (p9). These contextual factors were found to include their relationship with their home and how they value being at home, the degree of threat to their safety posed by older age, and the nature of individual health conditions.

3.3.3 Attributes of telecare assessments, telecare trials, and the infrastructure of provision can also impact outcomes

Research has drawn attention to the potential for poor matching of telecare technology to individuals' needs, providing another potential explanation for poor outcomes from telecare use. Evidence points towards the importance of needs assessments, the selection of which telecare devices to make available to users, and how devices are assigned to specific individuals as significant factors that can determine the quality of outcomes felt by users. These assessments are often made as part of technology trials, which can also affect the selection of telecare. In one striking example, a technology trial started with assigning telecare to individuals based on professional opinion, but due to the needs of the study, eventually telecare was assigned to as many individuals as possible (Pols and Willems 2011). The pressure that technology trials can place on technology provision has been described as a shift from 'care practice' to 'research practice' (Pols and Willems: 489). The context in which telecare devices are made available to older people therefore has clear implications for how its 'successes' and 'failures' should be understood. Indeed, the assessment of 'success' depends on how success is defined. This can be conceptually problematic, given that telecare use can often involve a shift from 'policy goals' to individuals' own 'local goals', something which is 'to be expected and encouraged rather than avoided' (Pols and Willems 2011: 493). A further dynamic to consider is that telecare trials are not comparable to 'real life' services. Telecare trials can involve social interactions with care professionals and with researchers that would otherwise not take place, and may therefore lead to more positive reactions than telecare services might when experienced as part of a mainstream service (Mort et al 2013). What all of this means is that the practice of telecare assessment can impact the outcomes of telecare assessment.

This evidence also draws attention to the dynamics of telecare provision, as a further variable that can impact how services are experienced, and the kinds of outcome they can have. This landscape of provision can be thought of as the institutional 'infrastructure' that is needed to establish and maintain the services making telecare available for older people: 'simply providing knowledge about what technology is or will become available, or how technology should be used, though essential preconditions, are unlikely to be enough to ensure it *is* used. There is a need to create an *infrastructure* to support its use' (Woolham and Frisby 2002: no page, authors' italics). By infrastructure, these authors refer to the series of steps and stages that are involved in the coordination of telecare services. This includes identifying users, assessing their circumstances, analysing their needs, identifying appropriate kinds of technology, identifying different options and suppliers, considering ethical issues, preparing care plans, as well as ordering, installing, monitoring and reviewing the selected equipment. Each of these steps is shown to require various forms of infrastructure at both local and national levels, from building the capacity of GPs, to building assessment tools, building relationships between primary care and other local services, coordinating the efforts of electricians, plumbers and engineers, and building knowledge sharing forums and databases at the national level. These components of the institutional infrastructure available for telecare service design and delivery can determine the ways that people are able to engage with the services on offer, the kinds of experiences they can have, and therefore the outcomes that telecare can achieve.

3.4 The broader institutional context, including national and local policy frameworks and governance structures, are important for the success of local telecare services

3.4.1 Local and national policy and governance frameworks are significant to telecare provision, and therefore to outcomes

Policy and governance frameworks can have important consequences for local telecare service infrastructure, and for the dynamics of provision. Laperche et al (2019), for example, look at the supply side of innovation for older people: the way innovations are created, and issues relating to their emergence and diffusion. They show that it is important to consider the institutional and organisational arrangements that determine the way that smart tech is rolled out and accessed. The authors identify barriers to technology diffusion: the solvency of the market, insufficient institutional support, and the variable availability of 'open innovation strategies' and innovation networks (Laperche et al 2019). Significant governance frameworks highlighted by other researchers include the capacity for co-ordination between the housing

sector, care and social services for innovation in housing and care for older people (Houben 2001). Another factor is national policy, which has advanced far less rapidly than the telecare technology itself (Berridge et al 2014).

Drennan et al (2018) argue that the English care system has shifted away from promoting health and wellbeing towards preventing illness and harm. Predictive technology may be more closely associated with the monitoring of crises than with promoting wellbeing, making this shift in national care frameworks pertinent to analysis. These researchers also found that 'only at local level did we identify some limited attention to preventative actions with people with early frailty' (168). This suggests that it is not only the national agenda but also the multilevel governance of care that can produce different approaches to provision of technology, and thereby to older people's experience of telecare.

Barlow et al (2005) stress the importance of integration across existing organisational boundaries at local level, in order to move from pilot telecare schemes to more mainstream service delivery. They point out that 'supporting independent living requires multi-disciplinary and multi-agency working and the integration of different approaches to care' (p452). Far from operating as one distinct service, the effectiveness of telecare 'depends on the quality of the interaction between stakeholders'. These include local authority housing and adult social services, NHS professionals, alarm services, housing providers and technology supply companies. Martens (2018) states that 'for ageing in place to be something other than a result of cutbacks and rationing ... ageing in place policies need to be accompanied by coordinated policies in their fields of housing, care and social services' (p2). Oldman (2003) also suggests that the 'ageing in place' agenda needs to be set within the context of a broader housing and planning policy framework. This literature shows that telecare cannot be considered as a stand-alone intervention for achieving greater independence for older people. As well as being embedded in the lives of service users, telecare is embedded in local and national policy and in governance frameworks that determine how care is rolled out within local communities.

3.4.2   The political context to local telecare service provision in the UK

Case studies of local authority telecare policies, and the development of local services, reveal that local authorities are often focussed on and prioritise cost-efficiency and reduced use of adult social care services. For example, the cost saving potential of telecare is emphasised in two recent case studies of telecare and assisted living services, one in Blackburn and Darwen, the other in the London Borough of Hillingdon (LGA 2015). In each case, 'improved outcomes' are qualified in terms of reductions in need for and escalations of care. The Hillingdon case, for example, states that 'the council's aim is to reduce/delay entry into residential care, prevent people needing ongoing care and support confidence during the reablement process, as well

as achieve cost savings' (LGA 2015). This is important because evaluations of effectiveness using these goals to define success might overlook individuals' own 'local goals', such as using telecare platforms to increase their social contact.

Telecare services are often designed with the policy goal of efficiency, 'based on a belief or hope that it will deliver cost savings and better outcomes' (Woolham et al 2019: 11). Others have argued that the prevailing logic informing telecare provision and promotion is the pressure to achieve cost efficiencies in care. Mort et al (2012: 803) argue that shrinking health and social care budgets, coupled with a discourse on unsustainable demands for care due to demographic ageing, mean that telecare technology can be deployed in a coercive way: 'In England, because of shrinking budgets, home telecare systems are more likely to be installed where older people are assessed as having high levels of need; moderate levels are increasingly not attracting support'.

And yet previous research, most notably the WSD, has shown that telecare may not deliver cost efficiencies at all (Woolham et al 2017, 2019). Other studies have shown that positive outcomes experienced by older people using telecare may not be associated with reductions in their need for in-person care (Mort et al 2012, 2013). This reveals a tension around exactly what telecare technology is for, what kinds of goals it is intended to achieve, and what kinds of indicators any degree of 'success' should be measured against. Local authorities are clearly under pressure to reduce the demands on adult social care budgets, and the capacity for telecare services to deliver cost-efficiencies may therefore be considered a fundamental component of success. Other potential positive effects include 'creative engagement with technology' or the 'co-production of care relations' (Mort et al 2012: 799). These present a different interpretation of the benefits that telecare might offer. Hamblin et al (2017: 77) observe this when researching the barriers to telecare adoption: 'different stakeholders (policy-makers, telecare commissioners, academics, care workers and unpaid carers) had varied perspectives on the purpose of telecare'.

3.4.3   Ethical implications

Telecare may have different purposes for different stakeholders, and the priorities of those engaged in production and provision are important considerations for the analysis of outcomes. How the goals of telecare services are established and by whom also has ethical implications. Mort et al (2013) observe that evaluation of telecare has developed within an industry context, and has therefore prioritised effectiveness and efficiency over social implications. They have developed an ethical framework for telecare which acknowledges the social component to telecare use and outcomes. This stipulates that telecare services should be produced in 'meaningful consultation' with older people, putting users at the centre of

service design; it acknowledges that telecare raises questions of privacy and confidentiality; it acknowledges that using telecare 'puts older people into new relations both with people they know, or have never met'; it acknowledges that telecare 'creates new forms of labour, both for providers and so-called users' (Mort et al 2013: 348).

Table 3: An ethical framework for telecare (Mort et al 2013):

Design: who is involved?	Who needs to be consulted, to participate in system design and to decide which needs are going to be met? Telecare should be designed, shaped and trialled through consultation with a broad range of actors. Many older people are ready and willing to participate in these processes: it is up to industry, government and providers to facilitate this activity, in collaboration with established networks of older people. Telecare that is produced without appropriate and meaningful consultation and engagement will not meet the needs of older people.
Policy and practice: what problems can telecare help with? How do other problems fit in or not?	Although telecare can be very useful in an emergency situation and has other specific roles, it cannot function as a panacea for problems associated with ageing. There are needs that it cannot recognise or meet. When telecare is designed to enhance (or can be used for) social support, it seems very popular. More often it is used to monitor older people who remain rather passive: if they are more active in using the system for social contact this is seen as 'misuse'. Telecare systems could be used to promote social relationships that are more horizontal and active rather than vertical and passive.
Use and implementation: who is connected to the telecare system?	The installation of a telecare system opens up questions of privacy and confidentiality, highlighting complex issues about the ownership, use and control of personal information and sensor data. The availability of data raises questions about access to it. Information about an older person's activities in their home, or their feelings about their chronic illness, is powerful. The sharing of such information has the potential to change relationships of care: between parents and adult offspring and between paid carers and older people. Some developers recommend the use of telecare to monitor the capacities of older people living alone. It must be made clear to the older person at the point of installation that this might happen.
Experience of use: how might a telecare device change an older person's home?	The aim of staying at home should be opened up to question, rather than assumed. Although many older people strongly desire to remain in their own homes as long as possible, this might not be so appealing if 'home' is under scrutiny and is the object of constant monitoring. Telecare systems run the risk of turning homes into 'institutions'. Strong

	efforts should be made to minimise the disturbance to people's homes: designers, prescribers and installers must take seriously the objections of older people to such intrusions. Telecare devices can diminish people's sense of security despite their aims to do the opposite: they can make people feel vulnerable and scrutinised.
Experience of use: who will be the active user of the telecare system: the older person/and others?	Becoming a user of telecare is to take on a new identity and accept a new network of connections in which older people have a particular (and quite limited) set of roles. There are notable differences in older peoples' experiences of telecare systems where they can maintain physical control (e.g. activate alarms to request help) and those in which alarms are triggered environmentally. The latter lead to more 'false alarms', creating difficult work for tele-operators and others involved in monitoring, and can create unnecessary concerns for older people and their families. Using telecare systems puts older people into new relations both with people they know, or have never met (but may come to know). These changes should be openly discussed with prospective users of telecare.
Policy: is it worth the effort?	Telecare involves a lot of work for many different groups and creates new forms of labour, both for providers and so-called users: it is not necessarily time or cost saving. In most cases, telecare cannot prevent negative incidents: it cannot stop people falling, becoming ill, or getting lost. Its two main functions are to triage assistance and/or enable support. Some telecare systems require a lot of effort from users, who need to log on daily or weekly to answer difficult questions and report on their health. Given that the telecare system is not usually going to prevent negative occurrences, is it really worth the installation and maintenance effort? Potential users and others need to balance the costs of the (material and emotional) labour involved against the benefits of being involved.
Politics, choice and flexibility	Sometimes older people receive telecare as part of trials or pilot studies designed to test the acceptability and workability of particular systems. This is often a positive experience for older people, who enjoy being involved in a detailed analysis. Trial results are often positive due to the care and attention this stage of development attracts. Difficult decisions must then be made at the conclusion of such studies: it would be unethical to remove technologies from people who had come to rely on them, without an adequate substitute. Conversely, it is sometimes unclear to older people how they can have telecare removed from their homes. Older people must be able to change their minds about accepting telecare, which itself should be adaptable (open to

	supplementation/reduction). The prescription and installation of telecare is a complex process. Practical questions of cost to individuals and health services are paramount. In some countries, national policies put pressure on local authorities to commission telecare services, which may then be prescribed to individuals who may not benefit. Families may also pressurise individuals to accept systems they do not actually understand or want. There is a widespread presumption that telecare saves funds by reducing demand for collective living and reducing demand on other care services, but this assumption is simplistic and needs to be carefully scrutinised and analysed.
Practice dynamics: what would happen if the older person's condition deteriorated?	Older people's lives can be subject to rapid change: often telecare is prescribed to very vulnerable people who are on the edge of being unable to manage on their own or who have serious chronic disease, with high support needs. Telecare is often installed as a 'last ditch' effort to help people stay 'at home'. The systems themselves, however may be 'static', unable to change according to individuals' needs. Some devices can be reprogrammed (e.g. bed sensors) but this requires ongoing analysis of how the current arrangements are benefiting the 'users'. In some countries telecare is not well supported, so devices remain unused: either because older people/families do not understand how to use them, or because the device no longer meets the person's needs. Individuals – both professionals and others – need ongoing training about telecare systems so they can use them as effectively as possible.

This framework raises very different issues to the goal of reducing demands on adult social care resources, for consideration as part of telecare programmes and evaluations. Issues about consent, privacy, remotely gathered data, how it is stored and who has access to it have also been recognised by Milligan et al (2011). Another issue raised is the possibility that telecare technologies could be used as a replacement for in-person care (Milligan et al 2011; Mort et al 2013). This seems plausible given the emphasis on cost savings as a key policy goal at the level of local authority telecare policy design. Evidence from elsewhere highlights some of the risks that reducing in-person care might pose. Paganini-Hill (2013) found that variables associated with living at home included many social variables, such as receiving 'meals on wheels'. This suggests that even these so-called 'superficial' social contacts may be a significant part of the benefits that older people can gain from staying in their own homes for longer. Milligan et al (2011: 250) point out that in-person care has benefits that 'cannot be picked up by remote monitoring', such as noticing the upkeep of the home. If technology becomes a replacement for social functions that might easily become automated, then loss of these kinds of social contact is a potential trade-off. Sorell and Draper (2012) also stress the importance of social contact to older people's wellbeing, drawing attention to the potentially

'depersonalizing character of telecare': '[...] it is hard to see how telecare can promote independent living without keeping carers (formal or otherwise) out of the homes of users. And if carers are typically important members of an elderly person's social network, the conclusion that telecare is isolating is unavoidable' (p42). These researchers conclude that technology for 'ageing in place' must therefore be rolled out in the broader context of social service provision and policy. In addition, they advocate the development of technology 'that explicitly addresses isolation' (p43).

Sorell and Draper (2012) argue that the independent living discourse is as much about this push for cost efficiency as it is about individual wellbeing. Given that socially organised health and care services will be in increasing demand as the population of older people grows, the cost-cutting potential of telecare is a key attraction for UK policymakers (Sorell and Draper 2012). This is also considered to be the case across Europe, as illustrated by Kaasalainen and Huuhka (2012) who write that, in Finland, 'austerity-driven government is set to increase home care and services delivered at home, since they are considered to be more cost-efficient than those offered at assisted living facilities or institutional care' (271). Stemming from this, 'ageing in place' policies have been criticised as amounting to the restriction of access to forms of care that would be more expensive than staying at home. Where 'ageing in place' is not a choice but a necessity, Martens (2018) describes it as 'staying put' rather than 'ageing in place', something that should be an option for older people but is often the only option available. Oldman (2003) writes that the discourse of independent living 'allows governments of any hue to justify substantial cutbacks in social and housing investment' (p45).

One of the most significant issues with 'ageing in place' policies and strategies (such as rolling out cost-saving technology) is therefore the degree to which they enable the withdrawal of other services or can be understood as a replacement. Houben (1997) is also wary of taking the 'independence paradigm' (355) at face value. In order to counteract the potential negative consequences of a 'modernisation' agenda and technological advancement that see increased 'independence' as necessarily beneficial, Houben (1997) argues that 'a broader, social participation model should be developed'. This approach would not restrict access to the benefits of advanced home technologies, but might serve to embed them within a broader social infrastructure, and safeguard against advanced technology being framed as an alternative to other measures. What this literature tells us is that advanced home technology may have a place in enabling older people to live independently, but that it should be considered an addition to rather than a replacement for in-person care services and physical home adaptations.

3.5 What does the existing evidence tell us about the provision of advanced telecare technology?

Various aspects of telecare provision and use can affect the nature of its benefits and the outcomes for older people. Research produced by the DoH did not find evidence that it reduced health or social care service use, mortality rates, or that telecare services were cost effective when compared with ordinary care. The existing evidence does not strengthen our understanding of when telecare works, when it doesn't, and why. It suggests that the analysis of telecare outcomes still requires a qualitative empirical approach that centres on the particular practices involved in its use and provision.

Evidence also shows that telecare plugs into, reacts to and changes existing social networks and relations. This field of research also makes it clear that users are not the only individuals to consider in analysis of telecare functionality and outcomes. Telecare plugs into (and changes) existing social networks and relations, and cannot be understood without regard for the social networks and relations that individual users experience. The attributes of telecare technology itself are important factors in its success. How these attributes are perceived by older people and how they impact use should therefore be considered within product design and evaluation. Nevertheless, the design and evaluation of products and services for telecare provision should not be limited to its technological aspects. Suppliers and providers of advanced telecare also need to consider how these interact with the specific context of users' circumstances, needs, preferences and lifestyles. These represent important variables and products and services should not be provided in a uniform manner, but should be used as part of bespoke services that are tailored to individuals' specific care needs.

Finally, the evidence shows that telecare services are impacted by governance and policy frameworks at different levels. Both local and national policy frameworks can impact the way that telecare services are rolled out. The success of telecare services can also be informed by broader market conditions, the availability of institutional support, and access to innovation networks for suppliers and providers of telecare. Coordination between the different actors and agencies involved in the provision of telecare is also likely to be a key determinant of its success. The research literature also makes a valuable distinction between 'policy goals' (such as reduced admissions to health and social care services) and the 'local goals' of clinicians, carers and users themselves, which may be very different (Pols and Willems 2011). Discrepancies have been found between policy goals for telecare and the goals pursued in practice (Mort et al 2013: 447). The assessment of 'success' depends on how success is defined. The fact that telecare may have different purposes to different stakeholders means that the priorities of those engaged in production and provision are important for analysis of outcomes.

4. Methods of data collection and analysis

4.1 The focus of our research

4.1.1 Advanced and predictive telecare

Questions about the benefits of telecare for older people are well covered in the research literature. However, the new predictive functionality of advanced, third-generation telecare introduces new questions about how telecare works and could even change the ethical issues associated with provision. The ethical framework for telecare devised by Mort et al (2013; see Table 3) does not account for the predictive functionality of advanced telecare:

> 'In most cases, Telecare cannot prevent negative incidents: it cannot stop people falling, becoming ill, or getting lost. It's two main functions are to triage assistance and/or to enable support. Some telecare systems require a lot of effort from users, who need to log on daily or weekly to answer difficult questions and report on their health. Given that the telecare system is not usually going to prevent negative occurrences, is it really worth the installation and maintenance effort?' (Mort et al 2013: 440).

Research in this field runs the gamut of telecare typologies, from stand-alone technologies (e.g. medicine dispensers), active devices which, when activated, can be linked to call centres, to sensors which work 'passively' by automatically detecting and monitoring activity such as movement (Woolham et al 2017). Passive sensor technology and predictive telecare is distinctive in its ability to monitor activity over time, recording how patterns of behaviour (such as use of certain rooms, or using certain household items) changes over time. A baseline of users' habitual behaviours can be created, and changes in behaviour can be tracked, allowing for certain conditions to be identified in advance (Stowe and Harding 2010). The predictive functionality of advanced telecare means that prevention becomes a goal against which 'success' can be measured and assessed. However, different stakeholders prioritise different goals, from local authorities seeking to reduce demand on adult social care budgets (LGA 2015), to individual users 'misusing' telecare to pursue social connections (Mort et al 2012). The definition of which goals to pursue through the provision of telecare therefore also has implications for how we define the 'benefits' of telecare. Our research findings, presented in the next sections of this report, focus on the provision of advanced and predictive telecare.

4.1.2 How does the supply side of advanced, predictive telecare services affect its outcomes?

Much of the existing research literature focuses on how telecare devices are received and used. However, the evidence suggests that the broader institutional context in which telecare services are designed, implemented and assessed is also a significant determinant of outcomes. Those on the supply side of telecare provision may have different goals to those on the demand side. The policy goals of central government, those of local authorities, and the business goals of telecare manufacturers will all feed into how telecare services are designed and assessed. These therefore warrant further investigation.

This focus on the governance of telecare is alluded to in the research literature, but receives far less attention than the dynamics of telecare use. Milligan et al (2011: 348) point out that telecare is 'conceived, produced and marketed within complex social arrangements […] Analysing telecare technologies thus requires a detailed examination of the technologies in practice, how they are designed and made, and how they are implemented and experienced'. Greenhalgh and Paoutsi (2019) also raise the institutional landscape of technology innovation, calling for new theorisations of this field. Nevertheless, the supply side and governance of telecare remains an under-researched area.

On the supply side, the role of manufacturers and their relationships with others involved in coordinating the provision of telecare is particularly under-researched. Telecare manufacturers and suppliers have a significant amount of power within the sector. Their significance is noted by Milligan et al (2011), who argue it is the technology-push of suppliers, rather than a demand-pull, that dominates the dynamics of the industry. Woolham et al (2019) also argue that the industry is 'at risk of market capture and supplier-induced demand'. It therefore seems pertinent to observe the social dynamics that occur between supply-side actors, including manufacturers, and how these might impact the outcomes of telecare provision. The way that the different interests of the public and private sector intersect in public service provision may also be of interest (Scott 2000). These different actors are institutionally distinct, and operate under very different (legal, financial, etc.) constraints and obligations. They may therefore have different (perhaps conflicting) goals for the provision of telecare.

The WSD results show that telecare was not able to improve outcomes for telecare users, particularly according to the goal of reducing health and social care service use, and providing cost-effective care (Woolham et al 2017, 2019). With an emphasis on predictive telecare technology, our study asked whether the way that the governance and coordination of telecare provision might impact the kinds of goals that are pursued, and therefore the kinds of

outcomes and experiences that older people can have. Our research findings are presented in the next sections of this report.

4.2   Methodology

The WSD was a quantitative clinical trial used to study the outcomes of telecare use. It found no evidence that telecare use reduced demand on health and social care services, or delivered more cost-effective care (Woolham et al 2017, 2019). However, there are methodological limitations to randomised controlled trials. They are designed to produce generalisable results, assessing pre-established variables (such as mortality rates), but not the details of individuals' specific experiences. More in-depth, qualitative analyses are required in order to understand *why* telecare did not produce the expected positive outcomes in this case (Woolham et al 2019). As Hamblin et al (2017: 77) observe, 'the methods used to explore telecare as a subset of technology need to be capable of exploring the contexts and social interactions in which it is embedded'. Hamblin et al advocate a qualitative approach to research, as do Pols and Willems (2011: 485), who argue that qualitative data is the most suitable form of data to 'trace attempts to domesticate technologies'. Our research applies a qualitative approach to analysis, in order to identify the social dynamics that feed into telecare technology provision. It sought to identify the goals ascribed to telecare provision by those involved in coordinating its provision, the practices used to pursue these goals, and the constraints, obstacles and opportunities faced in the process.

For our research, presented in the following sections, data was collected during interviews with stakeholders involved in coordinating the provision of smart assistive technology in England. These were conducted with the suppliers of advanced second- and third-generation telecare technology; with housing, health and social care providers delivering these products and services to users; with local authorities at the centre of care provision; and with other stakeholders, both public and private sector, otherwise involved in providing, catalysing or assessing access to digital telecare technologies. Twenty nine stakeholders were interviewed in total (see Table 4). Interviews were also undertaken with a small number of older people living independently in extra-care housing schemes that had expressed an interest in developing supplementary advanced assistive technology programmes.

Interviews were recorded with respondents' permission, notes taken, and then recordings destroyed. Some anonymised references from these interviews are used to illustrate the findings. Several respondents asked that direct references to their interviews not be made.

Table 4: Schedule of interviewees

Scheduled interviews	
Interview no.	
Manufacturers and suppliers of digital telecare	
1	Account manager
2	Chief Executive
3	Account manager
4	Product design
5	Chief Executive
Local government	
6	Head of department
7	Head of department
Housing associations and other housing providers	
8	Head of department
9	Head of department
10	Chief Executive
11	Housing manager
12	Contract manager
13	Head of department
14	Group of 4 respondents: Extra care housing managers and housing officers
15	Group of 4 respondents: Sheltered accommodation housing managers and housing officers
16	Group of 4 respondents: Residential care housing managers and housing officers
Other stakeholders	
17	Business accelerator
18	Business accelerator
19	Evaluation of assistive technology
20	Evaluation of assistive technology
Older people	
21	Woman, 55+
22	Man, 55+
23	Woman, 70+
24	Woman, 70+
25	Woman, 70+
26	Woman, 70+

Interviews were semi-structured and in depth. The purpose was to build a rigorous qualitative picture of the industry and some of the challenges its various actors have to deal with. Questions focussed on the intended outcomes of respondents' work providing technology to users; the purpose of such technologies and their views about what they could achieve; how they pursued these outcomes in practice; and the various motivations, challenges and constraints they had to navigate in the process.

4.3   Research questions

The central research questions informing our interviews were:

1) What are the challenges involved in coordination and provision of advanced telecare technology for older people?
2) How do these challenges affect the outcomes of digital telecare provision for older people?
3) How might coordination be improved to further develop positive outcomes for older people?

Qualitative thematic analysis was used to analyse our interview data. This raised four central themes that are addressed in turn in the next sections of report:

1) What is advanced digital telecare technology for, and how does it work?
2) How are advanced telecare services coordinated?
3) How does the broader national and local institutional landscape affect the outcomes of advanced telecare provision?
4) How does the network of responders that contribute to predictive telecare use affect its outcomes?

4.4   Limitations of the research

Our focus on advanced and predictive telecare limits the conclusions that can be drawn to reflections about these types of devices and platforms. The research also has limitations that are inherent to small-scale qualitative studies, principally that the conclusions are not generalisable. The data provide insights into particular practices deployed by the individuals interviewed. The sampling for this study was also limited: our focus for this report was to analyse the work of manufacturers of telecare, project managers engaged in the provision of telecare, and those involved in coordinating telecare services within local authorities. We were also interested in the relationships between these groups. The findings are therefore particular to these kinds of actor, and not necessarily representative of the sector as a whole.

Interviews with older users of telecare and advanced assistive technology were originally planned to feed into a parallel piece of research about the experience of telecare use. However, since interviews took place in early 2020, participation in this research became less of a priority

for older people and their carers who were coping with the Covid-19 crisis. The limited number of interviews that did take place (6 in total, see Table 2) provided useful insights into those individuals' lived experiences, and how these might interact with telecare service provision. Nevertheless, our findings do not address the experience of telecare use in depth. This limitation also means that we were not able to consider the experiences of older people with specific needs such as those living with dementia.

5. Findings: What is advanced telecare technology for, and how does it work?

This section presents the research findings of our study, drawing on analysis of the interviews described above. Quotes from the interviews are used to illustrate key points in the analysis.

5.1 The first, second and third-generation of telecare

Telecare divides into various different categories. A major distinction is between 'active' and 'passive' technology. Older, analogue telecare is active, in that it asks users to actively engage with it, for example by alerting a call centre in cases of emergency. This kind of technology is considered to be the first generation of telecare. It includes devices that can be worn and allow users to send a signal if they fall over or have any other difficulty. Active, analogue telecare technology cannot identify problems that have not already been identified by the user themselves.

With the advent of internet connectivity, telecare has been developed to include passive devices. These include monitors and sensors of various kinds, which can gather information automatically, without the need for users to intervene. For example, devices such as chair and bed mats can alert designated responders in the case of incontinence or if people fall over. The most advanced telecare technology is not only passive, but also predictive. Devices can be used to track daily activity, and with repeated use, it becomes possible to predict certain conditions, even before these problems have been identified by users themselves. The most commonly referenced problems in this study were falling (which might be identified in advance by monitoring the speed and gait of an individual's walk) and UTIs (which might be identified by monitoring the frequency of toilet use). Falling and UTIs are two of the most common problems behind entry into residential care. Other uses of advanced telecare technology include the identification of malnutrition through monitoring kitchen and fridge use, and identification of general wellbeing by monitoring use of different areas of the home.

5.2 Ambient assisted living

Another feature of advanced, third-generation telecare technology is that it can be connected via the 'internet of things', allowing monitoring data to be collected in one place that can be reviewed by users, their carers and family members. This allows numerous different devices around the home to be linked, with all information logged and stored, compiling a database of people's activity over time. Digital interfaces have been designed by various companies which present this information to users. Carers and family members can also log into these

interfaces, in order to monitor older people's activity remotely. Individual devices might include sensors on the fridge and other appliances to monitor use, mat sensors to monitor positions in the home and use of certain areas, or virtual assistants such as the Amazon Alexa, which can make calls or log visits from carers. Standard devices such as smoke alarms can also be integrated into some of these systems. Using ambient assisted living technology, these devices each export data to be compiled within the same interface, allowing viewers to see patterns of behaviour in the home, and whether these have changed over time, indicating certain problems:

> *Just by clicking through each day you can see a real pattern in someone's routine. It's normally very similar each day, they tend to wake at the same time, go to bed at the same time, spend most of their time in one particular room, go out on certain days. So you can really see that at a very quick glance after a couple of weeks of data. (Tech supplier)*

> *One person could monitor three different family members' portals. A local authority may be reviewing numerous clients. (Tech supplier)*

5.3 The purpose of advanced telecare technology

5.3.1 A preventative agenda in care

When discussing the features and advantages of advanced and predictive telecare, respondents emphasised its capacity for passive sensor technology to monitor changes in users' behaviours, allowing interventions to be made that might push back the need for moving into residential care. This preventative capacity of advanced telecare was framed as a means to promote independent living or 'ageing in place':

> *For quite a lot of people it's about remaining independent for longer. Prevention is better than cure. At what point do you use home technology that can help you stay independent for as long as possible? (Housing and care provider)*

Using telecare technology in the home to prevent the need for care was understood as something that motivated individual users of telecare, but was also understood as a motivation for local governments and health and social care professionals to deploy advanced telecare strategies:

There's a preventative agenda pursued by the county council. They are keen to push a preventative agenda and so have withdrawn older type [analogue telecare] support in residential care. (Housing and care provider)

The social worker says 'I want you to stay in your own home because that's what you want to happen but we have to manage the risks'. (Tech supplier)

This understanding of telecare as a preventative technology aligns with a preventative agenda in central government health policy (DoH 2006). It also aligns with the government target for individuals to have five more years of healthy living, embodied in the healthy ageing challenge of the UK Industrial Strategy and associated funding programmes (Department for Business, Energy & Industrial Strategy 2017; Centre for Ageing Better 2019; UKRI n.d.).

5.3.2 Cost efficiencies in care provision

A second function of advanced telecare reported by respondents to this study was its capacity to deliver cost efficiencies in the provision of care. Use of telecare in the home might deliver cost savings for local authorities operating under the pressure of increasing demand for care services. Authorities would need to 'do more with less', to work 'with a diminishing resource base', and to adjust to necessary cuts in support:

We get criteria from the local authority. It might be that they want to do a pilot because they want to look at reducing night staff. They could be creative with a bit of technology and reduce that by 50%. It's such a lot of money there that can be saved. (Tech Supplier)

In this case, the benefits of advanced telecare are framed as the ability to reduce the cost of providing in-person care. The local authorities we spoke to for this study were interested in technology that might lead to a reduction in the need for staff working at residential schemes. With older people able to stay in their own homes for longer, domiciliary care can be provided and, in theory, the costs associated with providing residential care could be reduced. The cost of domiciliary care itself could also potentially be brought down, with the monitoring of eating, drinking and other habits allowing for care to be planned more efficiently. The benefits of smart monitoring systems discussed by respondents also included their potential to allow house visits from carers to be logged, ensuring they arrive and leave to schedule and allowing welfare visits to be cut back:

Local authorities should model how much they can save on domiciliary care and then compare that to the cost of technology, welfare visits and welfare calls, which cost money, see how many of these calls can be saved. (Tech supplier)

So you can see if you're were paying for a half an hour call, you're getting your half an hour call. Local authorities would like this as well, because they're paying for 45 minutes or an hour and actually the carers are leaving after 20 minutes, so it allows them to check that they're spending their money wisely as well and actually paying for what they're getting. (Tech supplier)

Another place where local authorities can use advanced telecare is to gauge the care needs of individuals and plan their care packages accordingly. By monitoring whether individuals leave the house or use all rooms in their home for example, a local social worker may be able to more accurately determine where additional care is required, and where it is not required. This may have more to do with 'right-sizing' than with cost-saving per se, but nevertheless it provides a means towards greater efficiency in care, allowing authorities to save on the costs of care where possible. The potential to make these savings also applies to housing associations and other housing providers, who might use advanced telecare in the hope of bringing down costs associated with emergency beds, carers and other staffing costs:

You never have enough carers. These products are really for care homes and support organisations. (Housing and care provider)

Each organisation will have a price for one bed per day. You have to look at where they can possibly save the budget, it's about efficiency and productivity. (Tech supplier)

This aspiration for achieving cost savings provides a very different rationalisation for deploying advanced telecare services to the aspiration of achieving a preventative agenda in care. For those interviewed, the benefits of advanced telecare provision were as much about producing efficiencies and reducing the cost of providing care as it is about pursuit of a preventative agenda in care, enhancing the quality of care experienced by users, or the extension of quality of life.

5.3.3   The analogue switch off

A third function of advanced telecare, and a factor motivating housing providers to engage in the provision of digitally enabled care services, is in response to the approaching analogue 'switch-off'. This will entail the permanent removal of analogue phone lines by BT by the year

2025. All communications technologies will need to be fully digitised by this date, meaning that the door access systems and first-generation telecare technology commonly used in sheltered housing and residential care schemes will need to be replaced. This places pressure on housing associations and other housing providers to update their technology, simply to maintain the kinds of services they already provide. It also creates an imperative for housing providers and local authorities to familiarise themselves with the kinds of products on offer in the digital telecare market, and to investigate how these products might work within their service models:

> *All our analogue technology is through the phone line and has to change. (Housing and care provider)*

> *Local authorities might say they want to update their technology, they want to be more digital due to the big digital switchover, which is a huge thing at the moment. So they're trialling out different things. (Tech supplier)*

5.4   Ambiguities in the function of advanced digital telecare

Taken together, these three factors were identified by respondents of this study as motivating their provision of advanced telecare: its preventative capacity, its cost-cutting potential, and its ability to enable continued service provision after the analogue switch-off in 2025. It will therefore be vital to learn how these factors interact. Each represents a different function, purpose or capacity of advanced telecare, but the pursuit of each one will not necessarily result in achieving the others. If providers of telecare are primarily driven in the pursuit of one function above others, this may lead to a narrow service design or one that fails exploit the full potential of this technology.

For instance, the preventative function of digital telecare was emphasised by its manufacturers and suppliers. This function rests on repeated use over time, and the ability to identify changing patterns of behaviour that might signal certain frailties or conditions. Suppliers therefore saw telecare use as optimal when used to gather evidence about the behaviours and habits of older people and to respond to such data before any crises occur:

> *With all that data you can establish a baseline for that individual, what times they eat, sleep etc. […] The aspiration is… to use this in a preventative rather than a reactive way. (Housing and care provider)*

> *If you get into someone's house with the sensors before there's really a need for that to happen then you can prevent them needing to go [into residential care]. […]*

instead of jumping to the worst case scenario of putting someone in a residential home, you can use the system to prevent it happening for a lot longer. (Tech supplier)

People should just have the system in their house looking at their daily life. You can look back at the data. It's actually very useful to have when there's no need for it, just for data collection to start with and then you can build on it from that point. It would be really useful to have this technology tracking use before there is a need for it. (Tech supplier)

There are various reasons why this kind of preventative approach through data collection may not be pursued by individuals and housing providers. Firstly, individuals may not look into options for telecare until they are almost at crisis point:

By the time people think they need to be looking at products, mostly by then it's about crisis management... people hide their needs and it's only when they have a crisis [that they engage with technology]. There is a gap between the 'prevention' side of tech care, and the 'management' side of tech care. The products fall into these two categories and the difficulty is getting people to accept the technology earlier, when it is at the prevention end of things.... the time to make the biggest change might be before people even think they're old. (Housing and care provider)

This raises the point of the 'senior acceptance model' (Chen and Chan 2016; Hamblin 2016). Most of the older people interviewed for this study were reluctant to try new telecare technology, not because of any dislike of technology itself, but because they felt happy without it. Building interest from older people in trying new advanced home technologies before they need additional care may therefore be a barrier to its full preventative capacity.

Users' acceptance of telecare is not the only (or main) obstacle to it being used in a preventative way rather than simply for crisis management. Respondents suggested that housing and care providers may not always be able to help older people to exploit the advanced, preventative functionality of telecare. These responses suggest that the knowledge and capacity required to use advanced telecare in this way may be missing:

With people in institutions, it's about management. It's about having the most efficient way of managing. (Housing and care provider)

[Care organisations] don't know it's possible to have machine learning. They wait for the ambulance call. They do the monitoring but they do not do the alerting. (Tech supplier)

If individuals and service providers are using telecare primarily as a tool for responding to crises, the preventative function of advanced telecare may not be fully exploited. For instance, the subject of monitoring (rather than simply reacting to) individuals' care needs emerged as a contentious issue for housing managers working in one extra care housing scheme. The logic of preventative care necessitates that people are available to respond to changes in users' behaviour. While technology is often designed so that family members can monitor their elderly relatives, this does not account for those whose relatives live abroad, have complex needs of their own, or for whom family are not available. In principle, this task can instead fall to call centres. Nevertheless for local housing managers or those implementing care packages, and in the absence of family responders, the existence of predictive interfaces can represent an increased burden. Those interviewed felt it required more, not fewer, carers available on site. This was also framed as a legal and ethical issue, where the monitoring of changing behaviours could only be regarded as ethical if there was always sufficient in-person care available to respond, should unexpected emergencies be flagged by the technology. The pursuit of prevention may therefore require greater in-person care and greater expense. This may be contradictory to the pursuit of cost-efficiencies. With fewer and fewer carers available, some housing managers reported refusing to use technology that might alert them to crises where they would not have the capacity to respond. There may therefore be a tension between designers' aspirations for advancements in predictive telecare, and how they can actually be deployed in an institutional setting. To be fully realised, the preventative function of advanced telecare may require more, not fewer, hours of professional in-person care to be made available. This means that the preventative capacity and cost-cutting potential of telecare may represent conflicting goals.

The existing quantitative evidence suggests that the link between the adoption of telecare and achieving objectives such as cost efficiencies is far from straightforward (Hirani et al 2014; Steils et al 2019; Woolham et al 2019). Most strikingly, this evidence suggests that telecare is 'not cost-effective compared to "ordinary care"' (Henderson et al 2014, referenced in Woolham et al 2019). This refers to all types of telecare, including analogue. There perhaps remains some hope that advances in digital technology will allow potential cost efficiencies to be realised. However, respondents to this study also raised the issue of the expense involved for local authorities and other providers of care in offering advanced telecare services:

> *It's quite a huge task for an authority to completely change the way they do technology, and probably quite expensive as well, to change the whole of the county's way that they work with regards to technology... it's a huge, huge job. It's the work that's involved, the cost that's involved. (Tech supplier)*

We spent a lot of money getting that up and running. (Housing and care provider)

It has been expensive as well. The call system we're using and the bolt-on packages, the infrastructure we're using to put that in and manage it, and the broadband and the Wi-Fi, and the call system, and then obviously there's costs to having it designed and get it built and the installation… so I suppose cost would put a lot of people off. We've been able to do it because we're a start-up, we decided that we're doing this from the beginning, so it's been built into the design of the building and the service. And then hopefully we'll recover the costs through a combination of property sales and on-going revenue income. (Housing and care provider)

Some [housing providers] built new homes with this in mind, but retroactively fitting them is expensive. (Housing and care provider)

A further cost to providers is the pace of change in the market for digital telecare. This is an innovative field with frequent developments in both the technology itself and the structure of companies supplying the market. Keeping abreast of changes in the market therefore represents additional costs to providers in terms of time and expertise:

There are hundreds and hundreds of new products on the market…. we get approached by start-ups to test and trial them and we don't have the capacity. Keeping up to date with what is out there is a challenge, since the market is highly volatile… [e.g.] we found these smart plugs which were great, but 12 months later the company didn't exist… the call centres change ownership, one buys the other out, etc. It is difficult to keep up with changes in the market, we try not to have lots of tech on the shelves, and only use what we need at the time. There isn't that much resource so we have to be vigilant. (Housing and care provider)

Other costs, besides financial expenses and the cost of keeping up with change in the telecare industry, were identified by providers of care and housing. Whether replacing analogue telecare or investing in telecare for the first time, provision requires specific capacities that can pose an organisational challenge. For example, one area in which greater capacity is required is the on-going follow-up required. Digital telecare is not 'plug-and-play' (Woolham et al 2019), it requires on-going management and assessment. What this means is that, even disregarding the expense of installing and providing new telecare services, providers still need to build new infrastructure for continued service delivery, engaging with different users about their own specific requirements and how these change over time.

This raises the question of whether advanced telecare can be used to reduce the cost of public care services. It implies that the cost benefits of implementing digital telecare cannot be taken for granted. In general, technological advancements can be cost-escalating rather than cost-containing. Recent evidence has shown that up to 75% of health expenditure growth in industrialised countries may be attributable to technological change, increasing patient demand for services without reducing the cost of the labour required to provide said services (Office for Budgetary Responsibility 2015). Advanced technology carries the potential to reduce these costs by allowing older people and their families to monitor and manage their own changing health and defer the need for assistance from social care services, but if this is the object of telecare policy, it would need to be explicitly prioritised in the design of telecare services.

5.5   What is advanced telecare technology for and how does it work?

Advanced telecare has multiple functions. It can be seen as an update of previous 'active' technology requiring that older people themselves activate devices. Those interviewed for this study identified three potential additional benefits: using machine learning to monitor changes in behaviour and thus predict certain conditions and prevent the need for residential care; lowering the costs associated with in-person care; and allowing telecare services to exist beyond the analogue switch-off in 2025. These functions of digital telecare were all referenced by respondents to this study, but there was no clear emphasis on one being the most important driver of digital telecare provision. Different actors and agencies may have different interpretations as to what advanced, predictive telecare technology is for, what goals it should serve, and how services should be designed.

In some ways, the discourse on 'independent living' and the 'preventative agenda' remains ambiguous in its ambition. Its implied goal is a better quality of life for older people but it also refers to the cost efficiencies that can be achieved by delaying institutionalised care. These twin goals are possible in tandem but they are not dependent on one another. Neither the pursuit of cost efficiencies nor the pursuit of personal benefits for older people will necessarily result in the other. If the success of digital telecare rests on its ability to achieve cost efficiencies for local authorities and other housing and care providers, our findings suggest that this might not occur automatically, but would need to be explicitly prioritised in the design of services. The extent and nature of costs borne by telecare providers would need to be systematically identified, and pathways for reducing costs pursued. This may be at odds with an industry that is simultaneously trying to afford a better quality of care for older people. It may even be at odds with the expense represented by digital telecare rollout.

The fact that three different (possibly conflicting) goals were identified by those coordinating the provision of advanced telecare raises questions about which goals will be pursued in practice, and which goals will be used to define the terms of success against which telecare is assessed in specific cases. Who gets to determine these goals in practice also has ethical implications for telecare service design, such as whether these services come to replace or supplement others.

6. Findings: How are advanced telecare services coordinated?

6.1 The main actors involved in advanced telecare technology provision

6.1.1 The role of local authorities

Local authorities often play a coordinating role in telecare provision, whether publicly or privately funded, and whether in someone's own home or within a residential scheme. Authorities have varying roles in this process. Telecare services are accessible by individuals through different routes, for instance through direct contact with the council; through referral by health professionals; through contact with council housing officers; or by speaking with staff in sheltered accommodation and other residential schemes. Sometimes a local social worker will advise an individual that they might benefit from telecare services, and put them in touch with the appropriate teams within the council. The team responsible for coordinating the provision of telecare varies from council to council, but could be part of the housing or health and care departments. These teams are then responsible for assessing the circumstances and needs of each potential recipient, and making appropriate telecare services available to them.

Local authorities act as a contact point between the suppliers of telecare and those in need of their products. Since many suppliers of telecare are small, innovative companies who do not have the capacity to carry out their own needs assessments, risk assessments or data protection services, they reply on local authorities to connect them with users in this way. The local authority often also provides access to a call centre in case of emergencies. Some telecare users may choose to alert family members through their telecare systems, but where this is not possible, it becomes necessary to provide response services for urgent events. The local authority will also be responsible for maintaining a case load as individual telecare users' circumstances change. As such, the role of the local authority is to provide an umbrella service that requires various different services, departments and teams to work together. Good coordination is essential for effective provision.

As well as the teams that work together to provide services directly to recipients, local authorities are also involved in planning for future changes to public service provision. Interviewees identified three major factors that inform this process: firstly, the demand for care in the future; secondly, the funding that will be available for care in the future; and thirdly, changes in the technology available. In terms of demand, there is a growing need for housing specifically for older people, and local authorities will be responsible for building both general

needs housing and dedicated residential care schemes, alongside housing associations. Authorities therefore need to think ahead about the technological capacity these projects will need, if they are going to make advanced telecare technology available within them. Advanced telecare is an innovative field and is constantly changing. Authorities therefore face a degree of uncertainty when planning for the future. In addition, funding for the provision of local authority services is under pressure, and non-essential aspects of care, such as managers or 'wardens' in extra care housing schemes, are being reduced. A crucial part of local authorities' work is therefore to learn more about the advanced telecare market, how it might fill the gaps left by reduced care services, what the trade-offs might be (for example, increased isolation caused by reductions in on-site staff), what additional costs it might represent, and how it might be most effectively implemented. As well as procuring telecare equipment, local authorities must trial this equipment in order to learn more about it, before rolling out services at a larger scale. Local authorities therefore need either to undertake evaluations or procure independent evaluations of the telecare technologies they trial.

6.1.2   The role of manufacturers and suppliers of advanced telecare technology

Telecare manufacturers vary in size, ranging from very small innovative start-ups to large established firms. These companies face a range of different challenges getting their products to the people who need them. Each business faces the task of designing and building a product and getting it to market. This can involve building prototypes, evaluating and improving finished products, and scaling production to a level that makes the necessary return. For small companies in particular, managing these processes can be a challenge. Three obstacles to the production of telecare products were raised in interviews for this study: gaps in business knowledge; gaps in funding; and gaps in networking capacity.

In the first instance, small companies are often made up of technicians rather than business professionals, and may need external input in order to determine the kinds of business strategies required in order to achieve financial sustainability. Secondly, if companies lack the budget to trial equipment, they may rely on technology trials coordinated by local authorities in order to evaluate their products. This is partly due to a lack of funding and investment available for trialling innovative technology, which does not usually offer a high return. Telecare manufacturers can sometimes rely on local authorities' ability to trial, distribute and generate traction for their products. Partnerships with authorities through the mechanism of technology trials can pose a risk that publicly funded telecare services do not conform to the legal frameworks for public procurement. Finally, in order to achieve market penetration, entrepreneurs need to create business networks in order to build customer awareness of their products. Marketing their products and connecting with other organisations in the industry can be a challenge for small companies not yet making a profit. Catalysts do exist in the form

of central government funding, charitable partnerships, business accelerators and organisations like Innovate UK or the National Housing Federation. Nevertheless, in this study, it was reported that innovative ideas for advanced telecare often 'fizzle out' when new companies fail to build the necessary platforms for success.

6.1.3   The role of housing and care providers

Housing providers involved in the provision of advanced digital telecare are at the front line of service provision. These organisations include housing associations that provide extra care schemes, sheltered accommodation and other housing options with care, as well as private providers of retirement housing options. Within housing associations, housing managers and care workers coordinate the implementation of telecare technology and its ongoing management. This involves maintaining relationships with all the different agencies involved in supplying telecare services, as well as with users themselves. As well as managing the immediate, practical concerns involved in the provision of housing and care, housing associations also have to think strategically and are faced with the same questions as local authority housing and health departments, regarding the provision of care into the future. This means they can often be involved in trialling new technology, in order to work out how new products might fit within the services they offer. Housing providers are therefore concerned with both the immediate and practical provision of telecare, and more strategic issues such as planning for new telecare services. Acting as a bridge between immediate and strategic concerns in digital telecare provision comes with its own specific range of challenges.

Various respondents reported that housing associations lacked the time, knowledge, culture and funding to play a truly strategic role in telecare provision. This was reported by both housing providers themselves and by suppliers of technology working with housing providers. With funding for care services being cut, the emphasis of housing association telecare teams has been on service provision rather than on service design. In the face of the analogue switchover, housing providers are under pressure to identify and procure new digital telecare technology to replace older systems, rather than reviewing the kinds of systems on offer and how these might be changed to better meet the needs of older residents. There is a sense that housing providers are 'firefighting' in this respect, putting an emphasis on which technology to procure and learning how it works, rather than focussing first on the needs of older people and how these could be addressed through the provision of advanced telecare. This has implications for whether the services on offer will be well suited to the needs of older users.

6.2 The processes and challenges associated with advanced telecare provision

While telecare provision is not new, the provision of advanced and predictive telecare is a relatively new enterprise and one that implies a degree of risk for all parties. The first step in its provision to individual users, as reported by respondents to this study, usually entails manufacturers who have developed a new product making an approach to local authorities, or to housing associations and other providers of specialised housing for older people. Since this technology is relatively new, the first step is usually a trial. Manufacturers will offer their products in bulk and authorities can then incorporate these products within their services, with a view to learning more about how they work and what benefits they bring:

> *The organisations we are aiming our service at never approach us, we have to approach them. (Tech supplier)*

> *We tend to go to them. They're trialling out different things, so we've got in the door and said 'why don't you try us? And they'll say okay, here's a lump sum of money, let's see what you can do… then we'll report back to say how it's all gone. (Tech supplier)*

Trials are an important feature of current advanced telecare provision. Local authorities can organise the purchase devices for trial, making them available to the public via referrals made by local housing providers, care workers, medical professionals and social workers. housing associations and other housing providers can also purchase telecare technology and run trials for their residents independently.

One challenge posed by technology trials is the creation of bespoke services designed to meet individual specific needs. The context of individuals' particular circumstances can result in very different engagements with telecare (Mort et al 2012, 2013; Berge 2017). Local authorities and other care providers need to help users create bespoke telecare strategies, rather than simply designing services to be offered across user groups. This was reported by care providers as being a particular challenge. Ideally individual needs would be assessed in advance of telecare procurement, and tailored solutions found. When telecare is procured through a trial, devices are bought in bulk. With limits on the number of trials possible, this limits the range of products on offer, meaning that the right fit may not always be available. While there is an aspiration to create user-centred services, this is not always possible. Technology trials can focus on asking what technology is available and what it does, rather than starting with the specific needs of older people and asking what might be required to meet those needs. This also means there

is a risk that the technology on offer will not be suitable for certain individuals and will go unused:

> *What we don't want – and what I think you will find – is tech just sitting on the side gathering dust. This is why follow-up with users is very important....if they are not using it, perhaps it is not the right thing. (Housing and care provider)*

> *Block purchases by housing providers do not fit well with need for personalisation in meeting needs. (Evaluator of assistive technology)*

From the perspective of manufacturers, designers and suppliers, unused equipment can be perceived as inefficiency in implementation once service providers have made a block purchase. However, this should also be viewed from the perspective of local authorities and others purchasing the devices in order to offer them as part of a care service. An inefficient use of devices may have more to do with the challenge of providing bespoke technology packages that are tailored to individual needs.

Another challenge posed by technology trials is that manufacturers know far more about their products than the housing and care providers who buy them. Local authorities and housing providers can lack the in-house expertise to implement technology trials, or the resources for external trials. Telecare suppliers described trials in which housing managers and local authority staff 'lacked the confidence' to contribute to telecare evaluations. This led to suppliers taking a lead role in setting up pilot schemes and evaluating the successes of their own products:

> *They say, 'what can you do for this person?', and we would recommend what goes in. If we need to, we can help them analyse the data and set up the right rules. (Tech supplier)*

> *The social worker goes out to make an assessment: they say 'oh, I think you might be in need of some technology here, let me pass your details on to [company name]', and what I do is I will contact that client.... I'll get the details from the social worker and I'll say 'I've heard you've had an assessment and I've been passed your details by a social worker, can we just have a chat about your needs?' and what I think from what they've told me so far is what I would suggest. (Tech supplier)*

Care professionals were sometimes uncertain about the metrics that would be used to assess individual experiences with telecare, and deferred to the expertise of those supplying the product. In some cases, individuals involved in telecare trials would liaise directly with the

telecare companies themselves in order to measure the suitability of the products in each case. The relative lack of expertise and capacity amongst housing and care providers makes it necessary that telecare manufacturers contribute towards trials. Nevertheless, this also raises ethical concerns, as manufacturers can come to define the terms of public services as well as the performance metrics used to assess their success and efficacy. The ability for those designing telecare to assess its success may represent a conflict of interest.

6.3 How are advanced telecare services coordinated?

This section has considered the roles of the different types of organisations involved in the provision of advanced telecare. This provision is a collaborative effort between technology manufacturers and suppliers, housing and care providers, local authority social workers and care professionals, call centre operators, medical professionals, family members and users of technology themselves. Technology trials are an important stage in the provision of advanced telecare, since these products are new and often as yet untested before being bought by service providers.

Coordination between the actors and agencies involved in provision is vital for the delivery of telecare services. However, we were informed that the coordination of telecare services is not straightforward. Different types of organisation face different constraints and priorities. Commercial suppliers face challenges achieving market penetration, while publicly funded service providers often operate under pressure of rising demand and strained resources. These very different constraints, and the relative capacities of different actors, can mean that advanced telecare service providers are left unable to define the terms of the services they offer. The role that telecare manufacturers play in setting up pilot schemes and assessing the success of their own products may represent a conflict of interest. Additionally, there may be ethical concerns associated with telecare manufacturers having the scope to define the performance metrics used to assess the success, efficiency and goals of telecare provision.

Technology trials can be useful for making new advanced telecare available to service users. However, as a means of coordinating provision between technology manufacturers and service providers, this mechanism produces certain challenges. Trials have been observed to result in the poor matching of technology to user needs (Woolham et al 2019). In the case of advanced telecare service provision, we also found that care providers can struggle to create case specific solutions with and for individuals.

7. Findings: How does the broader national and local institutional landscape affect the outcomes of advanced telecare provision?

When the WSD findings did not provide evidence of the effectiveness of telecare – either in terms of cost or of reducing demand for adult social care services – this resulted in a 'policy problem' (Woolham et al 2019). The Department for Health did not alter its policy on telecare provision and local authorities continued to invest in mainstreaming telecare services, with these particular policy goals in mind (LGA 2015). The expansion of telecare use has been promoted as part of a 'significant policy push' (Mort et al 2013: 349) since the turn of the century (DoH 2008, 2009a, 2009b, 2009c, 2010). This continues to be justified on the basis that telecare can help to prevent hospital admission and to help people live independently, for longer, in their own homes (Clark and Goodwin 2010; BMJ 2018).

7.1 The UK national policy context: A crisis of care

Milligan et al (2011) characterise this as part of a 'turn' towards remote care across the EU, underpinned by the policy objective of reducing the number of residential care placements as a 'solution' to demographic ageing. Other commentators observe that this policy drive is selective in the use of existing evidence about the complexities of telecare outcomes (Eccles 2020), and that 'ageing in place' can be understood as part of the mechanism for withdrawing central government responsibility for local health and care services (Martens 2018). Reducing the weight of demand for adult social care, and the costs associated with care, remains a fundamental policy goal behind national telecare policy.

Since 2009, it is common to hear about reduced levels of public spending on social care in discussions about care for older people (e.g. IFS 2017; Bottery et al 2018). In England and Wales public spending on care for the elderly is channelled through local authority social care budgets. This spending was on an upward trajectory at the turn of the century, rising from £11.7bn in 2000-01 to £18bn by 2009-10 (IFS 2017). In 2010, the coalition government came to power with a commitment to austerity, leading to reduced local authority spending on social care. By 2015, spending on care in the UK was reported to be towards the bottom of the OECD league table, and the numbers of people accessing care had fallen by 30% since 2009, despite a growing and ageing population: 'the local authorities that most need additional funding for care will generate the least amount of funding'. (Franklin 2015: 7). Social care spending had fallen to £16.5bn by 2016-17, and its impact on spending per person was compounded by a growing and ageing population. In 2017, local authority spending began to rise again, but was not sufficient to return to the level of care observed in 2009-10 (Bottery et al 2018). In 2018,

the House of Commons Health and Social Care Committee and the Housing, Communities and Local Government Committee jointly found that the social care system was not fit to respond to current needs (House of Commons 2018).

It was during this escalation of the 'care crisis' that new conversations emerged about the nature of care in the UK, how it might need to become more efficient in the future, and how this could be achieved. This provided a backdrop to debates around new technologies for care and whether these could help people stay in their own homes for longer. In 2012, the government published 'Caring for our future: reforming care and support', a strategic White Paper, through the Department of Health (DoH 2012). The paper emphasised prevention, 'person-centred' care, and supporting people 'before they get into crisis' (2012: 14). The joint issues of prevention and personalisation emerged as the key organising principles in the policy for and delivery of public health and care, each being a way to make spending on care more targeted and efficient. Prevention was 'better than cure' (DoH 2018; HM Government 2019); applications for care funds should be 'joining up care around the person' (NHS England 2019); and crucially, these principles lent themselves to 'at home' rather than institutionalised care.

This preventative agenda in national care policy, with a focus on making spending on care more efficient, provides a useful contextual background to the expansion of telecare in local authority services. Both policymakers and industry have supported the expansion of telecare services, with their 'potential to enable more people to be cared for in their own homes by supporting them in managing their own care needs more effectively' (Deloitte 2012: 4). Local telecare services were supported because they respond to 'the policy requirement to provide more care closer to home and support service users to understand and self-manage their condition more effectively' (Deloitte 2012: 27). It was supported at the national level with the 2006 Preventative Technology Grant, which made £80 million available for spending on telecare (DoH 2006). In 2018, £412 million of government funding was made available to help NHS patients access care systems at home, with an emphasis on finding new technological solutions for this transition (BMJ 2018). As a national institutional agenda, the expansion of telecare services is closely associated with a policy for greater cost efficiency in adult social care services.

7.2   Expansion of telecare services at the local level

Telecare as a means of shifting care away from residential institutions and into the home has been foregrounded at multiple governance levels. At the local level, advanced telecare services were framed as part of this 'preventative agenda':

There's a preventative agenda pursued by the county council... They are keen to push a preventative agenda and have withdrawn older-type [analogue telecare] support in residential care. (Housing and care provider)

The council is putting increased emphasis on tech-enabled care. The council feels that tech-enabled care should be the first thought before other options are explored... There is a big emphasis on increasing the number of referrals to this service. (Housing and care provider)

Filtering through from the national to the local level, and encouraging a shift in the provision of care from residential institutions to individuals' homes, the preventative policy agenda has acted as a driver for housing providers to engage with technology companies in the provision of more advanced assistive technology. Framed by this context, telecare policies can be seen as part of a drive to decentralise the responsibility for adult social care. This decentralisation has been characterised as the 'vertical transfer' of responsibility for care from the national to the local level, and to commercial organisations in the market for care (Houben 2001: 660). Local authorities have been granted autonomy in allocating and distributing local economic growth, but have also being tasked with administering cuts to budgets for local services (Penny 2017). Individuals are therefore encouraged to live as independently as possible from social care services. As a local institutional agenda, this has been represented as a way to 'do more with less', rather than part of investing in new infrastructure. The result is that the development of local authority capacity and knowledge has not been made a priority alongside the development of technology. This has several implications for the practical delivery of telecare services, and those identified by participants in this study are addressed in turn below.

7.3 Public budgets and the coordination of telecare provision.

Technology manufacturers and supply companies rely on the assistance of local authorities in various ways (see Section 6.1). Local authorities play a crucial role connecting manufacturers to the organisations and individuals who purchase their products and services as suppliers' ability to get their products to market often depends on convincing local authorities to trial their equipment. Local authorities can however lack dedicated capacity for developing telecare services.

Respondents identified several areas where coordination between industry players was underdeveloped. Telecare manufacturers spoke about struggling to negotiate the large bureaucracies of local authorities. They reported that it was not always clear how to engage with authorities and other housing and care providers in order to get their products to market. Rather than dedicated contact points existing within authorities, manufacturers reported

struggling to identify the specific personnel who can help in the wider acceptance and adoption of digital telecare:

> *You'd almost hope there'd be a person in every county council saying if you have a product, come to me, but there's not. We haven't found any consistency.... there's no one person you can go to. You have to build up a number of different allies within one organisation. One isn't enough. Two isn't enough. (Tech supplier)*

> *This is one of our biggest challenges. Talking to anybody. People do not respond to calls and emails... especially when you are a small company and you are calling to speak with a big organisation, you can't speak to the right people. (Tech supplier)*

This issue of local authority personnel was highlighted as a particular issue for technology manufacturers. Identifying the correct individuals was one challenge, as was making and maintaining contacts, and 'persuading' these individuals to trial products. Once an individual within a local authority was 'on board' or 'saw the vision', a relationship could be built in order to make products available to older people living in the area. This process seems to rest partly on the quality of the relationship between these individuals, and to include an element of chance and persistence:

> *It's about getting the influencers, finding those people... they're hard to find sometimes because they're hidden away doing other projects. You might tell one person but they've got no interest in it because they don't see the vision or they don't see the bigger picture, so it's about finding the right people to talk to, and to demo to, and work out a plan. (Tech supplier)*

> *With local authorities, when one person gets on board with it, then they are your advocate... They say to people 'yes, we need to do this' (Tech supplier)*

There is not yet an established protocol as to who that 'champion' might be within each local authority, how to reach them, or how a business relationship might be developed. Within other housing providers, the practicalities of digital telecare provision may fall to operational staff rather than to policy teams. Where the necessary contact points for technology suppliers are split between policy and operational teams, it can fall to these companies to bridge this gap, something they may not always be able to do. An additional complexity identified was changes in local authority staff, with people moving between different jobs and locations:

> *Change of staff in local authorities is significant. Your champion can move to another council so there is no one in place to push through the service. (Tech supplier)*

People moving around is a problem. (Evaluator of assistive technology)

Given that the development of telecare services can rest on informal relationships with manufacturers, changes in personnel at local level can lead to inconsistencies between procurement processes – and between the eventual services offered – in different parts of the country, leading to geographically uneven provision of advanced telecare. These inconsistencies may depend more on the abilities and capacities of local authorities and of the individuals working within them, than on any clear strategy or policy about the benefits of telecare for older people.

At this relatively early stage in the adoption of advanced and predictive telecare, it may not be possible to generate momentum without recruiting individuals with digital expertise and a clear 'vision' on the costs and benefits of telecare within adult social care provision. Streamlined procurement requires established protocols for selecting and assessing products. In the long run, established protocols for service development can produce more efficiently coordinated services, but in the immediate term they require new frameworks that make clear the roles and responsibilities of different actors and organisations. This clarity seems to be lacking for companies producing new products.

Various other shortfalls in local authority capacity were identified as challenges by telecare technology suppliers. Shortfall in funding was noted as a clear issue, as was the lack of knowledge about telecare technology amongst local authorities, housing associations and other housing and care providers. These potential barriers to the adoption of advanced telecare products and services were experienced from the supply side as 'organisational inertia' and 'bureaucratic blockages':

With local authorities, a lot of the time there's no budget for it […] a big hurdle is finding the right people and the people who are holding the purse strings. (Tech supplier)

There is no problem in product availability, but housing providers aren't aware of these products. If they are aware of them, they don't know where to find them... if they know where to find them, they wonder if they can trust them. Even if they trust them, they may not have the ability to install them or to maintain them. (Evaluator of assistive technology)

Finally, respondents identified gaps in legal frameworks that could leave telecare users, providers and suppliers uncertain about their rights and obligations:

What's needed? Clarity for the users but also for the companies, to know if they're protected. If it's a carer who is saying they want it rather than the user, it's a grey area. It's a horrible thing to block something that might be beneficial, but the legality isn't sorted. [...] It would be nice if there as more information available for laymen. Easy-read documents, something fitting on one side of A4. (Tech supplier)

Creating new digital services will require new institutional frameworks that make clear the legal rights and obligations of different actors, so they can operate without undue risk. This requires clear policies to be set at both local and national level. It also requires that resources are made available for the development of these frameworks and for building knowledge at the local level. It therefore seems likely that creating streamlined, efficient and preventative digital telecare services will require larger public budgets for spending on adult social care – at least in the immediate term – rather than allowing spending to be cut back. Rather than expecting local authorities to 'do more with less', advanced telecare interventions require the development of knowledge, technical capacity, personnel, funding, legal clarity and other institutional infrastructure for coordination between industry players. Any lack of this kind of infrastructure can have a knock-on effect for the whole of the industry:

Due to how powerful the need is for technology for care, you would think that there would be more infrastructure built in at every stage. (Tech supplier)

Due to their reliance on local authority acceptance, and on particular individuals within local authorities, shortfalls in local authority capacity represent a cost faced by digital telecare supply companies. Where local authorities are constrained in terms of finance or personnel, these constraints are also felt by the companies helping them with telecare provision. This is particularly so for small companies who may face capacity constraints themselves. Start-ups and technology innovators face particular challenges in an environment in which they have multiple competitors. Market entry can be precarious, particularly for new companies working to make their products available in bulk.

This is an innovative field with frequent developments in both the technology itself and in the structure of companies supplying the market. The pace of change within the industry also represents a cost to housing providers looking to deliver advanced telecare packages. With hundreds of new products on the market, keeping abreast of such changes is costly both in terms of time and expertise:

We get approached by start-ups to test and trial [their products] and we don't have the capacity... it is difficult to keep up with changes in the market. (Housing and care provider)

7.4   Making a value proposition

Suppliers of telecare reported that local authorities were often lacking the capacity for creating and maintaining advanced telecare services in terms of personnel, legal frameworks, technical capacities and finance. Ultimately this may amount to the ceding of value from the industry, because its poor coordination results in fragmented service delivery, and the lack of a compelling case for large scale investment. The challenges faced within the advanced telecare industry may also have made it harder to make a case for large scale industrial investment:

It's difficult to make value propositions to investors... it's not a consumer market. There's a difference between nice to have and need to have, and people are very good at making do. That's the problem investors are finding... where this will really take off is when investors pile in, which is not happening right now. (Evaluator of assistive technology)

The policy drive for digital telecare is based on a preventative agenda moving on from the reactive telecare of the analogue age. One of the fundamental aims of digital telecare is to promote individual independence by monitoring changing behaviour and identifying problems such as frailty or UTIs before individuals themselves become aware of them. But exploiting the preventative capacity of advanced telecare requires that a lack of coordination between different industrial actors is overcome, and that a consistent and coherent model of provision be built. This will be necessary before a convincing value proposition can be made in order to draw investment into the industry. In other words, it seems highly likely that only when serious attention is given to the challenges experienced by those trying to build this industry will the provision of digital telecare move from the reactivity of crisis management to a preventative agenda in earnest.

7.5   How does the broader national and local institutional landscape affect the outcomes of advanced telecare provision?

Both national and local governance structures are important variables for the provision of advanced telecare. The findings reported in this study suggest that this is true not only on the demand side, with users' experience of telecare being mediated by contextual policy frameworks, as the institutional landscape impacts the experiences of those supplying telecare for the benefit of older people. In particular, a lack of central government responsibility for

adult social care and the increased responsibility of local authorities in recent years, coupled with pressure for authorities to cut spending on public services, may have a significant impact on the quality of advanced telecare coordination and delivery. This occurs because of the interdependencies between the different actors involved in telecare provision (see Section 2).

Local authorities act as a focal point for the various actors involved in the advancement of digital telecare provision. Any lack of capacity in building strategic oversight for the development of advanced telecare services may act as an obstacle to strong coordination between these actors. Providers of housing and care interviewed for this study spoke to their need to respond to falling budgets. With this constraint, authorities and other providers could struggle to take a comprehensive approach to preventative service design. This study has highlighted particular shortfalls in terms of personnel, legal frameworks, technical capacities, and finances. This may ultimately exacerbate a lack of investment being drawn into the industry.

8. Findings: How does the network of responders that contribute to predictive telecare use affect its outcomes?

8.1 The centrality of responders to advanced telecare use

There is a complex dynamic between telecare users and those who contribute to its use by acting as responders. The quality of this engagement (whether from friends, family, or a call centre) has the potential to impact on the quality of outcomes experienced by older people using telecare. In theory, advanced predictive telecare has the capacity to move beyond user reliance on responders by highlighting potential problems before the point of emergency. In reality, the predictive, preventative functionality of advanced telecare requires that user behaviour is tracked and monitored. Call centres employed directly by residential care institutions, by housing associations or by local authorities are all options for monitoring and responding to the collection of telecare data, as are users' own family members:

> *The technology won't work on its own. (Housing and care provider)*

Older people can also monitor their own data. However, several manufacturers said that they worked under the assumption that monitoring would not be done by users. This assumption could influence the way that telecare interfaces are designed:

> *As long as [the users] haven't got to do anything with it … they have to do nothing with the sensors at all. Whoever is the responder has to manage that, that's staff or family… it's designed with this in mind. (Tech supplier)*

The centrality of responders to the functioning of telecare services means that the quality of outcomes felt by older people is embedded in the responses of others. This has several implications. The first is a divide between those for whom family members are able to act as a primary responder, and those for whom this is not possible:

> *I thought families would be very happy to be able to check on people every day…*
> *In reality, they don't. (Tech supplier)*

Many of the older people interviewed for this study were in touch with adult relatives, but these relatives were not all able to monitor respondents' changing behaviours. Some were living with limiting health conditions of their own, others lived overseas. In the absence of family responders, local authorities can be obliged to make professional responders available. Nevertheless, there is likely to be a disparity between those for whom family responders are

available and those who rely on the responders made available through local authority services:

If it's a call centre, then people are put through to a stranger. We've experienced clients will often fall but not contact the call centre because they don't want to bother someone -one gentleman lay on the floor for hours. (Tech supplier)

A further implication of the centrality of responders for telecare use is whether they are able to respond in appropriate ways. For instance, the capacity of family members to understand and to cope with their role as responders may depend on the training available in a given local area:

There is an expectation that families and neighbours will respond to the emergency calls, but there's a need for more support for them to navigate the care and housing system. For example, [giving] more advice when we are installing a solution for their relatives, and providing support not only to the users but also to their responders. (Housing and care provider)

The preparedness and capacity of industry players to act as responders is also at different stages, and may be lagging in some areas. This was identified for example in the case of call centres, which are contracted by the providers of digital telecare to act as responders for telecare users:

Digital readiness is not that far advanced, particularly for call centres. The technology and equipment can be installed, but the call centre needs a digital platform in the centre, otherwise all this digital information is no better than having an analogue red button…. The readiness of call centres is the major difficulty. (Housing and care provider)

This can present a discrepancy between designers' aspirations for advancements in predictive, preventative telecare, and how this equipment is actually used. This may be due to an emphasis on product design and service delivery in telecare, rather than product and service design. The emphasis on innovation in telecare is largely at the level of products rather than services, with funding mostly available for the development of new technology. Telecare manufacturers spend a great deal of effort designing and evaluating these new products, but they are integrated into services that may have received less attention in their design. A particular area of oversight was how these products would work given the different capacities and abilities of the network of responders available. The rigorous design and evaluation of telecare products should therefore be accompanied by design and evaluation of entire telecare services, starting

with the initial needs assessments and finishing with the network of responders. The training that is available for families in order to deal with emergencies, the digital readiness of call centres, and the capacity of local housing and care teams are all variables that might impact on the efficacy and cost efficiency of advanced telecare.

8.2   Managing family expectations

If someone has had a stroke and their family says 'there's absolutely no way mum can live on her own any more, she has to go into a care home'.... if that person had our system in place, they come home and they're already familiar with it and comfortable with it, and the family know how it works. They could actually come home and just say 'let's see how she gets on for a couple of weeks'. (Tech supplier)

Part of the attraction of advanced telecare packages is the existence of a digital interface that allows families to monitor their relatives' changing behaviour. Suppliers of digital telecare consider the preferences and requirements of family members when designing these interfaces. Where housing and care providers oversee the provision of these products, they must also consider the preferences and requirements of family members, which can be an integral part of digital telecare functionality:

People are increasingly expecting a two-way conversation, e.g. family portals. Technology use is often driven by the demands of adult children.... technology is wanted by the families and therefore designed to give families assurance ('it's not for you, it's for your children'). (Housing and care provider)

Family members request lots of care needs for their relatives. (Housing and care provider)

This demand from adult children complicates the task of provision. Firstly, the demands associated with digital telecare are not straightforwardly correlated with the care needs of older people themselves:

Family portals provide more work for the housing provider when adult children are monitoring their parents and notice they have not done certain activities. (Tech supplier)

This means that additional care and attention may be required as a result of digital monitoring by family members:

You get a lot of resistance from some people who think that it's just their family that want them to have it…. they don't think they need it, blah blah blah. But we put it in and we just do some hand holding… it's all about hand holding with some people, just reinforcing that you don't need to do anything with it, this is just for family, we can't see you on the system, we can't hear you, it's just lines on a chart, there's nothing intrusive about it other than that we can see if you've been in the kitchen. (Tech supplier)

The phrase that 'this is just for family' suggests that digital telecare services may be designed by suppliers with family requirements in mind, rather than the care needs of users themselves. This is one of the ways that the industry may be more aligned to the requirements of family members and of technology supply companies than to the requirements of housing or care providers and older people themselves. The relationship between supply companies and older people's relatives can potentially be allowed to act as the driving force behind the mechanisms of provision, which has the capacity to obstruct the policy goals of cost-efficiency and of users' own preferences. This might take the shape of the 'hand-holding' required by older users of digital telecare, deployed by supply companies and bypassing the local authority or housing provider:

I will come up with a recommended kit list. Could be sensors, or I might speak to their daughter or their family members to discuss it with them. […] then they say 'yes that's great', and as part of the [housing provider's] pilot, we will take the equipment that's been paid for and we'll install that. (Tech supplier)

We train the family, we're in contact with the family. (Tech supplier)

Where the capacity to enact telecare provision is held largely by technology supply companies rather than care providers, this amounts to a potential ceding of value and of the ability to define the terms of service to those companies – a funding challenge for care providers who need to buy the technology. This may be pertinent to whether digital telecare creates relationships, requirements, expectations and demands that provide genuine benefits for older people. When manufacturers are left to coordinate a large part of provision, this can compromise the ability of housing providers to define the goals of provision. Manufacturers may not pursue efficiencies of the same extent or nature to housing providers, or the same benefits as older people themselves.

8.3 How does the network of responders that contribute to predictive telecare use affect its outcomes?

Responders are central to the operation of advanced telecare services. However, our findings suggest that the role of the responder is sometimes taken for granted within advanced telecare service design. Some telecare manufacturers assumed that people's relatives would be responsible for monitoring and responding, but this is not always possible.

The impact that different types of responders can have on the experience of older people (whether these are family members, carers, residential professionals or call centre operators) also warrants further investigation. Evidence about the perceptions, understanding and capacity of older people regarding their use of advanced telecare should be accompanied by evidence on the perceptions, understanding and capacity of different responders. Telecare is embedded within social contexts and the dynamics at play within these contexts (Milligan et al 2011). The interpersonal dynamics between telecare users and responders can therefore affect outcomes such as user experience, and policy goals such as cost effectiveness. Family members can exert pressure on telecare users (Mort et al 2013); our findings suggest that, when acting as advanced telecare responders, family members can also exert additional influence over the nature of care provision.

Innovation in advanced telecare product design should be accompanied by innovation in telecare service design. This should include a focus on the role of responders within these services, and how their capacities and capabilities as responders could be improved. The relationships between older people and those engaged in monitoring their wellbeing needs to be a central consideration in the design and configuration of service design. Where responders are friends, community or family members, the constraints on their capacity may be personal and circumstantial, or embedded in the particular features of their local area (such as the training and information available). Training may need to be provided for these responders. Family, friends or other members of the community are not always available to act as responders, and call centre operators will therefore need the capacity to act in their place. The preparedness and digital readiness of call centre operators to work within digital telecare services may be lagging in some boroughs. This capacity needs to be developed so that call centre operators can monitor and respond according to the advanced functionality of the new telecare products. If monitoring services cannot be provided, a discrepancy may emerge between those with family members available to monitor, and those without. Since the act of monitoring older people's changing behaviour is an important component of the preventative capacity of advanced telecare, any discrepancy in the availability and capacity of responders could impact whether telecare services are successful in this goal.

9. Conclusions

9.1 What is advanced digital telecare technology for, and how does it work?

9.1.1 Summary of findings

There is some tension around exactly what telecare is for, what kinds of goals it is intended to achieve, and what kinds of indicators should be used to measure success. Local authorities are under pressure to reduce the demands on adult social care budgets. The capacity for telecare services to deliver cost-efficiencies may therefore be considered a fundamental component of success. Other potential positive outcomes include 'creative engagement with technology', or the 'co-production of care relations' (Mort et al 2012: 799). These present a different interpretation of the benefits that telecare can offer. How the goals of telecare services are established and assessed, and by whom, therefore has implications for the experiences of older people using telecare services.

Respondents to this study identified three key goals behind the provision of advanced telecare services. It can use machine learning to predict certain conditions and prevent the need for residential care. This preventative (rather than reactive) agenda for technology use has been framed as a way to promote 'independent living' or 'ageing in place'. A second function reported here is the capacity to deliver cost efficiencies in the provision of care, by streamlining in-person care. A third function, and a factor motivating housing providers to engage in the provision of advanced telecare, is its digital functionality, thereby making use possible after the analogue 'switch-off' in 2025.

Various tensions exist between these different functions. Different actors and agencies involved in provision can have different interpretations as to what advanced telecare technology is for, and what aspects to emphasise in product or service delivery. In particular, there may be trade-offs between the preventative capacity and cost-cutting potential of telecare, due to differences between designers' aspirations for predictive interfaces, and how they are actually deployed. The preventative capacity and cost-cutting potential of telecare may represent conflicting goals.

9.1.2 Conclusions

The goals of telecare policy at the national level are not entirely clear, and thus different actors working towards its provision can be working towards different goals. The purpose of

providing advanced telecare includes the prevention of crises as part of achieving greater independence for older people, for the sake of those who prefer to age 'in place' at home for as long as possible. Another purpose behind the provision of telecare is the cost-efficiency from reducing in-person care. These goals are not necessarily complementary. This study found that the pursuit of cost efficiencies by care providers through the use of advanced telecare can undermine its preventative capacity. In addition, the preventative functionality of advanced telecare can represent rising costs for care providers, thereby undermining its cost cutting potential.

9.1.3   Recommendations

- At the national housing, health and industrial policy level, there needs to be greater clarity on the purpose of advanced telecare technology;

- Greater clarity about the role of advanced telecare in adult social care can be achieved through the creation of a national level strategic vision for advanced telecare provision and use. This should generate a clear policy, legal and funding framework for the design of telecare products and services, and for coordination between industrial actors; and

- If the success of digital telecare rests on the benefits felt by users, it should be recognised that this may be at odds with the search for cost efficiencies in care.

9.2   How does the coordination of advanced telecare services affect its outcomes?

9.2.1   Summary of findings

The outcomes of telecare can depend on 'the quality of the interaction between stakeholders' (Barlow et al 2005: 452). These stakeholders include local authority housing and adult social services, NHS professionals, call centres, housing providers, technology manufacturers and suppliers, and family members and users of technology themselves. Coordination between these actors and agencies is vital for the delivery of telecare services. Existing evidence has drawn attention to the potential risks associated with poor coordination, such as the potential for assigning telecare to individuals that is not tailored to their particular needs (Pols and Willems 2011; Woolham et al 2019).

The coordination of telecare services is complicated by the fact that different types of organisation face different constraints and priorities. Commercial suppliers face challenges achieving market penetration, while publicly funded service providers often operate under the

pressure of rising demand and strained resources. These very different constraints, and the relative capacities of different actors, can mean that those responsible for delivering adult social care services are left unable to define the terms of the services they offer.

9.2.2 Conclusions

Pols and Willems (2011) point out that telecare outcomes can be defined by the 'emergent local and practical goals' of users, carers and clinicians, rather than by policy goals. This report has argued that the goals of other stakeholders (e.g. telecare suppliers helping to coordinate telecare services) will also impact the outcomes derived from telecare provision.

The relationships between these stakeholders, and their ability to align and coordinate their operations, also has important implications for how telecare is experienced and the benefits derived from it. The fact that telecare may have different purposes for different stakeholders means that the priorities of those engaged in production and provision are important for analysis of outcomes. The role that telecare manufacturers play in setting up pilot schemes and assessing the success of their own products may represent a conflict of interest. Additionally, there may be ethical concerns as telecare manufacturers have the scope to define the performance metrics used to assess the success, efficiency and goals of telecare provision.

9.2.3 Recommendations

- Measures should be taken to ensure that effective coordination can be built and maintained between those involved in the provision of local telecare services;

- Given a lack of funding available for small telecare manufacturers and suppliers to trial their technology, seed funding should be made available by government for this purpose; and

- Efforts for greater coordination in the form of business accelerators and industry networks are vital for better industrial coordination.

9.3 How does the broader national and local institutional landscape affect the outcomes of advanced telecare provision?

9.3.1 Summary of findings

Telecare cannot be considered a standalone intervention. It is important instead to consider the institutional and organisational arrangements that determine the way technology is accessed (Laperche et al 2019). For example, local authorities can focus on cost-efficiency and

reducing the demands on adult social care services as a priority policy goal (LGA 2015). Telecare has been framed within UK policy as a means of shifting care away from residential institutions and into the home. This may represent part of a shift towards reduced central control of local care services, in a situation where local authorities are increasingly solely responsible for funding for care, and incentivised to cut its public provision. These institutional arrangements carry a risk that the infrastructure required to establish and maintain telecare services will face resource pressures. As Greenhalgh and Papoutsi (2019: 1) observe: 'Achieving any change takes work, and it usually also involves – in various combinations – spending money, diverting staff from their daily work, shifting deeply held cultural or professional norms, and taking risks'.

The pressure on local budgets for adult social care means that local authorities are sometimes poorly equipped to play the strategic role of aligning the operations of different stakeholders from across the sector. The different actors involved in provision rely on one another but must also pursue their own separate agendas for survival in a new, volatile market. This may inhibit integrated delivery of digital telecare and affect the goals that are pursued in provision. Given that the development of telecare services can rest on informal relationships between manufacturers and local authority project managers, there may be inconsistencies in the nature of provision in different areas. This could have more to do with the individuals involved, than with any clear strategy about the benefits of telecare for older people.

9.3.2   Conclusions

Both national and local governance structures are an important variable in the nature of advanced telecare delivery. Pressures on budgets for adult social care may explain a lack of strategic oversight amongst local authorities with which to steer the coordination of advanced telecare services. Such oversight is vital to successful coordination between the different actors and agencies involved in telecare provision, each working to their own divergent priorities and constraints. The strategic oversight and capacity of local authority teams involved in telecare provision should therefore be strengthened.

9.3.3   Recommendations

- Local authorities play a central role in coordinating advanced telecare delivery. Authorities capacity to play this role should be extended in order to achieve better coordination of outputs at the local level;

- Dedicated contact points should be established within local authorities, so that industry representatives can easily identify the individuals they should liaise with;

- The technical capacity of local authority teams involved in telecare provision should be advanced so that public care services can maintain strategic oversight of their design and delivery, rather than relying on the capacities of telecare manufacturers. Local authority care teams should be supported in their ability to develop knowledge and maintain institutional memory on the subject of telecare; and

- Integration is required for local policy making that impacts on the provision of telecare. Liaison will be required between local housing, planning, health, social care and economic development policy teams, in order to ensure that all aspects of telecare provision are aligned towards a consistent vision for service delivery.

9.4 How does the network of responders that contribute to predictive telecare use affect its outcomes?

9.4.1 Summary of findings

Telecare is embedded in the social context of each user, and in the networks of relations and responsibilities (Mort et al 2013). Individual practices are part of the way that telecare technology works. It is also embedded in the social dynamics between users, clinicians, carers, residential staff and monitoring centre staff, as well as users' family members. Friends and family members are not always available to act as responders for older people. Where they are available, they may need support in order to understand and fulfil their role. The preparedness and capacity of formal responders needs similar support, for example in the digital readiness of call centres. There is evidence to show that family members can pressure telecare users to use devices that they do not understand or want (Mort et al 2013). This study has also found evidence that telecare services can be designed by manufacturers with family requirements in mind, rather than the care needs of users themselves. This raises the issue of what goals telecare is designed to serve, how these goals are assessed, and who has the power to determine them.

Where family members do act as responders, their preferences and requirements can become fundamental to digital telecare functionality. The provision of additional care may be required on account of digital monitoring by family members. This may be pertinent to whether digital telecare creates expectations and demands that increase or reduce the cost of care.

9.4.2 Conclusions

Where the capacity to enact telecare provision is held largely by technology supply companies rather than care providers, this amounts to a potential ceding of value and of the ability to

define the terms of service to those companies – a funding challenge for the care providers who need to buy the technology. This may be pertinent to whether or not digital telecare creates relationships, requirements, expectations and demands that provide genuine benefits for older people. When manufacturers are left to coordinate a large part of provision, this can raise issues of housing providers' ability to define the goals of provision. Manufacturers may not pursue efficiencies of the same extent or nature to housing providers, or the same benefits for older people themselves.

9.4.3   Recommendations

- Advanced telecare product design and service delivery should be accompanied by service design extending beyond the consideration of the products on offer and their functionality. Service design requires consideration of all stages of telecare provision and access, from manufacturing and the role of industry players, to the role of telecare respondents and their relative capacities;

- Service design should take place at the local level, through coalitions of interest groups including housing and care providers;

- Training and support should be offered to family members and other informal responders responsible for monitoring older users of advanced telecare;

- Capacity should be built amongst call centres and other formal telecare responders so that they are equipped to monitor and respond to older users of advanced telecare, in order to provide a level of service that is aligned with the advanced functionality of digital telecare platforms; and

- If the preventative capacity of advanced telecare is to be optimised, this will require that pressures are removed from funding for in-person care.

9.5   Proposals for further research

The findings presented in this report suggest that a better understanding of the governance and coordination of telecare provision could be important for understanding when telecare works, when it doesn't, and why. Analysis of the supply side of telecare could highlight which goals are prioritised in design, how these goals are assessed, and who has the power to determine them.

A focus on innovation in telecare product design should be accompanied by innovation in telecare service design. This should include a focus on the role of responders within these services, and how their capacities and capabilities could be improved.

The impacts that different types of responders have on the experience of older people using telecare (whether these are family members, carers, residential professionals or call centre operators) also warrants further investigation. Evidence on the perceptions, understanding and capacity of older people towards advanced telecare should be accompanied by evidence on the perceptions, understanding and capacity of their responders. There is a need for a better understanding of the factors that affect different responders' ability to respond in appropriate ways.

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