An exploration into the implementation of monitoring technologies in care homes for people with dementia

A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy (PhD) in the Faculty of Biology, Medicine and Health

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List of Abbreviations

ADI	Alzheimer's Disease International
ANT	Actor-Network Theory
CAQDAS	Computer-Assisted Qualitative Data Analysis Software
CASP	Critical Skills Appraisal Programme
CQC	Care Quality Commission
CRD	Centre for Reviews and Dissemination
DH	Department of Health
EPHPP	Effective Public Health Practice Project
GPS	Global Positioning System
LBS	Location-Based System
MD	Managing Director
MeSH	Medical Subject Headings
MMAT	Mixed Methods Appraisal Tool
MRC	Medical Research Council
MTUAS	Media and Technology Usage and Attitudes Scale
NATO	North Atlantic Treaty Organization
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NIHR	National Institute for Health Research
NPT	Normalization Process Theory
ONS	Office for National Statistics
PICo	Population, Phenomena of Interest, Context
RFID	Radio Frequency Identification
RN	Registered Nurse
SUS	System Usability Scale
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
TRL	Technology Readiness Level
UTAUT	Unified Theory of Acceptance and Use of Technology
WHO	World Health Organization
WSD	Whole Systems Demonstrator

Abstract

The University of Manchester Alex James Hall Doctor of Philosophy (PhD)

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Background: An ageing society and rising prevalence in dementia are associated with rising demand for care home places. Monitoring technologies (e.g. bed-exit alarms; wearable location-tracking devices) are appealing because of their potential to enhance safety, increase resident freedom, and reduce staff burden. However, it is unclear how far use of such technologies can deliver potential benefits, and there are ethical challenges from their use. This study explored the implementation of monitoring technologies in care homes for people with dementia, to identify facilitators and barriers to the implementation of these technologies in practice.
Methods: An embedded multiple-case study design was employed with 3 dementia-specialist care homes in North-West England. Data collection included 36 semi-structured interviews with staff, relatives and residents, informed by Normalization Process Theory to focus on individual and organisational factors within implementation; 175 hours' non-participant observation; investigation of care records and technology manufacturer literature; and questionnaires to establish participant attitudes towards technologies. Qualitative data were analysed using Framework Analysis.
Findings: 5 overarching themes emerged: (1) Reasons for using technologies; (2) How technologies were implemented; (3) What happened when using technologies; (4) Understanding of technologies; (5) Business and environmental influences. Mitigation of risk seemed to override other potential benefits (e.g. resident freedom) or ethical concerns (e.g. the remote monitoring of residents with impaired cognition), as a reason for use. This emphasis seemed to position monitoring technologies as being understood as fundamentally different to other interventions, and challenged adherence to philosophies of care emphasising resident choice. Some staff, relatives and residents did not seem to be involved in discussion and decision-making regarding technologies, and seemed to lack knowledge about technologies within the homes. Staff training appeared mainly informal, based upon assumptions of simplicity of use, which might not have been sufficient to ensure that staff fully understood the technologies. Staff understanding and awareness of the technologies appeared to be influenced in part by location, both organisationally (i.e. their role) and physically (i.e. within the building). Technical and physical properties of the technologies appeared to work in relation with the physical environments of the homes, which suggested that there may not be an ideal set of physical properties for any particular technology. Some technologies offered a range of functional and information-gathering capabilities, which at times were perceived to be useful complements to practice, but at other times less useful, particularly if they were imbued with a financial cost that was not justifiable from a business perspective.
Conclusions: Care homes may need to consider greater involvement of all stakeholders in discussions and decisions regarding the use of monitoring technologies, in order to deepen understandings about the potential benefits and challenges from their use. There is also a need to consider the technical compatibility of technologies with the care home premises, and the financial implications from investing in technologies.

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

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The Author

Alex Hall gained a BA (Hons) in English Language (2001-2004) and a Graduate Diploma in Psychology (2006-2008) from Newcastle University, during which time he worked as a support worker with young people and adults with learning disabilities and brain injuries. He then completed an MSc in Social Science and Health Research (2010-2012) whilst working on a Knowledge Transfer Partnership project between Newcastle University and a specialist autism care organisation, implementing a video-based intervention to enhance communication between staff and service users within the organisation. During this project Alex became increasingly interested in the potential of technologies to enhance health and social care practice, and particularly by the challenges regarding implementation and uptake of technological interventions into practice. He moved to the University of Manchester to commence this PhD in September 2012.

Chapter 1: Technologies and the care of older adults

1.1 Introduction

The potential of technologies to enhance health and social care is increasingly advocated (e.g. World Health Organization [WHO], 2014). When I commenced this PhD in 2012, the UK Department of Health [DH] had recently published its 'Innovation Health and Wealth' review (DH, 2011a) citing technological innovation as key to improving patient outcomes and supporting the NHS as a major contributor to the UK economy. This review (DH, 2011a) acknowledged that in the UK we struggle with implementation, with slow uptake of technologies into health and social care practice. Like many countries in the world, the UK is faced with an ageing population, meaning that care homes are supporting increasingly high numbers of older residents with dementia (Alzheimer's Society, 2007; Alzheimer's Society, 2013a; Office for National Statistics [ONS], 2014a). In this thesis I focus upon technologies with potential to enhance the quality of care within care homes for people with dementia, and explore factors influencing the implementation of these technologies in practice.

In this introductory chapter I provide an overview of an ageing population, the prevalence of dementia and the role of care homes in the care of people with dementia; turning to focus upon technologies with the potential to enhance quality of care in care homes.

1.2 Ageing and dementia

The world's older population (i.e. adults aged 60 and over) stands at 12.2% of the global population, expected to rise to 21.2% by 2050 (Alzheimer's Disease International [ADI], 2015). In the UK, the median age of the population, and the number and proportion of older adults within the population, are increasing (ONS, 2012). The greatest increase is set to come in the number of adults over the age of 85, projected to make up 5% of the UK population by 2035 (ONS, 2012). Estimates suggest that 76% of older adults in the UK will need some form of care in later life (HM Government, 2012). The ageing population of the UK is thus a testament to the quality of health and social care services which at the

same time places ever-increasing demands upon those same services (House of Lords Select Committee on Public Service and Demographic Change, 2013).

One of the major demands placed by an ageing population upon care services is a higher risk of dementia (WHO, 2012; 2014). Dementia is a universal term for a group of similar symptoms caused by diseases involving death of brain tissue (DH, 2009a); throughout this thesis, I likewise use the term 'dementia' as a short-hand. The most common cause is Alzheimer's disease, accounting for around 60% of cases; other causes include (but are not limited to) vascular dementia; mixed dementia; and dementia with Lewy bodies (Alzheimer's Society, 2014). It has a devastating impact upon individuals, their relatives and friends (WHO, 2012), and presents challenges for the delivery of good quality care in a manner which preserves dignity (Alzheimer's Society, 2013c). Symptoms and behaviours include the following:

- Progressive decline in functional abilities such as memory, communication, reasoning, and ability to carry out daily activities (DH, 2009a)
- Excessive walking around (often termed 'wandering'), aggression, shouting, repetitive questioning, and disturbed sleep (Banerjee, 2009)
- Problems eating due to loss of muscle function, leading to weight loss and a weakening of the immune system; incontinence (Alzheimer's Society, 2013c).
- Physical and cognitive impairments also mean that dementia is an independent risk factor for falling (van Doorn *et al.*, 2003) in addition to the risk already presented by ageing alone (National Institute for Health and Care Excellence [NICE], 2013).

The ADI (2015) report estimated that there are 46.8 million people worldwide living with dementia, projected to reach 131.5 million by 2050. At the time I was conducting this PhD, there was widely believed to be a rising prevalence of dementia within the UK: Alzheimer's Society (2014) figures suggested there were around 850,000 people with dementia, projected to rise to over 2 million by 2051. However, when I was writing up this thesis, this projection was challenged by epidemiological work (Wu *et al.*, 2015) which found that the prevalence of dementia in the UK (and other Western European nations) may be stabilising. The ADI (2015) report suggested that much of the projected global increase would come in low- and middle-income countries, rather than high-

income countries like the UK. Nevertheless, the perceived rising prevalence led to increased policy attention; the UK government launched the National Dementia Strategy in England (DH, 2009a) to drive improvements in three fundamental areas of dementia care: raising awareness; ensuring earlier diagnosis; and delivering a higher quality of care. Alongside the Strategy was the appointment of a National Clinical Director for Dementia, Professor Alistair Burns, who recently reported that diagnosis rates have increased (Burns, 2015; see also Black *et al.*, 2015), and called for attention to now focus upon post-diagnostic support.

Post-diagnostic support is underpinned by a broad ethos within UK health and social care policy emphasising that older adults should have independence, choice and control over their care (e.g. HM Government, 2010; 2012; the Care Act, 2014), and should be supported to remain in their own homes and communities rather than move to care homes (e.g. Owen *et al.*, 2012). This ethos is in keeping with the wishes of the vast majority of older adults (Barlow *et al.*, 2012) and is at the fulcrum of explorations into potential alternatives to care homes, such as adaptations to own homes, retirement villages, assisted living, sharing homes with relatives, and co-housing (Tinker *et al.*, 2013). Yet care homes continue to play a crucial role in the care of older adults. Recent estimates for numbers and trends regarding the care home population vary: some place the figure at around 400,000 older adults (Kennedy, 2014); others at 291,000, or 3.2% of the population of over-65s (ONS, 2014a). Some data suggest that overall demand for places is rising (see Owen *et al.*, 2012); other data suggest it is stable (ONS, 2014a); still other data suggest a decline (Lievesley, Crosby and Bowman, 2011). What does seem clear is that the demographic of care home residents is shifting to comprise of increasingly high numbers aged 85 and over, associated with increasingly high numbers with dementia (Alzheimer's Society, 2007; Alzheimer's Society, 2013a; ONS, 2014a; Gordon *et al.*, 2014). Around a third of people with dementia in the UK live in care homes, and these residents make up close to 80% of the care home population (Alzheimer's Society, 2013b). The task of delivering good quality dementia care is thus fundamental to the care home sector (Alzheimer's Society, 2007).

1.3 Care homes and dementia care

In Box 1.1 I explain what I mean by the term 'care home'.

Box 1.1: What is a 'care home'?

The definition of a 'care home' can be problematic; in the UK there are terminological inconsistencies between England, Scotland, Wales and Northern Ireland (British Geriatric Society, 2011). The main distinction between types of home is based on whether or not the home offers nursing care. In England, a home that *does not* offer nursing care may be referred to as a 'care home', and a home that *does* offer nursing care may be referred to as a 'care home with nursing'. Elsewhere in the UK, a home that does *not* offer nursing care may be referred to as a 'residential home' and a home that *does* offer nursing care may be referred to as a 'nursing home' (Alzheimer's Society, 2013a). Terminology also varies internationally. For example, in the USA, the terms 'nursing' and 'residential' may be used, but care homes may also be included under the more general term of 'long-term care' (Harris-Kojetin *et al.*, 2013); in Japan, the terms 'nursing' and 'residential' may be used, but care homes for people with dementia may also be referred to as 'group homes' (Traphagan and Nagasawa, 2008).

The distinction between whether or not a home offers nursing care is important for regulatory implications; in the UK it has a possible impact on a resident's entitlement to NHS district nursing support, and whether or not (social) care workers are supervised by a qualified nursing (health) professional (British Geriatric Society, 2011). However, although a home with nursing care may be caring for residents with high levels of need, the case mix and clinical needs across the whole care home sector are broadly similar (British Geriatric Society, 2011) and the distinction between 'residential' and 'nursing' care is increasingly unclear (Lievesley, Crosby and Bowman, 2011). Additionally, because the term 'care home' is often used as a catch-all term in the literature, it can be difficult to determine either any difference between types of homes, or whether any difference would have been relevant to the research question or topic of discussion.

In keeping with literature produced by leading authorities in the field of older people's care (e.g. Alzheimer's Society, 2013a; British Geriatric Society, 2011; Kennedy, 2014; Owen *et al.*, 2012), I use the term 'care home' throughout this thesis to refer to homes which offer residential services both with or without nursing. Where any difference between the types of home is both identifiable and appears relevant to a particular issue, I will make this difference explicit.

I focus on care homes as institutions caring for adults who have highly complex needs, permanently staffed by social care workers, and which may or may not also include qualified health professionals such as Registered Nurses. I do not focus upon other types of housing, such as assisted living (in which an older adult may live in their own private residence within grounds in which there are wardens and support staff). This type of housing sits within the bracket of community care and the drive to support people in their own homes rather than move to care home institutions (e.g. Innovate UK, 2015).

Care homes can be positive places, providing a sense of community and security, and improved quality of life (e.g. Owen *et al.*, 2006; 2012), and recent decades have seen improvements in quality of care (MyHomeLife, 2016b). There are continued calls for innovation in the delivery of care (e.g. Commission on Residential Care, 2014); better integration of care homes into the dementia care system as a whole (All-Party Parliamentary Group on Dementia, 2011); and the Prime Minister's Challenge on Dementia (DH, 2012b) and Challenge on Dementia 2020 (DH, 2015) called for higher care standards, staff knowledge and skills within care homes. Care homes have traditionally followed a medical model of care (see Bond, 1992, for a critique) advocating antipsychotic medication for the treatment of behavioural symptoms of dementia which has resulted in gross over-prescription (Banerjee, 2009). Yet change is afoot: the National Dementia Strategy (DH, 2009) appears to be having a clear impact in reducing use of such medication (Black *et al.*, 2015); and social models of care, where behavioural symptoms are understood as communication rather than medical presentation (Keady and Jones, 2010), have become increasingly appealing (MyHomeLife, 2016a). The most influential social model is the 'Personhood' approach of Tom Kitwood (see Brooker, 2004, and Social Care Institute for Excellence, 2013, for an overview), which holds that understanding the person behind the dementia (e.g. their identity, preferences, values, life history, and relationships) can lead to a better quality of life than pharmacological interventions.

Non-pharmacological interventions have historically had a weak evidence base: comprehensive systematic reviews (Robinson *et al.*, 2006; O'Neil *et al.*, 2011) found a lack of robust, high-quality evidence to support the use of such interventions to manage behavioural symptoms, and another systematic review (Caddell and Clare, 2011) suggested that interventions to support the maintenance of self and identity in people with dementia are in early developmental stages. In recent years there has been a growth in the evidence base, including support for the use of person-centred approaches to reduce use antipsychotic medication and severity of behavioural symptoms (Brooker *et al.*, 2015; Chenoweth *et al.*, 2009; Zwijsen *et al.*, 2014), improve quality of life (Brooker *et al.*, 2011; Cabrera *et al.*, 2015), and improve staff feelings of burnout and job satisfaction (Zwijsen *et al.*, 2015). There is evidence for the effectiveness of e-learning in developing understanding of person-centred care (Hattink *et al.*, 2015), and care home managers and staff are increasingly able to receive dementia-specific training (Skills for Care, 2015).

Expectations for innovative, good quality care exist in a milieu of limited resources (MyHomeLife, 2016a), with care homes facing funding cuts, problems with workforce recruitment and morale, and a negative public image (Table 1.1). Following scandals in care such as Winterbourne View (see Table 1.1), the sector's regulatory body the Care Quality Commission [CQC] proposed a revised approach to inspection and regulation which aimed to standardise the inspection process and enhance its credibility and scope via use of expert teams rather than generalist inspectors (CQC, 2013). It also strengthened the regulatory powers of the CQC to hold care homes to account (CQC, 2013). The approach involves inspectors focusing upon five core questions: whether a care home is safe, effective, caring, responsive to residents' needs, and well-led. Homes are given one of four ratings (Outstanding; Good; Requires Improvement; Inadequate) which are intended to be clearly understandable to providers and the public (CQC, 2013). The future strategy outlined for 2016-2021 continues to emphasise the importance of safety within care homes, and highlights that the CQC will take enforcement action (including closure of a home and prosecution of the provider) if residents are exposed to significant harm or risk of harm (CQC, 2016). Calls for innovative, good quality care therefore co-exist with the need for providers to focus upon safety and risk management.

It is increasingly advocated that the use of technologies will enhance quality in care homes for people with dementia (e.g. Alzheimer Scotland, 2015; Cahill *et al.*, 2007; Topo, 2009; Westphal, Dingjan and Attoe, 2010). Technologies are widely believed and anticipated to enhance clinical outcomes, economic benefits, and patient experiences within health and social care (e.g. DH, 2011a; Liddell, Adshead and Burgess, 2008); enhancements that would appear particularly welcome in care homes given the challenges outlined in Table 1.1.

Table 1.1: Interrelated challenges faced by care homes

Challenge	Description
Funding	• The last thirty years has seen a shift from public to private provision: in 1980, 63% of places were provided by local authorities, and 17% by the private sector, but by 2002 this distribution had been reversed (Lievesley, Crosby and Bowman, 2011). Over a similar time period (1987-2009) there was a 60% reduction in number of geriatric NHS hospital beds, with an increase in demand for nursing places in care homes (Lievesley, Crosby and Bowman, 2011) • Recent cuts to social care funding mean that more older adults are having to support their own care (Ismail, Thorlby and Holder, 2014). Steps to reduce this individual burden included pledges in the Care Act (2014) of capping direct care costs and increasing eligibility for local authority support. Concerns about the financial implications for local authorities obligated to provide this support have led the introduction of the cap and eligibility changes to be deferred from 2016 until 2020 (Burt, 2015)
Workforce	• The vast majority of staff are paid at National Minimum Wage level and feel undervalued (Alzheimer's Society, 2007; Kennedy, 2014). Well-intentioned pledges to increase pay to a National Living Wage have been met by concerns from local authorities about financial implications (Local Government Association, 2015) • Historically the workforce has been disjointed, often isolated within individual homes and not offered robust qualifications or career pathways (Wild, Szczepura and Nelson, 2010) • The increase in demand for nursing places has been accompanied by inconsistencies in the provision of NHS care to residents via a failure to see care homes as an integral facet of healthcare services (British Geriatric Society, 2011; Goodman, 2015), and the recruitment of Registered Nurses into the sector remains a priority (Care Quality Commission [CQC], 2014) • Home managers have felt a lack of support from the wider health and social care field (Owen *et al.*, 2012), presenting recruitment and retention challenges for the 'poisoned chalice' role (Kennedy, 2014, p.33). Leadership and management have been identified as crucial in shaping the culture within a care home (MyHomeLife, 2016a) and there are likely to be challenges for delivering innovation if there is an absence of sustainable, experienced leadership (e.g. Eckert *et al.*, 2014)
Negative public image	• Care homes are often regarded by the public as a last resort; to be avoided at all costs (Commission on Residential Care, 2014; Lievesley, Crosby and Bowman, 2011; Midwinter, 2011 for a historical perspective) • Contemporary perceptions have been influenced by high-profile scandals such as Winterbourne View, which uncovered criminal abuse of residents by staff (South Gloucestershire Safeguarding Adults Board, 2012), and Orchid View, in which at least five residents died due to neglect attributed to a poorly-managed and doomed expansion strategy of parent company Southern Cross (West Sussex Adults Safeguarding Board, 2014) • 70% of respondents to a YouGov poll said they would be scared at the prospect of moving into a care home (Alzheimer's Society, 2013a)

1.4 Technologies with potential for care homes

In Box 1.2 I explain what I mean by 'technologies'.

Box 1.2: Technologies

A 'health technology' is defined by the National Institute for Health Research [NIHR] Health Technology Assessment Programme as 'any method used to promote health; prevent and treat disease; and improve rehabilitation or long-term care' (NIHR, 2013). There are a wide variety of examples of what might be classed as a health technology, including procedures (e.g. surgical operations), drugs, therapies, devices, diagnostic instruments and tests, and screening programmes (NIHR, 2013); it is therefore clear that health technologies are not always electronic technologies. In this thesis, I use the word 'technology' (and derivations thereof) to refer to electronic technologies.

Terminology regarding technologies can be confusing, with a range of terms used interchangeably as synonyms (Royal College of Nursing, 2015). These terms include 'telecare', 'telehealth', 'telemonitoring', 'telemedicine', 'assistive technology', and 'smart homes' (Barlow *et al.*, 2012). The drive for technological innovation in the UK tends to use 'telecare' and 'telehealth' (Royal College of Nursing, 2015). Since 1998 there have been at least 25 official reports advocating an increase in such technologies, accompanied by public funding of £160m for a variety of initiatives during the period 2006-2012 (Barlow *et al.*, 2012). 'Telecare' may be considered 'a safety net for vulnerable people' (Barlow *et al.*, 2012, p.22) in which technologies may be used in the detection of a problem and the generation of a response. Examples include personal devices (such as fall detectors and personal alarms) and environmental devices (such as water or gas detectors), all of which may possess the capability to contact assistance such as a carer or a remote call centre (DH, 2009b). 'Telehealth' may be considered a 'trend management service' (Barlow *et al.*, 2012, p.22) for the monitoring of long-term conditions. Examples include use of devices such as blood pressure monitors to record physiological data which can be exchanged with remote health care staff at a hospital (DH, 2009b).

In Table 1.2 I show examples of technologies which may enhance quality of care in care homes for people with dementia

Table 1.2: Examples of technologies which may enhance quality of care in care homes for people with dementia (adapted from Alzheimer's Society, 2015; Bharucha *et al.*, 2009)

Technology	Description	Examples
Cognitive aids		
Prospective memory aids	Artificial intelligence devices delivering reminders or procedural guidance as necessary to wearer for task completion	Reminder messages; clocks and calendars; automatic pill dispensers
Retrospective memory aids	Devices to show historical events to stimulate autobiographical memory	Multimedia software to show films and photographs of historical events; camera which passively takes photographs whilst worn by person with dementia
Physiological sensors		
Vital signs and metabolic parameters	Measurement of parameters, with potential to alert relatives or care staff to signs of adverse medical conditions	Bed sensors to measure heart rate or detect seizures
Fall detectors	Detection of falls, either manual (requires faller to activate alert after fall) or automatic (fall event triggers alert)	Body-worn sensors e.g. accelerometer on hip
Environmental sensors	Low-cost sensors to measure single or multiple factors	Acoustic; pressure; motion; e.g. may switch on lights automatically
Advanced integrated sensor systems	Combined system to detect and provide alert to adverse event (e.g. fall).	Usually comprised of control panel, various environmental sensors and alert device for caregiver (e.g. alarm or pager alert)
Wearable radiofrequency transmitters	Radio frequency identification [RFID] system to monitor location, movement and activity	Usually comprised of tag worn by person with dementia, and sensors installed within building
Satellite-enabled technology	Tracking devices able to trace a missing person in order to promote safer walking	GPS-enabled smartphone
Video-based systems	Video cameras to stream or record activity and behaviour	CCTV

All of the sensors, integrated systems, radio frequency, satellite and video-based systems (i.e. all of the technologies in Table 1.2 bar the cognitive aids) can be categorised as 'surveillance' or 'monitoring' technologies (e.g. Cahill *et al.*, 2007; Niemeijer *et al.*, 2010). In the interest of succinctness, I use the term 'monitoring technologies' throughout this thesis. Monitoring technologies may potentially increase safety, enhance clinical understanding, reduce staff burden, and promote freedom of movement for residents (Kennedy, 2014; Niemeijer *et al.*, 2010); such enhancements may be particularly desirable

in long-term dementia care (e.g. Bharucha *et al.*, 2009; Cahill *et al.*, 2007; Dorsten *et al.*, 2009; Rantz *et al.*, 2013; Wild *et al.*, 2014; Woolrych *et al.*, 2013).

Monitoring technologies are considered 'complex interventions' because their use involves consideration of numerous factors such as diverse components, user skill levels, training needs, time and resources, and acceptability (Campbell *et al.*, 2000). In Chapter 2 I will explore why consideration of factors relating to the implementation of such technologies in practice is important.

1.5 Summary

This thesis consists of nine chapters. In this first chapter I have introduced the following:

- Like many countries in the world, the UK has an ageing population which carries an increased risk of dementia. Care homes are supporting increasingly older adults with higher instances of dementia.
- Care homes are expected to provide innovative, good quality care against a background of challenges from a negative public image, lack of funding, and workforce issues.
- Technologies are increasingly seen as being able to enhance quality of care whilst addressing some of these challenges. 'Monitoring' technologies may be particularly appealing as potential means to help increase safety, enhance clinical knowledge, reduce staff burden, and promote independence of movement for residents.

In the subsequent chapters I present the following:

- The theoretical background to the thesis, highlighting the importance of considering factors relevant to implementation of technologies in practice (Chapter 2)
- A systematic review, appraisal and synthesis of the research literature regarding the implementation of monitoring technologies within care homes for people with dementia (Chapter 3)

- The research question, theoretical perspective and methodological approach (Chapter 4)
- The findings, including information about the care homes, technologies, and participants involved (Chapter 5); why they were using technologies (Chapter 6); how they implemented technologies (Chapter 7); and what happened during the use of the technologies in practice (Chapter 8)
- Discussion of the findings, reflections upon methodological approach, and the relevance of the thesis to practice, research and policy (Chapter 9).

Chapter 2: Theoretical background

2.1 Introduction

In chapter 1 I outlined that care homes are supporting an increasing proportion of older adults with dementia, whilst facing interrelated challenges of negative public image, lack of funding, and workforce issues. Monitoring technologies may be perceived to enhance the quality of care and address some of these challenges. These technologies are considered 'complex interventions', because their use involves consideration of diverse factors such as multiple components, user skill levels, training needs, time and resources, and acceptability (Campbell *et al.*, 2000).

An early framework for the development of complex interventions (Medical Research Council [MRC], 2000) suggested a linear trajectory, from design, through piloting and evaluation, to implementation. However, the implementation of a new intervention in any given context involves changes to both material and cognitive practices for the people working with the new intervention, and as such is never just about the intervention as an isolated artefact (May, 2013). Implementation may therefore be understood as active approaches towards making interventions mainstream practice (Greenhalgh *et al.*, 2004a), conceptualised as a continuous process rather than a static end point (May, 2013). Revised guidelines for the development of complex interventions (MRC, 2008) recognised the importance of considering implementation factors at an early stage, because an apparent lack of clinical effectiveness might be due to implementation complications rather than a genuine lack of effect.

The diverse factors and challenges associated with the implementation of complex interventions in practice means that realisation of potential benefits from the use monitoring technologies in care homes may not be straightforward. In this chapter I explore the following:

- The influence of two powerful concepts, technological determinism and social essentialism, upon the implementation of health technologies
- The relevance of these concepts for the implementation of monitoring technologies in care homes for people with dementia

- How theoretical approaches from the field of implementation research may help to explore factors which influence implementation.

2.2 Common conceptual understandings of technologies

2.2.1 Technological determinism

Technological determinism is the belief that technologies themselves are autonomous agents of social change, rather than human users or implementation strategies (Timmermans and Berg, 2003). It became pervasive within academic writing after the Second World War, in which technologies were either praised for modernising society (a utopian form) or blamed for cultural crises (a dystopian form) (Berg, 1998; Feenberg, 1999).

Utopian determinism is promoted by the emphasis upon novelty and opportunity intrinsic to the concept of innovation, allied to the Western view that technology offers 'progress' (Borup *et al.*, 2006). In today's society there is a propensity for images of the future to centre upon novel gadgets (Brown and Michael, 2003). It is often thought that simply increasing quantities of new technology in a given context will deliver benefits as a matter of course (Bauchspies, Croissant and Restivo, 2006). The seductive appeal of new technologies may supersede deeper thinking about their use: people often act in a compliant, disempowered manner with technologies rather than questioning and influencing their design and implementation (Bauchspies, Croissant and Restivo, 2006), and tend to isolate failed technological endeavours as unique cases which have nothing in common with new proposals (Borup *et al.*, 2006).

Contemporary examples suggest that the implementation of health technologies is often infused by utopian determinist expectation. In the UK, the drive for telehealth and telecare (c.f. Chapter 1) has been based primarily around an initiative called *3millionlives* (DH, 2012a), launched with the belief that there were at least three million people with long-term health conditions who could benefit from telehealth and telecare in their own homes. *3millionlives* was backed by the Whole Systems Demonstrator [WSD] project (DH, 2009b) which aimed to ascertain evidence regarding the effectiveness of telehealth and

telecare to inform the design of services around multidisciplinary health and social care teams and integrated care plans (Bower *et al.*, 2011). At the time of its undertaking, the WSD project was the world's largest randomised controlled trial of telehealth and telecare (DH, 2009b), but despite high hopes, there were mixed findings regarding the impact upon hospital admissions, mortality, quality of life, and cost-effectiveness (Cartwright *et al.*, 2013; Henderson *et al.*, 2013; Hirani *et al.*, 2014; Steventon *et al.*, 2012; Steventon *et al.*, 2013). Qualitative work suggested that such findings may have arisen from an implementation strategy imbued with utopian expectation: there was a lack of attention upon resources required to deliver whole system change, because it was expected to occur '*organically,* whilst in the process of rolling out the technology' (Chrysanthaki, Hendy and Barlow, 2013, p.50, original italics); delivery requirements imposed by the trial design denied local services the flexibility to shape implementation to suit their own contexts (Hendy *et al.*, 2012); and may have influenced decisions of patients who declined to participate or withdrew from the trial (Sanders *et al.*, 2012).

Other contemporary examples include the burgeoning field of mobile health ['mhealth'] applications, which appears to have been driven by highly profitable utopian expectation; there are approximately 40,000 mhealth apps for the monitoring of personal health and fitness on the market (Powell, Landman and Bates, 2014). Yet the sheer number is bewildering for clinicians and the public, safety and effectiveness is difficult to discern (Powell, Landman and Bates, 2014), regulation is in its infancy, and their status as formal medical devices is ambiguous (McCarthy, 2013). Perhaps the most egregious example of the pitfalls of utopian expectation is the abandonment of a vast NHS IT system reportedly to have cost £10bn, the implementation of which appeared to have been uninformed by failures of previous public IT projects of similar scope (Syal, 2013).

The dystopian form of technological determinism considers that inevitable technological development will ultimately lead to technologies having control over human subjects. At its most extreme, this form is exploited to hugely popular effect within science fiction (e.g. the *Terminator* film franchise, beginning 1984), in which artificially-intelligent technologies become capable of recursive self-improvement (see Eden *et al.*, 2012). In a less sensationalist form, it seems to underpin fears that telehealth and telecare technologies might replace staff or lead to social isolation of patients (e.g. Perry *et al.*,

2010). These fears are pervasive (Heath, Luff and Sanchez Svensson, 2003), yet may be brushed aside; the introductory information in the WSD project acknowledged such fears but dismissed them as 'myths' (DH, 2009b). This dismissal might be coupled with utopian expectation informed by political and financial pressures; the Department of Health has been criticised for selectively emphasising preliminary positive findings from the WSD project (see DH, 2011b) due to its concordat with the technology industry (see DH, 2012a) and for favouring clinical trial research designs which cannot elucidate this type of political influence (Greenhalgh, 2012).

All these examples highlight that implementation of health technologies may be influenced by powerful perceptions about their status as autonomous agents of change. Utopian expectation may overlook considerations of practical implementation challenges, and downplay dystopian concerns about their suitability within human, caring environments.

2.2.2 Social essentialism

Rather than crediting technologies as autonomous agents of change, social essentialism views them as blank slates whose meanings are derived from interpretations of their uses (Timmermans and Berg, 2003). Social essentialist analyses invite interpretations of the use of technologies within power relationships, often concerned that people in positions of power favour technologies which they can manipulate to help them maintain their position (Timmermans and Berg, 2003). There are two commonly-invoked metaphors to illustrate such concerns. The first, popular in academic discourse, is Michel Foucault's (1977) use of the Panopticon, an 18th century prison design which incorporated a circle of inward-facing cells with a central watchtower from which guards would be able to observe inmates whilst remaining unseen. Foucault (1977) advanced this metaphor to illustrate a twofold effect of social power and control in which people might be placed under surveillance at all times, but may also *feel* like they were under surveillance without ever knowing for certain. The second, common in wider discourse, is Big Brother, from George Orwell's (1949) novel *Nineteen Eighty-Four*. Big Brother presents an arguably even more threatening vision of a total invasion of privacy than the Panopticon (Dobson and Fisher, 2007), in which a controlling minority continually monitors the majority in

their own homes, engages in egregious acts of censorship, and seeks to control society through manipulation of language.

The Panopticon and Big Brother are compelling metaphors for concerns about contemporary technologies. A simple internet search for 'smartphones' and 'Big Brother' retrieves a near-limitless number of pieces discussing surveillance capabilities of such technology. The metaphor seemed particularly salient during the time I conducted this PhD, which saw a marked development of public scrutiny upon covert technological surveillance; from the impact of the Edward Snowden revelations about USA and UK security agencies (Greenwald, MacAskill and Poitras, 2013; MacAskill, 2013; Intelligence and Security Committee of Parliament, 2015), and the UK Draft Investigatory Powers Bill around the time of terrorist attacks in Paris (HM Government, 2015; scrutiny from Joint Committee on the Draft Investigatory Powers Bill, 2016). The metaphor of Big Brother regarding telehealth and telecare in the WSD literature was acknowledged, but like technological determinist fears, was again dismissed as a 'myth' (DH, 2009b). The sheer popularity of wearable personal health technologies and smartphones interconnected via the 'Internet of Things' (e.g. Internet of Things Council, 2015) appears to reveal a nuanced relationship between technological determinism and social essentialism, in which there is societal enthusiasm for novel personal technologies, yet the data captured by these technologies may be exploited in unseen ways (Fox, 2015).

These examples suggest that there may be concerns about health technologies being used to exercise social control. However, contemporary technologies are affordable and available for personal use, meaning that they now potentially discredit concepts of hierarchical power relations (Dobson and Fisher, 2007), and perceptions of cynical surveillance networks may be characteristic of old sociological models which viewed people primarily as victims (Ross, 1991). It seems uncertain to what extent such concerns resonate within mainstream society, or whether enthusiasm for new technologies outweighs such concerns.

2.2.3 Implications for the implementation of monitoring technologies in care homes

Utopian technological determinist thinking may inform beliefs that the implementation of monitoring technologies in care homes for people with dementia will automatically bring benefits, including alerting staff to potentially injurious incidents such as falls, indicating a decline in health, or helping residents to retain freedom of movement and independence in activities of daily living (c.f. Chapter 1). Yet it may overlook potential implementation challenges, such as removal or refusal of devices by residents, false alarms and overburdening staff with 'alarm fatigue', or creating a false sense of security through technologies which may lack reliability (Niemeijer *et al.*, 2010). Dystopian technological determinist thinking may inform concerns that monitoring technologies might replace care home staff, and might denigrate person-centred care (Niemejier *et al.*, 2010). Yet good dementia care is a negotiated, trial-and-error process with no simple hierarchy of values (Thygesen and Moser, 2010) and therefore rigid scepticism toward monitoring technologies may prevent the opportunity to explore their potential benefits.

Foucauldian critiques suggest that care staff favour technologies which they are able to use to exercise control over older adults in their care (Östlund, 2004). 'Big Brother' has often been invoked in discussions regarding monitoring technologies for people with dementia (e.g. Welsh *et al.*, 2003), and there are a multitude of social essentialist concerns about the influence of such technologies on care home residents' freedom, autonomy, human rights, privacy, and dignity (Niemeijer *et al.*, 2010). Yet the relationship between a technology and its context is one of mutual development (Berg, 1998). Monitoring technologies may embody a simultaneous 'duality' of humane and inhumane care (Sävenstedt, Sandman and Zingmark, 2006) in which the above concerns are pitted against a responsibility for staff to uphold a duty of care to residents; resulting in a lack of consensus about their ethical viability (Niemejier *et al.*, 2010).

At the time I was writing up this thesis, there were increasingly loud calls from the UK public for use of cameras (either overt or covert) in response to concerns about abuse or neglect of residents (e.g. CQC, 2015a). A consultation by a large UK care home provider (HC-One, 2014) with over 12,000 of its relatives, staff and residents, found that 87% of relatives, 63% of staff, and 47% of residents were in favour of use of cameras. However,

there seemed to be a strong preference for cameras in communal locations only, with considerable concerns about impact upon resident privacy, and access to and storage of footage (HC-One, 2014). Parallel work by the GMB Union consulting their members working in HC-One homes found that whilst over 70% agreed that cameras might help prevent abuse and false allegations of abuse, 87% stated that cameras would not be adequate replacements for sufficient numbers of properly-trained staff (see Fisk, 2015). There has been advice published for relatives considering installing cameras (CQC, 2015a), and proposals for the development of principles for the implementation of cameras (Fisk, 2015), but there clearly remains a pressing need for comprehensive exploration into factors influencing the implementation of monitoring technologies within care homes for people with dementia. I will now consider how the field of implementation research may assist such an exploration within this thesis.

2.3 Implementation research

2.3.1 Conceptual definition

Implementation research (also referred to as implementation science) is an emerging field which may be defined as *"the scientific inquiry into questions concerning implementation – the act of carrying an intention into effect, which in health research can be policies, programmes or individual practices (collectively called interventions)"* (Peters *et al.*, 2013, p.1). It is concerned with what, why and how interventions work in real world contexts (Peters *et al.*, 2013). 'Implementation' may be used as a shorthand within a very diverse field in which terminology can be confusing and haphazard; terms such as 'acceptability', 'adoption', 'uptake', 'feasibility', and 'sustainability' may be used interchangeably and synonymously to refer to outcome variables (see Peters *et al.*, 2013, for working definitions). An extensive systematic review of over 500 sources into the uptake of complex interventions within organisational environments (Greenhalgh *et al.*, 2004a; 2004b) discussed at length the challenges of clarifying terminology within the field, and provided the following definitions:

- An *innovation* is *"a set of behaviours, routines and ways of working, along with any associated administrative technologies and systems"*, introduced within an organisation to produce an outcome (e.g. health improvement; administrative efficiency; cost effectiveness; user experience) (Greenhalgh *et al.*, 2004b, p.40).

There may be subtle differences between the terms 'innovation' and 'intervention' (an intervention may be a specific means of implementing a broader innovation), but across the literature the two terms often appear to be used interchangeably

- *Diffusion* may refer to the *passive spread* of the intervention throughout a social system
- *Implementation* may refer to *active and planned efforts* to make the innovation/intervention part of routine practice within an organisation.

Despite recognition of 'diffusion' challenges (e.g. DH, 2011a), the uptake of interventions into practice has been consistently found to be slow, arbitrary and uncoordinated (Eccles *et al.*, 2009). In the past decade, there has been a burgeoning interest in a myriad of theoretical positions from a range of disciplines to understand factors and mechanisms which are likely to influence implementation (Nilsen, 2015). Use of theoretical positions can bring increased generalisability, transparency, reproducibility and testability to the field of implementation research (Eccles *et al.*, 2006). Recent taxonomic work (Nilsen, 2015) identified five broad categories for frameworks, models and theories used within implementation research (Table 2.1).

Table 2.1: Taxonomy of models, frameworks and theories within implementation research (adapted from Nilsen, 2015)

Taxonomic category	Description/features	Function/limitations
Process models	• Provide practical, step-by-step guidance in planning and execution of implementation • Present idealistic linear trajectory but acknowledge that actual process may be non-linear • Highlight need for careful planning of implementation strategy at an early stage	• Descriptive rather than explanatory
Determinant frameworks	• Describe factors which might influence implementation, e.g. characteristics of intervention, users, context and implementation strategy • Imply 'systems' approach which considers relationships between factors as part of an integrated whole • Context in which implementation takes place is an integral component	• Do not address how change might take place, or identify any causal mechanisms, and therefore not considered 'theories' • May be too generic to provide a 'how-to' guide to implementation
Classic theories	• Different determinants can be linked to classic theories from a variety of disciplines such as psychology (i.e. focus upon behaviour of individual users of the intervention), sociology (i.e. focus upon 'collectives' such as communities of practice and professions) and organisational factors (e.g. focus upon organisational cultures, leadership, and learning)	• Explain mechanisms of change and how change occurs, but do not bring about change in the way of process models
Implementation theories	• Enhance understanding and explanation of particular aspects of implementation	• Modified versions of existing theories or concepts to provide focus on what might be most critical factors related to the how and why of implementation
Evaluation frameworks	• Provide structure for evaluating implementation	• Either purposefully-developed frameworks, or application of models, frameworks and theories from other categories for evaluation purposes

It is important to emphasise the overlap between the categories in Table 2.1. For example, determinant frameworks, classic theories and implementation theories can all be drawn upon to some extent to in effect serve as process models guiding the practice of implementation (Nilsen, 2015). The great number of theoretical positions available to implementation researchers may often be confusing (Eccles *et al.*, 2006), and seems to have led some (Foy *et al.*, 2015) to allude to a moratorium on the development of new theories in favour of refinement of existing theories. The selection of any theoretical position therefore requires careful consideration of its contextual suitability (Eccles *et al.*, 2006; Nilsen, 2015); but justifications may be poorly reported (Davies, Walker and Grimshaw, 2010). In the remainder of this chapter I consider theoretical positions which may be useful in this thesis.

2.3.2 Diffusion of Innovations

Diffusion of Innovations (Rogers, 2003; hereafter 'diffusion theory') is the single most influential theory within implementation research (Nilsen, 2015). It proposes that an innovation is more likely to be taken up in practice by end users if they perceive it to be better than existing practice; compatible with their values and needs; if it is straightforward to use; if they are able to experiment with it on a limited basis so that it presents them with less uncertainty; and if they are able to see its impacts (Rogers, 2003). The theory proposes a predictable pattern of adoption, depicted by an S-shaped curve of slow early adoption, rising steeply as the majority of users adopt the intervention, before tailing off at the end as it is adopted by the remainder (Rogers, 2003). This pattern corresponds to a normal distribution of adopter characteristics, upon which the left-hand tail represents the 'innovators' (2.5%) and 'early adopters' (13.5%), the middle represents the 'early majority' (34%) and 'late majority' (34%) adopters, and the right-hand tail the 'laggards' (16%) (Rogers, 2003). The theory also considers the structure of the social system, the behaviour patterns of its members, opinion leadership, and communication about the intervention as being important to its diffusion (Rogers, 2003).

Most early work in the development of diffusion theory was undertaken in 1950s USA, underpinned by four general key assumptions (Greenhalgh *et al.*, 2004a; 2004b):

- The focus of analysis should be upon the individual innovation and/or person adopting the innovation

- Innovation was necessarily better than non-innovation
- Patterns of adoption depended upon and reflected individuals' personality traits
- Findings were transferable across contexts and settings.

The early work provided important insights such as consistent rates of adoption across a range of disciplines, however it is limited conceptually (Greenhalgh *et al.*, 2004a; 2004b). Most work occurred in one country at a time of economic prosperity with pro-innovation bias; the contemporaneous innovations were simple and unadaptable (e.g. agricultural advances); the focus upon individual people meant that blame was able to be apportioned to individuals if an innovation did not become adopted (Greenhalgh *et al.*, 2004a; 2004b).

From the 1970s there was an increase in sophistication via the fields of development studies, health promotion, management studies, and evidence-based medicine (Greenhalgh *et al.*, 2004a; 2004b):

- development studies introduced the idea that an innovation might mean different things to different people
- health promotion work began to embrace the idea that reciprocal communication and partnerships between change agent and target population might be more fruitful than linear transmission of advice
- organisation and management studies provided an avenue into local contexts and the 'innovativeness' of an organisation by focussing upon concepts such as organisational structures, processes, culture, and ways of working
- evidence-based medicine began to appreciate that evidence for particular interventions might need to be interpreted according to local context.

Diffusion theory thus appeared to diversify from its original focus upon fixed concepts of individual innovations and people to an increasing recognition of complexity, yet the early individual bias left an 'indelible stamp' on the field (Rogers, 2003, p.134). The adopter characteristics seem to have been widely assimilated into the lexicon (particularly the pejorative label of 'laggard') resulting in over-simplistic explanations and self-fulfilling prophecies: those labelled as 'laggards' may be the last to be informed by those driving a change due to negative expectations about attitudes to change; this lack of information

received by 'laggards' makes them even slower to embrace the change, and thus the label of 'laggard' becomes self-fulfilling (Rogers, 2003). The majority of examples cited by Rogers (2003) concern innovations within broad contexts, such as professions (e.g. a drug within the medical profession); countries (e.g. China's one-child policy); social communities (e.g. farming techniques within an agricultural community); or general society (e.g. mobile phones). Diffusion theory views innovations as being static entities which are released into a social system (Petersson, 2011; Greenhalgh *et al.*, 2004a; 2004b). Therefore, it may not be the most appropriate choice for research exploring implementation as a continuous and emergent process in which members of an organisation must actively do something with a new innovation to promote change (Greenhalgh *et al.*, 2004b).

2.3.2 Psychological theories of behaviour

The critique of diffusion theory above suggests that a focus upon individual behaviour in organisational implementation should be approached with caution; nevertheless it does not advocate an absence of attention upon individual behaviour. Prominent related theories focussing on individual behaviour include the Theory of Reasoned Action [TRA] (Fishbein and Ajzen, 1975); the Technology Acceptance Model [TAM] (Davis, 1989); the Theory of Planned Behavior [TPB] (Ajzen, 1991; 2015); and the Unified Theory of Acceptance and Use of Technology [UTAUT] (Venkatesh *et al.*, 2003; Venkatesh, Thong and Xu, 2012).

The TAM has been pervasive in research addressing user acceptance of technologies (Chuttur, 2009; Marangunić and Granić, 2015). Its simplicity (three basic constructs only) has led to its widespread popularity, but it is arguably too parsimonious to explain behaviour and decisions across all contexts relating to a wide range of technologies (Bagozzi, 2007). It views an individual's intention to use a technology as totally determining their subsequent action, yet the gap between intent to use and actual use may be filled with other influential variables, such as the obligation to use a technology (Chuttur, 2009). Methodologically the TAM was derived from controlled data rather than real-world use, and most of the contributing studies did not consider mandatory use of technology which is highly likely to be present to some degree in an organisational context (Chuttur, 2009). The UTAUT synthesises eight different theories including the

TAM, and is claimed as being designed for application in organisations (Venkatesh *et al.*, 2012). However, rather than being considered 'unified', it posits around 50 different independent variables in a potentially overwhelming and misleading level of fragmentation (Bagozzi, 2007), which arguably renders it of rather less value than that claimed by its authors for application within holistic organisational contexts.

The most useful of these theories might be the Theory of Planned Behavior (a development of the Theory of Reasoned Action), proposing that an individual's behaviour depends on their motivation and ability to perform the behaviour, determined by three constructs (adapted from Ajzen, 2015):

- **Attitude**: the individual's beliefs about the likely consequences of the behaviour (favourable or unfavourable)
- **Subjective norms:** the individual's beliefs about the expectations of others (will they approve or disapprove of the behaviour; whether those respected by or important to the individual performed the behaviour; the social norms within a cultural context)
- **Perceived behavioural control:** the extent to which the individual believes they have control over their behaviour they have over that behaviour.

All of these theories, including the TPB, appear to lack consideration of emotional processes such as aethetics, symbolism of the technology (Goh and Karimi, 2014), or the relationship between the technology and self-identity (Connor and Armitage, 1998); processes which recognise a technology as more than a funtional tool to improve practice. Yet all of these theories, including the TPB, have had a great deal of success in helping to explore cognitive decision-making of individuals during technology adoption (Goh and Karimi, 2014), and despite such limitations, it seems that the TPB might be of potential value for this thesis.

2.3.4 Actor-Network Theory

Actor-Network Theory [ANT] (Latour, 1992; 1993; 1996; 2005; Law, 1992) attempts to account for the essence of society by proposing that it is solely comprised of networks; there is nothing in between networks, and networks do not sit in some otherworldly space. This proposition is captured by founder Bruno Latour: *"Nothing is, by itself,*

reducible or irreducible to anything else. Never by itself, but always through the mediation of another" (1993, p.113). The central, controversial core assumption is a post-structuralist attribution of agency to non-human actors via the belief that agency is disseminated through networks of humans and non-humans rather than existing solely within human actors (Law, 1992; Petersson, 2011). One of the more radical interpretations is Donna Haraway's (1991) 'Cyborg Manifesto', which argued that due to the proliferation of personal technologies, not only are humans and technologies both agents within networks, the modern human is in effect part machine. The core assumption of ANT helps to counter social essentialism since it challenges the idea that technologies themselves are morally neutral; rather, they must at least contain some moral values of their human designers (Latour, 1992).

ANT is complex, and common misunderstandings abound:

- Unlike the commonly understood technical interpretation, a 'network' may have no strategic organisational properties or compulsory paths (Latour, 1996) and is thus difficult to define
- The maxim of ANT is 'follow the actors' (Latour, 2005, p.12), but the hyphen in 'Actor-Network' symbolises that actors themselves are also always networks of actors in their own right (Law, 1992), and thus defining actors becomes vulnerable to *reductio ad absurdum*
- The attribution of agency to non-humans may be misunderstood as placing humans and machines on an equal footing, when it is really intended simply to avoid an *a priori* duality (Latour, 2005).

ANT is targeted by broader criticisms of social constructivist perspectives of technology as focusing upon the formation and origins of technologies rather than consequences of their use (Winner, 1993). Nevertheless, it has been inspirational in helping to view change as non-linear (Greenhalgh and Stones, 2010), and may be of value in this thesis as a potential wider lens to view influential factors beyond the immediate context in which implementation occurs (May, 2013).

2.3.5 Normalization Process Theory

Normalization Process Theory [NPT] (May and Finch, 2009; May *et al.*, 2009; Murray *et al.*, 2010; May *et al.*, 2015) focuses upon the interactions between individuals and organisational contexts to explore the implementation of novel interventions as part of routine, embedded components of everyday practice; and is compatible with a range of philosophical positions (May *et al.* 2015). NPT is comprised of four generative mechanisms, which may be defined as follows (based upon May *et al.*, 2015):

- **Coherence** focuses upon participants' understanding of the intervention prior to working with it. Ideal conditions for implementation require, at the time an intervention is introduced: (1) participants to be able to tell whether it is different from other interventions that they use; (2) participants to agree on the anticipated benefits from using it; (3) participants to see it as compatible with their values and needs; (4) participants to be able to understand what they will each have to do in order to work with it.

- **Cognitive Participation** focuses upon the extent to which participants are personally involved in working with the new intervention. Ideal conditions for implementation require: (1) key participants to influence implementation of the intervention; (2) participants to feel they can and should make a contribution to its implementation; (3) participants to be willing and able to organise themselves collectively to contribute to implementation; (4) participants to be able and willing collectively to define actions and procedures involved in working with it.

- **Collective Action** focuses upon the work involved in actually using the intervention in practice. Ideal conditions for implementation require: (1) participants to be able to use the intervention in practice; (2) participants to be able to trust it, and in each other's work whilst using it; (3) participants to have the right mix of skills or training to use it; (4) its use to be supported by organisational factors such as management, finances and material resources.

- **Reflexive Monitoring** focuses upon participants' evaluations and appraisals of the intervention after they have been using it. Ideal conditions for implementation require: (1) participants to be able to determine the impact the intervention is having (including *how* they do this); (2) participants to individually and (3)

collectively think its impact is worthwhile; (4) participants to be able to adapt it to suit their own needs, or adapt their practice as a result of using it.

NPT emphasises the reciprocal nature between these mechanisms (Figure 2.1), since the work involved in implementation is a messy iterative process rather than a neat linear process (May and Finch, 2009).

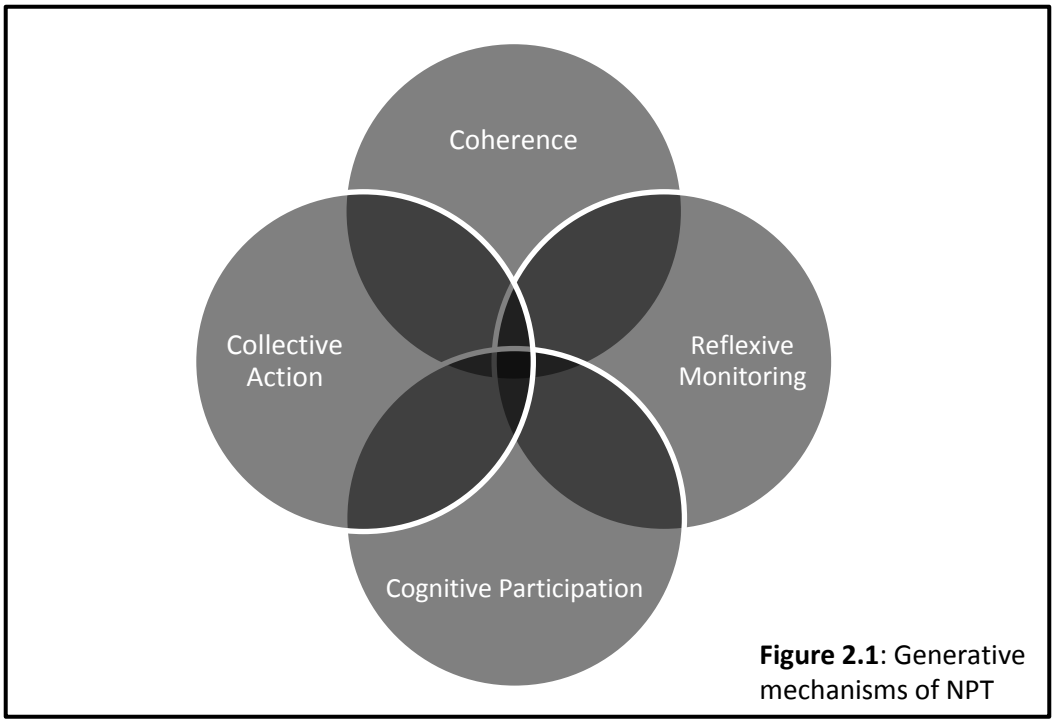

Figure 2.1: Generative mechanisms of NPT

From the description of these mechanisms, some overlap can be seen with diffusion theory, however May *et al.* (2015) highlight that NPT is concerned with the work that people do when using new interventions, rather than diffusion theory's focus on how interventions passively travel through social networks. An important point to emphasise is that **NPT views implementation as a continuous process rather than a final outcome; 'successful' implementation (i.e. 'normalisation') might be considered the point at which the intervention becomes "*the way we do things here*"** (May, 2013, p.14).

A recent systematic review of studies that have used NPT (McEvoy *et al.*, 2014) found that it has thus far mainly been used in the UK, with increasing diversification of application beyond its original fields of e-health and telehealth to include fields such as chronic

health care, maternity care, and speech and language services. Researchers offered reflections strongly endorsing its use as a heuristic rather than as a rigid framework (McEvoy *et al.*, 2014). I therefore decided that its use in this manner would be potentially of high value for this thesis. At the time I undertook this PhD, NPT had not been applied within care home settings, and therefore I was in a position to make a contribution to the theoretical literature via further testing of the wider applicability of the theory.

The contemporaneous developmental trajectory of NPT saw the first steps in attempting to position it as a contributor to a more general theory of implementation, in which it might combine with other theories (May, 2013). In this thesis I use NPT as a lens to influence some aspects of data collection (c.f. Chapter 4); and discussion of findings (c.f. Chapter 9) in which I consider how an NPT-informed interpretation might be enhanced by drawing upon Actor-Network Theory and psychological theories of behaviour.

2.4 Summary

In this chapter I have explored the following theoretical background to the thesis:

- Implementation of health technologies, including monitoring technologies in care homes for people with dementia, may be influenced by common conceptual understandings of technologies. These understandings may overstate anticipated advantages at the expense of consideration of implementation (including ethical) challenges, or may overstate (particularly ethical) challenges at the expense of consideration how such technologies might enhance practice.
- Implementation research, concerned with what, why and how interventions work in real world contexts, is likely to be useful to enhance understanding of factors involved in the implementation of technologies in practice. In this thesis I primarily draw upon Normalization Process Theory, whilst also considering Actor-Network Theory and psychological theories of behaviour.

In the following chapter I review the literature on the implementation of monitoring technologies in care homes for people with dementia.

Chapter 3: Literature Review

3.1 Introduction

In the first two chapters I illustrated how monitoring technologies may potentially enhance the quality of care in care homes supporting increasingly older residents with dementia. Implementation of these technologies in practice may be influenced by common conceptual understandings of technologies; the field of implementation research, concerned with what, why and how interventions work in real-world contexts, is likely to be useful to enhance understanding of factors involved in the implementation of monitoring technologies in care homes. In this current chapter I review the research literature regarding the implementation of monitoring technologies within care homes for people with dementia.

3.2 Literature review methods

3.2.1 Aims and approach

The aims of this review were to summarise, interpret and appraise the quality of evidence regarding factors that influence the implementation of monitoring technologies in care homes for people with dementia. Research exploring implementation factors is likely to employ qualitative methodologies (Centre for Reviews and Dissemination [CRD], 2008). However, information about implementation may not always be straightforward to retrieve; for example, it may appear in discussion sections of quantitative papers (Popay *et al.*, 2006). I thus adopted a systematic-style narrative synthesis approach, appropriate for incorporation of findings from diverse research designs which cannot be combined for meta-analysis (Mays, Pope and Popay, 2005).

3.2.2 Review question and search strategy

I used the 'PICo' mnemonic (**P**opulation, Phenomena of **I**nterest, and **Co**ntext; Table 3.1) to guide the development of the review question and the search strategy; recommended for methodologically diverse reviews because of its focus upon broad phenomena of interest within a specific context (Joanna Briggs Institute, 2014).

Table 3.1: PICo mnemonic for review question and search strategy

PICo term	Specification
Population	People with dementia/cognitive impairment
Phenomena of Interest	Monitoring technologies; Implementation in practice
Context	Long-term residential care homes or nursing homes

This approach led me to frame the review question thus: **What factors are facilitators or barriers to the implementation of monitoring technologies in care homes for people with dementia?**

I searched databases relevant to the review question (Table 3.2), including the broad disciplines of health and social sciences, and engineering and computing sciences to capture literature which may have explored implementation factors during design and field testing phases of technological development. I developed four strings of search terms around the PICo mnemonic, using MeSH headings and free-text including wildcards and truncation, combined with Boolean operators. Example search terms included Alzheimer's disease, dementia; assistive technology, electronic tracking; implementation, adoption; nursing homes, long term care. Full search terms can be seen in Appendix 1.

Table 3.2: Databases used for literature search

Heath/Social sciences	Engineering/Computing sciences
Cumulative Index to Nursing and Allied Health Literature [CINAHL]	Institute of Electrical and Electronics Engineers [IEEE]
British Nursing Index [BNI]	Compendex
Applied Social Sciences Index and Abstracts [ASSIA]	Inspec
Medical Literature Analysis and Retrieval System Online [MEDLINE]	
PsycINFO	
Cochrane Database of Systematic Reviews	
Cochrane Health Technology Assessment [HTA]	
Database of Abstracts and Reviews of Effectiveness [DARE]	

I limited searches to papers published in English, with no limits on date published. Retrieving qualitative papers from conventional database searches alone is challenging, partly because indexing is inferior to that of quantitative papers (CRD, 2008). Therefore, I also employed an additional 'snowball' strategy, scanning reference lists of included papers for relevance (Greenhalgh and Peacock, 2005); and screened publications from two relevant Cochrane literature topics: dementia and cognitive improvement (from the Dementia and Cognitive Improvement Group); and implementation strategies (from the Effective Practice and Organistation > Delivery of Healthcare Services > Implementation Strategies subgroup).

3.2.3 Inclusion/exclusion criteria

I considered all types of research papers eligible for inclusion, regardless of date published, methodology or methodological quality. I conducted searches, removed duplicates, and screened titles and abstracts of papers for relevance. I retrieved full papers considered relevant, read them in full and reviewed them against the inclusion/exclusion criteria (Table 3.3).

Table 3.3: Inclusion and exclusion criteria

PICo term	Inclusion criteria	Exclusion criteria
Population: dementia or cognitive impairment	Care of people with dementia or cognitive impairment (of any age)	Does not include care of people with dementia or cognitive impairment
Phenomenon of Interest: monitoring technology	Electronic technologies used directly to monitor any aspect of resident location or activity	Electronic technologies used for non-monitoring purposes (e.g. electronic care records; training materials; Skype; robotic pets); non-electronic technologies (e.g. walking aids)
Phenomenon of Interest: implementation	Must include implementation in practice of technologies used for monitoring, or contain participants with direct experience of using monitoring technologies	Explorations of hypothetical scenarios with no implementation; where participants have no experience of using the technologies; opinion pieces; lab-based development without introduction into real-world environment
Context: long-term residential care	Must include and clearly demarcate long-term residential care homes	Implementation within other contexts (e.g. hospital, short-term secure unit, respite care, supported living, home care, community outreach); or where care homes are not clearly demarcated

3.2.4 Data extraction and quality appraisal

I extracted the following data using a standardised form (Appendix 2) to ensure consistency: author names, date and country; technology; question; design; participants, setting and sample; methods; findings and discussion points; strengths and limitations; whether the paper had employed any model, framework or theory relevant to the field of implementation research; and the research discipline (i.e. health and social sciences or engineering and computer sciences).

I appraised qualitative papers using the Critical Appraisal Skills Programme [CASP] qualitative appraisal tool (CASP, 2013). The tool has been criticised for lacking explicit attention to the researchers' philosophical perspective (Hannes, Lockwood and Pearson, 2010), but I chose it as a user-friendly, widely-used tool to aid consistency in my appraisal of papers drawn from different disciplines and philosophical origins. I appraised quantitative papers using the Effective Public Health Practice Project [EPHPP] Quality Assessment Tool for Quantitative Studies (EPHPP, 2010). The tool is accompanied by clear instructions and definitions of terminology (EPHPP, 2009) to add confidence and consistency in application, and has been recommended by the Cochrane Collaboration (Higgins and Green, 2011). I appraised papers which employed a mixed methods approach on their qualitative and quantitative components using the CASP and the EPHPP tools. I then appraised their 'mixing' of methods using the mixed methods component of the Mixed Methods Appraisal Tool [MMAT] (Pluye *et al.*, 2011) which focuses on design rationale, methodological integration and limitations of mixing methods. The MMAT does contain separate components for appraisal of qualitative and quantitative methods, but these components are less comprehensive than the CASP or the EPHPP, and at the time I conducted this review the MMAT was in development (Hong, 2015). I decided that the CASP and EPHPP tools afforded a more thorough appraisal of separate components, and their use with mixed methods papers provided consistency with the appraisals of methodologically singular papers.

3.3 Search results

3.3.1 Paper selection

Figure 3.1 shows the review process according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines (Liberati *et al.*, 2009). I retrieved 2663 papers (without duplicates); from this, I retrieved 100 papers for full screening, of which I deemed 28 to meet inclusion criteria. The main reasons for exclusion were lack of information about implementation in practice (*n*=44), followed by papers set in the wrong context or a range of contexts in which it was not possible to identify specific issues relating to care homes (*n*=19). I completed database searches up to 11th March 2015.

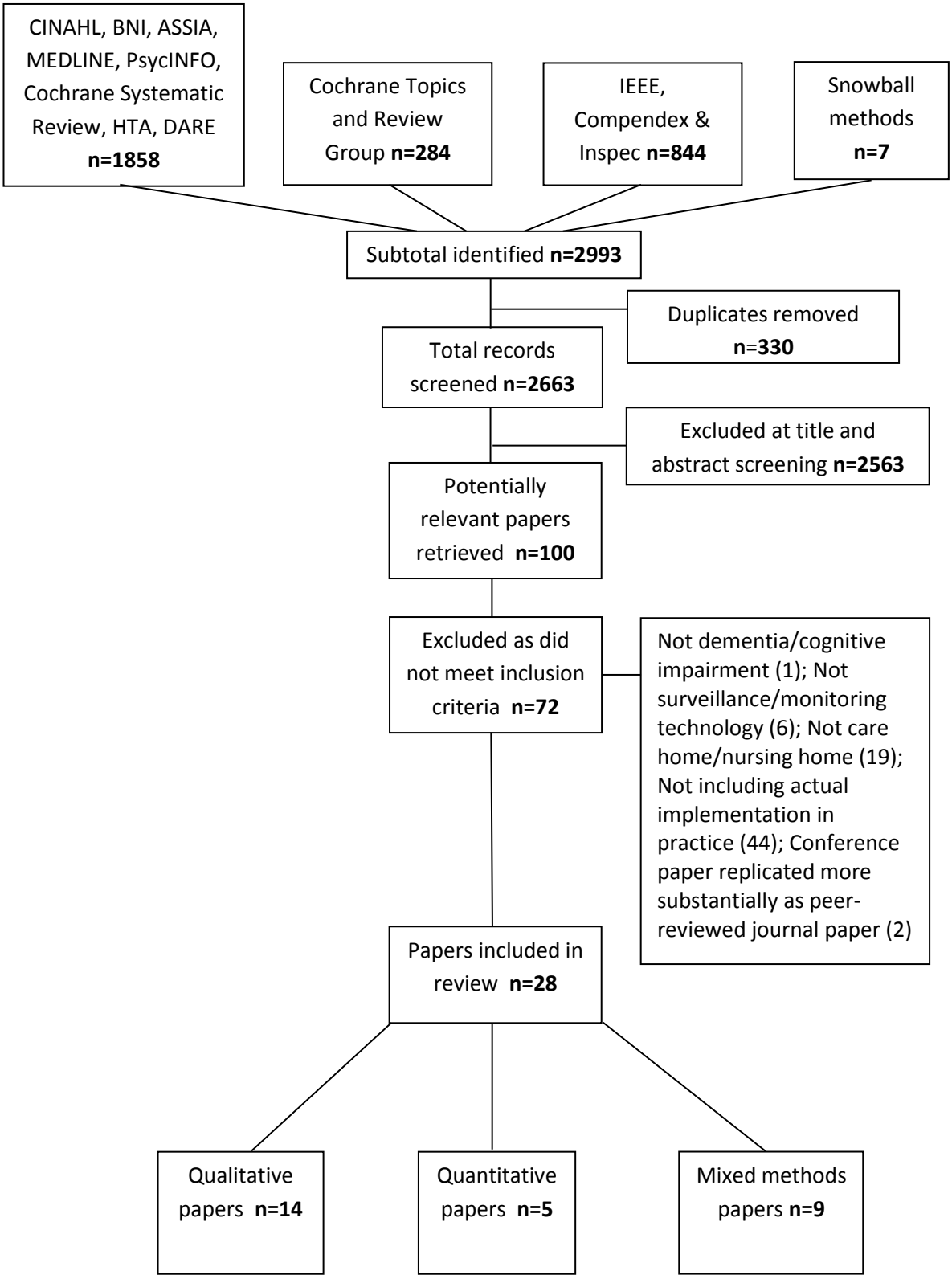

Figure 3.1: Flowchart of review process

3.3.2 Characteristics and quality appraisal

3.3.2.1 Characteristics

The 28 papers consisted of 14 qualitative papers, five quantitative papers, and nine papers which used a mixed methods approach. Summary tables of the papers can be found in Appendix 3. Table 3.4 shows the papers arranged according to methodology and research discipline.

Table 3.4: Methodologies and research disciplines of papers included in the review

Methodology (*n*)	**Research discipline (*n*)**	**Paper**
Qualitative (14)	Engineering/Computer Sciences (5)	Abbate, Avvenuti and Light (2014); Beckwith (2003); Müller, Lin and Wulf (2013); Sugihara *et al.* (2008); Sugihara *et al.* (2014)
	Health/Social Sciences (9)	Aud (2004); Engström *et al.* (2009); Godwin (2012); Kearns *et al.* (2007); Niemeijer *et al.* (2011); Niemeijer *et al.* (2014); Niemeijer *et al.* (2015); Wigg (2010); Zwijsen *et al.* (2012)
Quantitative (5)	Engineering/Computer Sciences (1)	Capezuti *et al.* (2009)
	Health/Social Sciences (4)	Engström *et al.* (2005); Engström *et al.* (2006); Holmes *et al.* (2007); te Boekhorst *et al.* (2013)
Mixed (9)	Engineering/Computer Sciences (6)	Aloulou *et al.* (2013); Charlon *et al.* (2013); Grunerbl *et al.* (2011); Schikhof, Mulder and Choenni (2010); Sugihara and Fujinami (2011); Wai *et al.* (2010)
	Health/Social Sciences (3)	Bressler, Redfern and Brown (2011); Nijhof *et al.* (2012); Zwijsen *et al.* (2011)

The papers appeared reasonably diverse in their origins, coming from ten different countries on three different continents: eight from North America (seven USA, one Canada), 15 from Europe (one Austria, one France, one Germany, eight Netherlands, three Sweden, one UK), and five from Asia (three Japan, two Singapore). A closer inspection highlighted that this diversity might not be quite as pronounced as it first appeared. Of the eight papers from the Netherlands, six were produced by the same

research group (Niemeijer *et al.*, 2011; Niemeijer *et al.,* 2014; Niemeijer *et al.,* 2015; te Boekhorst *et al.*, 2013; Zwijsen *et al.*, 2011; Zwijsen *et al.,* 2012), concerned mainly with exploring ethical issues about the potential of monitoring technologies to improve resident autonomy, quality of life, or serve as alternatives to physical restraints. These six papers focused upon a range of technologies, including motion, pressure and acoustic sensors, and body-worn devices. The three papers from Sweden were led by the same author (Engström *et al.*, 2005; Engström *et al.*, 2006; Engström *et al.*, 2009), from a study located within one care home concerned with staff and relative perspectives on a range of technologies, including motion and pressure sensors. The three papers from Japan (Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014) were taken from a study concerned with the development and initial testing of a video-based system to cover 'blind spots' within communal areas of care homes.

Three of the qualitative papers (Abbate, Avvenuti and Light, 2014; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2014) were engineering papers exploring prototype technologies in real-world settings. Two of the qualitative papers (Beckwith, 2003; Müller, Lin and Wulf, 2013) were produced by researchers from the field of computer sciences but were conducting research into technologies that were beyond a prototype stage. The other nine qualitative papers (Aud 2004; Engström *et al.*, 2009; Godwin, 2012; Kearns *et al.*, 2007; Niemeijer *et al.*, 2011; Niemeijer *et al.*, 2014; Niemeijer *et al.*, 2015; Wigg, 2010; Zwijsen *et al.*, 2012) were from health and social sciences, exploring the implementation of technologies beyond a prototype stage. One of the quantitative papers (Capezuti *et al.*, 2009) was a collaboration between health and social science researchers and technology developers exploring the performance of different bed-exit alert systems. The other four quantitative papers (Engström *et al.*, 2005; Engström *et al.*, 2006; Holmes *et al.*, 2007; te Boekhorst *et al.*, 2013) were from health and social sciences, exploring technologies beyond a prototype stage. Six of the papers using a mixed methods approach (Abbate et al, 2014; Charlon *et al.*, 2013; Grunerbl *et al.*, 2011; Schikhof, Mulder and Choenni, 2010; Sugihara and Fujinami, 2011; Wai *et al.*, 2010) were engineering and computer science papers exploring prototype technologies in real-world setting. Two of the papers using a mixed methods approach (Nijhof *et al.*, 2012; Zwijsen *et al.*, 2011) were exploring implementation of technologies which were beyond a prototype stage. The final paper

(Bressler, Redfern and Brown, 2011) was a unique piece of work exploring the removal of an alarm system which had been well-established in practice within a nursing home.

A useful way to understand a fundamental difference between health and social science papers and engineering and computer science papers is to consider where the work contained within might be located on a spectrum of Technological Readiness Level [TRL]. The North Atlantic Treaty Organization [NATO] (2010) developed a scale of nine TRLs, ranging from the basic conceptual level of awareness that a technological intervention may be possible (TRL 1) through to application of the technology in final form including evaluation and reliability measures in fully operational conditions (TRL 9). Work conducted within the health and social science papers explored the impacts of fully-developed technologies implemented in practice; located at TRLs 8 or 9. By contrast, work within the engineering and computer science papers largely involved the first steps in moving the testing of prototype technologies out from laboratories and into real-world environments; located at TRLs 6 or 7. It was interesting to see that the majority of the papers adopting a mixed methods approach were engineering and computer sciences papers concerned with this initial real-world testing of prototype technologies; this mixed approach suggested potentially valuable work moving beyond solely technical performance testing to include consultation with end users in real-world environment tests.

3.3.2.2 Quality appraisal

Appendix 4 shows the CASP appraisal of the 14 papers which used solely qualitative methods. Five papers (Aud, 2004; Engström *et al.*, 2009; Niemejier *et al.*, 2014; Niemeijer *et al.*, 2015; Zwijsen *et al.*, 2012) were appraised as being of higher quality as they were judged to meet either all or the vast majority of CASP items. Three papers (Godwin, 2012; Kearns *et al.*, 2007; Niemeijer *et al.*, 2011) were appraised as being of mid-to-high quality as they were judged to meet most CASP items. The other six papers (Abbate, Avvenuti and Light, 2014; Beckwith, 2003; Müller, Lin and Wulf, 2013; Sugihara *et al.*, 2008; Sugihara *et al.*, 2014; Wigg, 2010) were rated as being of lower quality as they were judged not to meet several CASP items: in general they had clear aims and findings but

lacked detail regarding recruitment, data collection and analysis, considerations of the researcher-participant relationship and ethical issues. A clear picture emerged whereby most papers appraised as lower quality were from the engineering and computer sciences disciplines (Abbate, Avvenuti and Light, 2014; Beckwith, 2003; Müller, Lin and Wulf, 2013; Sugihara *et al.*, 2008; Sugihara *et al.*, 2014). This was perhaps unsurprising; it seems likely that researchers more familiar with mechanistic research questions might be less familiar with nuances of qualitative research, such as ethical considerations and reflections upon the researcher-participant relationship.

Appendix 4 shows the EPHPP appraisal of the five papers which used solely quantitative methods. Two papers achieved a global rating of moderate (Holmes *et al.*, 2007; te Boekhorst *et al.*, 2013). Three papers (Capezuti *et al.*, 2009; Engström *et al.*, 2005; Engström *et al.,* 2006) achieved a global rating of weak. Four of these five papers were from health and social sciences in which context appeared to have restricted conditions favourable for strong ratings (such as the existing presence of the intervention meaning that no pre-test data were possible, or small samples and high drop-out rates from work conducted in real-world scenarios). This lack of quality may reflect the relatively nascent implementation research of these technologies in practice.

Appendix 4 shows the quality appraisal of the nine papers which used a mixed methods approach. Four papers (Aloulou *et al.*, 2013; Nijhof *et al.*, 2012; Schikhof, Mulder and Choenni, 2010; Zwijsen *et al.*, 2011) were appraised as being of mid-to-high quality for their qualitative components as they were judged to meet the majority of the CASP items. The other five papers (Bressler, Redfern and Brown, 2011; Charlon *et al.*, 2013; Grunerbl *et al.*, 2011; Sugihara and Fujinami, 2011; Wai *et al.*, 2010) were appraised as being of lower quality for their qualitative components because they were judged as failing to meet several CASP items. In general these papers had clear aims and findings but tended to lack detail regarding recruitment of participants, rigor of data collection and analysis, and considerations of the researcher-participant relationship and ethical issues.

One paper (Bressler, Redfern and Brown, 2011) achieved a global rating of strong via the EPHPP tool for its quantitative component. The other eight papers were appraised as being of globally weak, with mainly weak individual component ratings. Five of these (Aloulou *et al.*, 2013; Charlon *et al.*, 2013; Grunerbl *et al.*, 2011; Sugihara and Fujinami, 2011; Wai *et al.*, 2010) were from engineering and computer sciences disciplines, concerned development and performance testing of prototype technologies in small-*n* observational studies. This testing was referred to as a 'trial' (Aloulou *et al.*, 2013), an 'experimental trial' (Charlon *et al.*, 2013) 'experiment' (Grunerbl *et al.*, 2011), and 'clinical trial' (Sugihara and Fujinami, 2011; Wai *et al.*, 2010). This phrasing reflects the location of this work at TRLs 6 or 7 (NATO, 2010), referring to early field tests that have moved beyond a laboratory environment to include a very small number of participants in a real-world environment. This phrasing should not be considered synonymous with health sciences clinical trials and experimental designs, which typically involve much larger numbers of participants in a controlled design, to ascertain effectiveness of a fully-developed intervention in relation to a clearly-defined clinical outcome, at TRLs 8 or 9 (NATO, 2010). Some of the items on the EPHPP were therefore less applicable for papers conducting a 'trial' at a lower TRL; for example, a 'withdrawal and drop-out' rate is of less importance to small-*n* observational studies which are not testing clinical effectiveness.

Use of the mixed methods component of the MMAT tool suggested that seven papers (Aloulou *et al.*, 2013; Bressler, Redfern and Brown, 2011; Grunerbl *et al.*, 2011; Nijhof *et al.*, 2012; Schikhof, Mulder and Choenni, 2010; Sugihara and Fujinami, 2011; Zwijsen *et al.*, 2011) appeared to have combined their methods to a mid-to-higher standard of quality. Two papers (Charlon *et al.*, 2013; Wai *et al.*, 2010) were appraised as being of lower quality. The value of the engineering and computer sciences papers which had been appraised of being of lower individual component quality thus became clearer when considering the overall contribution they made through mixing methods. The clearest example of this emerging value was the work by Grunerbl *et al.* (2011), employing a nuanced mix of sequential and concomitant methods in two stages. The first stage began with qualitative discussions with staff about implementation issues followed by concomitant qualitative-quantitative methods to test the performance of a tracking system for resident location in correlation with researcher observations. The second stage

had progressed the testing with further concomitant qualitative-quantitative methods in which the qualitative care records logged by staff were quantised and correlated to location and movement data recorded by the tracking system. Despite the qualitative methods being appraised as weak via the CASP tool, and the quantitative methods being appraised as weak according to the EPHPP tool, Grunerbl *et al.* (2011) incorporated a clear rationale for integrating the different methods, showed clarity in when, how, and who were involved in integrating data from the different methods, and showed an awareness in the limitations of their work. The two papers appraised as being of lower mixed methods quality (Charlon *et al.*, 2013; Wai *et al.*, 2010) lacked this level of clarity about the integration of methods.

3.4 Findings

Table 3.5 shows the technologies included in each paper. The majority of the papers included a range of monitoring technologies comprised of various environmental, body-worn or body-fixed sensors. Four papers focused specifically upon video-based systems (Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014) with a further three papers including video-based systems as part of a range of monitoring technologies (Müller, Lin and Wulf, 2013; Niemeijer *et al.*, 2014; Niemeijer *et al.*, 2015). Findings were grouped into four broad themes: ethical debate surrounding the use of the technologies; the impact of the technologies upon practice; designs and costs; and use of theory relevant to implementation research.

Table 3.5: Technologies within each paper

Paper	Technologies
Abbate, Avvenuti and Light (2014)	Fall detection: SYSTEM 1: Day system - fall detector (accelerometer) worn round waist; SYSTEM 2: Night system - electrophysiology sensor worn in headband, measures brain activity via digital electrodes; heart activity; eye movement;
Aloulou *et al.* (2013)	Integrated system including various pressure, proximity, vibration, motion sensors; interaction devices e.g. speakers, smartphone
Aud (2004)	Door alarms (sound upon opening; sound upon activation by sensor worn by resident)
Beckwith (2003)	Motion sensors; load cells (attached to bed legs) to monitor weight and movement; ID badges for residents and staff with infrared for indoor and radio frequency for outdoor monitoring, also with call button
Bressler, Redfern and Brown (2011)	Bed-exit alarms sounding throughout building. Built-in bed alarms, bed alarm pads, tabs clipped to residents, chair alarm pads
Capezuti *et al.* (2009)	Two types of bed exit alarm: single pressure sensor under mattress; 'dual sensor' of pressure sensor under mattress and horizontal infrared beam 2 feet above bed
Charlon *et al.* (2013)	Body-worn patch to identify and monitor residents via infrared sensors. Alerts sent to mobile phone carried by staff
Engström *et al.* (2005)	Corridor alarms activated by sensor worn by resident; by pressure sensor; sensor activated night lights; fall detectors (pressure mats)
Engström *et al.* (2006)	As Engström *et al.* (2005)
Engström *et al.* (2009)	As Engström *et al.* (2005)
Godwin (2012)	Building exit sensor; Bedroom door sensor; Gate exit sensor; Pressure mat to activate bedside lamp
Grunerbl *et al.* (2011)	Tracking system to collect data relating to resident behavioural and psychological states
Holmes *et al.* (2007)	"Vigil" - bed exit sensor under bed; bathroom and bedroom exit monitors. Alert staff via silent pager and records caregiver response times
Kearns *et al.* (2007)	Elopement management systems. 7 subtypes: pressure activated; pull tabs; audible alarms; optically activated alarms; visual deterrents (not electronic); tracking systems; advanced systems with multifunctional devices
Müller, Lin and Wulf (2013)	Video cameras, door safety systems with body-worn sensors e.g. wristbands or chips in shoes, pressure mats beside beds, GPS
Niemeijer *et al.* (2011)	'Surveillance' technologies, not described
Niemeijer *et al.* (2014)	Motion and acoustic sensors which sent alerts to cordless phones; Electronic bracelets to open doors; Hallway video and centrally located monitor
Niemeijer *et al.* (2015)	As Niemeijer *et al.* (2014)
Nijhof *et al.* (2012)	'IST Vivago' sleep-monitoring watch measuring movement, skin temperature and conductivity; computer system for data
Schikhof, Mulder and Choenni (2010)	Video-based system with cameras (including in bedrooms), door sensor and infrared beam
Sugihara *et al.* (2008)	Video-based system with cameras in communal areas
Sugihara and Fujinami (2011)	As Sugihara *et al.* (2008)
Sugihara *et al.* (2014)	As Sugihara *et al.* (2008)
te Boekhorst *et al.* (2013)	GPS, movement sensors, acoustic monitoring, chips worn in clothing, bed pressure sensors, door sensors, inactivity sensors
Wai *et al.* (2010)	Intelligent Continence Management System "iCMS" (diaper with wetness sensor)
Wigg (2010)	Motion detector on main door
Zwijsen *et al.* (2011)	GPS, movement sensors, acoustic monitoring, chips worn in clothing, bed pressure sensors, door sensors, inactivity sensors
Zwijsen *et al.* (2012)	As Zwijsen *et al.* (2011)

3.4.1 Ethical debate

3.4.1.1 Safety and freedom

Niemeijer *et al.* (2011) conducted an exploration with professional carers and academics of an ideal model for implementation of monitoring technologies, which suggested that the technologies should be understood as being able to balance enhancements to both safety and freedom rather than positioning them as irreconcilable opposites. However, participants struggled to define the concepts of safety and freedom or depict what any such 'balancing' might look like (Niemeijer *et al.*, 2011), suggesting that there may be challenges in realising such a model. Te Boekhorst *et al.* (2013) found that the use of a wide range of monitoring technologies did not have a positive effect upon resident quality of life, and speculated that such technology might only improve quality of life for residents already able move without assistance. This speculation highlights the complexities found by Niemeijer *et al.* (2011) in defining concepts such as 'freedom'.

Wigg (2010) explored safety and freedom by considering social constructions of risk in two homes. The first home had pathologised 'wandering' to justify locking doors and arranging the layout so that staff could always see residents, who often became distressed at the restriction of their movement. The second home had viewed 'wandering' as beneficial for residents, using a motion sensor on the main door to support wandering outside. The technology was understood as contributing to an approach which simultaneously enhanced safety and freedom for residents, and was believed by Wigg (2010) to contribute to resident calmness and increased interaction between residents and carers. Realisation of both enhanced safety and supported freedom seemed heavily contingent upon physical layout, a high ratio of staff to residents, and staff consulting relatives about the approach (Wigg, 2010).

Nine further papers (Engström *et al.*, 2005; Engström *et al.*, 2009; Godwin, 2012; Kearns *et al.*, 2007; Niemeijer *et al.*, 2015; Sugihara *et al.* 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014; Zwijsen *et al.*, 2012) highlighted some understanding and appreciation amongst staff, relatives and residents of the potential of monitoring

technologies to enhance freedom of movement for residents as well as safety. The Japanese team (Sugihara *et al.* 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014) found that potentially highly intrusive video technologies were perceived to enhance rather than impair freedom, since staff members felt that they were disturbing residents less after installation of a video-based monitoring system.

Five papers (Aud, 2004; Müller, Lin and Wulf, 2013; Niemeijer *et al.*, 2014; Zwijsen *et al.*, 2011; Zwijsen *et al.*, 2012) reported that outcomes other than safety did not seem to have been considered or valued by all participants in the studies. Staff appeared ambivalent towards tagging and tracking technologies aimed at providing freedom of movement, and instead preferred technologies enabling them to monitor bedrooms (Niemejier *et al.*, 2014). There were doubts about the usefulness of alarms which could not ensure safety (Zwijsen *et al.*, 2012). When used as a strategy to manage 'wandering', monitoring technologies appeared to be framed by staff and relatives as enhancing safety rather than freedom of movement (Aud, 2004; Müller, Lin and Wulf, 2013).

3.4.1.2 Legality and consent

Legal issues were raised in relation to physical restraint (Zwijsen *et al.*, 2011) or locking doors (Godwin, 2012); Niemeijer *et al.* (2011) mentioned that people with dementia and intellectual disabilities in the Netherlands have the same legal rights as one another regarding freedom of movement and monitoring technology, but detail was not offered in any of these papers. Müller, Lin and Wulf (2013, p.102) reported that a newly-built home in Germany had been fitted with a video camera in a communal area, but management were in consultation with lawyers and "did not expect a fast solution" as to whether they would be able to use it. It was interesting that this home appeared to have been equipped with a camera during its construction phase, seemingly without consideration regarding the legality of its implementation in practice. The papers reporting test deployment of video-based monitoring systems (Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014) did not discuss the legality of video, although Schikhof, Mulder and Choenni (2010) had explicitly elicited and addressed concerns regarding privacy during their design phase.

Müller, Lin and Wulf (2013) suggested that care homes and staff may face litigation if they fail to keep residents safe, but also if they deprive residents of their autonomy and freedom of movement in doing so. The organisational positions occupied by staff might be influence their ethical acceptance of monitoring technologies, with managers perhaps more concerned than care staff about negative ethical consequences. Some managers had decided to obscure individual resident identification from a door exit technology in order to preserve resident anonymity; or were reluctant to use pressure mats in bedrooms because the bedroom was the only private space available to residents (Müller, Lin and Wulf, 2013). Nurses may have been more likely than managers to favour (or not question) the use of monitoring technologies because of their direct responsibility for daily care (and therefore safety) of residents (Zwijsen *et al.*, 2011; Zwijsen *et al.*, 2012). Staff might justify monitoring technologies as non-restrictive based upon consideration of the perception of the resident (e.g. if the resident is unware; if the resident is not inconvenienced), and the intention behind the use (e.g. a bed-exit alarm is not intended to allow staff to restrain a resident by putting them back in bed immediately, but rather is intended to allow staff to see if the resident needs help) (Zwijsen *et al.*, 2011; also Godwin, 2012).

Two papers (Beckwith, 2003; Niemeijer *et al.*, 2015) reflected that the invisibility and unobtrusiveness of passive monitoring technologies could result in higher involuntary resident compliance. Most papers did not consider in detail the issues of negotiating resident consent to the use of monitoring technologies. The notable exception was Godwin (2012), who had been involved in introducing technologies to residents as part of her study, and reported the involvement of residents in ethical discussions about monitoring technologies despite relatives assuming that they would not have the capacity to participate in such discussions.

Godwin (2012) reported that one resident's room had been fitted with a door sensor, which was deemed to be an "excellent idea" which had solved problems of his aggressive behaviour, yet due to "irrevocable" plans he was still transferred to a more secure facility (i.e. where his freedom would be further compromised) (Godwin, 2012, p.125). He had

been labelled by staff as 'difficult' and 'needing to be moved', and it appeared that a somewhat tentative implementation of the door sensor had not been strong enough to overcome more familiar bureaucratic responses to safeguarding challenges (Godwin, 2012, p.133). This finding was unique, but it appears to support the conditions for ideal implementation proposed by Niemeijer *et al.* (2011) which stated that there should be normative guidance for the use of monitoring technologies.

3.4.2 Impact of technologies upon practice

3.4.2.1 Impact upon workload

Eight papers (Engström *et al.*, 2005; Engström *et al.*, 2006; Engström *et al.*, 2009; Nijhof *et al.*, 2012; Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011, Wigg, 2010) reported that technologies had at times appeared to have made a positive impact upon the work of staff. Monitoring technologies, including video systems, could lead staff to feel more confident and in control of their practice, with more time to complete other tasks (Engström *et al.*, 2005; Engström *et al.*, 2006; Engström *et al.*, 2009; Nijhof *et al.*, 2012; Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011). Disturbing residents through 'just in case' checks could be reduced, with information from the technologies helping to coordinate delivery care (Nijhof *et al.*, 2012; Sugihara and Fujinami, 2011). Staff reportedly found some technologies straightforward to use, including a multi sensor system (Aloulou *et al.*, 2013), a sleep-monitor watch system (Nijhof *et al.*, 2012) and a video-based system (Schikhof, Mulder and Choenni, 2010). Concerns that monitoring devices might be used to replace staff could be transformed into positive attitudes and enthusiasm about the possibilities of using such technologies (Engström *et al.*, 2009). Niemeijer *et al.* (2014) reported that one home had reduced the number of night staff following implementation of surveillance technology, presented as a benefit borne out of the expectation that the technology would reduce staff workload. Use of technologies to supporting residents to wander more freely involved staff flexibility in switching duties with colleagues to follow a resident's lead (Wigg, 2010).

Fifteen papers (Abbate, Avvenuti and Light, 2014; Aloulou *et al.*, 2013; Aud, 2004; Bressler, Redfern and Brown, 2011; Capezuti *et al.*, 2009; Charlon *et al.*, 2013; Engström *et al.*, 2009; Godwin, 2012; Holmes *et al.*, 2007; Müller, Lin and Wulf, 2013; Niemeijer *et al.*, 2014; Niemeijer *et al.*, 2015; Schikhof, Mulder and Choenni, 2010; Wai *et al.*, 2010; Zwijsen *et al.*, 2012) reported that technologies at times seemed to present challenges, with a lack of reliability or a lack of trust in the technologies, and teething problems in the compatibility between technologies and existing practice. At times staff developed strategies to overcome these problems, but these strategies were not always successful. False alarms meant that staff might perform more physical checks upon residents, thus disturbing residents more frequently as well as increasing their own workload (Engström *et al.*, 2009). Staff also disabled sensitive technologies and positioned themselves physically closer to bedrooms, although this may have helped to ensure that existing skills were retained (Niemejier *et al.*, 2014). Staff used their knowledge of residents to organise their responses to alerts (Zwijsen *et al.*, 2012), but might make erroneous assumptions that alerts had been triggered accidentally by residents who did not need help, or that other staff would respond (Aud, 2004). Technologies worn by residents which could open doors may have inadvertently caused residents to get lost, and required increased staff vigilance to other resident slipping through doors (Niemeijer *et al.*, 2015). Staff failed to follow manufacturer guidelines and lacked knowledge about how to reset alert technologies (Aud, 2004; Wai *et al.*, 2010). Holmes *et al.* (2007) found that staff spent significantly more time in direct care for the intervention group, which might have been an artefact of using the new system, but experienced major problems of staff resistance due to reluctance to change their existing routines; attempts to address this resistance through additional training were unsuccessful (Holmes *et al.*, 2007). Bressler, Redfern and Brown (2011) reported on the removal of an alarm system initiated by management concerned that staff had become over-reliant upon the technology.

3.4.1.2 Lack of interest in data collected by technologies

Six papers (Abbate, Avvenuti and Light, 2014; Aloulou *et al.*, 2013; Beckwith *et al.*, 2003; Charlon *et al.*, 2013; Grunerbl *et al.*, 2011; Nijhof *et al.*, 2012) discussed the predictive potential of monitoring technologies to improve clinical understanding. Aloulou *et al.* (2013) reported that their multi-sensor system seemed to be able to predict decline in

health, but stated that these results were very tentative observations. The sleep-monitoring watch of Nijhof *et al.* (2012) allowed staff to implement tailored interventions based on data collected by the watch, however it seemed that there may have been more interest amongst staff in a desire for location-tracking functionality to enhance safety. Abbate, Avvenuti and Light (2014) and Charlon *et al.* (2013) tested fall detection technologies which could potentially monitor clinical signs during sleep or establish behavioural patterns of residents; both papers appeared to conceive of these monitoring functions to help enhance safety rather than to enhance other clinical knowledge. Staff and relatives showed a lack of awareness or interest in data collected by bed sensors (Beckwith, 2003) and a location-based system (Grunerbl *et al.*, 2011).

3.4.2.3 Importance of communication

The ideal implementation model (Niemejier *et al.*, 2011) recommended that any application of monitoring technologies should include thorough training for end users prior to implementation so that they understand how the technologies work, and understand that technologies are fallible. One unique piece of work (Bressler, Redfern and Brown, 2011) involved the removal of a home-wide alarm system for falls prevention after management concerns that staff had developed a false sense of security. This removal had involved regular discussions with staff and relatives regarding the removal of alarms for several months prior to implementation, including communication training for staff, and resulted in significant reduction in numbers of falls and percentage of residents involved in falls (Bressler, Redfern and Brown, 2011).

Six papers (Beckwith, 2003; Grunerbl *et al.*, 2011; Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014) reported fears amongst staff that technologies might be used by management to control their activities; four of which (Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014) involved video technologies. The work of the Japanese team led by Sugihara found that these concerns appeared to be related to the functional capacity of the video technology; where the system was capable of recording, staff became more stressed from feeling like they were under constant surveillance

(Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014). Grunerbl *et al.* (2011, p.34) stated that staff were concerned that "their work would be judged by the sensor data". Beckwith (2003) reported that some staff misunderstood the functionality of a monitoring system and tried to trick it by leaving radio-frequency ID badges inside to enjoy a longer cigarette break. Schikhof, Mulder and Choenni (2010) found that staff concerns about being monitored dissipated after clear discussion about the technology, which suggested that communication with staff about technologies may be important.

All these findings reinforce the importance identified in the ideal model proposed by Niemeijer *et al.* (2011) of clear communication with staff about the purpose and functionality of monitoring technologies. Niemeijer *et al.* (2014) found in their own fieldwork that use of monitoring technology was not part of a wider vision of care, with a lack of stakeholder consultation prior to introduction, and poor training for staff. It was interesting that such aspects were explored in most depth within a project involving removal of a technology (Bressler, Redfern and Brown, 2011) rather than in projects introducing new technologies. Nijhof *et al.* (2012) reported that staff who were unprepared for an introductory meeting, and sceptical about their sleep-monitoring watch, changed attitudes after two staff became positive opinion leaders. Nijhof *et al.* (2012) reflected that implementation projects might be more likely to succeed from the outset if introduction is focused upon anticipated benefits to practice (e.g. saving time) rather than being focused directly upon the technology itself.

3.4.3 Designs and costs

Eight papers (Abbate, Avvenuti and Light, 2014; Aloulou *et al.*, 2013; Aud, 2004; Capezuti *et al.*, 2009; Charlon *et al.*, 2013; Kearns *et al.*, 2007; Niemeijer *et al.*, 2015; Nijhof *et al.*, 2012) advocated flexibility in design and doubted that one-size-fits-all technologies would be fruitful for performance or for acceptability to residents. Successful implementation might benefit from considering how technologies might work in regard to individual resident behaviour and movement, with a need for flexibility to allow post-installation reconfiguration to suit resident behaviour (Aloulou *et al.*, 2013), bed-exit strategies of individual residents (Capezuti *et al.*, 2009), or whether residents were able to interfere

with wearable devices (Aud, 2004; Charlon *et al.*, 2013). Abbate, Avvenuti and Light (2014) suggested that devices need to be tailored to fit with resident dress preference whilst being close enough to the body to ensure accurate performance. Nijhof *et al.* (2012) found that staff reported that their sleep-monitoring watch was too big, yet their study appeared to show that the watch delivered promising benefits to practice, so the impact of the design upon functionality or performance was unclear.

Two papers (Kearns *et al.*, 2007; Niemeijer *et al.*, 2015) reported the need for technologies to be of discreet design, resembling common items (e.g. necklace, watch) to avoid stigma to residents from devices marking them out as being different. Kearns *et al.* (2007) found participants advocated different designs according to the level of severity of dementia, in which the aesthetics of body-worn technologies were more important for residents with early-stage dementia, but in later stages the priority was to keep the device attached to the resident to ensure functionality. Residents (without dementia) advocated implantable devices, drawing a parallel with implantable cardio-rhythmic devices (Kearns *et al.*, 2007).

Three papers (Abbate, Avvenuti and Light, 2014; Capezuti *et al.*, 2009; Nijhof *et al.*, 2012) contained explicit information regarding costs, with one other paper (Kearns *et al.*, 2007) discussing cost concerns in depth. Abbate, Avvenuti and Light (2014) argued that the cost of widespread deployment of their monitoring system within a care home might be US$100 per month, a cost advantage to deployment in large numbers. Capezuti *et al.* (2009, p.8) stated that bed exit alarms presented “a major financial investment” for homes of US$150 to US$300 per resident. Nijhof *et al.* (2012) stated that the total cost of their sleep monitoring watch including installation was around €1300, but this figure was not related to the budget of the care home itself, and therefore implications for implementation were unclear. Kearns *et al.* (2007) did not provide explicit figures but reported that cost was a major concern to participants in their study, who felt that access to expensive advanced technologies could be restricted from those who needed it the most. This finding seemed to imply that there may be a view that newer, expensive

technologies might be considered more desirable and more effective than cheaper, simpler alternatives.

3.4.4 Use of theory relevant to implementation research

Six papers (Aloulou *et al.*, 2013; Engström *et al.*, 2009; Müller, Lin and Wulf, 2013; Nijhof *et al.*, 2012; Schikhof, Mulder and Choenni, 2010; Wigg, 2010) used frameworks, models or theories relevant to implementation research (c.f. Chapter 2). Two were engineering and computer sciences papers (Aloulou *et al.*, 2013; Schikhof, Mulder and Choenni, 2010) focusing upon the design and real-world testing of technologies. A third engineering and computer sciences paper (Müller, Lin and Wulf, 2013) considered use of technologies as part of strategies for managing wandering. The other three papers were from health and social sciences (Engström *et al.*, 2009; Nijhof *et al.*, 2012; Wigg, 2010). I summarise the use of theory in Table 3.6.

Table 3.6: Use of theory relevant to implementation research in reviewed literature

Researcher(s)	Theoretical approach and application	Category (after Nilsen, 2015)	Main findings from use
Engström *et al.* (2009) Nijhof *et al.* (2012)	**Diffusion of Innovations** (c.f. Chapter 2; Rogers, 2003). Applied in discussion sections of papers rather than prospectively guiding implementation strategy	The most influential **classic theory** upon the field of implementation research	Both papers suggested that r*elative advantages* over existing practice and *compatibility* with care home environment appeared to be most important factors facilitating implementation. *Trialability* also important but potentially difficult to realise: staff would have liked more training (Engström *et al.*); research team had no time to introduce technology to allow staff to trial (Nijhof *et al.*) Nijhof *et al.* also perceived the importance of *communication* with staff, and *opinion leaders* amongst staff
Wigg (2010)	**Foucauldian concepts of power and control** (c.f. Chapter 2; Foucault, 1977) in two homes, one with and one without technology. Foucauldian concepts are commonly invoked to suggest that care staff favour the use of technologies enabling them to control older adults in their care (c.f. Chapter 2; Östlund, 2004). Interesting therefore that Wigg applied Foucauldian concepts to critique care home which *did not* have monitoring technology	Not specifically related to implementation research but is seminal, **classic sociological thinking**	Afforded interpretation of motion detector in second home as simultaneously able to enhance safety and support resident freedom, thus negating need for Foucauldian surveillance via strategically-placed staffing posts of second home. Helped to consider how traditional understandings of 'wandering' as pathological risk may be redefined as healthy risk which should be supported rather than restricted
Schikhof, Mulder and Choenni (2010)	**Iterative, user-centred approach** informed by **Human-Centred Design** (Maguire, 2001) and **Value-Sensitive Design** (Friedman, 1996) to incorporate values of staff and relatives in design and implementation: *Understand* context and values within home; *Study* whether prototype was compatible with this understanding; *Design* and *Build* using feedback from early testing to improve design; *Evaluate*	5-step **Process model**, providing practical guidance in planning and execution, highlighting need for careful planning at early stage, along linear trajectory **Determinant framework**, highlighting understanding of context-specific factors as integral component of implementation	Change in relatives' disposition towards cameras in bedrooms from initial concern to favourable attributed to consultation processes. Use of value-sensitive design ensured all stakeholders made contributions to shaping end product Allowed identification and address of technical problems to ensure that system met needs of end users

Table 3.6 continued			
Aloulou *et al.* (2013)	**Iterative, user-centred approach;** did not name an explicit approach but seemed to be conducted along a very similar trajectory and to a similar level of depth as Schikhof, Mulder and Choenni (2010); design of a multi-sensor system involved continual consultation with care home staff	**Process model***,* providing practical guidance in planning and execution, highlighting need for careful planning at early stage, along linear trajectory **Determinant framework**, highlighting the understanding of context-specific factors as an integral component of implementation	Similar reflections to Schikhof, Mulder and Choenni (2010) that technical problems and user preferences were identified and addressed along trajectory of project
Müller, Lin and Wulf (2013)	**Situated Action** (Suchman, 1987) to inform research design. Clear overlaps with approaches used by Schikhof, Mulder and Choenni (2010) and Aloulou *et al.* (2013); main difference is that Situated Action is a broader theory with a focus upon how people act in given situations and how plans of action may be changed as people respond to situations (Suchman, 1987), rather than process model	**Classic theory** from the field of Human-Computer Interaction which emphasises that design of technologies needs to consider relationships between actors, and between actors and environment	Possibly allowed research team to appreciate complexities involved in balancing safety and rights to freedom in the management of 'wandering'. However, Situated Action only mentioned in introduction to paper and therefore extent of influence unclear

3.5 Discussion

I conducted a systematic-style, narrative synthesis of the literature to explore factors that are facilitators or barriers to the implementation of monitoring technologies in care homes for people with dementia. I included 28 papers, which cited a wide range of monitoring technologies, such as a variety of sensors, integrated systems, and video-based systems. I appraised more papers as being mid to low quality rather than higher quality. I grouped findings into four broad themes: ethical debate about use of the technologies; impact of the technologies upon practice; designs and costs of the technologies; and use of theory relevant to implementation research. By focusing upon papers exploring actual implementation in practice, this review complements an existing review which I drew upon in Chapter 2 (Niemeijer *et al.*, 2010), which mainly contained discussion and debate of hypothetical scenarios.

The manifestation of the ethical debate in practice appears to be extremely nuanced. There seems to be more emphasis placed upon safety, which may be easier to 'see' than other potential benefits such as freedom of movement in residents with dementia and concomitant physical and cognitive impairments. Ethical acceptance of monitoring technologies by staff may come from relativist positions such as lack of objection or awareness from residents, the intention behind the use, or priorities of staff roles. A difference of opinion according to staff role may have implications for the understanding and delivery of person-centred philosophies of care, which may be debated between management and care staff. Monitoring technologies may help to increase staff confidence about the safety of residents, and free up time to complete other tasks. However, the majority of technologies appear to generate false alarms or 'alarm fatigue', meaning that staff appeared to either continue to use existing practices alongside the technologies, or use alternative strategies such as knowledge of residents or disabling technologies. More work is needed to understand this picture. There were signs that technologies might be able to capture clinical data about residents, but the attractiveness of this functionality to care home staff was unclear. There seems to be a lack of detail regarding communication, decision-making, and consent processes within implementation, a lack of information about how straightforward or complex staff find the technologies to use, and a lack of information about staff training. One-size-fits-all designs may be felt to be inappropriate for functionality and acceptance by residents in the early stages of dementia. Costs of technologies to care homes were not considered in depth.

Organisational contextual factors (for example, the presence of emotionally-intelligent leadership, a variety of processes to evaluate practice, positive social connections between staff members) have been shown to influence the uptake of good practice in care homes (Estabrooks *et al.*, 2011; Estabrooks *et al.*, 2015). Good-quality care is facilitated when the values held by individual staff and espoused by the organisation are coherent and shared at all levels within care homes (Killett *et al.*, 2016). Some of the literature reviewed in the present chapter alluded to the influence of organisational context and culture upon the implementation of monitoring technologies. Niemeijer *et al.* (2011) highlighted the importance of clear communication about the purpose and

functionality of monitoring technologies, and found this to be lacking in their own fieldwork (Niemeijer *et al.* 2014); Holmes *et al.* (2007) reported strong barriers to implementation from staff reluctant to alter their routine practice; Wigg (2010) explored constructions of risk and their manifestation in approach to implementation of monitoring technologies; and Bressler, Redfern and Brown (2011) outlined how the successful *withdrawal* of monitoring technologies was facilitated by the prior development of a shared understanding of the rationale and a careful approach to implementing the withdrawal. However, the influence of organisational context and culture upon implementation of monitoring technologies remains under-explored.

Most of the literature has explored staff perspectives rather than the perspectives of residents and relatives. From the health and social sciences literature, one paper had drawn upon classic Foucauldian sociology, two papers had used classic diffusion theory, but most papers had not explicitly drawn upon implementation research theory. There is thus the potential for exploration using different theoretical approaches.

In Chapter 4 I examine methodological considerations for the design of the study in this PhD, which includes the development of explicit theoretical propositions arising from this literature review.

Chapter 4: Methodology

4.1 Introduction

In the previous chapter I reviewed the literature exploring factors that were facilitators or barriers to the implementation of monitoring technologies in care homes for people with dementia. This review highlighted:

- A complex ethical debate around the issues of safety and freedom
- A mixed picture about the benefits conveyed by monitoring technologies
- A lack of detail about communication, decision-making, and consent processes
- A lack of knowledge about how staff find the technologies to use, and staff training
- Little information about designs and costs
- Most literature explored staff perspectives rather than the perspectives of residents and relatives
- Most literature had not explicitly drawn upon implementation research theory.

In this chapter I will discuss methodological considerations for an exploration into the implementation of monitoring technologies in care homes for people with dementia.

4.2 Methodology

4.2.1 Research question, aim and objectives

Question:

- How does the use of monitoring technologies become part of routine practice in care homes for people with dementia?

Aim:

- To understand factors which appear to help or hinder the implementation of monitoring technologies in care homes for people with dementia

Objectives:

- To explore the influence of the ethical debate between 'safety' and 'freedom' upon implementation
- To explore the benefits conveyed from using the technologies, balanced against the ease or difficulty of use
- To explore decision-making processes underpinning implementation
- To explore the influence of technological design and cost.

4.2.2 Philosophical position

Polemical writing during the last century proposed fundamental irreconcilable differences between philosophical positions occupied by 'quantitative' and 'qualitative' research (e.g. Guba and Lincoln, 1994). Quantitative research has been seen as synonymous with positivism, naïve realism, naturalism and deductivism; qualitative research has been seen as synonymous with relativism, idealism, anti-naturalism and inductivism (Guba and Lincoln, 1994; Hammersley, 1996). Whilst a distinction between quantitative and qualitative research may be useful, the dichotomy is increasingly recognised as untenable (Hammersley, 1996); qualitative approaches may be more rigorous than quantitative advocates believe, and quantitative approaches may be more socially constructed than qualitative advocates believe (Hanson, 2008). Implementation research recognises the benefits of flexible methodologies, acknowledging the role of quantitative approaches to understand impacts of interventions, and the role of qualitative approaches to understand contextual factors which can facilitate those impacts (Kelly, 2012). MRC guidelines for the development of complex interventions (MRC, 2008) provide clear acknowledgements of the vast array of contextual variables that may affect methodological decisions, and advocate for qualitative approaches in helping to explore facilitators and barriers to the implementation of complex interventions in practice.

Greenhalgh *et al.*'s (2004a; 2004b) comprehensive review of the implementation of interventions within organisations (c.f. Chapter 2) included the following recommendations for implementation research:

- It should be theory-driven in order to develop understanding of mechanisms underpinning success or failure of implementation efforts
- It should elucidate a process-based understanding of causality rather than make simple inferences about whether or not intervention X 'works'
- It should recognise the importance of the context in which implementation takes place.

These recommendations for implementation research, combined with the aim and objectives of this present study, point to the suitability of adopting a realist position. Realism is increasingly attractive to social science researchers (Gorski, 2013; Sobh and Perry, 2006) since it is able to reconcile the divide between quantitative and qualitative approaches: it occupies a 'post-positivist' position (Trochim, 2006) on a continuum between an extreme positivist quantitative position and an extreme subjectivist qualitative position. There are many fine-grained interpretations of realism, exemplified by numerous adjectival prefixes including 'critical', 'experiential', 'constructive', 'multi-perspectival', 'subtle', and 'emergent' realism (Maxwell, 2012). A conflation simply to 'realism' (Maxwell and Mittapalli, 2010; Maxwell, 2012) will suffice for this thesis: the important uniting philosophical feature is the detachment of epistemology from ontology (Maxwell, 2012). It accepts a realist ontology (i.e. there is likely to be a single external reality, rather than multiple realities), but favours a constructivist epistemology (i.e. the only way that we are able to access and understand this reality is from our own perspectives, which will always be imperfect, incomplete, and influenced by our own assumptions) (Maxwell, 2012). Realism therefore values multiple perspectives on reality, yet eschews what it perceives as an ultimately self-defeating constructivist ontology that a single external reality does not exist (Seale, 1999; Hammersley, 1995).

The separation of ontology and epistemology anchors a central tenet of realism, namely that 'there is a world which exists largely independently of a researcher's knowledge of it' (Sayer, 2005, p.6). This tenet has important implications for understandings of causality. The dominant conception of causality, based on David Hume's empiricism, states that it is only possible to perceive a 'constant conjunction' of events - i.e. *whether* A causes B – and thus knowledge of causality is limited to observed associations between events (Bhaskar, 2013; Maxwell, 2004). Realism argues that causal mechanisms are ontologically distinct entities, and therefore it *is* possible to see mechanisms involved in associations between events - i.e. *how* A causes B – with the operation of these mechanisms influenced by the context in which events occur (Bhaskar, 2013; Maxwell, 2004; Pawson and Tilley, 1997). This conception of causality highlights the particular relevance of realism to inform the design of the present study, since it is clearly aligned with recommendations that implementation research should explore process-based understandings of causality, and place value upon the context in which implementation takes place (Greenhalgh *et al.,* 2004a; 2004b).

4.2.3 Case study methodology

4.2.3.1 What is 'case study'?

Case study has been identified as 'a bridge across the paradigms' due to its flexible approach to research (Luck, Jackson and Usher, 2006), and is thus particularly compatible with a realist philosophical position. It is becoming well-established as a methodology within health and social care research, but its use is often poorly accounted for in research papers (Anthony and Jack, 2009). It has been proposed confusingly and variously as a methodology, a design, a method, a strategy, a teaching technique, the process of research, the unit of study, or the written report at the end of a study (Anthony and Jack, 2009; Walshe, 2011; Yin, 2009). Two of the most prominent authorities on case study methodology are Robert Yin and Robert Stake. In this study I was guided by the approach of Yin (2009) since he is more compatible with realism, subscribing to finding commonalities between qualitative and quantitative approaches, and aiming for case study reports to represent reality (e.g. Easton, 2010; Perry, Riege and Brown, 1999; Wong, 2014; Yazan, 2015); Stake aligns himself firmly with a qualitative constructivist

position and expects readers of case study reports to add another layer of knowledge construction (e.g. Stake, 1995; Yazan, 2015). In this thesis, I defined case study as a research methodology best suited to guiding exploration of 'how' or 'why' research questions, making use of multiple sources of evidence collected via different methods, qualitative and quantitative, to investigate a phenomenon within its real-life context (Yin, 2009). Case study affords practical, context-dependent knowledge which remains true to the complexity of the context studied (Flyvbjerg, 2006).

4.2.3.2 Case study design

Yin (2009) outlines a variety of single- and multiple-case study designs consisting of a context, in which sits the case(s), containing unit(s) of analysis. Single-case designs are appropriate if the case presents a critical opportunity to test a theory, is a rare circumstance, or considered representative; in all other situations, multiple-case designs are more robust (Yin, 2009). Case study research has been criticised for lacking generalisability due to small samples of cases, but such criticism stems from ontological and epistemological perspectives advocating statistical generalisability (Flyvbjerg, 2006). The selection of multiple cases is *not* based on statistical sampling logic; multiple cases should be identified either because they should replicate one another or because they should provide anticipated contrasts (Meyer, 2001; Yin, 2009). Yin (2009) draws a parallel between multiple cases and multiple scientific experiments as both capable of replicating the same phenomenon under different conditions, and thus argues that both case studies and experiments are not generalisable to populations, but are generalisable to theoretical propositions.

Yin (2009) advocates the development of theoretical propositions at the outset of a study to help inform the case study design, stating the conditions in which a phenomenon is likely to be found (a literal replication) and not likely to be found (a theoretical replication). In Table 4.1 I offer theoretical propositions arising from the literature review:

Table 4.1: Theoretical propositions arising from the literature

Propositions	Literature
There will be more emphasis placed upon the ability of the technologies to enhance safety than to enhance other aspects of care. If other aspects of care are emphasised ahead of safety, the technologies may be unlikely to be implemented as part of routine practice; There is likely to be a varied picture regarding the ethical considerations of the use of these technologies. Ethical acceptance is likely come from relativist positions such as a lack of objection or awareness from residents, the intention behind the use, or from priorities of staff roles	Aud, 2004; Beckwith, 2003; Engström *et al.*, 2005; Engström *et al.*, 2009; Godwin, 2012; Kearns *et al.*, 2007; Müller, Lin and Wulf, 2013; Niemeijer *et al.,* 2011; Niemeijer *et al.*, 2014; Niemeijer *et al.*, 2015; Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014; te Boekhorst *et al.*; 2013; Wigg; 2010; Zwijsen *et al.*, 2011; Zwijsen *et al.*, 2012
The technologies may help to increase staff confidence about the safety of residents, and free up their time to complete other tasks. If the technologies do not increase staff confidence and are too time-consuming to use, they are unlikely to be implemented as part of routine practice; The majority of technologies are likely to generate false alarms or 'alarm fatigue', however staff will be likely to continue to use existing practices alongside the technologies, or use alternative strategies to mitigate this overburden of alarms. The extent to which this overburden will impact upon the implementation of the technologies as part of routine practice is unclear	Abbate, Avvenuti and Light, 2014; Aloulou *et al.*, 2013; Aud, 2004; Beckwith *et al.*, 2003; Bressler, Redfern and Brown, 2011; Capezuti *et al.*, 2009; Charlon *et al.*, 2013; Grunerbl *et al.*, 2011; Engström *et al.*, 2005; Engström *et al.*, 2006; Engström *et al.*, 2009; Godwin, 2012; Holmes *et al.*, 2007; Müller, Lin and Wulf, 2013; Niemeijer *et al.*, 2014; Niemeijer *et al.*, 2015; Nijhof *et al.*, 2012; Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011; Wai *et al.*, 2010; Wigg, 2010; Zwijsen *et al.*, 2012

A multiple-case study using two to three cases would predict literal replication of these propositions (Yin, 2009). The definition of the case should be made at the level of the main research question and should be a logical progression from the research question (Bergen and While, 2000; Yin, 2009). The research question focuses upon implementation of monitoring technologies; implementation of any intervention should be adapted to suit the local context in which it occurs (May, 2013). **I defined the case as the process of implementation of monitoring technologies, which occurs within the context of a particular care home.**

I chose a multiple-case design with embedded units of analysis (Figure 4.1). The most complex decision in case study research is the identification of the units of analysis (Yin, 2009). I identify units of analysis in Table 4.2.

Table 4.2: Units of analysis

Unit of analysis	**Reason for decision**
Staff members' perspectives	Relationships between staff, residents and relatives are integral to care home life (Brown Wilson, Davis and Nolan, 2009) yet most literature on implementation of monitoring technologies in care homes (c.f. Chapter 3) has only focused upon staff perspectives
Relatives' perspectives	
Residents' perspectives	
Organisational documentation (e.g. care plans)	To gain a fuller picture of the relationship between the case (the implementation process) and the context (the care home)
Technology manufacturer material	Literature review included papers by technology developers. It might be important to consider how monitoring technologies are promoted by manufacturers to care homes, and how this promotion might influence the implementation process.

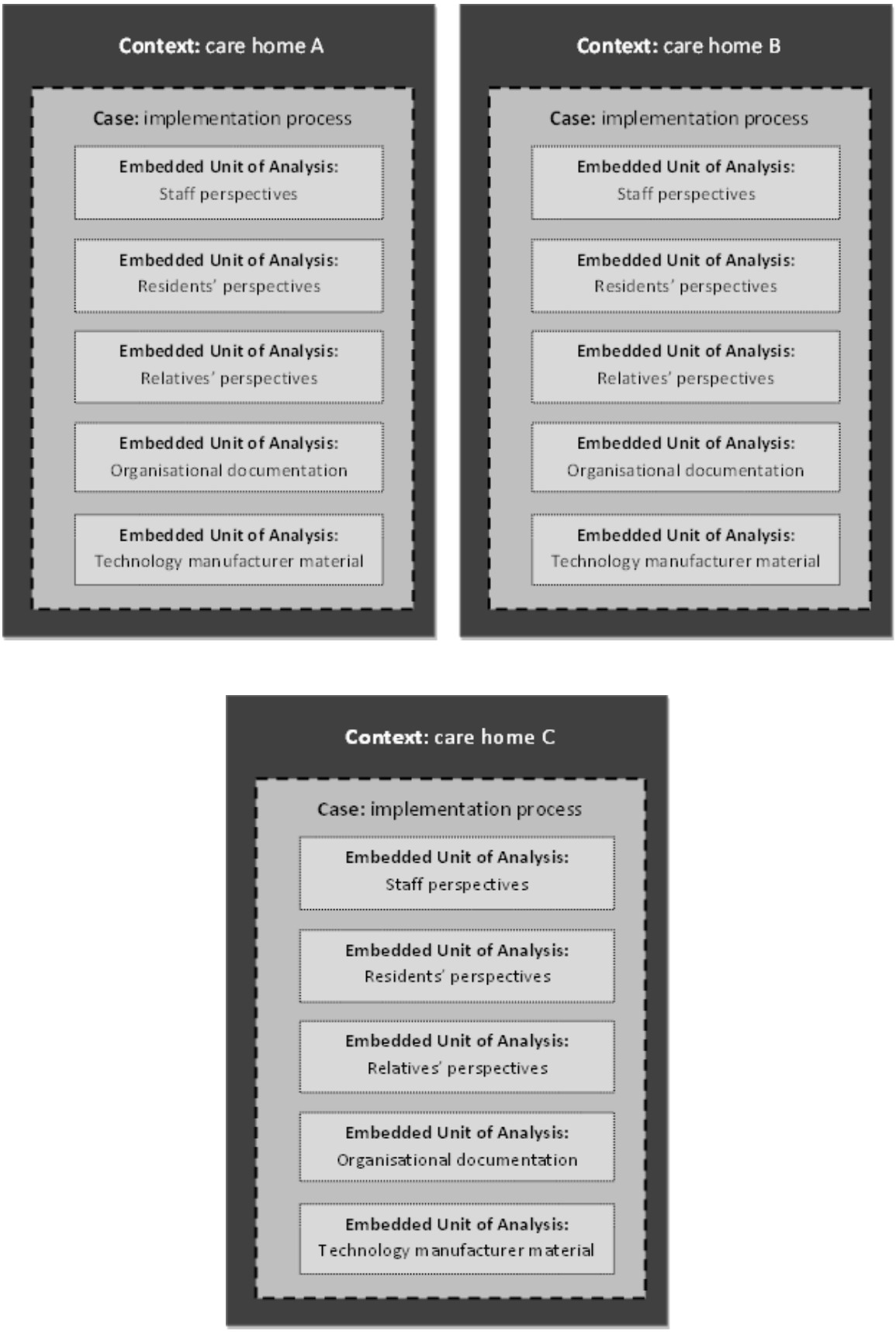

Figure 4.1: Embedded multiple-case study design (from Yin, 2009)

4.3 Methods

4.3.1 Sampling, recruitment, ethics and consent

4.3.1.1 Sampling

Multiple-case study designs and realist approaches to research both recognise that selections of settings and participants involve strategic decisions, encapsulated in purposive and theoretical sampling strategies (Maxwell, 2012; Yin, 2009). The logic underpinning purposive and theoretical sampling approaches is not the same logic underpinning statistical sampling; purposive and theoretical approaches are appropriate for research which aims to understand processes and contextual influences upon the phenomena of interest (Maxwell, 2012). There is debate about the relationship between 'purposive' and 'theoretical' sampling, however one useful conception is that 'purposive' sampling may relate to initial decisions, with 'theoretical' sampling referring to ongoing decisions guided by emerging findings and reflections (Coyne, 1997). There are a wide range of purposive and theoretical sampling strategies, including variation sampling (to cover a broad spectrum of perspectives); criterion sampling (settings or participants who meet certain criteria); theory-guided sampling (if testing a particular theory); and snowball sampling (participants help to identify further participants) (Coyne, 1997; Maxwell, 2012; Palys, 2008). Another form of sampling is convenience sampling (that which might be most readily available to the researcher), which has been argued to be a form of purposive sampling, but this classification has not been universally accepted (see Coyne, 1997). In this study I applied purposive, theoretical and convenience sampling decisions in the recruitment of care homes and participants, as explained in the following sections.

4.3.1.2 Care homes

The study involved three dementia-specialist care homes, located in the North West of England, which I renamed Sycamore Lane, Conifer Gardens and Heather Grove in order to maintain confidentiality. Sycamore Lane and Conifer Gardens were purpose-built, 60-bed homes providing residential care with nursing. Heather Grove was a converted Victorian house with 27 beds providing residential care without nursing.

I invoked convenience sampling through existing networks: I recruited Sycamore Lane and Conifer Gardens through existing relationships between one member of my supervisory team and the management of the homes; Heather Grove via a local care homes research network event; and all three homes were located within an hour and a half's drive from central Manchester. Dismissals of convenience sampling as devoid of rigor are rejected by realist approaches recognising that realities of cost, time, access and difficulty influence every sampling decision (Maxwell, 2012). However, realist approaches do caution against convenience sampling being the sole criterion (Maxwell, 2012). I was also guided purposively by variation sampling, as I also selected the homes based on variation in nursing care, size, physical environment, and use of different technologies which appeared to be at different stages of implementation. I provide further details about the care homes and their technologies in Chapter 5.

4.3.1.3 Participants

Inclusion criteria

I involved staff members, relatives, and residents of the three care homes, with the following inclusion criteria:

- Any involvement with monitoring technologies in the care home, including refusal to use monitoring technologies
- Over age 18
- Able to communicate in English.

I employed variation sampling to recruit staff participants from a wide variety of roles, responsibilities, shift patterns, and length of employment within the care homes. Resident and relative participants included those who had been with the care home for varying degrees of time and therefore had differing levels of experience of life within the care home, and included residents with different care needs and levels of cognitive impairment. A recent systematic review (Bradshaw, Playford and Riazi, 2012) found that studies adopting purposive sampling in qualitative investigations within care homes tended to have sample sizes of approximately 20-25 participants per care home, which provided some indication as to the approximate numbers of participants that might be required. However, the concept of data saturation (the continual collection of data until

no new data are generated) offered little practical guidance in determining final numbers of participants during the planning stage of the study (Guest, Bunce and Johnson, 2006). I present details about participants in Chapter 5.

Ethics and consent

Recruitment of participants is closely bound with consideration of ethics issues and consent to participate in research, which are particularly complex in research including participants lacking cognitive capacity. It is necessary to seek consent from any participants involved in research regardless of their level of cognitive capacity (Mental Capacity Act, 2005), and it is therefore incumbent upon researchers to ensure that those lacking capacity are given every opportunity to understand the research and to provide their consent as far as their capabilities allow (British Psychological Society, 2010; Mental Capacity Act, 2005). Traditional guidelines have been biased towards a model of seeking informed consent at the outset of a study, which makes two related assumptions: that everybody is capable of giving informed consent; and that consent is a static entity (Dewing, 2007). The cultures of individual care homes, including staff beliefs about the involvement of residents with dementia in research, may also have a substantial impact upon attempts to recruit residents with cognitive impairment (Goodman *et al.*, 2011). Authors such as Dewing (2007), Goodman *et al.* (2011), and the British Psychological Society (2010) provide guidance and reflections on the recruitment of participants with cognitive impairment, but their underlying arguments should hold for *all* participants: a realist approach to research argues that *any* recruitment decisions and processes need to be based upon extensive contextual knowledge (Maxwell, 2012). I intended to involve staff members, relatives and residents, and thus I required flexibility in the consent process to respect the different needs of *all* these groups (e.g. Brown Wilson and Clissett, 2010; Brown Wilson, 2011). In the remainder of this section I discuss the recruitment of each of these groups of participants and describe the processes for obtaining consent; for information sheets and consent forms, see Appendix 5. In the discussion chapter (Chapter 9) I will reflect upon the process for obtaining consent.

Ethics approval for the study was granted by the NHS National Research Ethics Service Committee North West – Haydock (reference number 13/NW/0752; Appendix 6).

Staff members

At Sycamore Lane and Conifer Gardens, I was able to introduce myself to a small number of senior staff at the beginning of a regular team meeting. However, the vast majority of introductions with staff members occurred informally during initial periods of acclimatisation in which I conducted general observations to 'get my bearings' and gain a sense of familiarity of day-to-day life within the homes. I introduced myself to as many staff as possible, explaining the purpose of my study, and sought verbal consent to conduct observations.

Following these initial periods of acclimatisation, I felt that I had developed enough contextual knowledge to begin identifying potential staff members for more in-depth participation. For example, I established that there were certain residents whose care involved more use of technology than others, and I then consulted organisational structure documents (where available), and management and senior staff, to identify potential staff participants with key roles within these residents' care. As the research progressed, I was able to identify further potential participants through theoretical sampling, according to emerging findings and reflections. I thus employed a combination of variation, snowball and theoretical sampling. I was able to discuss the information sheets with individual members of staff and obtain their written consent, although I was careful to stress that they did not have to decide in that moment and that they were entitled to take as much time as they wanted to consider their participation. I was also careful to stress that their written consent was reversible.

Relatives

At Conifer Gardens I had the opportunity to introduce myself at a regular relatives' meeting, and to answer some questions about the study and how it would be conducted. The other two homes did not appear to hold regular relatives' meetings. I sought guidance and support from staff about how best to approach relatives (e.g. times at which certain relatives tended to visit; which members of a family were the primary contact; offers to mention my study to relatives in their regular conversations with them), and asked staff to make introductions. I made initial remote contact with relatives through staff, who sought permission from relatives to pass their telephone numbers on to me. Once I had made this contact with relatives, I arranged to meet with them to

provide full information, discuss the details of the study, and obtain written consent. As with the recruitment of staff members, I was careful to stress that they did not have to make any immediate decisions, and that any written consent was reversible.

Residents

According to the Mental Capacity Act (2005), an individual must be assumed to possess capacity to make a decision unless a lack of capacity is established in relation to the particular decision at the time the decision is offered. An individual may be considered unable to make a decision for themselves if they are unable to (a) understand the relevant information; (b) retain the information; (c) use or weigh the information as part of making their decision; or (d) communicate their decision by any means (Mental Capacity Act, 2005). Care home staff were able to advise me regarding the general level of capacity of individual residents, but there may be underlying assumptions about capacity made by care home staff (Goodman *et al.*, 2011) and I approached residents with the principles of the Mental Capacity Act firmly in mind. It became clear that most (but not all) residents lacked capacity to consent, because they were not able to understand all the relevant information about the study; in particular I was concerned that even where residents seemed to have some understanding about my interest in technology in their care, they did not appear to understand the implications about the use of data in the study. In order to seek consent regarding the involvement of residents lacking capacity, I applied the five-stage process model of consent (Dewing, 2007; Box 4.1).

Box 4.1: Process model of consent (based on Dewing, 2007)

Stage 1: Approach a relevant individual to act as personal or nominated consultee to the resident, able to grant access to the resident based on a judgement about whether they feel the resident would be interested in taking part. A personal consultee would usually be a relative, and a nominated consultee a professional who has experience of working with the population group (National Research Ethics Service, 2011).

Stage 2: Establish how the resident may prefer to signal consent, for example, by understanding behaviour associated with well-being.

Stage 3: Consider how the individual resident might prefer receiving information.

Stage 4: Revisit consent with each interaction, and during interactions if necessary.

Stage 5: If a resident becomes distressed it will be necessary to inform others. There is need to consider of how best to withdraw from a research interaction with a resident.

All the consultees were personal consultees. I first approached relatives of residents to discuss the study, providing information sheets and asking them to sign a consultee form. I sought guidance from relatives and staff about how to approach residents, drawing upon their established relationships and knowledge of the residents' behavioural and communication skills; however, I remained vigilant to the potential for assumptions by relatives about residents' abilities (Godwin, 2012). I visited and revisited consent each time I was involved in interaction with a resident; and during the same interaction if I deemed it necessary. During my interactions with residents I remained particularly attuned to signs that they might be disinterested in the interaction, or uncomfortable in my presence around them, and recorded these signs in my field notes. I was also vigilant to any signs that other residents were becoming distressed at my interaction with a particular resident. Relatives would often ask me whether I had spoken with residents and I was able to describe how interactions had progressed. No residents became distressed during interactions with me, but I was prepared to inform key staff members and relatives if this had been the case. Towards the end of the study I informed residents that I was nearing the end of my time coming into the homes, and ensured that I bid them farewell and thanked them for their participation on my final visits.

4.3.2 Data collection

Case study (Yin, 2009) and realist approaches (Maxwell, 2012) advocate the use of multiple sources of data and methods of data collection. I collected demographic data, data describing the technologies in the homes, observational data, interview data, documentary data, and data from two questionnaires. In this section I present the detail of each of these sources and methods; I discuss the relationship between sources and methods in section 4.3.4 (quality assessment).

4.3.2.1 Demographic data

I collected background demographic data for all participants who had provided written consent to participate, including gender, age, ethnic origin, age upon leaving school, whether the participant had taken further or higher education, and length of time in the home. These data were collected via a questionnaire adapted from Todd *et al.* (2007; Appendix 7). Staff and relatives completed the questionnaires themselves, and relatives completed questionnaires to provide this information for residents.

4.3.2.2 Observations

Observations are a long-standing method within social research (Kawulich, 2005), and of particular value for research within dementia care in which traditional methods such as interviews are unreliable on their own (Brooker, 1995). I conducted non-participant observations, remaining an "accepted outsider" and observing as a "fly-on-the-wall"; appropriate for my study since this type of observation has been deemed useful for exploring routine practice (Fitzpatrick and Boulton, 1994, p.110). I clarified with management and staff that I was not in a position to be a substitute for staff in the delivery of care, although I did help out with simple domestic tasks such as making cups of tea and washing up dishes in communal kitchens, which helped to build rapport. I conducted overt observations, because covert methods are deemed unethical unless there is no alternative (Brewer, 2000), and posted observation notices advising that research was being conducted, including a photograph of myself (Appendix 8).

I began fieldwork with general observations to establish familiarity and to build up rapport and trust with participants. These observations were not rigidly structured; rather, I was keen to pay attention to a variety of artefacts, including structural and organisational features; behaviour and interaction of people; daily activities; the occurrence of special events e.g. staff meetings; dialogue between people; and I also reflected upon the data collection process (Mulhall, 2003). After I had acclimatised to the homes, I began to attune my focus to emerging areas of perceived importance via theoretical sampling, for example, regarding a particular resident or staff member who was participating in the study, or a particular item of technology at its moments of use. I conducted observations within all shift patterns over the 24-hour period of daily care, continuing until data saturation. A PhD study using observational methods in care homes (Brown Wilson, 2009) suggested approximately 60-100 hours per home might be appropriate, although this suggestion could only serve as a guide at the outset of my study. I conducted observations primarily within communal areas of the homes, and did not record the activities of any individual who had not agreed to observational research. I also conducted brief observations within bedrooms of resident participants in order to see some of the technologies (e.g. bed-exit systems) located in their rooms. These observations only occurred when I was granted permission by the resident to enter their bedroom, were usually accompanied by a relative, and I remained vigilant to signs that the resident no longer desired my presence. I was not present during any personal care routines.

There is debate about the appropriate time at which to write field notes (Mulhall, 2003). I decided to record brief notes by hand during the observation periods, which I then typed up into fuller field notes within 24 hours. I found that this delay in writing full notes until I had stepped away from the field provided me with a good balance between time to replay and reflect upon what I had (or had not) observed, but not so much of a delay that I felt I had forgotten or risked grossly misrepresenting what I had observed. I wrote my field notes in a style in keeping with the realist philosophical approach underpinning the study, rather than in a more interpretivist emotive style (Mulhall, 2003; van Maanen, 2011).

4.3.2.3 Interviews

Interviews allow the researcher to understand the world from participants' perspectives in a moment of close interaction (Kvale, 2006). There are three broad approaches to interview typically described in research methods literature; structured, semi-structured, and unstructured; and the philosophical approach underpinning the research helps guide decisions about which approach to use (Edwards and Holland, 2013). In this study I used semi-structured interviews, guided according to the topic of my interest by drawing upon Normalization Process Theory as an heuristic device, whilst ensuring that there was enough flexibility and room within the interview for participants to develop the conversation (Edwards and Holland, 2013) and for their talk to be explored further through spontaneous follow-up questions. The interview prompts are shown in Appendix 9. They are intended as examples only and were often paraphrased. This approach aligns with a realist approach which recognises that the researcher needs to use creativity to judge what questions are likely to be effective, whilst also involving use of theory to guide questions and probes to enhance the depth and complexity (Maxwell, 2012; Smith and Elger, 2012). To guard against the traditional privileging of interview data in qualitative research (Silverman, 2005), I invited participants to comment on actions I had captured in observational data (e.g. Brown Wilson and Clissett, 2010; see also section 4.3.4).

I conducted interviews with staff and relatives, mostly in quiet areas of the homes (such as an unused room); however, some staff preferred to hold the interviews whilst they were engaged in another task (e.g. cleaning). I audio-recorded the interviews wherever possible (the vast majority); although I recorded some which took place in more open areas via handwritten notes because there was a lack of privacy for audio-recording. Audio-recorded interviews with staff members lasted from around 22 to 90 minutes, most often around 40 minutes; with relatives from around 16 to 35 minutes, most often around 25 minutes. I transcribed the audio-recorded interviews verbatim, and typed up the handwritten interviews, within three to four days after they took place, as I wanted to reflect promptly upon how they might further guide data collection (see section 4.3.3). I conducted interviews with participants individually, except for two pairs of senior staff at Conifer Gardens, and two daughters of a resident at Conifer Gardens, due to convenience for these participants. The realist approach underpinning the study allowed for the

contingency that the locations for interviews, their recording, and participant preference were sometimes dependent upon the context.

Interviews with residents were much more challenging due to levels of cognitive impairment. There is increasing recognition of a range of innovative methods to explore the perspectives of residents with dementia on complex issues. These methods include video and audio recordings of interactions between residents and staff (Williams, Herman and Bontempo, 2013), use of photographs of constructed scenes (Parke, Hunter and Marck, 2015), and use of communication tools such as Talking Mats which allow residents to indicate their feelings on a specific subject via use of images and visual scales (Murphy, Gray and Cox, 2007). These methods are labour-intensive and were beyond the resources available for this PhD study. Informal conversation with residents with dementia has been advocated as a complementary data collection method since it may be tailored to individual cognitive ability (Bamford and Bruce, 2000), and guards against privileging the voices of those able to participate in long conversation (Brown Wilson and Clissett, 2010). I held informal conversations with residents to the extent to which their level of cognitive ability would allow, and took notes rather than audio-recording; I did not have consent to audio-record, and these conversations were often brief and frequent rather than sustained. These conversations took place within communal areas of the homes, but also within the bedrooms of these residents when a relative was present, which conveyed some advantages: for example, I was able to point to a pressure mat in the bedroom as a visual stimulus to help the resident understand what I was asking; relatives were also able to help with rephrasing my questions. I discuss this issue further in section 4.3.4.

4.3.2.4 Documentary collection

I consulted care records of resident participants to further explore the decision-making processes for use of monitoring technologies in their care, extracting data using a standardised form (Appendix 10.). I sought agreement from management, and consent from residents and personal consultees, for this extraction, detailed in the information sheets and consent forms.

Conifer Gardens had a training manual supplied by the manufacturer for one of the technologies. I was not able to make photocopies of this manual because it was copyrighted; therefore I sat in a quiet room and took notes on relevant detail, which I subsequently typed up. In addition, I consulted manufacturer websites related to each technology.

4.3.2.5 Questionnaires

Due to the potential influence of common conceptual understandings of technologies (c.f. Chapter 2), I decided to use two questionnaires: the Media and Technology Usage and Attitudes Scale [MTUAS] (Rosen *et al.*, 2013) and the System Usability Scale [SUS] (Brooke, 1996) (both are provided in Appendix 11). At the time I conducted fieldwork, the MTUAS was the most contemporary questionnaire exploring use of and attitudes towards technologies, with a level of granularity that was hitherto unavailable. I considered it would be a useful tool to ascertain if there were any participants who appeared to be extremely in favour or extremely opposed to technological intervention, which could then serve to triangulate observation or interview data. The SUS is a widely-used tool in industry to ascertain perceptions of the usability of particular technology or system. I considered it would be a useful tool to triangulate observational and interview data about perceived usability of monitoring technologies.

The MTUAS contains 60 items focusing upon people's general attitudes towards and use of everyday technologies. It has been assessed as valid and reliable, although with the caveat that it was developed with a convenience sample in Southern California; Rosen *et al.* (2013) called for further validation work. The SUS consists of ten items, and is described by its developer as a “quick and dirty” measure (Brooke, 1996; 2013). It is practical to apply, and can be used with small sample sizes and still provide a good estimate of perceptions of usability (Brooke, 2013). I asked staff participants to complete the SUS and the MTUAS, and relative participants to complete the MTUAS. I did not give either questionnaire to residents as they focused upon technologies that largely did not require active use by residents. Based upon a pilot with two members of staff at Conifer

Gardens, I estimated that to complete these questionnaires would take 15-20 minutes in total.

4.3.2.6 Data protection and storage

I stored paper data files (participant contact details, consent forms, handwritten field notes, questionnaires) in a locked cabinet at the University of Manchester to which only I had access. I stored electronic data files on an encrypted University of Manchester laptop and secure University of Manchester server space. I assigned each participant a unique alphanumeric identifier and pseudonym used in field notes and in transcripts of interviews. I stored the key for participant identifiers on paper in the locked cabinet. In field notes and transcripts I rendered anonymous any other identifiable information referred to by participants, such as names of individuals or locations.

4.3.3 Data analysis

4.3.3.1 Qualitative analysis

To analyse the qualitative data I chose the framework approach, developed in the 1980s at the UK National Centre for Social Research, and increasingly popular within social science research (Ritchie, Spencer and O'Connor, 2003). The key aspect is the rigorous and transparent charting of coded data via analytical matrices (Ritchie, Spencer and O'Connor, 2003). It has no prior allegiance to either inductive or deductive research (Gale *et al.*, 2013), is compatible with a realist position (Snape and Spencer, 2003), and its transparent matrix approach aligns well with the systematic approach advocated by Yin (2009) for cross-case synthesis of multiple-case study designs.

I used NVivo 10 (QSR International, 2015) to support my analysis. NVivo is an example of Computer-Assisted Qualitative Data Analysis Software [CAQDAS] which offers support to the non-linear nature of qualitative research (Sinkovics and Alfoldi, 2012). CAQDAS packages can help facilitate the handling of large data sets, but they do not actually conduct analysis, and therefore their use should be decided by the individual researcher

who remains the crucial actor in the analytic process (Spencer, Ritchie and O'Connor, 2003; Silverman, 2005). I followed the approach of Gale *et al.* (2013), who provided what I considered to be the clearest illustration of working through framework analysis:

- Transcribed my interview data and typed up my field notes, care record data, and notes relating to technology manufacturer material
- Read these documents to familiarise myself with their content, and imported them into NVivo
- Coded the data from three sources within NVivo
- Grouped the codes into sub-themes to develop my working analytical framework
- Applied this framework to code the remaining data within NVivo, refining some of the codes and categories since coding is never 'final' until all data have been coded (Gale *et al.*, 2013); see Appendix 12 for an example
- These stages generated a final analytic framework of 49 codes grouped into eight sub-themes (Appendix 13).

Throughout the development of the codes and themes I adopted a combined inductive and deductive approach. My interview topic guide was informed by Normalization Process Theory and hence its mechanisms and focus were present within the interview data. I was also exploring the data in relation to the theoretical propositions generated from my literature review (see Table 4.1). Therefore, both NPT and my theoretical propositions were present in my mind whilst I was undertaking analysis, but I did not impose these theoretical frameworks upon the data to pre-select codes and themes. I coded in a manner which allowed exploration of the specific issues highlighted by NPT (i.e. exploration of participants' understandings, involvement, use, and evaluation of the technologies) and the theoretical propositions (i.e. exploration of participants' views upon the role of the technologies in enhancing safety; the manifestation of ethical questions; the level of burden for staff in using the technologies; the impact of false alarms and alarm fatigue). However, I also left enough room and openness in the analysis to explore unexpected elements within the data (Gale *et al.*, 2013). A good example of this is the exploration of the interaction between physical properties of the technologies and the physical properties of the care home premises (see Chapter 8). This element provided a level of ecological depth to the exploration of the use of the technologies in

practice which was unexpected from either the findings in the literature or from an *a priori* reading of NPT.

I summarized this analysis by charting the data into eight separate matrices, one for each sub-theme. The rows of each matrix represented individual participants, field visits etc.; the columns represented individual codes; the cells were populated with data. NVivo 10 has a function to generate such matrices, however I opted to use manual copy and paste approach in MS Excel. Although laborious, I felt more confident that this approach would allow me to further check my coding decisions in a reflexive process that would not have been facilitated by simply clicking on a inbuilt function within NVivo. Within the NVivo matrix function, the data remain hidden until a cell is selected, and I found this display awkward since I wanted to be able to see the data within each cell at a glance.

The final stage involved interpretation of the charts. I compiled memos noting down my thoughts about each matrix. During this process, further relationships between the sub-themes became clearer, resulting in the organisation of the eight sub-themes into a further matrix structure of five overarching themes (Figure 4.2).

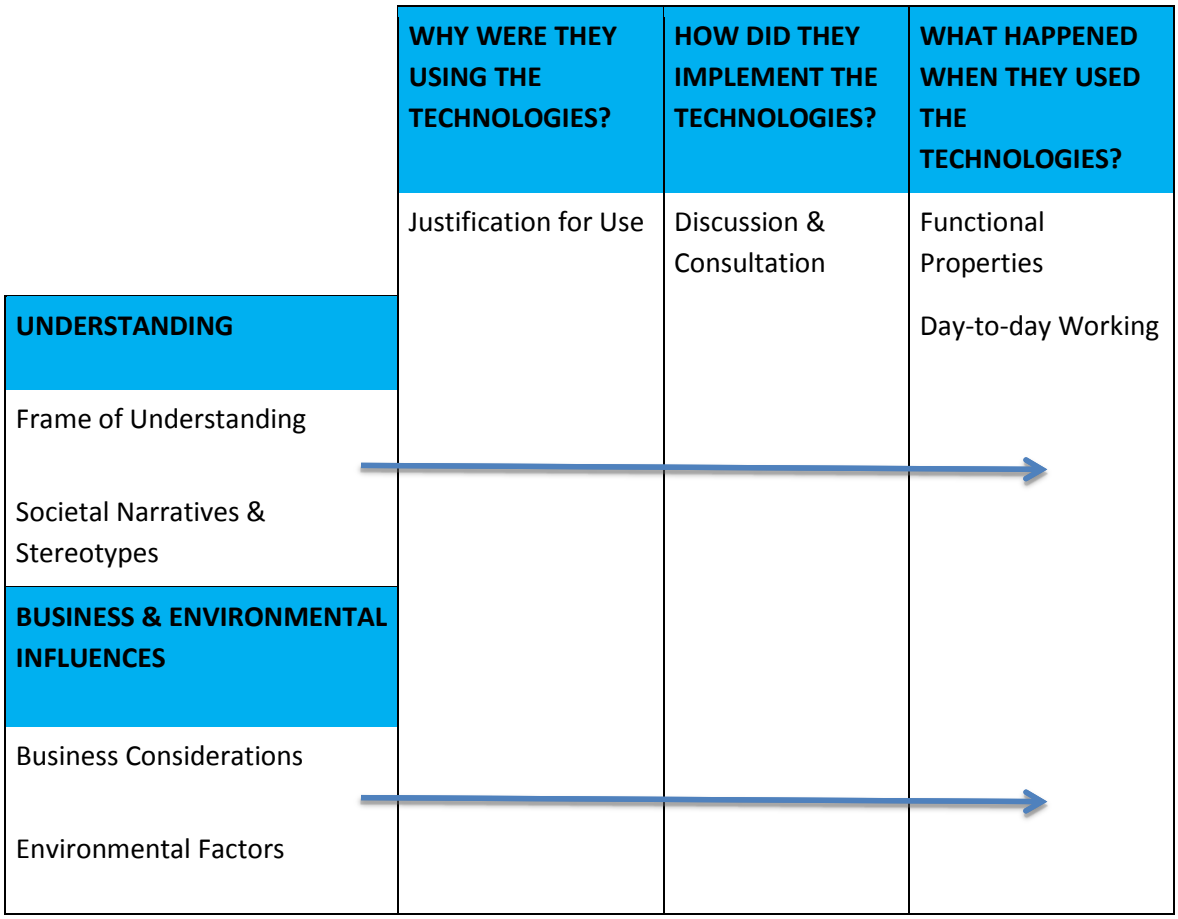

Figure 4.2: Final thematic matrix structure

I use the structure in Figure 4.2 to organise the presentation of findings:

- In Chapter 6, 'Why were they using the technologies?', I analyse the reasons for using the technologies in the homes
- In Chapter 7, 'How did they implement the technologies?', I analyse how the technologies were put into practice within the homes
- In Chapter 8, 'What happened when they used the technologies?', I analyse what actually happened within the homes during use of the technologies
- As Figure 4.2 shows, each of these chapters is informed by findings from the two other themes of Understanding and Business and Environmental Influences.

4.3.3.2 Descriptions of technologies

I gleaned detailed descriptive information about the technologies in the homes from observation and interview data, combined with data from technology manufacturer documentation. I synthesised this information using a taxonomy (FARSEEING, 2014) developed as part of a multisite, multinational European project focusing upon use of technologies to support older adults to live independently via better prediction and prevention of falls (FARSEEING, 2015). The taxonomy was developed by a multidisciplinary group of experts to characterise and classify technology-enabled interventions to allow for easier and more consistent comparison of gerontechnologies within research literature (Boulton *et al.,* 2016). It includes five domains (Approach; Base; Components of outcome measures; Descriptors of technologies; and Evaluation); I used the Descriptors domain to provide detailed consistent technical descriptions of the technologies within my study (Appendix 14).

4.3.3.3 Questionnaires

I analysed data from the MTUAS and the SUS using SPSS Version 22 (IBM, 2015). I calculated mean and median scores for each subscale of the MTUAS for participant type (staff or relative) and for each care home. I tested differences in means between staff and relatives, and between each care home, for statistical significance using non-parametric tests (Mann-Whitney U; Kruskal-Wallis one-way analysis of variance). I provide the MTUAS results in Chapter 5. I calculated mean and median scores for the SUS for certain technologies, testing differences in mean scores tested for statistical significance using non-parametric tests (Mann-Whitney U). I provide the SUS results in Chapter 8.

4.3.4 Quality assessment

Assessment of research quality is intrinsically linked with the philosophical position underpinning the research. Positivist assessments of quantitative research typically apply criteria of internal validity (how well a study was conducted), external validity (how generalisable its results might be), reliability (would repeated studies give the same result) and objectivity (freedom from bias) to inform a hierarchy of methods in which the

RCT is the gold standard (Maxwell, 2012). Constructivist assessments of qualitative research have rejected these criteria, favouring parallel criteria (including credibility, transferability, dependability and confirmability) to better serve relativist ontological and epistemological commitments (see Lincoln and Guba, 1985; Shenton, 2004). Despite deep philosophical differences, central both these positions is the idea of procedural fidelity in which the methods used are an intrinsic indicator of quality (Maxwell, 2012).

Realist research requires a different approach, which incorporates consideration beyond procedural specifics alone to include consideration of conclusions drawn from the research by using the procedures in the context of the research (Maxwell, 2012). Yin (2009) proposes three principles for good quality case study research (multiple sources of evidence; a case study database; a chain of evidence); but these principles do not seem sufficiently well-developed to serve as definitive criteria. To reflect upon the quality of my study I chose Mays and Pope's (2000) suggestions of questions to ask of qualitative research underpinned by a realist philosophy, incorporating my use of the two questionnaires within these criteria. These questions are a development of quality criteria common to qualitative and quantitative research (Mays and Pope, 2000). I offer these questions with three realist caveats: first, the idea of a single set of quality criteria is fundamentally debatable (Mays and Pope, 2000); second; there is emphasis upon the relational aspect between criteria, rather than viewing them as discrete entities (Maxwell, 2012); third, that an assessment of quality may only be made once the reader has conclusions drawn from the research (Maxwell, 2012). I shall explore these questions in the discussion chapter (Chapter 9); I present them here for the reader to hold in mind:

- Was the research worth doing, and has it has contributed usefully to knowledge?
- Was there a clear research question?
- Was the design appropriate to the question?
- Was the context described well enough to relate the findings to other settings?
- Was there use of more than just convenience sampling approaches?
- Was there clarity about the data collection and analysis methods?
- Were there sufficient data presented in the findings of the study, and reflections upon the impact of the methods used upon the data obtained?

Reflexivity in realist research advocates the need for researchers to acknowledge themselves within their research, including reflections upon the effects of personal characteristics upon their data (Mays and Pope, 2000), and the personal decisions made throughout their research (Maxwell, 2012). The following information about me may be useful before turning to the findings chapters; I shall return to my position in Chapter 9:

- I am White British, middle-class, male, from Northern England, in my early 30s
- My further and higher education initially involved arts subjects. In my mid-20s I became interested in health and social sciences, completing a Psychology diploma with a view to becoming a Clinical Psychologist. Subsequent experience as a research assistant saw me move towards research rather than clinical practice, and I undertook a Master's degree in Social Science and Health Research
- I am based within a School of Nursing, Midwifery and Social Work, but I am not a clinician. My thesis is concerned with technologies, but I am not an engineering or computer scientist
- I have experience of social care work, supporting children with learning and developmental disabilities, and adults with brain injuries, but not with older adults or those with dementia.

4.4 Summary

In this chapter I proposed the research question "How might the use of monitoring technologies become part of routine practice in care homes for people with dementia?" in order to understand factors which appear to help or hinder the implementation of monitoring technologies in care homes for people with dementia. I outlined the following methodology to explore this question:

- realist philosophical position
- embedded multiple-case study design
- combination of purposive and theoretical sampling of three dementia-specialist care homes in North West England, and of a range of staff, relative and residents within each of these homes

- primarily qualitative methods (interviews, non-participant observation, documentary collection), analysed via the framework approach
- questionnaires regarding attitudes towards and use of technologies, and usability of technologies, analysed by non-parametric statistical tests
- realist considerations of quality assessment.

In Chapters 5-8 I present the findings from the study; in Chapter 9 I discuss the findings and reflect upon the study.

Chapter 5: Contextual details

5.1 Introduction

I recruited three dementia-specialist care homes in the North West of England to participate in the study. The homes were diverse in their organisational and physical characteristics and care registration. They were each using a type of nurse call system, and all had experience of different additional monitoring technologies. Table 5.1 summarises the characteristics and technologies of each home.

Table 5.1: Care home characteristics and technologies

Care home	Beds	CQC registration	CQC inspection	Building design	Ownership structure	Location	Technologies
Sycamore Lane	60	Nursing	Meeting all areas (July 2014)	Purpose built	Independent	Coastal town	Nurse call system; activity tracker
Conifer Gardens	60	Nursing	Meeting all areas (October 2014)	Purpose built	UK-wide chain	City suburb	Nurse call system; location-based system
Heather Grove	27	Residential	Meeting all areas (May 2014)	Converted Victorian house	Small local group	Town suburb	Nurse call system; door monitors

In this chapter I provide:

- a detailed description of each care home, including its organisational and physical characteristics, monitoring technologies, and philosophy of care
- information about data collected and participants involved in the study.

5.2 Sycamore Lane

5.2.1 Characteristics

Sycamore Lane was situated in a residential area of a coastal town. It was a purpose-built facility with rooms for 60 residents, set over four floors. The home specialised in caring for people with dementia, and was registered as a 'nursing home' with the Care Quality Commission [CQC], providing both residential and nursing care. At the time of fieldwork, the latest available CQC report (July 2014) showed that the home was meeting all standards of inspection. Sycamore Lane was an independent care home which was not part of any parent company or chain. The senior organisational structure of the home included a Director (the owner), a Registered Manager (who was not a clinician or care worker), and a Head Nurse (Registered Nurse - RN).

The ground floor contained administrative offices, the main kitchen/dining area, two lounge areas, and a bar area. One lounge area and the bar area were equipped with TVs, with the other lounge area functioning as a library containing books and DVDs. There were seats arranged along one side of a main corridor. Resident bedrooms were located along two smaller corridors, one at each end perpendicular to this main corridor. There was a room along the main corridor which contained arts and crafts materials, but tended to function as a quieter room, occupied less regularly than the other lounge areas. This room contained a door to the garden. Access to the garden was also gained through a door from the kitchen/dining area. The garden contained paving with outdoor seating, a barbeque, grass areas, plant beds, and a chicken coop.

The first and second floors were arranged very similarly to the ground floor, with resident bedrooms on corridors located at either end of the main corridor. The first floor contained a small kitchen area and a salon area off the main corridor. There was a fish tank in the main corridor and a large TV mounted on the wall. The second floor contained a small kitchen area and a small lounge space with TV off the main corridor. There were seats arranged along the walls of the main corridors of the first and second floors. The kitchens on the first and second floors were used to prepare breakfast and snacks

throughout the day, but lunch and main evening meals were prepared in the ground floor kitchen and sent up for those residents who were unable or did not want to eat in the main dining area on the ground floor.

On each floor, resident bedroom doors displayed the room number. Each resident had a cabinet mounted on the wall outside their room in which photographs and other artefacts could be displayed. Some residents had their names displayed in their cabinet. Biographical profiles of some residents were displayed on the walls in the corridors.

Figure 5.1 summarises the layout of the ground, first and second floors described above: a long main corridor with communal areas, and bedroom corridors aligned perpendicular to the main corridor.

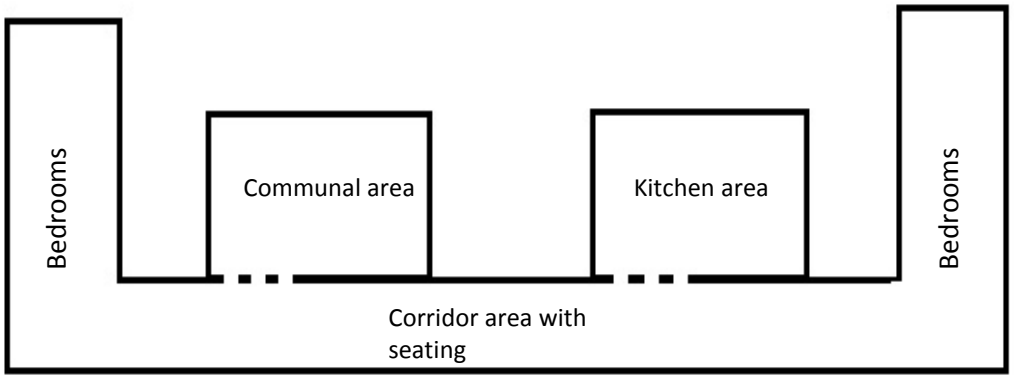

Figure 5.1: Sycamore Lane floor plan

The third floor contained a smaller number of resident bedrooms, and was home to two residents at the time of fieldwork. There were no seats in the corridor and no communal space occupied by residents; residents from this floor spent their day on the ground floor. There was a small lounge space with a TV which tended to be used by staff for breaks. There was also a small meeting room.

The ground floor was mainly home to the most cognitively able and most mobile residents, receiving residential care. The first floor was mainly home to residents presenting with more challenging behaviours (often with mental health comorbidities), receiving a mixture of residential and nursing care. The second floor was mainly home to residents receiving nursing care. The third floor was home to two residents with good mobility who were receiving residential care. There was movement between floors by residents, for example, some residents from the first floor spent the day time on the ground floor. The staff teams were broadly divided amongst each of these floors so that any one member of staff was likely to work on the same floor each shift, although there was some movement between floors depending on service need. On a day shift, each of the ground, first and second floors was staffed by one Senior Care Worker overseeing a small team of Care Workers. The third floor was not staffed because the residents from the third floor spent their days on the ground floor. There was one RN on duty for the whole home. On a night shift, there was one Care Worker on each of the ground and third floors. The first and second floors were staffed by one Senior Care Worker and one Care Worker. During any shift, there was at least one RN on duty for the whole home.

5.2.2 Monitoring technologies

Sycamore Lane had installed a nurse call system which could be activated by residents or by staff requiring help. Most bedrooms were equipped with a bed sensor placed underneath the mattress which would generate an alert when the resident left the bed. This bed sensor plugged into a unit attached behind the headboard. For staff, there were buttons on this unit to press; for residents, there was a button at the end of a cable that plugged into this unit. There were also buttons on units positioned on the wall in the ensuite bathroom. In addition, one resident had a sensor installed outside his bedroom door which would alert staff when the door was opened. In communal areas there were alert button units affixed to walls in prominent positions e.g. outside lifts and in communal bathrooms. All alerts from this entire nurse call system were delivered to pagers carried by staff.

Sycamore Lane was also experimenting with one resident using an activity tracker. This tracker was carried by the resident, either clipped to clothing or in a pocket, and could record information about the resident's mobility, including steps, duration of activity, distance and caloric burn. These technologies were off-the-shelf technologies rather than bespoke designs. For further descriptive detail about the technologies at Sycamore Lane, see Appendix 14.

5.2.3 Philosophy of care

Sycamore Lane appeared to promote a philosophy of care which tried to involve residents as much as possible in the midst of activity within the home, rather than a stereotypical care home where residents sat in isolated rooms with little stimulation. This philosophy was emphasised by Registered Manager Erica:

> *"it's quite a different sort of care home really...it's not the usual, because people are encouraged to live their lives rather than sitting in a lounge"*
>
> (Erica, Registered Manager, Sycamore Lane, interview)

This philosophy appeared to help to explain the layout of the home shown in Figure 5.1, in which seating was arranged in the corridors as well as in lounge areas. Many residents regularly sat in these corridor seats, which seemed to have advantages and disadvantages:

> [Ernie] said that the chairs in the corridor were a bit odd and that it felt like "*they're waiting in the corridor*"… He did however say that the arrangement "*sort of works*" because residents are in the middle of the "*hustle and bustle*" of what is going on, rather than being tucked away in rooms.
>
> (Ernie, Care Worker, Sycamore Lane, informal interview)

Head RN Tiffany, who had 35 years' career nursing experience, underscored the appeal of the home in contrast to her experiences of other homes:

> *"you go into dementia homes and they're all sat round looking at each other and there's no stimulation, there's no touching or hugging and communication...when I met [Sycamore Lane owner] Nigel, I just liked his drive and his enthusiasm and his ideas and to give these people a better life"*
>
> (Tiffany, Head RN, Sycamore Lane, interview)

At the individual resident level, helping residents enjoy a better life was well exemplified by George, who appeared to be one of the most cognitively able residents and had a keen interest in DIY. He had a selection of tools in his room and on a preliminary field visit, owner Nigel mentioned to me that they were looking into providing George with a shed in the grounds outside his room. Later during my fieldwork, I noticed that this shed had been installed.

On a preliminary field visit, Nigel reported that he would like to see more diary entries within the care records about what residents have done during the day, and he was keen to share this information with relatives. This feeling was echoed later in the fieldwork by other staff, including night RN Nicky, who said that clinical data alone cast the residents as "*eating and drinking machines"* (Sycamore Lane, field visit 18). Nigel acknowledged the time demands for staff to record non-clinical (and non-legally-required) information, which perhaps illustrated challenges in realising the person-centred philosophy of care for which the home was striving.

Sycamore Lane's website suggested that they appeared to promote a philosophy of care emphasising a full range of dementia services, including heavy investment in innovative technologies. On a preliminary field visit, owner Nigel also stated that he was concerned about the cost of technologies that were marketed at care homes. His concern was informed by a previous career in technology development. He felt that care homes were targets for exploitation by some technology manufacturers who convinced care home managers to spend vast sums of money in the name of sophistication and enhanced data

security. His technological knowledge meant that he was keen to explore as much potential for technologies to enhance care as possible, but at an affordable price.

5.3 Conifer Gardens

5.3.1 Characteristics

Conifer Gardens was situated in an suburban area of a city. It was a purpose-built facility with rooms for 60 residents, set over three floors. The home specialised in caring for people with dementia, and was registered as a 'nursing home' with the CQC, providing both residential and nursing care. At the time of fieldwork, the latest available CQC report (October 2014) showed that the home was meeting all standards of inspection. Conifer Gardens was the flagship specialist dementia care home of a large UK health and social care charity supporting people in England and Scotland with a range of care needs including dementia, autism, learning disabilities, and mental health needs. The senior organisational structure of the home included a Registered Manager (who had experience of delivering care), a Deputy Manager (who was also an RN), a Clinical Lead, and an Occupational Therapist.

Conifer Gardens contained five identical 12-bed households, each of which functioned as a self-contained household with its own entrance. Each household was designed in an open plan fashion containing a kitchen area and living space. The kitchen was fully equipped but used mainly for making breakfast, snacks and drinks throughout the day. Snacks and drinks were made whenever residents desired, so that the kitchen was more akin to a home kitchen than a formal dining room or canteen. Lunch and the main evening meal were prepared in the main kitchen of the home and delivered to each household via mobile hotplates; the kitchen of the household was then used as a base from which to serve meals and wash up. There were three four-seater dining tables adjacent to the kitchen. The living space contained a variety of lounge chairs and a large shelving unit for books, DVDs and a TV. There was a staff workstation in one corner containing a desk and cabinets with resident care files. Three bedrooms were located on the periphery of this open plan area with the remaining nine located down either side of

a corridor running away from one corner of the open plan area. Each bedroom door displayed the room number and the name of the resident. Figure 5.2 summarises the layout of a household:

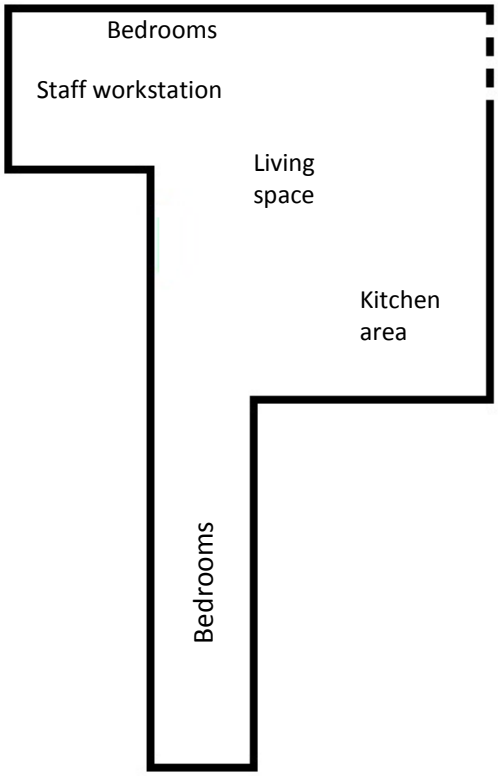

Figure 5.2: Conifer Gardens household floor plan

One of these households was on the ground floor. The ground floor also contained the reception area, a salon, and a large, open-plan café space. There was access to gardens which contained a number of plant beds and a chicken coop. The other four households were located on the first and second floors. These two floors were identical in layout. Each floor was a mirror image design containing two households located at opposite ends of a corridor. There was a communal area off this corridor between each household; on the first floor this area was used as an exercise area, on the second it was used as a library. On each of the first and second floors there were meeting rooms/management offices located off the main corridor. Each household had access to outdoor space. The ground floor household had doors which opened directly into the gardens described above. The first and second floor households each shared balcony space with the

opposite household on that floor. These balconies overlooked the gardens, ran parallel to the corridors and were accessed from doorways within each household. Figure 5.3 summarises the mirror image design on the first and second floors:

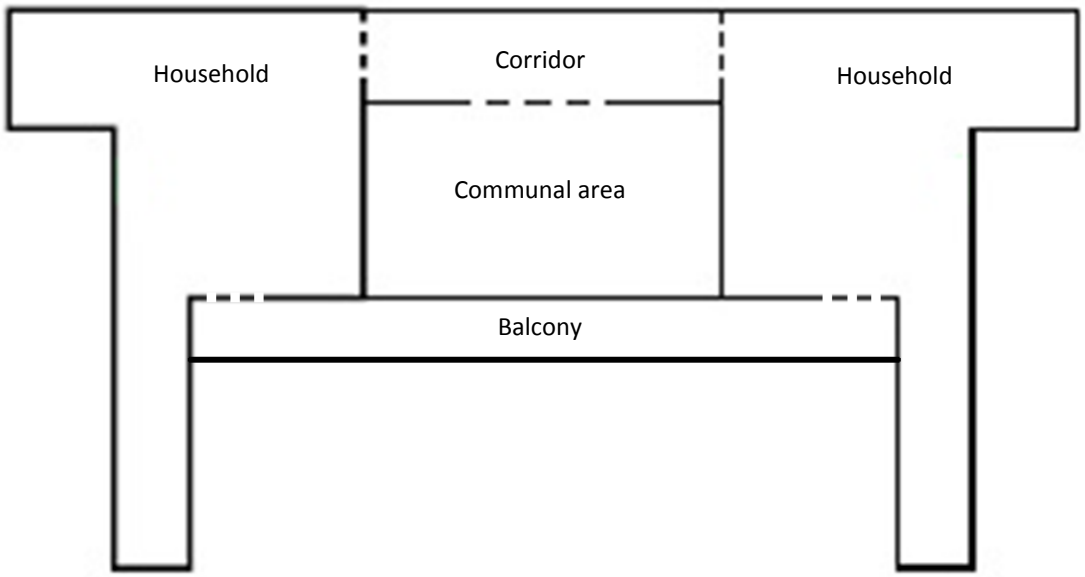

Figure 5.3: Conifer Gardens floor plan

The three households located on the ground and first floors were for residents receiving residential care. The managers reported that the household on the ground floor had been intended to provide temporary respite care, however this provision had been eclipsed by an increased demand for permanent residential places. The two households on the second floor were for residents receiving nursing care. Residential and nursing care was delivered by separate staff teams. There was rotation of staff between the individual households within each area of care, but no rotation of staff between residential and nursing care. On a day shift, each household was led by a Senior Care Worker (residential care) or an RN (nursing care) overseeing a small team of Care Workers. On a night shift, there were two Senior Care Workers across the three residential households, and one RN

for the two nursing households, again overseeing a small team of Care Workers in each area of care.

5.3.2 Monitoring technologies

Conifer Gardens had installed a nurse call system which could be activated by residents or by staff requiring help. Some bedrooms were equipped with a pressure mat, which could be positioned beside the bed and which would generate an alert when the resident placed pressure on this mat. This mat plugged into the unit installed in the wall, which also contained call buttons. Residents could also pull chords located near their beds or in their bathrooms. In communal areas there were buttons installed in the walls in prominent places, e.g. stairwells and communal rooms. All alerts from this whole nurse call system were delivered to wall units in communal areas. Each of the 12-bed households had a wall unit prominently displayed in the living space. There were also wall units in reception and management offices.

Prior to fieldwork, Conifer Gardens had made use of a location-based system [LBS] with some residents. This technology required residents to wear individualised fobs which communicated with sensors installed in the ceiling via radio-frequency identification [RFID]. The LBS could be set up to send alerts to pagers carried by staff regarding the location of each resident, and could record data about their movement. The LBS could also record the location and movement of the pagers carried by staff. Data such as resident activity levels and movement patterns, and time spent by staff in rooms, were collected on a computer system accessible by management. At the time of fieldwork, Conifer Gardens was not using the LBS; reasons for this are explored in the subsequent findings chapters. These technologies were off-the-shelf technologies rather than bespoke designs. For further descriptive detail about the technologies at Conifer Gardens, see Appendix 14.

5.3.3 Philosophy of care

Conifer Gardens' philosophy of care appeared to be an approach in which any intervention and support should make sense for the individual resident, rather than being justified on any general grounds. The home's website emphasised a tailored nature of support, delivered within state-of-the-art facilities by highly trained staff. Examples of this modern provision included employing its own Occupational Therapist, and the presence of gym equipment in the communal area of one floor (see Figure 5.3). Throughout all of my field visits I never saw this equipment being used, or hear any staff encouraging its use, and hence there may have been challenges in maximising its potential; however, the home occasionally offered other modern exercise activities such as Zumba classes.

The personalised, tailored philosophy of care was well exemplified through consideration of the home's experience of using the LBS technology. During a preliminary field visit, Deputy Manager Ben stated that the aspect he most valued about the LBS was its capacity to be personalised for individual residents, rather than simply employed as blanket monitoring of all residents regardless of individual need. The LBS was promoted via the manufacturer website and the training manual as being able to offer a range of benefits, including its potential to monitor the impact of a clinical intervention at the individual resident level, described in interviews by two clinical staff:

> *"it might be that somebody's undertaking physio, and you want to measure the movement and how much more movement that person is doing compared to what they were doing before…"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

> *"from an OT, physio even perspective, that would be, brilliant when you put a care plan in place, we would've been able to monitor how often somebody was walking around…you could look on the system… pull out the graphs and say, such-a-body's not mobile, or, you can see the patterns changing, and then at least you could look into why"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

The above quotes exemplify how this potential of the LBS seemed to appeal to a philosophy of intervention tailored to individual residents. However, there seemed to be suggestions of unease in justifying expensive specialist technologies such as the LBS as synonymous with specialist care:

> *"just because people are in a specialist 'care home', doesn't mean they need specialist products to keep them 'safe', because they still live in essentially their own house, it's just a bigger house now"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

Ben's comment here seemed to echo concerns of Nigel, owner of Sycamore Lane, about a dubious narrative around costly products which might be promoted by technology manufacturers.

5.4 Heather Grove

5.4.1 Characteristics

Heather Grove was situated in a suburb of a large town. It was a converted Victorian house with rooms for 27 residents, set over four floors. The home specialised in caring for people with dementia and was registered as a 'residential home' with the CQC, providing residential care. This registration meant that Heather Grove provided specialist dementia care for residents who may have complex needs, but unlike Sycamore Lane or Conifer Gardens, Heather Grove did not provide nursing care. At the time of fieldwork, the latest available CQC report (April 2014) showed that the home was meeting all standards of inspection. There had been a care home on the site for over two decades, but the home had been operating as Heather Grove since 2009 when it was taken over by a small parent company which provided a range of support services for older people in the North West of England. The senior organisational structure of the home included a Registered Manager (who was not a clinician or care worker) and a Deputy Manager (who was also a Senior Care Worker).

The ground floor contained a large lounge area at the front of the house with seating and a TV. At one end of this lounge was bookcase, a filing cabinet for resident care files, and a large table which often served as a staff workstation. At the other end of the lounge was the main TV set. At the back of the house was a conservatory area which had been converted into a dining room. From this conservatory dining room there was access to outdoor decking containing plant beds, and a chicken coop. The basement of the house contained offices, a staff room, and the kitchen, and was not accessed by residents. Unlike the smaller kitchens located in Sycamore Lane and Conifer Gardens, this basement kitchen was the only kitchen within Heather Grove. All snacks and meals were prepared in this kitchen and were brought up to the ground floor via a mobile hotplate. Snacks and meals were served either in the conservatory dining room or in the lounge area depending upon individual resident preference. Figure 5.4 summarises the layout of the ground floor:

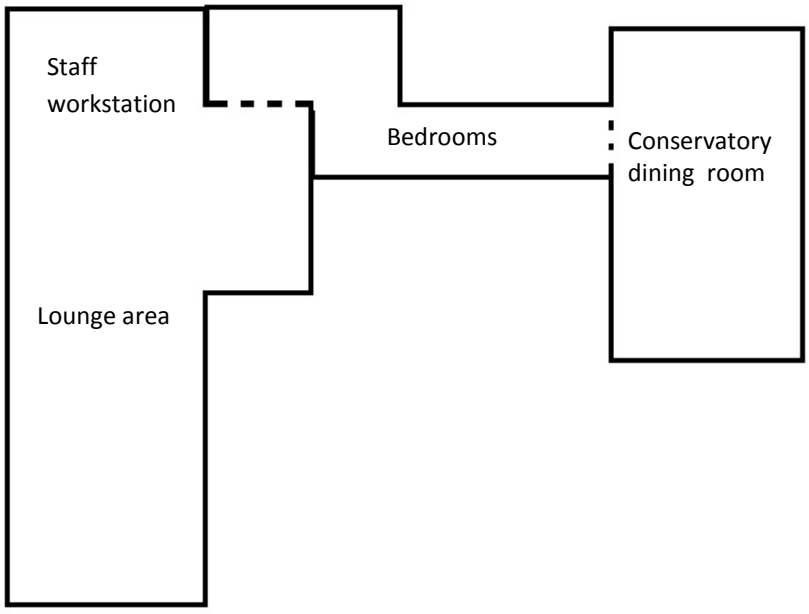

Figure 5.4: Heather Grove ground floor plan

In the middle of the ground floor between the lounge and the conservatory dining room there were a small number of bedrooms. The majority of the bedrooms were located on the other floors. Each resident's bedroom had a number on the door, the name of the resident, and a picture of the resident. There were communal bathrooms on each floor, but no other communal spaces on any floors other than the ground floor. Therefore most residents spent their day time on the ground floor. The home paid homage to the generation of the residents: the décor of the ground floor included pictures of cultural icons such as Marilyn Monroe and Audrey Hepburn, reprints of 1950s advertisements for household products, and reprints of newspaper pages from 1952 referring to Queen Elizabeth II's imminent coronation. There was also a smart TV (television with integrated internet) near the staff workstation which essentially functioned as a jukebox; it was usually playing 'Golden Oldies' playlists via YouTube. Residents and staff did not seem to comment upon this décor or upon the music, and I did not observe any residents interacting with the smart TV. However the home also made other gestures of generational tradition such as serving fish on Fridays, which some residents stated that they enjoyed.

Each day, the home was staffed by a small team consisting of one Senior Care Worker and three Care Workers. On a night shift there were two Care Workers on duty. Unless directly attending to residents in bedrooms, staff were based on the ground floor and were not permanently stationed on other floors. Therefore in contrast to Sycamore Lane and Conifer Gardens, there was only one staff team in operation at any time, which worked throughout the home rather than operating within a particular area of service in a particular location.

5.4.2 Monitoring technologies

Heather Grove had installed exactly the same nurse call system as Conifer Gardens. There was one main wall unit displaying alert information which was located in the ground floor lounge area. There were smaller wall units located in corridors on each of the other floors. In addition to the nurse call system, Heather Grove had also installed door

monitoring technology in the form of wireless tags, approximately 5cm^2, affixed to the inside top corner of each bedroom door. These door monitors could record data about the time and duration that the door was opened. These data were accessed via a laptop in the managers' office and were not sent directly to staff. These technologies were off-the-shelf technologies rather than bespoke designs. For further descriptive detail about the technologies at Heather Grove, see Appendix 14.

5.4.3 Philosophy of care

In comparison to Sycamore Lane and Conifer Gardens, Heather Grove was a small building with a lower number of residents. The home's website pointed to a philosophy of care which emphasised a safe and homely environment. This philosophy appeared to help staff feel they could get to know individual residents in detail due to the frequency with which they would see one another:

> *"you get more of a one-to-one, because you're only a small home… we're in nearly every day, they get used to us and we get used to them"*
>
> (Tracy, Care Worker, Heather Grove, interview)

One relative suggested that although the general décor of the home might not be the most modern, the warmth of the staff was more important:

> *"it felt very homely straight away, the lady that's sort of in charge, Kathy, she's just a very warm person...at the time it wasn't the most lavish sort of surroundings...but I thought it wasn't just that…"*
>
> (Lucy, daughter, Heather Grove, interview)

The owners of Heather Grove were carrying out a makeover of the building. On a preliminary field visit, I noted that I got a strong sense of how the home, in a converted Victorian house, was very different to the modern, purpose-built facilities of Sycamore Lane and Conifer Gardens, and how the owners were working to modernise the building:

> Upstairs is rather dingy, with dark red/maroon carpets. It feels like a budget hotel. [Registered Manager] Julian said that they had started to colour-code doors and that they wanted to get new carpets...There is also a new decking area outside which Julian said they had got planning permission for and recently put in, as previously there was only grass and the residents couldn't get down to it.
>
> (Heather Grove, preliminary field visit)

There was a sense that the ongoing modernisation was contributing to making the homely environment better for the residents and their relatives and improving opportunities for interaction:

> *"the people who have got it now have really really improved the care for the residents, with getting like the garden at the back so that everybody can sit out with their relatives in the summer"*
>
> (Tracy, Care Worker, Heather Grove, interview)

> *"it's nice they have the outdoor [decking]… they've done quite a lot with it since my dad came in"*
>
> (Lucy, daughter, Heather Grove, interview)

Deputy Manager Kathy articulated a philosophy which tried to put resident interest at the heart of decisions which were made about care:

> *"everything that's prescribed for that person, it's always in the interest for them...[there are] a lot of things we do here that doesn't make it easier for the carers"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

I recruited Heather Grove into the study when a preliminary conversation with the Managing Director [MD] of the parent company revealed that they had received government funding to invest in the door monitoring technology. The MD reported that the reason for implementing this technology within Heather Grove was that as the

specialist dementia home within the company, it had the most acute problem in terms of residents 'wandering' and subsequently falling or injuring themselves, or absconding through fire exits. The technology was intended to provide more robust data about door openings rather than relying on oral reports and hearsay from staff. The technology was to be implemented within Heather Grove and if deemed useful, would be rolled out to the other homes in the group. The MD felt that if this technology were implemented throughout the company's homes, they would be one of the leading companies in the country in terms of use of technology in care homes.

5.5 Data and participants

5.5.1 Data collected and participant demographics

I collected data via a total of 175 hours' observation, 36 interviews, nine resident care plans, 33 Media and Technology Usage and Attitudes Scale [MTUAS] questionnaires, 24 System Usability Scale [SUS] questionnaires, five technology manufacturer websites and one technology training manual. The breakdown of this data collection by care home and participants is shown in Table 5.2.

Table 5.2: Data collected

Method/source	Sycamore Lane	Conifer Gardens	Heather Grove	Total
Observation (hours)	73	74	28	**175 hours**
Semi-structured interviews	10 staff (1 Registered Manager; 2 RNs; 6 Senior/Care Workers; 1 facilities)	11 staff (1 Registered Manager; 1 Deputy Manager/RN; 3 RNs; 4 Senior/Care Workers; 2 clinical)	3 staff (1 Deputy Manager/Senior Care Worker; 2 Care Workers)	**24 staff**
	2 relatives 1 resident	6 relatives 1 resident	1 relative 1 resident	**9 relatives** **3 residents**
Care plans	4 residents	4 residents	1 resident	**9 residents**
MTUAS	10 staff 2 relatives	11 staff 6 relatives	3 staff 1 relative	**24 staff** **9 relatives**
SUS	10 staff	11 staff	3 staff	**24 staff**
Manufacturer literature	Nurse call/bed sensors (website); Activity tracker (website)	Nurse call/pressure mats (website – as at Heather Grove); LBS (website and training manual)	Nurse call/pressure mats (website - as at Conifer Gardens); Door monitors (website)	**5 websites** **1 training manual**

I use the following terminology when citing data:

- **Field visit** refers to observational notes, which may include direct quotations from brief conversations with people. Field visits are presented typographically as notes which may contain clearly demarcated direct quotations
- **Informal interview** refers to an in-depth, semi-structured interview conducted with a specific participant, during which notes were taken but which was not recorded (either because the participant was a member of staff who was unable to set aside time for a recorded interview in a quiet room, or because the participant was a resident who was cognitively capable of an informal interview in

repeated short moments). Informal interview data are presented typographically like field visit notes, with clearly demarcated direct quotations

- **Interview** refers to an in-depth, semi-structured interview conducted with a specific participant which took place in a quiet room, recorded and transcribed verbatim. Interview data are presented typographically as direct quotations from the participant
- Clarifications and explanations are presented in square brackets within the extract of data.

The 24 staff members who took part in semi-structured interviews also completed the MTUAS and the SUS. The nine relatives who took part in semi-structured interviews also completed the MTUAS. Of the nine residents whose care plans were accessed, three were cognitively capable of participating in informal interviews. Demographic data for the 24 staff, nine residents and nine relatives are shown in Table 5.3. For Sycamore Lane and Conifer Gardens, the majority of staff participants had worked in the home for around two years. Both of these homes were purpose-built and had been opened within recent years. Heather Grove had functioned as a care home site for much longer, under previous ownership. One staff participant had worked at Heather Grove for 21 years, which was a notable outlier in these data; the other two staff participants at Heather Grove had worked in the home for between three and five years. Most relatives and residents had been involved with the homes for between one and two years. The mean age of staff was around 40 years, although ages ranged from early 20s to early 60s. The mean age of relatives was around 55 years. The mean age of residents was around 81 years. The majority of participants were of White British ethnic origin. Most staff and relatives had experienced some form of education after leaving school. Most residents had either not experienced post-school education, or their relatives did not supply this information.

Table 5.3: Participant demographic data

Demographic data		**Sycamore Lane**	**Conifer Gardens**	**Heather Grove**	**Total**
Staff	*n*	10	11	3	24
Age (years)	Range	21–64	24–52	27–62	21–64
	Mean	43.1	36.36	41.0	39.75
	Standard deviation	14.99	8.44	18.52	12.62
Time working in home (months)	Range	12-37	12-28	43-252*	12-252
	Mean	25.8	24.55	118.33	36.79
	Standard Deviation	8.84	4.39	116.07	46.93
Further or Higher education	Yes	9	11	2	22
	No	1		1	2
Ethnic origin	White British	10	8	2	20
	Asian or Asian British Indian		1		1
	Mixed White & Black African		1		1
	Black or Black British African		1	1	2
Residents	*n*	4	4	1	9
Age (years)	Range	72–95	72–81	95	72–95
	Mean	83.75	76.75	n/a	81.33
	Standard deviation	10.24	3.78	n/a	8.22
Time resident in home (months)	Range	24-27	12-24	9	9-27
	Mean	25.5	16.5	n/a	19.33
	Standard Deviation	2.121	5.26	n/a	6.58
Further or Higher education	Yes		2		2
	Unknown	3			3
	No	1	2	1	4
Ethnic origin	White British	4	4	1	9
Relatives	*n*	2	6	1	9
Age (years)	Range	49–66	41–78	51	41–78
	Mean	57.5	55.8	n/a	55.67
	Standard deviation	12.02	14.9	n/a	12.67
Further or Higher education	Yes	2	5	1	8
	No		1		1
Ethnic origin	White British	2	6	1	9

*252 months is not a typographical error; one staff member had been working at the site for 21 years.

5.5.2 MTUAS and SUS

I calculated mean and median scores for each subscale of the MTUAS for participant type (staff or relative) and for each care home; I tested differences in means for statistical

significance using the Mann-Whitney U test and the Kruskal-Wallis one-way analysis of variance (Table 5.4).

Results from the Usage subscales suggested that there were very few significant differences between staff and relatives in their usage of technologies in everyday life; however, the sample size was very small and thus likely not powered to detect statistical differences. Significant differences at the .05 level were found between mean scores for staff and relatives on the subscales of Internet Searching, General Social Media usage, and Facebook Friendships. For each of these subscales the staff mean score was higher, showing a significantly higher level of internet searching, use of social media, and number of Facebook friendships amongst staff than relatives. These data are not surprising; Table 5.3 shows that the mean age of staff (39.75 years) was lower than the mean age of relatives (55.67 years), and internet use (particularly use via mobile devices) has been shown to be higher in younger age groups than older age groups (ONS, 2014b). For all other subscales there were no significant differences between staff and relatives in their usage of technologies in their daily lives. There were no significant differences in mean scores for any subscale between care homes, suggesting that there were no significant differences between care homes in how participants used technologies in their daily lives.

Results from the Attitudes subscales showed that there were no significant differences in attitudes towards technologies between staff and relatives. Mean scores on the Positive Attitudes subscale were in the low to mid-20s out of a maximum 40, which suggested that participants generally seemed to hold reasonably positive attitudes towards technologies. There was no particular group of participants with very strongly positive or negative attitudes towards technologies. There were also no significant differences in attitudes towards technologies between care homes, which suggested that there was not one particular care home in which there might have been a prevailing culture of either very high enthusiasm or strong scepticism towards technologies in general.

Table 5.4: MTUAS scores by subscale according to participant type and care home

MTUAS Subscales		**Participant type (all care homes)**		**Tests between participant type (two-tailed)**		**Care home (all participant types)**			**Test between care homes (two-tailed)**
Usage subscale (highest possible score*)		**Staff**	**Relatives**	**Mann-Whitney** p-value	**Kruskal-Wallis** p-value	**Sycamore Lane**	**Conifer Gardens**	**Heather Grove**	**Kruskal-Wallis** p-value
Emailing (40)	Mean score	23.04	17.33	.131	.124	26.00	19.29	17.25	.176
	95% CI for mean	19.38 – 26.70	7.89 – 26.78			21.22 – 30.78	13.76 – 24.83	2.02 – 32.48	
	Median score	24.00	16.00			24.00	18.00	19.50	
	Interquartile range	9	20			12	17	18	
Phone Calling (20)	Mean score	12.42	11.22	.766	.743	11.33	12.35	13.25	.481
	95% CI for mean	10.94 – 13.89	7.92 – 14.52			8.70 – 13.96	10.39 – 14.32	11.73 – 14.77	
	Median score	12.50	13.00			11.00	13.00	13.50	
	Interquartile range	4	5			6	3	2	
Text Messaging (30)	Mean score	20.92	17.89	.392	.380	20.75	20.18	17.75	.255
	95% CI for mean	19.20 – 22.64	12.63 – 23.15			18.03 – 23.47	17.11 – 23.24	13.77 – 21.73	
	Median score	21.00	21.00			20.50	21.00	17.50	
	Interquartile range	5	5			5	4	5	
Smartphone Usage (90)	Mean score	38.25	23.89	.111	.106	35.24	35.25	30.25	.772
	95% CI for mean	30.12 – 46.38	9.77 – 38.01			21.15 – 47.68	24.39 – 46.08	8.00 – 52.50	
	Median score	40.50	23.00			31.00	40.00	34.00	
	Interquartile range	28	30			33	29	26	
Media Sharing (40)	Mean score	10.42	7.25	.135	.124	12.08	8.50	6.75	.097
	95% CI for mean	7.99 – 12.84	2.57 – 11.93			7.98 – 16.19	5.61 – 11.39	3.74 – 9.76	
	Median score	10.50	5.50			12.00	8.00	7.50	
	Interquartile range	8	6			8	8	3	
Internet Searching (40)	Mean score	19.42	11.88	**.037**	**.038**	19.83	16.94	13.00	.515
	95% CI for mean	15.41 – 23.42	6.25 – 17.50			13.00 – 26.67	12.34 – 21.54	0.47 – 25.52	
	Median score	18.00	11.00			18.00	16.50	13.50	
	Interquartile range	11	9			16	8	15	
Television Viewing (20)	Mean score	9.75	7.75	.174	.157	9.58	9.13	8.75	.934
	95% CI for mean	7.95 – 11.55	6.43 – 9.07			6.79 – 12.38	7.01 – 11.24	6.36 – 11.14	
	Median score	9.50	7.00			7.00	9.00	8.00	
	Interquartile range	5	2			5	4	2	

Table 5.4 continued									
Video Gaming (30)	Mean score	7.33	5.22	.179	.161	9.08	5.59	4.75	.656
	95% CI for mean	5.18 – 9.49	1.25 – 9.19			4.51 – 13.66	3.99 – 7.18	1.47 – 8.03	
	Median score	6.00	4.00			5.00	6.00	4.50	
	Interquartile range	6	4			15	5	4	
General Social Media Usage (90)	Mean score	34.67	16.22	**.026**	**.023**	41.33	23.76	19.50	.053
	95% CI for mean	25.40 – 43.94	5.73 – 26.72			27.67 – 55.00	13.53 – 34.00	-5.30 – 44.30	
	Median score	39.00	9.00			43.50	9.00	13.50	
	Interquartile range	45	14			33	36	27	
Facebook Friendships (18)	Mean score	6.13	3.67	**.036**	**.030**	6.17	4.82	6.00	.076
	95% CI for mean	4.32 – 7.93	0.90 – 6.44			4.24 – 8.10	2.42 – 7.23	-3.00 – 15.00	
	Median score	5.50	2.00			6.00	2.00	4.00	
	Interquartile range	5	2			2	5	10	
Online Friendships (18)	Mean score	2.58	3.67	.486	.395	2.58	3.12	2.75	.697
	95% CI for mean	2.26 – 2.91	0.10 – 7.23			2.08 – 3.09	1.38 – 4.85	1.23 – 4.27	
	Median score	2.00	2.00			2.00	2.00	2.50	
	Interquartile range	1	1			1	1	2	
Attitude subscales (highest possible score)**									
Positive Attitudes Towards Technology (30)	Mean score	23.71	21.33	.29	.271	24.75	22.41	20.75	.054
	95% CI for mean	22.38 – 25.03	17.27 – 25.40			23.06 – 26.44	20.09 – 24.73	16.57 – 24.93	
	Median score	24.50	23.00			25.00	24.00	21.50	
	Interquartile range	4	7			3	5	5	
Anxiety About Being Without Technology/ Dependence On Technology (15)	Mean score	8.63	8.33	.858	.855	9.25	8.53	6.50	.313
	95% CI for mean	7.27 – 9.98	5.46 – 11.21			7.08 – 1.42	6.84 – 10.22	1.73 – 11.27	
	Median score	9.00	9.00			9.50	10.00	7.00	
	Interquartile range	5	7			5	5	6	
Negative Attitudes Towards Technology (15)	Mean score	10.04	9.11	.309	.288	10.50	9.12	10.50	.203
	95% CI for mean	9.12 – 10.96	7.55 – 10.67			9.08 – 11.92	8.08 – 10.16	7.45 – 13.55	
	Median score	10.00	9.00			10.00	9.00	10.00	
	Interquartile range	4	4			4	4	4	
Preference For Task-Switching (20)	Mean score	11.25	9.78	.272	.255	11.08	11.29	8.25	.361
	95% CI for mean	9.64 – 12.86	7.58 – 11.98			8.83 – 13.34	9.39 – 13.20	3.68 – 12.82	
	Median score	11.00	10.00			10.00	12.00	9.50	
	Interquartile range	7	4			7	7	5	

*higher score indicates higher level of usage **higher score indicates stronger attitude

The 24 staff participants also completed the System Usability Scale [SUS] in relation to the nurse call/bed monitoring technology in their home. I present results from the SUS alongside findings about functional features of the technology in Chapter 8.

5.6 Summary

In this chapter I have provided contextual information about each care home, the technologies used, the data collected, and the participants involved:

- The study involved three care homes, Sycamore Lane, Conifer Gardens, and Heather Grove
- These homes had diverse organisational and physical characteristics and care registration
- Each home was using a type of nurse call/bed monitoring technology, and all had experience of different additional monitoring technologies
- All homes were working to interpretations of person-centred philosophies of care
- Generally there were no significant differences between staff and relatives, or between care homes, in participants' general usage of and attitudes towards technologies. Most participants had a reasonably positive attitude towards technologies. Staff showed slightly more significant levels of internet use and aspects of social media use than relatives, but these data were expected given that staff participants spanned a wider age range than relatives.

In the following three chapters I present the qualitative findings based upon the framework analysis presented in Chapter 4.

Chapter 6: Why were they using the technologies?

6.1 Introduction

In this chapter I explore reasons why the care homes were using the various monitoring technologies. The chapter is mainly comprised of one subtheme *Justification for Use*, intersected by the themes of *Understanding* and *Business and Environmental Influences*. I explore justifications given for using the technologies and consider how justifications may be related to people's understanding of technologies and related to influences from the wider environment of social care.

6.2 Mitigation of risk of falling

The most common justification reported for using bed sensor and pressure mat technologies was to mitigate risk of residents falling. There was some evidence that justifications for using the technologies were made based on the likelihood that a resident would fall. For example:

> Hilary, an RN (night) at Sycamore Lane, stated that staff did not need to know when a resident who was able on their feet got up to go to the toilet, but they did need to know for a resident who was assessed to be at risk of falls
>
> (Sycamore Lane, field visit 5)

Similarly, a nurse at Conifer Gardens stated:

> *"if someone's never had falls or they're mobile or they're steady on their feet, there's no reason to put [a pressure mat] in place"*
>
> (Sonia, RN, Conifer Gardens, interview)

At Conifer Gardens and Heather Grove, justification for use of a pressure mat was documented within individual resident care plans. At Heather Grove, falls intervention sections in resident Jack's care plan stated that a pressure mat was to be used. At Conifer Gardens, falls intervention sections of care plans for residents Gillian, Duncan and Thomas also stated that pressure mats were to be used. At Sycamore Lane, justification for use of bed sensors was not clearly documented within the care plans. For example, resident Barry's care plan contained a detailed falls risk assessment which outlined how he was at risk of falling out of bed, at risk of falling over obstacles, was unsteady on his feet, and had a history of climbing over bed rails. Due to his high risk of falling, Barry had been given protective headwear. Use of the protective headwear seemed to illustrate the suggestion that the bed sensor was used as a first line of defence against falls, and that care provision could be expanded upon if the bed sensor was not deemed to be lowering the number of falls:

> *"it starts off obviously they have one or two falls out of bed so the bed alarm gets put on...if that keeps happening...then the basic bits are back in place, bed rails, wedges, so on and so forth, so the technology does play a vital part because that comes in first before everything else"*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

Barry's care plan contained entries stating that the protective headwear was to be used "*on a daily basis"* and that staff should *"remove before bed"*. However, there were no entries in his care plan regarding the bed sensor.

Justifications based on assessment of risk of falls were often initially made based on information within pre-admission documentation. On a field visit to Conifer Gardens there was a new resident who was due to arrive later that day. I observed staff putting together a new care file for this incoming resident containing the resident's pre-admission assessment:

> Olivia [RN] asked Nicola [Care Worker] to find a pressure mat for the new incoming resident. Olivia said that the lady was a falls risk.
>
> (Conifer Gardens, field visit 16)

Whilst the initial decision to use a bed sensor or a pressure mat might have been made according to pre-admission information, the decision seemed to be an ongoing process open to review. It could transpire that resident behaviour might differ from the pre-admission assessment. There was a sense that for a new resident, a pattern of activity needed to be established to determine their movement, mobility and risk of falling. Once this pattern was established, "*the bed sensor would be adjusted accordingly"* (Erica, Registered Manager, Sycamore Lane, interview). A resident's night-time mobility pattern may be very different to their day-time mobility pattern, as the Deputy Manager at Heather Grove illustrated:

> *"you trial [a pressure mat] out on some people for say a week, and they might not get out of bed at night at all, just cos they wander in the day doesn't mean they wander in the night…so maybe after a couple of weeks they wouldn't need that mat"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

Ongoing justification for use of a pressure mat was most evident at Conifer Gardens. It seemed that there was a willingness to use a pressure mat as a temporary measure if a resident was experiencing periods where they were deemed to be at an increased risk of falling. This temporary use was exemplified by Deputy Manager Ben:

> *"through [name of female]'s life with us, we put and took a pressure mat away on two occasions, we put it in when she first came because she was getting out of bed and very unsteady, then she put weight on and became a lot more steady so we took it away, then she became more frail and wouldn't be able to stand up, but tried anyway, and so we put it back in again, and then near the end of her life she wouldn't try at all so we took it back out"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

One way to decide whether or not a resident continued to need a pressure mat seemed to come from a review of their falls care plan, evaluated *"at least every month"* (Sonia, RN, Conifer Gardens, interview). It appeared that for some staff, decisions that residents

no longer needed a pressure mat were difficult to accept. For example, one nurse suggested that removal of a pressure mat might lead to an increase in falls:

> *"the ones that didn't have a fall in such a long time, he eventually he's [Ben, Deputy Manager] took off all the sensor mats...but then the ones that had the mats took off them have fell again"*
>
> (Martha, RN (night), Conifer Gardens, interview)

Another member of staff reinforced this view by suggesting that pressure mats might be effective in decreasing in falls, and hence removal would likely lead to an increase in falls:

> *"through all the accident reports and everything you can see that they've not had accidents for ages now, [but you would not remove the mat] because, they're still getting up, you're just getting there before they're falling"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

At face value both Martha's and Simone's statements appeared to be well-grounded in logic: a reduction in falls could be seen within accident or incident report data, this reduction had occurred following introduction of a pressure mat, and therefore it seemed reasonable to believe that removal of the mat would lead to an increase in falls. However, on closer inspection their statements appeared to be somewhat generalised to all residents who had simply not fallen for a long period of time. The justification to keep or withdraw a pressure mat with any individual resident may have been made on a more nuanced risk assessment than simply quantitative falls data. For example, resident Thomas's care plan showed that despite his falls risk assessment score decreasing over time, a pressure mat was still written into his care plan. When asked how she would feel about a hypothetical removal of the pressure mat from Thomas's care, his daughter Tabatha replied:

> *"I'd want to keep it in all the time because he's so unpredictable…he could think he's Superman one day and 'I can do it', and get out the bed"*
>
> (Tabatha, daughter, Conifer Gardens, interview)

Tabatha's quote suggested that knowledge of the individual resident could be important in the decision to use a pressure mat in that resident's care: even if a resident was assessed as being low risk of falling, use of a pressure mat might be justified on grounds of their unpredictability. In most cases it appeared that removal of a pressure mat was more likely to occur when a resident's mobility had decreased to the point where they were not getting out of bed independently at all:

> *"sometimes they're [pressure mats] used when somebody's no longer getting out of bed…and they [management] will remove them"*
>
> (Olivia, RN, Conifer Gardens, interview)

So far, justification for use of bed sensors and pressure mats to mitigate risk of falls appeared to be based on continuous quantitative and qualitative assessments of risk levels of individual residents. Further understanding about justifications for use of these technologies to mitigate risk of falls can be found by a deeper exploration of how far people understood that use of the technologies was able to actually ensure prevention of falls.

Entries in care plans and interview data combined to reveal a range of different understandings about how far the bed sensors and pressure mats were able to prevent falls. At Heather Grove, resident Jack's care plan stated that a pressure mat was to be used '*to enable carers to be alerted if he begins to wander in his room'* with the outcome '*to ensure that Jack remains falls free'*. These entries were made by Deputy Manager Kathy, who said in her interview that the pressure mat meant staff were alerted every time a resident got up "*cos they might be at risk of falling"*. Taken together, these data suggested that Kathy seemed to understand the pressure mat as providing an alert, which together with a response from staff could ensure that residents remained free of falls. What was most interesting was the use of the word '*ensure'* in Jack's care plan because it implied that use of the pressure mat was imbued with a sense of guarantee of falls prevention. This word was also used at Conifer Gardens, where resident Gillian's care plan stated that pressure mats were used '*to ensure Gillian does not fall'*. The use of '*ensure'* and its implications of guarantee within the care plans stood out when

considered in relation to other data which suggested that many staff seemed to be of the understanding that bed sensor or pressure mat technologies would not be able to guarantee prevention of falls:

> *"even though they've got the sensors, people still fall…it's just to alert you that they're getting out of bed"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

Some staff seemed to understand that one function of the technologies was to alert them when a fall had occurred so that the fallen resident would not have to endure a long lie: *"we can't prevent it…but he doesn't have to lie there"* (Jodie, Care Worker, Sycamore Lane, interview). One resident also seemed to share this understanding, saying that the pressure mat was *"for when you fall, the staff come running"* (Thomas, resident, Conifer Gardens, informal interview). Pressure mats and bed sensors seemed to be understood as a valuable complement to scheduled observational checks:

> *"you could go into someone's room [on a scheduled observational check] and five minutes later they've got up and fell on the floor...if you've got that sensor activated then you do know [that the resident has fallen]"*
>
> (Nicky, RN (night), Sycamore Lane, interview)

One member of staff at Sycamore Lane seemed to understand the bed sensor as providing a prompt for staff action to deliver whatever assistance might be required:

> *"we rely on the bed sensor, so if they move out of bed we are alerted to that so we can go straight and assist"*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

Others suggested a wariness about relying on the technology, but also felt that a combination of observation and technological alert might be confusing:

"good old fashioned regular observations throughout the night is probably the best way of reducing risks to people…technological alerts can go wrong and if you, if you're relying upon them and you're waiting for them and they're not happening… so at the minute I would say we're doing both [observation and bed sensor], which is quite confusing"

(Erica, Registered Manager, Sycamore Lane, interview)

The debate about a potential for staff to rely upon technological alerts, and the relationship this might have with observational checks, was summed up by the management of Conifer Gardens who differed in their beliefs about how their night staff understood pressure mats:

Ben: *"night staff are almost reliant on them [pressure mats]…it feels to me that the night staff want to know when to go into someone's room than just do routine checks… cos if the pressure mat goes off they know they've got to go in, but if it doesn't go off they know they haven't"*

Philippa: *"I kind of differ, I kind of feel that it's, they don't want to be going in and finding people on the floor, or going in and finding that people have been on the floor potentially up to two hours"*

(Ben, Deputy Manager; Philippa, Registered Manager, Conifer Gardens, joint interview)

It is possible that use of the word 'ensure' was a reflection of the vocabulary of falls prevention guidelines (e.g. NICE, 2013; 2015), but although the word 'ensure' does occur frequently in these NICE guidelines, it is not used in direct reference to the actual prevention of a fall. It appeared that although the word 'ensure' was present in care plans, there was a general understanding amongst staff that use of the bed sensors and pressure mats could not ensure prevention of falls. This understanding did not always seem to be shared by some relatives, who reportedly believed that use of these technologies should guarantee falls prevention. It was outlined that despite staff repeatedly explaining to relatives that there was no such guarantee, some relatives did not alter their belief. One member of staff at Conifer Gardens cited discussions with *"irate*

relatives" who failed to understand that a pressure mat could not prevent a fall (Judy, Senior Care Worker (night), Conifer Gardens, informal interview). This perspective was reinforced by Deputy Manager Ben:

> *"I've told a number of relatives…'I'm not gonna be able to stop this person falling over, they're gonna continue to fall over'"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa).

Relatives themselves offered a mixed picture of understanding about the technologies. At Sycamore Lane, Alice seemed to suggest that any alert triggered by the bed sensor in her father Edgar's care should have meant that he would be prevented from falling as long as staff were not impeded from responding to that alert:

> *"if there's one staff on and they're busy, are they gonna ignore it anyway so by the time they went there he'd be on the floor?"*
>
> (Alice, daughter, Sycamore Lane, interview)

At Conifer Gardens, Carl's wife Geraldine drew on her own experience as a nurse to shape her understanding that staff might be simply too busy to respond in time:

> *"I cannot say how quickly they respond to the alarms when they go off…but working night myself and working in a nursing home, I do know that you can't be in two places at once"*
>
> (Geraldine, wife, Conifer Gardens, interview)

Thomas's daughter Tabatha stated that despite Thomas falling in a previous care home, she was unaware of pressure mat technology until Thomas moved into Conifer Gardens:

> *"I didn't know anything about [pressure mats] until he came here, I don't know how long it's been going"*
>
> (Tabatha, daughter, Conifer Gardens, interview)

Tabatha seemed unsure about a guarantee of falls prevention from use of the pressure mat, as she suggested in her interview that use of a pressure mat "*could have prevented"* her father Thomas falling in a previous care home. Gillian's son Colin suggested a deeper analysis as he considered that there might be a distinction between prevention and alert based on the physical capacities of individual residents. A pressure mat had been introduced in Gillian's care due to her lack of physical capacity upon return from hospital for treatment for a broken hip caused by a fall. Colin appeared unconvinced about the ability of the pressure mat to mitigate further falls. He felt that the pressure mat served only to alert staff to Gillian falling out of bed, because at the time the mat was introduced, Gillian did not have had the physical capacity to stand independently:

> *"it's alright putting mats there, but it's basically 'DOOF, yeah she's hurt herself'…it's not prevention, it's an alert system…[the pressure mat] was put in place…so we knew if my mum fell out of bed… I suppose she might've tried to get out of bed and stood on it, I don't know, but my main concern at that point was that she would fall out of bed"*
>
> (Colin, son, Conifer Gardens, interview)

Colin stated that the home had *"explained there was the risk involved in someone…trying to get out* [of bed] *and making it even worse"* if they used cot sides instead of pressure mats (Colin, Son, Conifer Gardens, interview). He felt that the pressure mat *"wasn't the perfect solution"* and described falls prevention for residents who lacked physical capacity as "*the million dollar question isn't it…how do you stop them falling out of bed"* (Colin, son, Conifer Gardens, interview).

Other relatives revealed that they had also expected cot sides and had not seen the pressure mats before. At Conifer Gardens, resident Duncan's wife Pamela reported that she had experience of a range of assistive technologies at home for Duncan prior to him moving into Conifer Gardens:

> *"I had all that for him, a bed that lifted up like that, with a back thing on, but that was no good to him, then they had to get the one of them beds that, remote control lifted him up, lowered to the floor, come up at the back, everything, I had all sorts like that at home, a crash mat on the floor*

and everything… I didn't have one of those that beeped but I just had the crash mat"

(Pamela, wife, Conifer Gardens, interview)

Despite this range of technologies, neither Pamela nor Duncan's daughters Amy and Caroline had seen pressure mats before Duncan moved into Conifer Gardens. His daughters reflected that they were expecting cot sides on beds and were initially unimpressed when the home revealed it used pressure mats instead of cot sides:

"they said 'oh we don't have cot sides', and we all went what do you mean you don't have cot sides?" (Amy)

"honestly… I thought that's pretty rubbish, you know, for a care home not to have cot sides… but… over a year's gone by, and… I totally understand why they don't have them" (Caroline)

(Caroline & Amy, daughters, Conifer Gardens, joint interview)

Data therefore suggested that staff understood that bed sensors or pressure mats could not guarantee falls prevention, but that this understanding might not always shared by some relatives. There was a perception that some relatives failed to understand that staff might be busy elsewhere at the time an alert was generated:

"I suppose some people [relatives] have the picture that you've got somebody almost standing outside the door ready to dive in if the mat goes off...people will obviously respond quick to that, but you could be down the other end of the corridor"

(Harry, Clinical Lead, Conifer Gardens, interview)

It seemed therefore that although bed sensors and pressure mats were used to mitigate risk of falling, their use could not completely prevent falls. I will now turn to examine use of technologies to mitigate risks other than falling.

6.3 Mitigation of risks other than falling

Justifications for using technologies also appeared to be based around mitigation of risks other than falling. One justification included cases where a resident might be identified as posing a risk to the safety of other residents. A pressure mat was used to help staff intervene when a resident got out of bed before that resident reached another bedroom:

> *"somebody might get up and go into the bedroom opposite...it could lead to an incident that could end up as a safeguarding…the pressure mats are quite useful for that...we can intervene very early"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

The clearest example of such use was at Conifer Gardens in resident Carl's care, following a number of incidents in which Carl had got up in the night, entered other bedrooms, and attacked the occupant. According to Carl's care plan, this risk was due to his agitation at noise from other residents. Carl's care plan contained numerous entries specifying use of a pressure mat to mitigate such incidents, including specification that the pressure mat should be placed by his feet if he was sitting in his chair in his bedroom. At Sycamore Lane, there was one resident who was assessed as being a risk to other residents. Rather than using a bed sensor to mitigate this risk, Sycamore Lane had installed a door sensor which would trigger an alert to staff whenever he opened his door. The door sensor was therefore used for the same reasons as the pressure mat for Carl at Conifer Gardens. It appeared likely that the use of the pressure mat in Carl's care was due to the fact that the pressure mat could be moved within the bedroom and placed next to a chair, whereas the bed sensor at Sycamore Lane did not have this flexibility of deployment and hence the addition of the door sensor was required (see Appendix 14 for detailed description of technologies). Portability for the pressure mat meant that it could be moved within the immediate environment of the bedroom, as long as the connecting cable could still reach the wall socket. The bed sensor was portable in that it could be moved between bedrooms, but the sensor had to be installed underneath the mattress and therefore there was no portability within any one bedroom.

Further understanding about justifications of use of these technologies to mitigate risks posed by residents to other residents can be found by a deeper exploration of how far people understood that use of these technologies was able to ensure prevention of incidents. The falls risk section above showed that there was a diverse understanding about whether the technologies guaranteed prevention of falls, or whether they merely provided an alert. In the example of Carl's care where a pressure mat was used to mitigate risk he posed to other residents, it seemed that there was more of an emphasis placed on the role of staff than there may have been around use for risk of falls. For example, Carl's care plan stated '*Staff to ensure sensor mats are in place. Staff to act promptly if alarm goes off*'. The additional emphasis here upon the prompt response from staff to an alert, which was not included in care plans around falls, suggested that at least in Carl's case there was a clearer recognition that the technology merely provided an alert which also required a timely response from staff to guard against the risk of Carl entering another resident's bedroom.

Further examples about the use of technologies to prevent incidents came from the Location Based System (LBS) at Conifer Gardens. One justification of use of the LBS had been to mitigate what the training manual described as *'social risk',* or the coming together of residents known to dislike one another. Conifer Gardens had set up the LBS so that *"the alarm would go off for us if them two [residents living in the same household] went anywhere near each other*" (Simone, Senior Care Worker, Conifer Gardens, interview) and staff could intervene to prevent or diffuse any altercation between the residents. However, use of the LBS to mitigate this type of risk appeared to have become redundant when the home had opened another household on the opposite side of the floor:

> *"we used it [the LBS] to keep them apart but then that person got moved to another household when it opened anyway"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

There was no comparable technology to the LBS (i.e. a body-worn location tracking technology) at either Sycamore Lane or Heather Grove (see Appendix 14 for detailed

description of technologies). At Sycamore Lane, one resident was using a body-worn activity tracker, which was able to record data about number of steps taken, duration of activity, distance, and caloric burn. The resident, George, felt that the activity tracker could be used to locate him *"if I went missing"* and felt that *"when you're getting older it's important to know where you are"* (George, resident, Sycamore Lane, informal interview). One member of staff seemed to feel that this functionality would be useful but hinted at an ethical concern:

> *"hopefully we might be able to use the technology to see where, not to track our residents to see where they are and what they're doing, not in that type of way, but to see, [pause] not in a horrible way tracking them but in a good way tracking them to see where they are in the building, you know in case, just to see what they're doing, where they're sat most of the time, where they're spending most of their time, what rooms they prefer to be in, thing like that"*
>
> (Jodie, Care Worker, Sycamore Lane, interview)

The activity tracker was not able to provide location information or trigger alerts to staff so it seemed that George and Jodie may have misunderstood its capabilities about mitigating against risk of him going missing. However, Facilities Manager Noel appeared to support George's feeling, emphasising the importance of locating residents above collection of data about activity:

> What would be better than an activity tracker would be a system to tell staff where [resident] George was. If George goes outside and falls down behind the vegetable trays, staff wouldn't be able to see him…*"no-one cares how far you've walked, they care where you are."*
>
> (Noel, Facilities Manager, Sycamore Lane, informal interview)

However, Head Nurse Tiffany suggested that there might be some interest in collecting data relating to how far a resident had walked:

> *"at night time they can walk for miles, and people don't realise...other external professionals are saying 'well they're losing weight, why are they losing weight, you're not feeding them properly'. But yeah we are feeding them properly but he's, he's walking ten thousand calories off a day"*
>
> (Tiffany, Head RN, Sycamore Lane, interview)

Thus far in this chapter I have outlined how justification for using technologies seemed centred upon mitigation of some kind of risk; either risk of falling, or other risks to residents which required monitoring of location and movement. The quote above from Tiffany suggested a potential use for technology in helping homes provide evidence to external stakeholders about the quality of the care they were providing. I will now consider how strong mitigation of risk was in the justification of decisions to use technologies, by considering the technologies in relation to privacy, freedom of movement and the influence of accountability within social care.

6.4 How strong was mitigation of risk as a justification?

6.4.1 Mitigation of risk vs. considerations of privacy and freedom of movement

Many participants appeared to justify decisions to use the pressure mats or bed sensors through a belief that the technologies mitigated against risk in a manner which could also preserve resident privacy. At Heather Grove, resident Jack's daughter Lucy drew a favourable comparison between use of a pressure mat over a perceived alternative of increased staff presence:

> *"[the pressure mat] is the difference between having a nasty fall or being safe and having somebody there when needed, but not having somebody 24/7 sat over you, which is also taking his independence away really… I don't think he'd like that either"*
>
> (Lucy, daughter, Heather Grove, interview)

Jack did seem to value his privacy, but this value appeared to lie in privacy from other residents known to wander throughout the home. During field visits to Heather Grove Jack often spoke about his continual irritation at these residents, which seemed a departure of character from his usual self-reported placid demeanour:

> Jack told me that *"she'll be off in a minute, you watch, her and her friend, they're always walking around"* and complained that they go into other people's rooms. He referred to his room as *"my flat"* and said that he had gone in his "flat" to find this woman in there watching his TV...He said that he had told the staff that *"either they go or I do"* and said that he *"detests them".* He said that the staff *"probably thought I'd be alright because I'm placid"* but that he had not been placid about this issue.
>
> (Heather Grove, field visits 3 & 5)

In contrast with his irritation at intrusion into his privacy from other residents, Jack appeared not to find the pressure mat intrusive and did not seem to object to the current level of intervention from staff:

> Lucy [Jack's daughter] and I asked Jack about the mat and he said *"I don't really know what it does"…*we told him that it alerts the staff if he gets out of bed at night. He didn't seem remotely bothered by this. There were also three red emergency pull chords suspended from the ceiling (one above the chair, one above the bed, one in the ensuite bathroom). I asked Jack if he had ever had to pull one of the chords. He said *"no not really, the staff just come round"* and that *"they know when you're in here".*
>
> (Jack, resident, Heather Grove, informal interview)

At Conifer Gardens, one nurse felt that the pressure mats helped staff to intervene when necessary, which could enhance privacy for residents and support provision of compassionate care:

> *"ultimately it's supposed to be their home...rather than having to constantly watch them…[the pressure mats] can give you time to give better care to them who need it at that time...being compassionate, not leaving someone to wander round their room not finding the toilet"*
>
> (Olivia, RN, Conifer Gardens, interview)

Decisions to use the bed sensors at Sycamore Lane also seemed to be made on grounds that they might help to enhance resident privacy by enabling them to keep their bedroom doors closed:

> *"I've heard at other nursing homes [without bed sensors] if they go to bed they have to have the door wide open...even if they're not feeling well, and how can you have a sleep if the door's wide open and people are going past you all the time?"*
>
> (Emma, Senior Care Worker, Sycamore Lane, interview)

However, observational data suggested that use of the bed sensor technology to provide this level of privacy might not always be upheld:

> Barry was in bed asleep and his bedroom door was open…Tara [Care Worker] said that Barry is on bed rest in the afternoon. I asked Tara about them keeping the door open and she said she thought that was in case Barry wakes up and gets agitated.
>
> (Sycamore Lane, field visit 17)

There were numerous examples suggesting that some relatives favoured mitigation of risk as a justification for use of monitoring technologies even where resident privacy may be potentially threatened by the technologies. The clearest examples came when discussing CCTV; although none of the homes was using CCTV inside the buildings, the idea was raised by some participants as a hypothetical option. At Sycamore Lane, George's daughter Madeline suggested that concerns about technologies impinging upon resident privacy were trivial compared to the need to keep residents safe:

> *"I know it's all this civil rights business…but I just think well if you're vulnerable and you're in this situation where you need to be looked after, that privacy thing is a silly thing to be worrying about, it's your safety...I would have cameras in all the rooms"*
>
> (Madeline, daughter, Sycamore Lane, interview)

Madeline advocated use of CCTV in every room in the home but acknowledged a need to respect the wishes of residents who had capacity to consent. She also acknowledged the challenges of accounting for the possibly conflicting views of relatives:

> *"with someone of my dad's level, you'd still be asking them, and I suppose you'd have to respect their wishes to that, or respect, cos obviously some families might want it and some families might not … it would have to be on an individual basis I suppose … and then if you were thinking about putting them in public areas then again that would be difficult if, some people didn't agree to it and so… it isn't straightforward"*
>
> (Madeline, daughter, Sycamore Lane, interview)

Another relative recognised that use of CCTV would be contentious but justified the idea on the grounds that residents who were severely cognitively impaired would not have the capacity to be able to object to use of cameras:

> *"all's I'm saying is obviously a lot of people would object if they were of sound mind, but mum and dad wouldn't even know or they wouldn't even, I don't think they'd know to object, or know to feel anything"*
>
> (Alice, daughter, Sycamore Lane, interview)

The quote suggested Alice had a view of consent which meant that residents would need to have capacity to object to any decisions made on their behalf, and that if they did not have this capacity then there could be no reasonable objections. This quote also suggested that for Alice the very concept of privacy might not exist for residents who did not have the capacity to 'feel anything'. At Conifer Gardens, Gillian's son Colin was not uncritical about the idea of CCTV and its implications for resident privacy, but concluded that Gillian's safety would be his overriding concern:

> *"I'd make whatever decision was best for my mum, what would be best for my mum and that's the decision I'd make…in terms of her, yeah, safety"*
>
> (Colin, son, Conifer Gardens, interview)

Conifer Gardens Deputy Manager Ben felt that any use of cameras inside the home would contravene legislation which entitled residents to privacy:

> *"it would be 100% categorically improper for us to install CCTV to monitor the people that we support as this is their home, there would be no amount of legislative change which can actually change the Human Rights Act, which would entitle people to that level of privacy"*
>
> (Ben, Deputy Manager, Conifer Gardens, interview)

At Heather Grove, Kathy stated that she and Registered Manager Julian had justified the use of the door monitors by comparing their level of intrusiveness favourably with CCTV:

> *"we had a discussion whether we thought it was OK or whether it was like an invasion of privacy, but it's not really because it's not a camera or anything like that, and it doesn't record sound"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

The training manual for the LBS at Conifer Gardens stated that the technology was intended to support people *to "live as independently as possible"* and *"without sudden change of habits"* when moving into a care home. There was some indication that staff had initially been excited about the LBS for these very reasons:

> *"everybody was excited, we was gonna have the [LBS] in, you know, all of the things that we talked about that people would be able to have more freedom erm, their independence...wouldn't have necessarily needed to have staff all the time round them [residents]...they [staff] could monitor it on the [LBS]"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

However despite the potential of the LBS to enhance freedom of movement for residents, for some staff this potential seemed to be trivial in comparison to its potential for mitigation of risk:

> *"it was <u>just</u> [hinted at a fairly trivial benefit] to give them a bit of freedom to go down to the café…so staff didn't have to take them down"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview).

> Some residents used to *"exit-seek"*. On one occasion a resident got down to the front doors at reception and staff were only alerted because of the LBS. The LBS was good for preventing social risk due to its ability to alert staff when two residents who were known to clash came in close proximity of each other.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

Conifer Gardens managers reported that they had been initially wary of the LBS as being too intrusive to be ethically justifiable, and that this wariness still remained:

> *"I have an ethical, and did from the beginning with it, issue, in the sense of Big Brother…it took me a bit, little bit of convincing"*
>
> (Philippa, Registered Manager, Conifer Gardens, joint interview with Deputy Manager Ben)

The data above showed that there were believed to be some benefits from monitoring technologies, such as enhanced resident privacy and independence of resident movement, which served as justifications for using the technologies. However these benefits seemed to have been secondary justifications which faded when compared to the overriding strength of 'mitigation of risk' as the justification for using monitoring technologies.

The weighting of mitigation of risk as a justification for using technologies was most questioned at Conifer Gardens through a clear link to a tailored philosophy of care which emphasised a *"treat what you see"* approach (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa). This philosophy meant that decisions to use technologies to mitigate risk should be made in the same way as decisions to implement any other intervention or supportive practice:

> *"introduction and removal of different elements of support happens for everyone in every way irrespective of technology...use of technology and use of assistive technology or protective technology is exactly the same, you only should use if they need it"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

Registered Manager Philippa suggested that a fluctuating use of pressure mats only when deemed necessary for an individual resident was an indication that the home was delivering high-quality care:

> *"that tells me that we're delivering quality care because we're responding to changes in people and we're responding to changes when people have improved"*
>
> (Philippa, Registered Manager, Conifer Gardens, joint interview with Deputy Manger Ben)

The managers stated that they believed in the need for a firm justification for using a pressure mat with a resident rather than simply to mitigate any possible risk. The managers acknowledged that such a position was challenging for many relatives to understand due to the strength of their concerns about mitigation of risk:

> *"from a relative's perspective mostly it's do what you can to protect, they're probably not that worried about mum losing that bit of independence, as long as she doesn't fall"*
>
> (Philippa, Registered Manager, Conifer Gardens, joint interview with Deputy Manager Ben)

Ben enacted a role-play of a typical conversation he might have with families regarding the introduction and removal of a pressure mat. This role-played conversation exemplified his understanding of a pressure mat as being like any other intervention and also illustrated how this understanding could be very challenging for families to accept:

> *"I'll say [to families] 'she might only need [a pressure mat] whilst she's got an infection because she's unable or unaware of her own abilities at this point in time', because infection can bring an enhanced level of confusion just due to the chemicals in the body, 'after her infection's cleared and we feel that things are safe, we'll remove it', and sometimes you get 'Wh-? B-?' [mimes looks of astonishment and confusion], and you go, 'well she hasn't got one now, I'm putting one in <u>because</u> her mental health's deteriorated with an infection…she's not aware that she's unable to walk on her own, so I need staff to be able to respond quickly… but I can reasonably foresee once this infection's cleared and the antibiotics have done their job that she's not going to have moved too far in her dementia journey, so she'll still return back to 99.9% of where she was before the infection'"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

Ben expanded on this example conversation by suggesting that emphasis upon mitigation of risk rendered people's understanding of pressure mats as being intrinsically different to other interventions:

> *"I think people see it [pressure mat] as something very very different...because it's a safety net for people…they don't rely on a safety net of nutritional support, that's different, they see that as treatment, but a pressure mat alerts them to when something is wrong, and anything that can alert you to a problem, if not there, can't alert you to a problem, and therefore in their mind's eye they go 'well it must stay there because then I'll <u>know</u> if something's wrong'"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

So far, it seemed that the most nuanced picture of how mitigation of risk seemed to fit into a person-centred philosophy of care was outlined by the Conifer Gardens management, who believed that technologies used to mitigate risk were exactly the same as any other kind of intervention and should only be used when necessary for the individual resident. However, for the majority of participants, mitigation of risk was the overriding justification for using technologies. There were other justifications suggested, such as enhanced privacy for residents and independence of movement, but these

justifications seemed a distant second to mitigation of risk. This analysis of the strength of mitigation of risk as a justification for using technologies may be explored further by considering the influence of accountability within the field of social care.

6.4.2 The influence of blame culture within social care

Managers at Conifer Gardens suggested that that their approach of not intervening until they deemed absolutely necessary was poorly understood by staff with experience working in social care due to a fear that they would be held personally accountable for adverse incidents:

> *"many of the staff that have had a history in social care realise there's quite a big blame culture out there...with safeguarding being top of the agenda, if they're found to have omitted something in some way... they may lose their job"*
>
> (Philippa, Registered Manager, Conifer Gardens, joint interview with Deputy Manager Ben)

There was a suggestion that this fear might lead staff to favour immediate use of technology with a new resident rather than carrying out a thorough assessment of need prior to use:

> *"I listen to the nurses...'oh I need, we, I haven't got a pressure mat, I haven't got a pressure mat', 'well what do you want a pressure mat for?' [pause] 'well new admission we need a pressure mat', 'well do we?'…I think they think it's a given"*
>
> (Philippa, Registered Manager, Conifer Gardens, joint interview with Deputy Manager Ben)

The managers' beliefs about staff emphasising mitigation of risk seemed to be supported by quotes from some staff in response to being asked what they saw as important aspects to their job:

> *"how I can minimise the risk basically...that's the main core"*

(Rochelle, Senior Care Worker, Conifer Gardens, interview)

"reducing risks, that's a big one for me personally...and putting measures in place… keeping residents safe"

(Sonia, RN, Conifer Gardens, interview)

"I've got a role in the first place to ensure the safety of the residents I look after on the 12-hour shift... the equipment is vital in keeping them safe, like the [pressure] mat"

(Martha, RN (night), Conifer Gardens, interview)

The managers felt that staff began to relax their overwhelming emphasis on safety when there was an accident and they found that they were not held personally accountable as a matter of course. However, the managers felt that any relaxation in emphasis appeared to be difficult to sustain, as staff tended to "*slip back into the same pattern"* of thinking (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa). This temporary relaxation seemed to imply that a high likelihood of being held personally accountable may have been a firmly entrenched fear for some staff which was difficult to overcome. Nevertheless, there was recognition from some staff that technologies could at times be justifiably removed from a resident's care, suggesting perhaps there was some acceptance of the managers' philosophy of care:

"if the person doesn't need it any more then we take the pressure mat away…there's a stigma…it's not doing the purpose"

(Rochelle, Senior Care Worker, Conifer Gardens, interview)

The apparent strength of a pervasive blame culture within social care and the desire for protection against potential accusations of negligence was further alluded to by the Conifer Gardens managers' opinion that the LBS manufacturer may have altered its sales pitch to emphasise the potential of the LBS to provide evidence in safeguarding incidents rather than emphasising its potential to support freedom of movement for residents:

> *"you kind of got the feel that [other care homes] had suggested 'well maybe this [LBS] could be good for that' [evidence provision]...and then...their sales pitch has changed"*
>
> (Philippa, Registered Manager, Conifer Gardens, joint interview with Clinical Lead Harry)

This quote suggested that although the manufacturer might have initially promoted the potential of the LBS to support freedom of movement of residents, this potential benefit was not a priority for the majority of their customer base (i.e. other care homes) who were primarily concerned with evidence provision and accountability. The Occupational Therapist at Conifer Gardens saw this function as being potentially useful:

> *"if the staff wear pagers [as part of the LBS], we could monitor whereabouts the staff are…., how much care input is being given, because you knew where the pagers had gone in the building…so it gives some indication that at least you could have the evidence"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

Another senior member of Conifer Gardens staff also suggested that part of protection against accusations of negligence favoured by other care homes might include a desire to hold their own staff accountable:

> *"I'm sure that a lot of companies would buy into that cos they were thinking…we can…sort of protect ourselves or we can use it as evidence against staff if we don't feel they're doing their job"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

The LBS training manual explicitly cautioned managers against using the LBS to discipline their staff as this use would *'undermine the value of the technology'*. Yet there was evidence elsewhere that the desirability for management in holding staff accountable to protect the home might be powerful. On a preliminary field visit to Heather Grove, Registered Manager Julian stated that they had installed the door monitor technology to ensure that night staff were regularly checking on the residents out of fear that work does

not get done when management are not in the building. This fear seemed to be influenced by media depictions of care homes:

> *"you do see a lot of, erm, on these, on programmes and stuff and we shouldn't be stereotypical cos you're supposed to trust people you work with, but the nights [night staff] sleep a lot don't they"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

Kathy suggested that data from the door monitors could be used to aid authorities attending to the death of a resident by providing additional information that would not be available without the technology:

> *"if someone's not had a doctor out in the past five days, then it's treated as a suspicious death even if they did fall asleep in bed and die...it helps the investigation cos then they [authorities] think OK so they were definitely found between 2 and 4… .it just gives them more information that they might have not been able to get"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

Kathy stated that prospective relatives were shown the door monitors, which suggested a recognition that they would value safety and the reassurance that the home was holding its staff accountable:

> *"when anyone shows people round, we point out the [door monitors]…it sort of puts people at ease cos you think 'oh that's a good idea', cos then they know that they can ask at any time...if someone was ever concerned....they could say 'well obviously she wasn't seen to all night' …you can show them, and that's quite good"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

At Conifer Gardens Harry supported this view by suggested that evidence from the LBS could be provided to reassure relatives anxious about the amount of care their relative received:

> *"if you have an anxious family, say there's the empirical data to say they were checked at this time, this time, this time, this time and this time"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

Alerts and response to alerts from the nurse call technologies were logged by the central computers which co-ordinated the nurse call systems (see table Y in the previous chapter for technological description). These data could be used to provide evidence in defence against allegations of negligence:

> *"there was an allegation a while back that a buzzer wasn't answered for 20 minutes...I was able to go into the system and see that that was answered within four minutes"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Philippa)

However, the strength of these data as evidence that appropriate care had been delivered appeared to diminish under further scrutiny. At Heather Grove, one Care Worker reflected on her experience of working in a different home which had set staff targets for responding to alerts, and suggested that there may have been a difference between responding to an alert and actually delivering care to a resident:

> [her previous home] was able to record when the alert was generated and when it was turned off. The home required staff to answer all alerts within three minutes….if you were dealing with a resident and an alert had been unanswered, you would just excuse yourself from that resident and go and turn off the alert from the other room.
>
> (Natalie, Care Worker (night), Heather Grove, informal interview)

There was similar recognition at Conifer Gardens that data gathered from the LBS regarding staff movement and location would not necessarily prove that any care had been administered:

> *"if pressure relief's being done in bed as in turning the person, it doesn't necessarily mean that you've turned the person if you've gone into the room, it just means you've gone into the room"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Philippa)

There were some data to suggest that emphasis on the recording of staff activity might risk disturbing residents. There was a perception at Heather Grove that bedroom doors needed to be opened in a certain manner in order for the door monitors to register the opening:

> The door monitor flashes when the door is moved, however if you just open the door gently a crack, it does not flash. Staff now open the doors wide and with some degree of force to ensure that the monitor is picking up that the door has been opened.
>
> (Natalie, Care Worker (night), Heather Grove, informal interview)

At Conifer Gardens there were data suggesting that logging of staff location through the LBS pagers might be unnecessary and detrimental to residents:

> The LBS was a waste of money. It is easy to monitor residents at night when they are in bed, and that staff being made to enter the room just so the LBS could register they had done so created an unnecessary disturbance for the resident.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

Managers at Conifer Gardens suggested that addressing hypothetical clinical problems such as pressure sores would be *"not about buying a piece of kit to fix the issue, it's what are the hidden causes"* (Philippa, Registered Manager, Conifer Gardens, joint interview with Ben). This quote pointed to a lack of justification for use of monitoring technologies to address this kind of problem. However, a preliminary conversation with the Managing Director [MD] of the parent company of Heather Grove suggested that implementation of monitoring technologies could be justified as a means to addressing this kind of problem. Following implementation of the door monitors, the MD appeared to suspect that the

reason why accidents had been high at night had been because residents who had been incontinent and who had not been attended to were getting up in a state of distress. He suggested that after the installation of the door monitors, residents who had been incontinent at night were being changed, and felt that there was the potential for pressure sores to decrease (Heather Grove, preliminary field visit discussion).

At Conifer Gardens, Duncan's daughters Amy and Caroline revealed their concerns about an aggressive resident who lived on Duncan's household. They stated that they would favour cameras in communal areas of the home to record incidents of resident aggression because such technology might be able to hold the home accountable for such incidents:

> Caroline*:* *"[other resident] really had it in for my dad at one point didn't he, and [other resident] was like 'I'm gonna come over there in a minute'…"*
>
> Amy*:* *"…we have witnessed him [other resident] battering somebody in that room when there's been nobody [staff] on that floor, now I think if there was a camera, that man would not be here now… we're here every single night, the amount of incidents that we see, and I think if that was caught on camera they would have to do something about it"*
>
> (Caroline and Amy, daughters, Conifer Gardens, joint interview)

Amy and Caroline also suggested that visiting relatives could be at risk from violent residents. They referred to a relatives' meeting which I had attended to introduce myself and my study, and recalled how after I had left the meeting the discussion had turned to potential use of cameras:

> *"[Deputy Manager Ben] started off with saying 'everybody in this home is classed as a vulnerable person…' so if somebody's coming at you to hit you and you go to defend yourself you'll be prosecuted… so I said 'oh so I'm supposed to sit there and get beaten up by somebody when I know they're a bully?'…and they said 'no you press the panic buttons', so I actually said 'well where are the panic buttons?' …and they said 'they're all around the building', but I don't know where they are"*
>
> (Amy, daughter, Conifer Gardens, joint interview with Caroline)

Amy and Caroline extended their justification for cameras to hold the care home accountable for the protection of relatives; this quote suggested that there might be a lack of knowledge amongst some relatives about what to do in the event of being attacked by a resident.

6.5 Summary

In this chapter I have explored the justifications made for using monitoring technologies. The managers of Conifer Gardens appeared to present the most nuanced picture of justifications for use of monitoring technologies, working to a 'treat what you see' philosophy which understood monitoring technologies as being just like any other intervention or supportive practice. This position of nuanced justification appeared to be a minority position. The majority of people seemed to find mitigation of risk a very strong justification for use of all the different monitoring technologies. There seemed to be a strong emphasis upon enhancing safety which greatly outweighed all other considerations, such as privacy concerns or other potential benefits from the technologies. There seemed to be a pervasive fear of a blame culture within social care. This fear seemed to underpin a desire for technologies which might help provide evidence to defend either individual staff members or care homes against accusations of negligence.

Chapter 7: How did they implement the technologies?

7.1 Introduction

In this chapter I examine the main theme of how the care homes implemented the technologies in practice. The theme mainly incorporates the sub-theme 'Discussion and Consultation' which includes consideration of how the technologies were introduced to people, how staff were trained in using the technologies, and how the technologies were discussed within the homes. The chapter also draws upon aspects of the themes of 'Understanding' and 'Business and Environmental Influences' which appeared to have a relationship with how the technologies were implemented practice.

7.2 Nurse call/bed monitoring technologies

7.2.1 Staff introduction

At each home, the nurse call/bed monitoring technologies were usually introduced to new staff when they began working for the home. This introduction tended to take the form of senior staff showing new staff the technology:

> *"I remember my first day I had an induction, obviously they showed me how to use the pagers… and then… Emma [Senior Care Worker]… showed me the under the bed sensors"*
>
> (Jodie, Care Worker, Sycamore Lane, interview)

> *"before I actually started we were shown round and we were shown in the rooms and obviously shown the [pressure] mats and then told what they were and then shown the monitor on the wall [wall unit]"*
>
> (Eleanor, Care Worker (night), Conifer Gardens, interview)

There seemed to be a perception that the technologies were straightforward to use and that formal training might not be prioritised or considered especially important:

> Hilary [night RN] said she had been working here for a few months. She said she had picked up on the job how to use the nurse call/bed monitoring system. I asked if there had been any training and she said no.
>
> (Sycamore Lane, field visit 5)

> *"no I never did [have training], I'm not sure if they have training on it, they probably do, I think they've got training in nearly everything but it's quite a simple piece of technology to understand"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

Kathy's comment above was interesting as she was the Deputy Manager of Heather Grove and yet she stated that she was not sure if new staff received training on the nurse call system. Taken with her feelings about its simplicity, this comment possibly suggested a relative lack of importance placed on formal training for this technology due to its perceived ease of use. Another staff member from Heather Grove offered clarification that introduction to this technology might take the form of a discussion with new staff:

> *"we all sit round like a group meeting you know and they explain the [nurse] call system to everybody"*
>
> (Tracy, Care Worker, Heather Grove, interview)

The sense of perceived simplicity of the nurse call systems was reinforced by staff from all three care homes. During my first field visit to Heather Grove, I was introducing myself to some staff:

> Millie [Care Worker] said *"you just plug it [the pressure mat] in and turn it on, there's not much else to know"* and seemed puzzled as to why I was researching the technology.
>
> (Heather Grove, field visit 1)

Regarding the same technology at Conifer Gardens, a member of night staff joked:

> *"I'd be worried if you couldn't figure it out!"*
>
> (Eleanor, Care Worker (night), Conifer Gardens, interview)

At Sycamore Lane, a senior member of staff felt likewise about their bed sensor and pager system:

> *"there's not really a great deal to know about it, only you switch it on and off... it is simple to use"*
>
> (Emma, Senior Care Worker, Sycamore Lane, interview)

There was a suggestion that an informal introduction might be accepted by staff on the presumption that they would be able to relate the home's nurse call/bed monitoring system to similar technologies they may have encountered during a career in social care:

> *"I think you did yeah [pick up using the nurse call system on the job]… I think most of the carers are more used to using the technology cos they've worked in care for a long time"*
>
> (Olivia, RN, Conifer Gardens, interview)

> Ernie recalled a *"rather slapstick induction"* in which he did not receive any training for the bed sensors until a few months after he started; however he felt that he was generally familiar with the bed sensors from his prior experience working in social care.
>
> (Ernie, Care Worker, Sycamore Lane, informal interview).

Other data suggested that assumptions of simplicity and familiarity could be problematic. There were reflections that a lack of formality in the training for the nurse call systems might mean that certain aspects of information could potentially be omitted:

> Senior Care Workers explain to new staff how the nurse call system works but this is usually done in the moment rather than in a more formal briefing, which means that sometimes the Senior can't remember everything that needs to be covered in that particular moment.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

Some staff highlighted a danger in assuming that they would perceive a new technology as similar to technology they had experienced elsewhere. At Sycamore Lane, Head Nurse Tiffany suggested that the bed sensors were unlike any technology she had encountered in her 35-year nursing career:

> *"training round new technology is really important, if you're gonna use new technology, you can't just expect people to know how to use it, especially something as specialised as the under-bed things, you know, cos I'd never seen owt [anything] like that before… the most I've ever seen was pressure mats"*
>
> *(Tiffany, Head RN, Sycamore Lane, interview)*

Tiffany's understanding seemed to be that 'technology' was a distinct concept in which each piece of 'new technology' required thorough training. Throughout the fieldwork I made similar observations on a more general level that some staff seemed to lack knowledge or confidence when introduced to new technologies. I continually reflected on how despite my repeated stressing that my background was not in electronic engineering or computer science, some staff seemed to see me as a stereotypical 'IT guy' with specialist knowledge that they believed was necessary to address any technological queries. During one visit to Sycamore Lane I happened across Tina, one member of staff, trying to operate a new smart TV. As soon as Tina saw me she exclaimed *"Ah! You're technical!"* and asked me for advice about how to operate the TV (Sycamore Lane, field visit 12), although in the end she did not need my help. An informal interview with Stuart, a night Care Worker, revealed that he was called upon in a similar way by some colleagues because they deemed him to be skilled at using computers:

> I asked Stuart if he was a Senior Care Worker and he said *"no but I just have to do everything"* [regarding technology in the home]. Shortly after Stuart left the room in which we were talking, another member of staff came in looking for him because one of the residents couldn't operate her TV.
>
> (Stuart, Care Worker (night), Sycamore Lane, informal interview)

The data from Stuart and Tina above suggested that even for fairly mundane technological activities, seeking an 'expert' was favoured over perseverance. Faith in expertise was also seen on another visit to Sycamore Lane, when there were some workmen in the building replacing some cabling. There was an assumption amongst some staff that because these workmen were doing something with 'technology', I would know precisely what they were doing:

> Doug [Care Worker] asked me if I knew what the workmen were doing. When I said not really, he joked that *"he has a PhD and <u>he</u> doesn't even know!"*
>
> (Sycamore Lane, field visit 3)

Doug's comment suggested a perception that a high level of formal education was both necessary for, and synonymous with, advanced technological understanding. Taken together, these data about the belief in a need for expertise in all things technological seemed to suggest that informal introductions to new technology, or assumptions that staff would be able to pick up new technologies quickly based on familiarity with other technologies, might be misguided.

7.2.2 Staff ongoing involvement and awareness

Staff appeared to be involved to an extent in discussions and decisions about use of the bed sensors and pressure mat technologies. A main forum for involvement of staff at all homes appeared to be the daily shift handover meetings in which staff could discuss use of the technologies in relation to specific residents:

"we were discussing that this morning in the handover... he's got a bed sensor [that] allowed us to be alerted to the fact that he'd fallen out of bed... what else could we put in place?"

(Aggie, Senior Care Worker, Sycamore Lane, interview)

Temporary use or alteration of pressure mat provision at Conifer Gardens would be communicated between senior staff in a communication book and passed on to the care staff at handover:

"if I changed the mats I'd document that in that communication book and then the [next] nurse would hand over to all the carers on the next shift"

(Sonia, RN, Conifer Gardens, interview)

Handover meetings were a point at which important information about the functionality of the technology could be passed on:

"if there was anything wrong with it or if there was anyone's that was broken or anything like that it would be passed at handover... bed sensor's been playing up... you would be told before you started your shift"

(Nicky, RN (night), Sycamore Lane, interview)

Conifer Gardens highlighted regular discussion between management and staff around use of pressure mats which seemed to be related to their philosophy of care outlined in previous chapters which required firm justification for any intervention with an individual resident:

"the seniors or the nurses usually come in to us and go, 'can I talk about a pressure mat', 'right', and then we'll do the brainstorm rationale between us"

(Philippa, Registered Manager, Conifer Gardens, joint interview with Deputy Manager Ben)

"I have a conversation once a month with Rochelle [Senior Care Worker] about [name of resident], about how she needs a pressure mat, and I'll constantly refuse"

(Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

One nurse suggested that she would like more formal guidelines about when to use a pressure mat:

"we could do with a criteria in place, now it's just the nurse in charge saying 'oh they've had a fall tonight, shall we have a [pressure] mat'"

(Martha, RN (night), Conifer Gardens, interview)

Deputy Manager Ben explained that he had attempted to develop formal guidelines but that doing so had proven challenging due to the variety of reasons why a pressure mat might be used:

"I was also trying to develop a means test to assess for them… there's so many different variables why we use them, it's hard for me to be able to put a form together where you could tick a box to say this person does or doesn't require one"

(Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

At Heather Grove there was a sense that all staff were involved in observing new residents and were involved in a continuous dialogue via the mechanism of the shift handover to build up a picture about resident mobility, which would be used to inform a decision about a pressure mat:

"the day staff will watch… how much he walks around, if he's steady on his feet, how independent he is… [night staff] will monitor how the sleeping patterns are at night, if they're a good sleeper, whether they get up at night, and then they'll tell the day staff in the handover in the morning, and then day staff will tell the night staff on the handover in the evening"

(Kathy, Deputy Manager, Heather Grove, interview)

Kathy also explained how although staff at Heather Grove could be involved in gathering information relevant to a decision about a pressure mat, the final decision could only be made and recorded in care plans by herself or the Registered Manager:

> *"if it's written down it means it's prescribed, and that can only be done by myself and the manager… carers can't prescribe the care… everybody can watch them and swap stories... but the ultimate prescription of care, so including the pressure mat, would be the decision of myself and the manager"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

At all three homes, incident reports were cited as a mechanism for staff to exchange information about the bed monitoring technologies. As shown in Chapter 6, Conifer Gardens seemed particularly keen to review use of a pressure mat in a resident's care based on incident reports. These incident reports were included in a resident's care plan which also contained entries stating whether a pressure mat was in use with that resident. As also shown in Chapter 6, Sycamore Lane's care plans did not seem to include any entries that bed sensors were in use. Staff at Sycamore Lane stated that they were supposed to enter into the care plans if a bed sensor had alerted them to an incident:

> *"if the bed sensor's gone off because they've gone to the toilet, then we wouldn't record that, because it's not an accident or anything, but if the bed sensor's gone off because they've fallen… we have to say how we found out"*
>
> (Jodie, Sycamore Lane, Care Worker, interview)

On closer inspection it did not appear that this data entry was always performed. George's care plan showed 75 entries for accidents or incidents over a two-and-a-half year period. Some of these incidents were 'social' (such as arguing with other residents or staff), but there were many incidents of falls, in communal areas or in his ensuite bathroom, some of which included him being found on the floor in his room. For some incidents, the 'witnessed by' box had been completed with a staff name, but other incidents were either recorded as 'unwitnessed' or left blank. In all of the records relating

to falls there did not seem to be a single mention of a bed sensor alerting staff that George had fallen.

One of the more interesting possible consequences of this lack of formal documentation of the bed sensors at Sycamore Lane was that during my fieldwork I realised that I was building up a rather diverse picture of awareness amongst staff about precisely which residents had a bed sensor in their care. Some staff suggested that every resident had a bed sensor:

> I asked Ian [Care Worker] how many residents had the bed sensor. He said every resident does.
>
> (Sycamore Lane, field visit 6)

> Lorraine [Care Worker] told me that every resident on the [second] floor has a bed sensor, which confirms what Ian had told me on my previous visit.
>
> (Sycamore Lane, field visit 7)

> The [nurse call unit] is on the wall in every bedroom, so the infrastructure is there, and therefore every resident must have a bed sensor.
>
> (Ernie, Care Worker, Sycamore Lane, informal interview)

However, there were some data which cast doubt on the picture that every resident had a bed sensor:

> *"I think everyone's got one of those in… more or less"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

A nurse suggested that although every bed should have a sensor, at times some of the sensors may be non-functioning:

"they should all have sensors, but sometimes you find they're not working"

(Nicky, RN (night), Sycamore Lane, interview)

The Head Nurse suggested that although every bed was fitted with a bed sensor, some sensors might be deactivated deliberately:

"it is there under the mattress… in place on every bed… but they're not plugged in for anybody that doesn't really need it"

(Tiffany, Head RN, Sycamore Lane, interview)

The Registered Manager seemed unsure whether all beds were fitted but some sensors were simply not activated:

"[bed sensors are] not on the nursing beds because people wouldn't get up and out of the nursing beds themselves… it's on the divan beds... who they need to be turned on for"

(Erica, Registered Manager, Sycamore Lane, interview)

Both the Registered Manager and the Head Nurse thus suggested that some distinction might be made about which residents 'needed' a bed sensor, but did not seem to be able to offer clarification about how this 'need' was assessed. It was also not clear whether they had a shared understanding: it was unclear from the Registered Manager's quote whether she meant that all beds were equipped with sensors but only the divan beds were activated, or whether there were no bed sensors fitted to the nursing beds at all. Other staff appeared not to be able to clarify this confusion:

I asked Hannah [Senior Care Worker] if she would be able to help me with the information about the bed sensors. She offered to go round and make a list for me… Matt [Care Worker] came back with the list that Hannah had been making... He handed me a sheet of paper with each room number written on it, the type of bed, and whether or not there was a bed sensor. This list stated that some 'normal' [divan] beds did not have a sensor installed, and that some 'hospital' [nursing] beds did have a sensor.

(Sycamore Lane, field visit 7)

This episode was also interesting because the staff had to physically check every resident's bed for the presence of a sensor; they did not seem to already have this knowledge or be able to check in any documentation.

It seemed therefore that at Conifer Gardens and Heather Grove, some staff were involved in discussions about use of pressure mats with residents, and this use was clearly documented within residents' care plans. The picture appeared much less clear at Sycamore Lane, where there appeared to be a lack of consistent understanding amongst staff about precisely which residents had bed sensors, which may have been a symptom of a lack of documentation of the bed sensors in residents' care plans.

7.3 Other monitoring technologies

7.3.1 LBS at Conifer Gardens

The LBS had been installed on one of the residential floor households and had been introduced in formal training sessions to a small number of staff who were going to be using the technology. This training was delivered by the company who manufactured the technology. The training manual outlined three separate levels of training according to seniority of staff. The basic level training was aimed at the Care Workers with instructions about how to use the pager and fobs. The middle level of training was aimed at Senior Care Workers who would be able to set up resident profiles and access some of the data captured by the system. The most comprehensive level of training was for management and senior clinicians, and contained guidance on how to set up the fobs and pagers and how to process advanced levels of data about delivery of care in an individual resident's room. The Occupational Therapist received the most training and felt that:

> *"the initial training was good, and it was thorough, but it was a lot of information to take in, so you needed to have regular updates, and time, I suppose time to be able to sit down and get your head around the system and use it regular to be able to understand it"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

Beatrice's opinion here was that there was a benefit from learning on-the-job as well as from the formal training. The training manual encouraged getting started in using the LBS as soon as possible with the statement *'you cannot do any harm'* which seemed to support Beatrice's opinion. However, some of the staff suggested that their level of training was perhaps rather basic and that they would have preferred more information before starting to use the LBS:

> It was a training session of about an hour, which described the components (fobs, pagers) and how to use them, rather than being in-depth and outlining the expected benefits…*"here it is, off you go, see how you get on"*. There could have been training around adapting the use for the night staff as it seemed to be more aimed at the day staff.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

Another member of staff suggested some staff might have perceived this brief level of training as a lack of training:

> *"we didn't have any training for [name of LBS], we got told what it was about but we didn't get training, we basically got given the pagers, we had to sign them in and sign them out in a book...we were told how it worked but we never had any training ourselves on how to use it"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

From these quotes it appeared that there may have been a balance between providing formal training which provided substantial detail about all the potential benefits of the LBS before it was used, but also affording staff practical use to begin to understand how the LBS worked in practice rather than them having to retain a lot of abstract information from training sessions alone.

Functionality of the LBS was discussed during shift handovers between staff:

> *"when they're doing the handover sheets they have to ask us, like, if things worked and anything that needed to be handed over"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

However, the actual data recorded by the LBS were not visible to staff at the shift handover, and there were reflections that perhaps staff needed regular access to the data in order to better understand the LBS:

> *"the training was good from my point of view, but I think from other people's, staff, they probably needed more regular updates… I think the [name of LBS manufacturer] or whoever, maybe one of the staff from here, it could have been me, probably could have put more training sessions on and had the [central computer] system set up working on the floor… and people could have seen what the outcomes are"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

It seemed possible that a lack of training and/or access to data collected by the LBS might have led staff to understand the benefits of the LBS as alerting them in real time to resident location so that they could intervene to keep residents safe, rather than any other benefits such as identifying patterns in data:

> *"[the LBS] is more to do with safeguarding, it's really helpful with the safeguardings because like we can't one-to-one… because we haven't got enough staff"*
>
> (Simone, Senior Care Worker, Conifer Gardens)

Some staff demonstrated a lack of awareness about the LBS; about what it was for, regarding its operational status, or even its very existence. One of the nurses who had worked at Conifer Gardens since the home opened recalled receiving some basic information when it was installed, and tentatively speculated that the LBS might enable residents to access the community outside of the home independently:

> *"from what I've read about it… it does give people more independence and then you know if the time frame came that they're missing or it's chucking down and they haven't come back, then you'd be able to find out where they were and go and assist them"*
>
> (Olivia, RN, Conifer Gardens, interview)

The LBS worked via radio frequency identification (see Appendix 14), which meant that it would not work outside of the range of the sensors installed within the building . Olivia thus appeared to be confusing the LBS with GPS tracking technology which does work in outdoor environments via satellite. Olivia had never actually used the LBS herself and stated that *"I don't work down there* [on the residential floor] *so I don't actually know* [precisely what the LBS does]*"* (Olivia, RN, Conifer Gardens, interview). Martha, another nurse, was unsure whether the LBS was still being used within the home, stating that *"they used it a while back, I'm not sure if they're still using it now"* (Martha, RN (night), Conifer Gardens, interview). Eleanor, a Care Worker based on the nursing floor who had started working at the home around a year after it had opened, did not appear to have heard of the LBS until we were discussing it in her interview. She said that she was *"quite shocked"* to learn of it, and *"I don't understand why it's all installed downstairs and not up here"* (Eleanor, Care Worker (night), Conifer Gardens, interview).

There were some data suggesting that staff from the residential floor who had used the LBS also lacked awareness about the current status of the LBS:

> I started chatting to Lindsey and April [Care Workers] about my study... April said she had been working here for about a year and a half. I said that when I had visited about a year ago, the LBS had been in use on this floor. She remembered it and said it was *"quite good because you knew where they [residents] were"*. She did not know why the home had stopped using the system. Lindsey did not know either. They said something to the effect of they wouldn't know about nursing because *"that's up there"*, pointing upstairs.
>
> (Conifer Gardens, field visit 6)

The above data showed that staff who had worked directly with the LBS on the residential floor seemed to be unaware about whether or not the same technology was installed on the nursing floor. The data also showed that these staff were unaware why the LBS had been withdrawn from use. One member of the night care staff described the withdrawal of the LBS in more detail:

> The LBS had *"dwindled off quick"*. Night staff were aware that there were some problems with it, but there was no explanation why it was withdrawn... As part of the shift handover, the day shift would give the phones and pagers across to the night shift, and one day the LBS pager just wasn't there anymore in the handover.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

It therefore seemed possible that awareness and understanding of the LBS amongst staff may have partly depended on whereabouts in the building staff were based and when they had started working for the home. It also seemed that some staff who had directly used the LBS in the past did not know why it had been discontinued.

7.3.2 Activity tracker at Sycamore Lane

Owner Nigel had introduced the activity tracker to trial its potential for collecting data about resident mobility. Nigel had shown the tracker to some senior staff:

> *"Nigel brought it and showed [some Senior Care Workers and RNs] and talked about it and showed us the, the, you know the [website] link that you go to for, so that you can look at it and see what it's doing"*
>
> (Tiffany, Head RN, Sycamore Lane, interview)

However some staff seemed to suggest that they had not had any feedback on what was happening with the tracker and did not have a great deal of awareness about what was happening with it:

> *"I don't think it's kicked off as of yet… we're just trialling it I think… I've not heard much of it again since"*
>
> (Jodie, Care Worker, Sycamore Lane, interview)

It seemed that few staff knew much detail about the activity tracker. This lack of knowledge may have be partly due to the tracker being trialled with just one resident,

George, whose own location in the home may have determined which staff had awareness about the tracker. George lived and spent the vast majority of his time on the ground floor. The Head Nurse suggested that staff who did not work on the ground floor *"maybe…know about it* [the activity tracker] *but they don't go any deeper than knowing about it"* (Tiffany, Head RN, Sycamore Lane, interview). This highly localised awareness appeared similar to that of the LBS at Conifer Gardens, discussed in the previous section of this chapter, in which staff who had not worked with the technology because it was not used in their area of the home seemed unsure about its use or existence. These similarities suggested that unless staff were using technologies regularly, they did not recall how to use the technology or recall what they may have been shown in any introduction.

There were data to suggest that information about technologies at Sycamore Lane appeared to be disseminated to staff informally *"through the grapevine"* (Nicky, RN (night), Sycamore Lane, interview). There were some team meetings in which ideas were discussed amongst management and senior staff, but perhaps these discussions were not quite as democratic as staff might have liked:

> *"Nigel [owner] does come to the team meetings and he does throw certain ideas around about technologies… when I say team meetings I mean it's Erica [Registered Manager] sits and tells us what's going on, what's new... and then we put our input over"*
>
> *(Aggie, Senior Care Worker, Sycamore Lane, interview)*

There seemed to be different perspectives amongst staff about their involvement in new technological ideas within the home. Some thought that the owner was *"always coming up with cool things"* (Jodie, Care Worker, Sycamore Lane, interview), however others suggested that a perceived lack of involvement around new ideas could lead staff to become disinterested in new ideas which they perceived would not be sustained in practice:

> *"you think it's [a new technology] just another one of these ideas he's [the owner] had and it's just another flash in the pan"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

Another Care Worker suggested that the owner *"likes his gizmos"* and tended to be more receptive to ideas from staff about new technologies than *"the smaller, life-changing stuff"* (Ernie, Care Worker, Sycamore Lane, informal interview). However, there seemed to be a mixed picture about how much staff actually wanted to be involved in discussions about new technologies unless there was some kind of problem or presentation of a new risk:

> *"it's [new technology] always something that benefits the clients anyway I think, you know…it's not a bad thing…I suppose if I felt as though there was something wrong somewhere I would say to Erica anyway…if I felt as though it was detrimental or something like that, you know, I'd always say, she'd get my opinion"*
>
> (Nicky, RN (night), Sycamore Lane, interview)

It seemed possible that one consequence of a general lack of information and ongoing involvement in discussions may have led to some staff to misunderstand the purpose of the activity tracker. The Registered Manager herself reported that the owner had given her a tracker to test out on herself, but may not have provided her with much information:

> *"it was just on my desk one day you see…so I carry it in my bag but I'm not quite sure what happens now… [Nigel] did say he'd come and show it to me, but he's been quite busy, as have I"*
>
> (Erica, Registered Manager, Sycamore Lane, interview)

This lack of information seemed to have led her to feel initially that the tracker was because *"he's* [Nigel] *trying to track me down"* (Erica, Registered Manager, Sycamore Lane, interview). This feeling appeared to be replicated in a rumour circulating amongst

some staff that the tracker was to monitor their activity rather than that of resident George:

> *"I had to set the staff straight... some of the impressions that the staff were getting that it's to see how active the staff are, because there was reports that the staff are being lazy"*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

George himself stated that Nigel *"must think the girls aren't working hard enough"* (George, resident, Sycamore Lane, informal interview).

It was therefore possible that a general lack of ongoing involvement of staff in discussions about new monitoring technology could have led some staff believe that the tracker was being used to monitor their own activity to hold them accountable, rather than for any potential benefits from monitoring resident mobility.

7.3.3 Door monitors at Heather Grove

I began my fieldwork at Heather Grove shortly after the home had installed door monitors on every bedroom door that could record when that door had been opened, and for how long. In Chapter 6 I showed that this technology was used by management to ensure that staff were checking on residents and could be used to hold staff accountable and protect the home from claims of negligence. Prior to beginning field work, the Managing Director of the parent group of Heather Grove stated that staff had been involved in conversations about the door monitors and therefore management had not imposed this technology upon staff. However, one member of staff said that they were informed by management but suggested that the reasons for the technology were perhaps not explained clearly:

"they just explained that it, it, it, had to be a something, er, you know, er, for, training purposes I suppose, that you know they can tell er like you say erm how long you've been in the room, you know, erm, I, I, I don't know [pause] I don't know how to explain anything else"

(Tracy, Care Worker, Heather Grove, interview)

Deputy Manager Kathy stated that management had deliberately not informed some staff about the door monitors in advance of installation:

"people know they're here cos we told them, but they were here for a good two weeks before anyone realised, and that was simply so we could see that people were doing their job at night"

(Kathy, Deputy Manager, Heather Grove, interview)

Kathy said that she and Registered Manager Julian had tested a couple of door monitors to make sure they worked properly, had informed day staff about the technology, but had initially withheld the information from the night staff:

Kathy: *then we told everyone we were putting them up and we put them up*

AH: *right ok, ok, when you say everyone do you mean day and night staff*

Kathy: *erm, days first*

AH: *days first*

Kathy*: yep and then once, and then we did tell the night staff once they'd been up*

(Kathy, Deputy Manager, Heather Grove, interview)

Kathy explained further about why this information had initially been withheld from the night staff:

"the big issue you'd find they [night staff] were lying to you in the morning... we just wanted to see how long that would go on for... they were saying they were checking on [residents] they weren't checking on"

(Kathy, Deputy Manager, Heather Grove, interview)

When asked about the reaction of the staff upon being told about the technology, Kathy said that *"day staff are fine with it, and then the night staff, they were a bit taken aback at first"* (Kathy, Deputy Manager, Heather Grove, interview). A preliminary conversation with the Managing Director revealed that some staff initially tried to blame the technology for revealing that residents were not being checked upon at night:

> After installing the door monitors they [management] have found that residents were not being checked on as the doors were not being opened. Staff were adamant that they had been checking and blamed 'the system'. They [management] had to demonstrate to the staff that the technology was not faulty and gradually they have won them over.
>
> (Heather Grove, preliminary conversation with the MD)

Deputy Manager Kathy felt that staff had little choice but to accept the technology since it only compelled them to carry out the requirements of their role:

> *"you can't say 'well I know we're supposed to do this but we haven't done it for ten years and now we have to do it, it's not fair' because you're supposed to be pretending that you've been doing it all that time anyway, so I suppose the staff have got to like it haven't they"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

Kathy suggested that although the staff seemed to have grown to accept the door monitors, perhaps she did not quite fully trust the night staff and wanted to access data before shift handovers:

> *"most days that I'm in I'll have a quick flick through… before I go upstairs and get a handover from the night staff… just so you're… not one step ahead, that sounds awful, but so that you're prepared in case somebody says something like, you know, 'such-a-body's still in bed because they're not feeling well', and I could say 'well how do you know? You haven't been there for 6 hours'"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

An informal interview with a member of night staff revealed a reaction to the implementation of the door monitors in which being monitored may not have been difficult to accept in itself, but that the initial covert installation was more challenging:

> I asked [Natalie, Care Worker] how they were explained to her and she laughed and said that they were not explained in advance. She said [Registered Manager] Julian only told her after they had been in place for a while… She said that she should have been told, and that there was no reason for Julian to have been secretive. She felt he should have just told her beforehand what he was going to do, and the reasons why. She would have accepted this, because ultimately Julian is responsible for the safety of the residents.
>
> (Natalie, Care Worker (night), Heather Grove, informal interview)

Natalie appeared to suggest that she accepted being monitored by management because she understood their weight of responsibility in keeping residents safe, and called for more open communication between staff and management.

7.4 Involvement of relatives and residents in implementation

At Conifer Gardens it seemed that a pressure mat might be implemented with a resident when deemed necessary and relatives would be included in conversations about the pressure mat:

> *"we'd normally, we put it in anyway and then probably discuss it with the families, like 'right, this is what we have done'"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

Relatives would be been shown how to work a pressure mat so that they could lay it out or deactivate it when visiting:

> *"it's discussed with the family and they know it's there, and families usually know how to unplug it and stuff when they go in to the resident"*
>
> (Olivia, RN, Conifer Gardens, interview)

Some relatives appeared to take a more active role in decisions about pressure mats. One resident had two pressure mats in her care because her relatives did not want staff to rearrange the furniture in her room to help mitigate falls:

> *"her family point blank refused to let us have the bed against the wall, and she was still having falls getting out the other side, so we had to put two mats in there"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

In Chapter 6 I showed how the use of pressure mats as a favourable alternative to cot sides was explained to relatives at Conifer Gardens. Duncan's daughters reflected that the pressure mat must be working because Duncan had not had many falls, but then appeared slightly hesitant about trusting the home to keep them fully informed about any adverse incidents:

> *"we've only had one call to say he's come out of bed, and he had a little graze on his head, but then [pause] maybe I shouldn't say this, but did they only tell us cos he had the cut on his head and we'd asked the question? So I don't know... we're trusting them looking after him twenty-four seven… we haven't got a lot of choice… that's the situation and that's it"*
>
> (Caroline, daughter, Conifer Gardens, joint interview with Amy)

At Sycamore Lane, Alice reported a similar challenge in trusting the home to provide her with information about adverse incidents:

> *"they tell me, he [her father Edgar] stays in bed all night now... and I was surprised cos he was up and down all the time at home… you see that's the thing… you only know what you're told"*
>
> (Alice, daughter, Sycamore Lane, interview)

Alice also suggested that a lack of involvement might be preferable to receiving information which might be bad news:

> *"ignorance is bliss in a way… it's only when they come with a big cut on their elbow, or a cut here, and you think 'well how on earth's that happened?' And you've only got their, I mean you have to trust people don't you"*
>
> (Alice, daughter, Sycamore Lane, interview)

Alice's parents Karen and Edgar were both residents at Sycamore Lane, however, when asked whether there was a bed sensor used in Karen's care, Alice replied *"I don't know…I presume so"* (Alice, daughter, Sycamore Lane, interview). George's daughter Madeline also did not know that George had a bed sensor and said that she only became aware of the sensor when I was initially talking with her about my study. I will reflect on my role in relation to the perceptions of relatives in Chapter 9. The Sycamore Lane Head RN Tiffany stated after her interview that relatives were not involved in any decisions about using bed sensors.

For the Conifer Gardens managers, resident choice seemed an important aspect of their philosophy of care in which interventions should be tailored to individual residents. The managers gave an example of a resident who had continually refused to have a pressure mat in her care despite injuring herself falling out of bed. The managers had assessed this resident as having the cognitive capacity to make this refusal and hence they did not insist that she accepted a pressure mat despite her risk of injury:

> *"we've got to assume that she's OK until she's not, and until she loses the ability to make those decisions for herself then we're not to intervene, we're to allow that to happen because that's her right, people are entitled to make a bad choice"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Philippa)

There appeared to be less awareness of resident choice around bed sensors at Sycamore Lane. For example, one member of staff at Sycamore Lane seemed to speculate that any residents who were cognitively aware of the bed sensors would simply feel positively about the technology and that they had not been consulted:

> *"They're [residents] probably happy that it's [bed sensor] there. Give them a bit of reassurance to know that if they did have a fall… the residents that do understand… it wouldn't affect them, they'd be happy that it's there, give them relief to know"*
>
> (Jodie, Care Worker, Sycamore Lane, interview)

At Sycamore Lane, George's daughter Madeline stated that she did know about his activity tracker but speculated that she only knew because she had been in the building at the time these discussions were taking place, since George's level of cognition meant that she might not need to be consulted about his care provision:

> *"[owner] Nigel did talk to me about it, as I say, cos I was there, whether he would have spoken to me had I not have been there at the time I'm not sure…[George] can answer for himself, so there would be no reason to sort of seek permission from us other than to be explaining to us what is happening and what is going on"*
>
> (Madeline, daughter, Sycamore Lane, interview)

George reported that he had been involved in discussing the activity tracker with the owner, and that *"the boss had a good long talk with me at first"* (George, resident, Sycamore Lane, informal interview). Madeline felt that George's cognitive ability was starting to decline to the point where the home now might have to start consulting his relatives more:

> *"<u>now</u>, I'm not quite sure whether, you know, they would come to us first and say listen, we're thinking of this… his faculties are still there but, you know, some moments are better than others, some days are better than others, so I don't know"*
>
> (Madeline, daughter, Sycamore Lane, interview)

Generally there was a sense that although staff tried to explain technologies to residents, it was difficult to know how much information residents were able to retain:

"it's hard in this type of home because you'll always explain anyway, cos obviously you don't know how much information they're gonna take from you… you will always explain anyway, that there's a bed sensor on the wall and if they need us they just need to press this button"

(Nicky, RN (night), Sycamore Lane, interview)

"you just try and explain… what the chord is, you just have to have patience, you know, to say 'well only buzz it when you need it, but it's no problem'"

(Tracy, Care Worker, Heather Grove, interview)

At Conifer Gardens the LBS training manual advocated discussion of the technology with residents. The manual included a step-by-step guide to assessing resident cognitive capacity, and a resident information pack in large type with visual images that addressed potential concerns about falling and stressed keeping active. The LBS had been discussed with residents who had used it because they had been deemed cognitively capable of having such conversations:

"the level they were at with their dementia allowed them to engage in a conversation when it was explained"

(Harry, Clinical Lead, Conifer Gardens, interview)

However, upon closer inspection these conversations might have been challenging at times:

"you were trying to explain to someone 'oh this is so you can, go, you know, have a bit more independence, you'll be able to go down'… at that point people are like 'well I can go where I want when I want'"

(Beatrice, Occupational Therapist, Conifer Gardens, interview)

Beatrice's quote above seemed to suggest that even where residents were cognitively capable of engaging in discussion about the technology, there may have been challenges in ensuring that residents with dementia were fully aware of the implications of

monitoring technology and the care home environment in which they were living. One member of night staff felt quite certain that residents did not understand the LBS:

> Residents had no understanding of what the LBS was for, and the system was used for staff benefit.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

The LBS training manual also advocated discussion with relatives and included proformas to record consultations. There was a sense that the LBS had been discussed with relatives but *"I don't think it really bothered them"* (Simone, Senior Care Worker, Conifer Gardens, interview). Simone here seemed to perceive discussions with relatives as being around whether relatives objected to the LBS, rather than whether they might endorse its positive potential.

The door monitors at Heather Grove did not seem to have been discussed with relatives or residents of the home. At the beginning of the fieldwork shortly after the door monitors had been installed, Registered Manager Julian stated that he had not yet informed relatives, and Jack's daughter Lucy did not mention the door monitors at all. This lack of discussion with current relatives and resident appeared interesting considering that Heather Grove showed the door monitors to prospective relatives looking around the home (see Chapter 6).

7.5 Summary

In this chapter I have examined how the monitoring technologies were implemented in practice within the three care homes. Findings suggested that staff may have benefitted from a higher level of involvement in the implementation of monitoring technologies, which might be understood as receiving more detailed, formal training, and having greater input into ongoing discussions about the implementation of technologies.

At each home, formal training for the nurse call/bed monitoring technologies did not seem to have been deemed necessary, but some staff appeared to lack confidence with new technologies, which suggested that more formal training might be beneficial. At Sycamore Lane, where bed monitoring technologies were not clearly visible in discursive behaviour and processes (perhaps most saliently, the absence of documentation within care plans), staff seemed to offer a diverse and confusing picture about precisely which residents had this technology in their care. At the other two homes where there did seem to be more discussion and documentation of implementation for individual residents, there seemed to be a clearer understanding, which suggested that implementation might benefit from higher levels of staff involvement in discussions.

The LBS at Conifer Gardens seemed to involve a difficult balance between providing enough formal training in advance of use, and the benefits of practical use and developing understanding through experience. Building upon findings from Chapter 6 regarding justifications for using the LBS, findings here suggested that most staff had not received enough formal training to develop their understanding about the range of potential benefits from its use since they appeared to emphasise its ability to enhance safety rather than any other aspects of care.

Most staff at Sycamore Lane seemed to have had a very low level of involvement regarding the activity tracker (including the Registered Manager), which appeared to have led to rumours that it was to monitor their activity rather than to explore resident mobility. It seems reasonable to suggest that greater involvement of staff in discussions about this technology might have facilitated a clearer understanding of its purpose.

Relatives and residents appeared to be more involved at Conifer Gardens in discussions about technologies than at Sycamore Lane or Heather Grove. Conifer Gardens particularly respected resident capacity to make a choice, even if the choice was deemed to be an unwise choice.

Chapter 8: What happened when they used the technologies?

8.1 Introduction

In this chapter I discuss the main theme of what happened when the technologies were used in practice. The chapter includes activation and deactivation of alerts from the technologies, and the delivery of and responses to the alerts. I explore staff roles and responsibilities in the use of the technologies and explore the impact of the technologies on the time and attention demands of staff. I consider how information and data gleaned from using the technologies was used, and discuss the capability or potential uses of the technologies. I draw upon descriptors of the technologies which are outlined in Appendix 14.

8.2 Alerts: activation and deactivation

8.2.1 Nurse call: bed sensors and pressure mats

The bed sensors at Sycamore Lane, and pressure mats at Conifer Gardens and Heather Grove, were activated by kinaesthetic method, i.e. by touch or pressure from the resident; bed sensors were also able to monitor vital signs and could activate an alert due to lack of movement e.g. a seizure (c.f. Appendix 14). There was a sense of immediacy about the speed of alerts activated by the bed sensors and the pressure mats, which suggested that both technologies were very sensitive. Some data suggested that bed sensors were perceived to be slightly more sensitive than pressure mats because they were placed within resident beds and could respond to movement, whereas pressure mats were placed on the floor and required a resident to place their foot fully onto the mat to activate an alert:

"The bed sensor alerts you quicker… if somebody's put their foot on the floor [onto a pressure mat], by the time they've put their second foot on the floor they could actually be on the floor... maybe stumbled or what have you, whereas the bed sensors, they're activated straight away, as soon as this person moves to get out the bed"

(Nicky, RN (night), Sycamore Lane, interview)

However other participants used phrases which suggested a similar immediacy of activation from the pressure mat to the bed sensor:

"they don't have to touch it hard, as soon as their foot brushes the mat, or their hand or anything, the alarm will go off"

(Simone, Senior Care Worker, Conifer Gardens, interview)

"they said to us even if he sort of puts his leg out of bed or touches it, it'll beep"

(Caroline, daughter, Conifer Gardens, joint interview with Amy)

There were some suggestions at Sycamore Lane that the bed sensors might at times be extremely sensitive:

"we laugh and joke that there's some ghosts in the bedrooms... sometimes they can be activated if the window's opened and there's a wind... there's no-one in that room, and you go up and it could be activated by the window being opened"

(Nicky, RN (night), Sycamore Lane, interview)

Another staff member also referred to this false alert, but although there was no resident in this room at the time she did not seem to have given much thought to deactivating the bed sensor:

> When Holly [night Care Worker] told me about the bed sensor which she believed to be activated by a breeze through the window, I asked her whether it was possible to turn off the sensor given that the resident was not in the bedroom. Holly said she didn't know, that she didn't know very much about how the sensors worked, and did not appear to have considered this option at all.
>
> (Sycamore Lane, field visit 14)

Night nurse Nicky also suggested that the bed sensors could be activated based on movement of a resident whilst they were asleep in bed:

> *"people turn in bed and they go off... and the person's lying there snoring, you know, fast asleep"*
>
> (Nicky, RN (night), Sycamore Lane, interview)

Despite these data, it seemed that 'false positive' alerts from both bed sensors and pressure mats were thought to be uncommon:

> *"the only thing that will get false alarms is if the cleaners have been in and pressed it by mistake… otherwise no it doesn't really show a false alarm"*
>
> (Emma, Senior Care Worker, Sycamore Lane, interview)

> *"only one [false alarm] and it's always in the same room... it doesn't do it anymore but it used to continuously go off... and she'd be asleep in bed"*
>
> (Olivia, RN, Conifer Gardens, interview)

The location of the pressure mats on bedroom floors meant that they could be inadvertently activated by staff, the most vivid example of which came at Conifer Gardens:

> Beatrice [Occupational Therapist] had disappeared around the corner with Carl's wheelchair and came back into the lounge area without it. The wall unit had started to beep… it was displaying Carl's room number. I walked down the corridor to Carl's room. The door was wide open and the pressure mat was in the middle of the room away from the bed, with the wheelchair parked next to it. I began walking back down the corridor and Emily [Care Worker] was walking towards Carl's room. She asked me if I had just been in Carl's room because the alert was beeping… I said that I hadn't been in the room but I had noticed the alert going off, and asked her why this was the case when Carl was clearly sitting at a table in the kitchen area having his lunch. Emily said that the alert might have gone off because *"they brought his wheelchair back and might've stood on it [the pressure mat] or something"*. She said that the mats have a *"mind of their own"* and can *"go off for no reason".*
>
> (Conifer Gardens, field visit 10)

In the field note above, Emily suggested that the pressure mats were extremely sensitive to activate. At Heather Grove, during the informal interview with resident Jack in his room, I knelt down and moved his pressure mat by pulling the power cable gently rather than by touching the mat, and the alert was activated. It was therefore possible that in the field note above, Beatrice had not actually stood on the pressure mat but had perhaps brushed it with the wheelchair.

One perceived advantage of the bed sensors was that their location underneath the mattress meant that unlike the pressure mats there seemed to be no risk of 'false negatives' of failing to activate an alert:

> *"if you've got a pressure mat at the side of the bed, that person has to get out onto that pressure mat for it to go off... if they shuffle to the bottom of the bed and get out there, you've no idea"*
>
> (Tiffany, RN, Sycamore Lane, interview)

Sometimes the physical properties of the pressure mat might mean that traditional observation was felt to be more suitable for certain residents:

"she's a small lady, if you didn't position it [pressure mat] right it'd miss her… I think we removed it because it was better to physically check on her than to trust the technology"

(Olivia, Nurse, Conifer Gardens, interview)

There was evidence at Conifer Gardens which suggested that whilst most residents were unaware of the pressure mat, some might find it irritating in some way:

"Duncan bless him, he doesn't know if it's there or not there, it doesn't bother him, [name of female] probably doesn't know that it's there or it's not there… Carl, I think they used to bother him… he will sometimes pick it up and look at it or fold it up"

(Martha, RN (night), Conifer Gardens, interview)

Carl's care plan contained an entry stating that on one occasion he had unplugged his pressure mat, entered another resident's room and attacked that resident. There was a suggestion that some more cognitively aware residents might have deliberately activated alerts by stepping on the mat:

"some of them will put their feet out and as you walk in, they put their legs back into bed... and then when you've gone back out they'll step back on it again… it's like they know if they step on that, you're gonna come running in"

(Eleanor, Care Worker (night), Conifer Gardens, interview)

There was a suggestion that residents might avoid the mat because they might not want to disturb staff, which could result in an accident:

"there's another lady upstairs, she knows what it's there for, but I don't think she fully understands it… she had a fall by stepping round the mat because it was there… the logic isn't there to say 'oh I should step on that and someone'll come and help me', she'll think 'oh I'll go round that so I don't disturb anyone'"

(Simone, Senior Care Worker, Conifer Gardens, interview)

Some residents might have lacked the cognitive awareness to know that the pressure mat activated an alert, but might have been aware of the pressure mat as a foreign object on the floor:

> *"a lot of residents have spatial awareness problems so stepping onto a different surface... you notice a different surface and a different sound when you step onto it... they might wonder what it is, because the mats are blue they might think 'oh it's a pool of water'"*
>
> (Sonia, RN, Conifer Gardens, interview)

> *"if they've got two different colours of carpet, or where the carpet separates from the lino [the pressure mat], to them that could look like a step, or uneven flooring... Gillian can be quite wary and her pace will slow right down if she's attempting to go across the [pressure] mat"*
>
> (Eleanor, Care Worker (night), Conifer Gardens, interview)

Conifer Gardens had attempted to find out more about residents' feelings towards the pressure mat but these conversations could be challenging due to levels of cognitive impairment:

> *"I've had a conversation with them, they can't actually vocalise that, but it just seems to be something there that they feel that that is something alien and they wanna move round it"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

Conifer Gardens had attempted to mitigate residents avoiding mats, including tailoring their attempts to a resident's routine:

> *"if you put his shoes on the mat… it was a trick cos we knew he'd go for his shoes… where if you didn't he would sort of shimmy himself down and try and bypass [the pressure mat]"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

There were some data to suggest that setting up the pressure mat when a resident was going to bed might be challenging due to the resident's bedtime routine:

> *"Gillian always wanted to shut the door, so you'd put her in bed and put the [pressure] mat on, and she'd have to get up and check and lock the door [after the staff member had left her room]. So it was pointless, because she'd set it off, and you'd have to go in…"*
>
> (Olivia, RN, Conifer Gardens, interview)

Olivia spoke in some depth about the physical properties of the pressure mats and how their use might be unsuitable for certain residents:

> *"you couldn't have a mat in there all time because he wouldn't understand it, he'd probably start pulling it apart, he'd trip over it, there'd be all sorts of complications, but then when he's too poorly to bother about what the technology is in his room, that's when we'd use it"*
>
> (Olivia, RN, Conifer Gardens, interview)

Olivia here seemed to suggest that the pressure mat might only be suitable for this particular resident when he was not well enough to pay it any attention. She discussed her feelings that the generic design of the pressure mat might not be compatible with truly person-centred care:

> *"it should be person-centred and technology isn't person-centred… you've got the technology, but you can't use it until… he's capable of accepting [it]"*
>
> (Olivia, RN, Conifer Gardens, interview)

Olivia cited financial implications as a potential barrier to person-centred technological designs:

> *"they are individuals and you can't treat everybody the same, and that's where technology falls down, because it'd be too dear to personalise it, and then who'd pay for that?"*
>
> (Olivia, RN, Conifer Gardens, interview)

Conifer Gardens managers were aware that pressure mats were not universally appropriate but stated that the home's position as part of a large company meant that they were at times restricted by company procurement strategy and contractual obligations with manufacturers:

> *"some of the constraints with delivering a person-centred service is that we've still got to fall in line with an overall strategic position within our organisation with certain contracts and certain available products, so sometimes we've got to make what's available to us try and best fit the people that we support… it's a lot of work... to do a full business case for one product [that is not on the company's approved list] that might only be £150... when we can order a pressure mat for 80 quid no questions asked"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

One function that the Conifer Gardens managers felt would be useful was an alert activation which could be set to a delay so that alerts could be tailored to individual resident mobility levels:

> *"a pressure mat that had a delay [would enable] somebody to be able to get up and use the bathroom independently"*
>
> (Philippa, Registered Manager, Conifer Gardens, joint interview with Deputy Manager Ben)

The bed sensors at Sycamore Lane had this additional delay functionality over the pressure mats at Conifer Gardens and Heather Grove (c.f. Appendix 14). This functionality was explained by Registered Manager Erica:

> *"that would be more the nurse role, the clinical role really, I mean we have bed sensors and they're all set to different times as far as I know, so if… Mr Smith [who is not assessed as being at risk of falls]… was out of bed for five minutes, well that's fine cos Mr Smith gets up to use the toilet… but if Mr Brown [who is assessed at being at risk of falls] got up and was out of bed for five minutes, that's a worry"*
>
> (Erica, Registered Manager, Sycamore Lane, interview)

What was particularly interesting about Erica's quote was that she suggested she had limited knowledge about this delay functionality because the actual settings were specified by nursing or clinical staff. However, Head Nurse Tiffany stated that the nurses were not involved in setting the delays, as they appeared to be set by owner Nigel:

> *"I'd like to be involved in that a bit more, you know, cos like me and the night sister, well, more the night sister really… about setting them up… for the amount of time that we want for each [resident]... Nigel sets them you see"*
>
> (Tiffany, Head RN, Sycamore Lane, interview)

Most staff at Sycamore Lane did not mention customised delays; data suggested that most staff did not seem aware of this functionality. For example, one Care Worker showed a lack of awareness when commenting on variation in activation speed of alerts:

> *"like all technology sometimes it can be a bit slower... I don't know if it's because we're at a different end of the building to where, I don't know, the, the box is for it or something"*
>
> (Jodie, Care Worker, Sycamore Lane, interview)

Jodie's comment here seemed to attribute differences in speeds of alert activation to stereotypical challenges posed by the infrastructure of 'all technology' as a homogenous concept, rather than showing an understanding that differences in activation speed might have been clinically specified. There also appeared to be a variation in knowledge amongst staff about the deactivation of alerts, as the night nurse suggested some alerts deactivated automatically:

> *"once they're back on the bed anyway they'll automatically stop"*
>
> (Nicky, RN (night), Sycamore Lane, interview)

Doug, a member of the day team, was unsure about this functionality but suggested it would be beneficial:

> *"I don't know if it works that it switches itself off if a resident got back into bed, I think that'd be a good idea"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

Stuart, a member of the night team, seemed certain that this functionality was not present:

> The bed sensor alert only tells you when a resident has left the bed and doesn't tell you when they have got back in again.
>
> (Stuart, Care Worker (night), Sycamore Lane, informal interview)

8.2.2 Nurse call: activation and deactivation by staff

At all three homes, staff could activate or deactivate alerts by pressing buttons to indicate to colleagues that they were attending to an alert, that they required assistance, or that there was an emergency situation. Staff often seemed to forget to deactivate alerts when attending to residents. There was a clear example at Sycamore Lane when a pager was buzzing continuously in a kitchen area:

> Matt [Care Worker] said that the room number it [the pager] was showing belonged to a resident who was being helped to get up, and hence that was why the pager kept going off.
>
> (Sycamore Lane, field visit 4)

Ben, Deputy Manager at Conifer Gardens, suggested that in moments of care delivery the focus for staff was the resident not the technology, and that staff might lack a detailed understanding of the technology:

> *"I don't think they care... they're getting someone up... people forget how to reset them or to put a presence... I don't think they're aware of what the system actually does... they know to answer the buzzers and what sets the buzzer off, but I'm pretty sure they'll get side-tracked when delivering personal care"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

Ben's suggestion seemed to be exemplified at Heather Grove, where two Care Workers did not seem to fully understand how to operate the system:

> Leah [Care Worker] said 'presence' [the word displayed on the wall unit in the lounge] indicates that someone has been in the room. I asked her how this was recorded and she said it was by the staff member pressing the button on the wall unit in the resident's room... she said that she wasn't totally sure how it worked. When she asked Louise [Care Worker], Louise said *"technology's nothing to do with me"*.
>
> (Heather Grove, field visit 2)

There was a laminated sheet of operating instructions affixed to the wall immediately below the wall unit which explained how to operate the system:

> I read through the instructions which revealed that 'presence' will be displayed when staff press 'reset' in the resident's room when they attend to the resident to stop the alert beeping. Once they have assisted the resident they are able to press 'reset' a second time in order to fully reset the system.
>
> (Heather Grove, field visit 2)

These instructions seemed potentially a little confusing, because staff seemed to be required to press a button labelled 'reset' twice; once to record their attendance to the call, and once again to actually reset the system. It was also interesting that despite these instructions being displayed immediately below the wall unit, neither Leah nor Louise seemed aware of them. However, staff were able to demonstrate how to generate an emergency alert by pressing both buttons together:

> Louise showed me the emergency alert which is activated by pressing 'call' and 'reset' together.
>
> (Heather Grove, field visit 2)

At Sycamore Lane, the bed sensors plugged into units mounted behind the headboards of the beds. On these units were three buttons; green, red and blue. The manufacturer's website stated that these buttons referred respectively to *'nurse present'*, *'nurse request for help'* and *'code-blue'* [the latter is medical terminology referring to an emergency requiring resuscitation]. There were data that suggested that staff did not clearly understand which buttons to press when responding to an alert, and hence they could generate a call that appeared more serious than it needed to be:

> *"people press the wrong one, they will probably press the red one when they only want assistance instead of the green one, so you go into a particular room and just find it's 'can you just get me a towel'"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

This confusion was summed up by night nurse Nicky stating that she was unsure how to record that she had responded to an alert:

> *"I found it quite difficult to begin with cos I didn't know whether I'd pressed it once or I'd pressed it twice… I just used to have to shout 'what colour do I press?', you know, cos I think they're green, red and blue, are they? I think there's three, or is it green or red?"*
>
> (Nicky, RN (night), Sycamore Lane, interview)

In summary, it appeared that there was a lack of thorough understanding amongst staff at each home about how the nurse call systems worked. It seemed that diverse physical properties of the buttons were not enough to ensure that staff fully understood how to operate the technologies. In chapters 6 and 7 I have shown that staff training around the nurse call systems seemed rather brief and informal, and may have been imbued with assumptions that the technologies were straightforward to use and were familiar to staff with prior work experience in social care. It is possible that the approach to training could

have led to a lack of complete understanding amongst staff; one staff member at Conifer Gardens explicitly offered this suggestion:

> Some staff don't know how to generate an emergency call from a resident's room if they need help... training was really comprehensive when the home first opened but now the induction is not as detailed.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

I will discuss the implications of staff training in Chapter 9. In this current chapter, I now turns to explore how the various buttons and pull chords on the nurse call systems may have been activated by residents.

8.2.3 Nurse call: activation by residents

Each nurse call system contained buttons and chords which could be operated by residents to call for assistance (c.f. Appendix 14). There were some suggestions that more cognitively aware residents would be able to understand how to call for assistance:

> *"he's pressed the buzzer 10 times and he doesn't really want me, or for example 'can you switch my smart TV over to a different channel cos I can't do it tonight'... down here [on ground floor] they're more residential so they'll do it [call for assistance] on purpose"*
>
> (Emma, Senior Care Worker, Sycamore Lane, interview)

However, many participants acknowledged that most residents did not retain this knowledge or apply it in all environments:

> *"a lot of them do know the call on the bed is for calling the nurse but sometimes when they go in the shower they'll look at the blank buttons and say 'what are they for?'"*
>
> (Emma, Senior Care Worker, Sycamore Lane, interview)

Another Senior Care Worker was concerned about whether most residents knew how to summon help, even if operating instructions were repeatedly explained and demonstrated:

> *"they're not gonna press that, because they haven't got the capacity. This is one of my biggest issues, how much the residents actually understand what those things are for… you can tell them and you explain to them and you can show them… but will they remember when it comes to going to bed?"*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

Relatives tended to feel that residents would not understand how to actively summon help and therefore any activation mechanism had to be passive:

> *"it's got to be something automatic… they couldn't cope with an alarm of any kind, if there was something here and you asked them to press to call someone, they wouldn't be able to do it"*
>
> (Alice, daughter, Sycamore Lane, interview)

> *"that was the problem where he lived before, we'd say 'dad, if you have a dizzy spell or you're not well you pull the chord' but he never seemed to use it… whereas the pressure mat it's there next to his bed, so he can't get out of bed without that going off"*
>
> (Lucy, daughter, Heather Grove, interview)

What often seemed to be the case was that residents inadvertently activated alerts based on a lack of cognition combined with physical properties of the technologies:

> They sometimes get emergency alerts from [name of resident]'s room and when they check he is in bed... when the wall unit is primed, there is a small red light... this light might draw [name of resident]'s attention in the dark and he might press the buttons thinking they are the light switch, given the location of the wall unit adjacent to the actual light switch.
>
> (Natalie, Care Worker (night), Heather Grove, informal interview)

The wall units at Heather Grove and Conifer Gardens were hardwired into the walls and could not be moved; the units at Sycamore Lane were wireless and could be moved (c.f. Appendix 14), which meant that Sycamore Lane had been able to take steps to address similar instances of resident confusion:

> *"it's in front of the toilet... they're going to grab hold of it to get themselves up and they're pressing the big red button... a lot of them think it's a bathroom light... we had one in front of the lift and we had to remove it cos residents were pressing it thinking it was the lift button"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

Sycamore Lane's Facilities Manager Noel reported that moving wireless units could come at a financial cost to the home from contacting the company supplying the technology. Noel felt that he had the ability to move these wireless units himself, and appeared to question the contractual arrangement that was in place with the supplier:

> The home needs take control of the whole system themselves... he doesn't need to pay a guy £150 to attached a wireless device when he can do it himself.
>
> (Noel, Facilities Manager, Sycamore Lane, informal interview)

The physical properties of the alert buttons may not just have increased the potential for inadvertent alerts; there was some speculation that they might actually dissuade residents from summoning help:

> *"to you and me a big red button means 'emergency', you press it, to people with dementia it can sometimes mean if they see red they think 'hot'... so they don't touch it"*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

Therefore the location of the buttons rather than the colour of the buttons might have been more salient. As Emma at Sycamore Lane stated, an alert would generate a response from staff regardless of what colour button had activated the alert:

"If you press the blue sensor it means another member of staff will run to them, it means that there's a member of staff in there... the red sensor is an emergency sensor that the resident will push but obviously if they push the blue button you're still going to go running to them"

(Emma, Senior Care Worker, Sycamore Lane, interview)

This quote also suggested that staff might lack a full understanding of the green, red and blue alert codes described in section 8.2.2.

8.2.4 LBS at Conifer Gardens

The LBS comprised of fobs worn by residents which transmitted data about the resident's location via RFID communication with sensors installed in the ceiling (c.f. Appendix 14). The LBS at could be set up to activate alerts if residents spent too long in a particular location of the home:

"the alarms would go off if they walked out the front door or in the stairwells or the lift for five minutes or more"

(Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

This alert activation setting could be personalised according to resident need:

"you can individualise the fob… it can say Mr A goes in the lift, you can alert me, or Mr A goes to the back yard, alert me, or Mr B goes to this level, alert me"

(Rochelle, Senior Care Worker, Conifer Gardens, interview)

The LBS could also be set to activate alerts if residents known to clash with one another came in close contact:

> *"[fob] number 1 can't go near [fob] number 2... and if it gets within so much distance of number 2, then an alarm would be activated for how long or whatever"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

There was a suggestion that one benefit of using the LBS was that it had reassured staff that the residents would not need checking on frequently:

> *"[the LBS] made [staff] a lot more relaxed rather than thinking 'right every ten minutes or so I've got to send a member of staff down to, to have a little look', and thinking 'oh God I haven't sent somebody down for twenty minutes'"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

However, there appeared to be an assortment of functional problems with the LBS because it generated a frequent amount of false alerts. One reason for this frequency was reportedly due to the physical nature of the removable, body-worn fob which meant that residents did not always keep the fobs on:

> Some of the residents would leave the fob in various places around the household, and then the alert would go off. Staff could be *"completely baffled"* as to why the alert was going off when they could clearly see the resident sitting in the lounge.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

It was unclear whether the residents had mislaid their fobs by accident or on purpose. Nevertheless, these inadvertent alerts could lead to a lack of trust between staff, with some staff becoming suspicious that the LBS was a tool for management to check on their activities:

> [Name of resident] had left her fob on the balcony... the Occupational Therapist must have been checking the LBS data online from home because she rang to ask why [name of resident] had been on the balcony for two and a half hours*..."as if we would have left her out there!"* [sounding incredulous at the question]... night staff felt like the LBS was being used as a Big Brother tool for management to watch over staff... staff were *"quite relieved when it did start playing up"* and was ultimately dropped from use.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

The sensors for the LBS had been installed on one household of the first floor (residential care) and in the ground floor café area. If residents walked out range of the sensors (e.g. across the first floor to the adjacent household), an alert was repeatedly activated unnecessarily with no way for staff to stop it:

> *"if the resident walked over to the other unit [household] the alarm would go off constantly until they came back... you could cancel it but it would just go off again after so long, like after 10 seconds"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

This problem could have potentially been rectified if the LBS had been installed throughout the entire building, however the cost of doing so was felt to be prohibitive:

> *"in all honesty it was a cost thing, our plan was to spread it over to the other side of residential and down into the garden"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

An alert would also be activated if the fobs were taken out of the building:

> *"if they're [relatives] taking the residents out they have to take the fobs off, cos it goes off at the door and then you've got staff running outside thinking they've gone out, and really they're with their relatives"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

For some residents it seemed that rather than misplace their fob, they became dependent upon the fob and were very reluctant to let staff remove the fob:

> *"[name of resident] got so used to having that [fob] on and it gave her access in the building and that, she started to become hyper-anxious when leaving the building because she didn't have that round her neck"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

The home had to establish strategies to address this anxiety, all of which added to the effort required to use the LBS:

> *"we had to... take the batteries out or give her a dud one when she went out the building... more logistical issues to using it than it is to just not have it at all"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

One member of staff did not seem to like the design of the fobs and felt that residents had found them too large:

> The fobs kept breaking. For the product to be useful the design would need to be smaller; something that could be clipped to clothing rather than a cumbersome fob around the neck.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

However, by way of comparison, the activity tracker used by George at Sycamore Lane was a small design which could be clipped to his clothing, but George reported this design might be challenging:

> George was not currently wearing the tracker and he said that sometimes he forgets to take it off and it gets put through the laundry. He said one time it came back and half of it had melted away… Madeline [George's daughter] asked him what they could do to make it better and he said *"make it bigger"*.
>
> (George, resident, Sycamore Lane, informal interview)

Therefore it seemed that calls for smaller fobs for the LBS might not be a panacea. One nurse, Olivia, referred to the need to personalise the fobs for residents but as with her comment about the pressure mats earlier in this chapter, she suspected that there would be financial implications from this idea:

> *"you couldn't just have a pendant, and expect everybody to just go along with that… I don't know what you could have [pause]… [name of resident]! You could have a card in his wallet, because he carries a wallet all the time… but… it's gonna cost a fortune if you've got loads of different designs to meet everybody's needs"*
>
> (Olivia, RN, Conifer Gardens, interview)

Staff using the LBS wore pagers which displayed alert information and were also equipped with an emergency button for them to summon assistance from colleagues. This button may have been too easy to press accidentally due to having to wear the pager attached to clothing at waist-height:

> *"if you're in the kitchen and you lean over to get something out the cupboard it would set the alarm off... it had a case on it but it didn't stop you from pressing any of the buttons, they were too easy to press"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

The door monitors at Heather Grove did not generate alerts to staff members, but rather recorded data about when and for how long the doors had been opened, which were available to managers via a laptop in their office. The activity tracker at Sycamore Lane did not generate alerts of any kind.

8.3 Alerts: delivery mechanisms and responses

The nurse call systems at all three homes, and the LBS at Conifer Gardens, required a delivery of alerts to staff. There were two main aspects to consider in relation to the delivery of alerts. Firstly, there appeared to be a difference between delivery to pagers carried by staff or delivery to wall units. Secondly, each home had ensured that the alerts were received by all delivery ports in the building at the same time, rather than opting to isolate alerts to specific areas of the home (e.g. a pager or wall unit on the floor on which the alert was activated). These factors appeared to be intertwined with physical features of the home and the distribution of pagers.

8.3.1 Pagers vs. wall units

At Heather Grove, one staff member stated that the small size of the home meant that staff *"don't have to run far"* to see a wall unit (Natalie, Care Worker (night), Heather Grove, informal interview). The compact nature of Heather Grove meant that staff were usually in close proximity to one another and seemed to have devised a system of informing each other that they were responding to an alert:

> *"if they [staff] come in to the lounge and they hear that same buzzer they'll say 'has anybody gone?', and the others will say 'yeah Kathy's gone'... because I've shouted out the number and I'm not there anymore... If you walk past it and you don't read out the number then you've not seen it and you've not gone"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

The size of Heather Grove and its compact layout suggested that the wall units worked well because they were audible to staff wherever they were:

> *"no matter where you are [in Heather Grove] you can pretty much hear a beep [from the wall unit], plus no matter which floor you're on it beeps on every floor, whereas in a bigger home you'd need a pager cos you could walk into the dining room and you'd have no idea that anybody was calling for you"*

(Kathy, Deputy Manager, Heather Grove, interview)

Kathy here also suggested that larger homes would be better served with pagers rather than wall units, but data from the other two homes did not unequivocally support this suggestion. Conifer Gardens was a larger home but as the floor plan showed (Figure 5.3 in Chapter 5), it was divided into smaller, open-plan households. There was a feeling that staff could respond promptly to alerts from the wall units within each household because of this compact nature:

> *"on the whole I think we get there very quick, cos of the layout of the lounge as well and the bedrooms, it's all sort of quite compact"*
>
> (Sonia, RN, Conifer Gardens, interview)

Sycamore Lane was the same size home as Conifer Gardens in terms of number of beds, but as the floor plan showed (Figure 5.1 in Chapter 5), it was arranged as long corridor-like floors rather than open-plan households. Sycamore Lane was using pagers but many staff appeared critical of the pagers and showed a preference for wall units:

> *"the nurse call system I prefer [is] the one where it's on a panel in the corridor and you can see exactly what room number rather than a pager where a lot of the time people don't carry it around or it doesn't work, so therefore the system's failing"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

Doug's suggestion here was that the portable nature of the pagers relied on people carrying the pagers at all times, which at Sycamore Lane did not always happen:

> *"a lot of the time people don't carry the pagers around with them, you can find the pagers either on the desks in the kitchens… it's only when the thing goes off they realise it's there"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

One of my observations seemed to support to Doug's comment:

> The pager went off. Hilary [night RN] didn't seem to notice at first until I pointed it out. The pager was on the counter and had been placed on top of some kitchen roll. Hilary said the staff do this to muffle the noise of the vibration.
>
> (Sycamore Lane, field visit 5)

Analysis of the use of pagers required consideration of how the pagers were distributed amongst the staff. At Sycamore Lane the Senior Care Worker on each floor, and the nurse on duty that day, each had a pager. This distribution at times could place a burden onto the pager carrier:

> *"they were going off all over the building and I were traipsing up and down to every one, you know, and I just don't have the time...to go on wild goose chases"*
>
> (Tiffany, Head RN, Sycamore Lane, interview)

This distribution also meant that there could be challenges in ensuring responses to emergency alerts activated by the staff member carrying the pager. One challenge appeared to be logistical, i.e. only the pager-carrier on that floor would be aware of the alert:

> *"there's no point in me pressing the emergency alarm because I'm the one with the pager anyway. So I've got to go, leave that [resident] to shout for a member of staff to ask them to go and get the nurse"*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

Another related challenge appeared to be a risk that other staff with pagers would assume that the staff member with the pager on that floor would respond to the alert, not realising that they were the very person who had activated the alert:

> *"if it's me that's in resident X's bedroom and they're on the floor, I've got to then leave them to go and get somebody… the nurses are automatically going to think 'oh it's ok, Aggie's got that pager, she'll turn it off'"*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

A limited supply of pagers meant that when the staff member carrying the pager left 'the floor', another member of staff would need to assume temporary responsibility for the pager:

> *"if I'm going for my lunch or going for a meeting or for a break, I will hand my pager over… for example, today Jodie is doing meds [medication] down here, when I go for my lunch I will hand the pager to her"*
>
> (Emma, Senior Care Worker, Sycamore Lane, interview)

However this transfer of pagers did not always appear to be successful:

> Communication can be chaotic, especially if the person responsible for the pager has left the floor and has taken the pager with them… Either more pagers or a more visible alert system would be beneficial.
>
> (Ernie, Care Worker, Sycamore Lane, informal interview)

Other staff advocated more pagers on the basis that response to alerts would be more straightforward:

> *"if everybody had a pager the nearest person could go switch it off couldn't they, rather than it coming through to one person"*
>
> (Tiffany, Head RN, Sycamore Lane, interview)

However, Kathy from Heather Grove suggested that from her prior experience of a broad distribution of pagers, several staff might respond to the same alert because they were unaware that colleagues were also responding:

> *"it worked well [in a larger home with more pagers] because people did go, but you'd find maybe three or four people going at the same time because they weren't aware"*
>
> (Kathy, Deputy Manager, Heather Grove, interview)

Pagers were often deemed to lack physical robustness, which could mean a drain on resources for the home. These resource implications appeared to have been problematic at Conifer Gardens when using the LBS:

> *"technically you've got seven staff on a day shift so you should have seven pagers, that's two grand [£2000], two and half grand's [£2500] worth of kit just attached to someone's hip, that gets put in the bath, go down toilets, get smashed"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

Damage to pagers at Sycamore Lane appeared to be an ongoing problem. After the recorded interview with Registered Manager Erica had ended, she pointed to a box of three new pagers in the corner of her office and said that she had not issued all three at once, but rather had issued one and was waiting to see if it got lost or damaged quickly. Erica suggested that staff were aware of the continued expense of replacing pagers:

> *"people wouldn't necessarily volunteer themselves to look after a pager… nobody wants to be responsible for them because they're so expensive"*
>
> (Erica, Registered Manager, Sycamore Lane, interview)

Staff at Sycamore Lane seemed reluctant to take on the responsibility of a pager because of the cost:

> *"if anything happens to that pager, that's me… I don't like having that… I know they cost a lot of money"*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

There seemed to be a rumour circulating amongst Sycamore Lane staff that they would be held personally responsible for the cost of replacing pagers:

> The member of staff who signs out the pager is responsible for footing the cost of a replacement... £130… not sure that the marginal pay increase for being the Senior Care Worker was worth that responsibility.
>
> (Ernie, Care Worker, Sycamore Lane, informal interview)

> Iona, a night Care Worker, said that staff don't want to take responsibility for having the pager because they have been told they have to meet the cost of a replacement.
>
> (Sycamore Lane, field visit 18)

However this rumour appeared to be unfounded, as senior staff stated that the home met this cost:

> *"the organisation replaces it, that's why it's cost a fortune in the last two years for pagers"*
>
> (Tiffany, Head RN, Sycamore Lane, interview)

One night Care Worker at Sycamore Lane suggested that staff did not respect the design of the pagers:

> The pagers should be smartphones because *"people would have more respect for them and take more care of them"*
>
> (Stuart, Care Worker (night), Sycamore Lane, informal interview)

Staff cited other difficulties with using pagers, including a risk of disturbing residents:

> *"it's not very good at night when you're seeing to clients' [residents'] needs and they're fast asleep and you're trying to be dead quiet and this buzzer [pager vibration] goes off"*
>
> (Nicky, RN (night) Sycamore Lane, interview)

Some staff appeared to try to avoid the pagers by claiming that they were not working:

> *"I think because staff aren't keen on the pager alerts they would be quite happy if they weren't using them... sometimes they'll say like 'oh it's not working, it's not working' when it's simply the battery that's not working"*
>
> (Erica, Registered Manager, Sycamore Lane, interview)

Interestingly, when Conifer Gardens used to have nurse call pagers rather than wall units, staff there adopted a similar strategy of avoidance:

> *Once batteries ran out on the pagers, staff simply didn't replace them, and made out that they hadn't been able to find any batteries.*
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

The LBS training manual claimed that the LBS could free up staff time as they would not have to follow residents constantly, however there was a suggestion that battery replacement in the pagers was a time-consuming burden:

> *"the battery changing [on the LBS pagers]… very frequently we needed to change the battery... really, on top of everything, and you have to change the battery"*
>
> (Rochelle, Senior Care Worker, Conifer Gardens, interview)

During the fieldwork, use of pagers in Sycamore Lane was reduced from one on each floor plus the duty nurse to just one pager for the member of ground floor staff looking after the one resident with the door sensor. Staff did not seem concerned about this reduction and suggested they had devised an alternative strategy of using their mobile phones, even though they were not supposed to use their mobile phones at work:

> *"we text each other, we just say so and so's number's going off"*
>
> (Nicky, RN (night), Sycamore Lane, interview)

The data therefore seemed to pointed to a strong preference for wall units over pagers as the mechanism through which alerts could be received. However it was important to note

that this preference was not unequivocal. One member of staff at Heather Grove recalled her prior experience of working in a different care home that had used pagers:

> With a pager, you can see the room number immediately… it can allow you to make a judgement about the likelihood of severity of the resident's need and therefore how fast to respond... the wall unit alert *"can panic you"* because you are made aware that somebody needs you but you cannot immediately see who.
>
> (Natalie, Care Worker (night), Heather Grove, informal interview)

There was also a feeling that beeping from wall units could disturb residents, although it was not entirely clear how aware residents might have been of the noise:

> *"they are quite irritating and they're loud, I don't know how the residents manage"*
>
> (Martha, RN (night), Conifer Gardens, interview)

> The second time the wall unit beeped, Carl turned his head slowly towards the direction of the noise (it was to his left about 20 feet away). I know from talking with his wife Geraldine that his hearing isn't as good as it used to be so I was a bit surprised that he might have heard this. I asked him what the noise was but he didn't respond.
>
> (Conifer Gardens, field visit 13)

The visual display of the wall units might have been rather small and some staff suggested that a larger display would be more helpful:

> Judy said that you have to have good eyesight to see the numbers. She felt it would be better if the display was a lot bigger, like a bingo number display.
>
> (Conifer Gardens, field visit 19)

In the comparison between pagers and wall units, I now turn to include exploration of the specific ways in which the alerts were set to be received by the wall units and pagers.

8.3.2 Alerts to all ports vs. isolation of alerts to local areas

In all three homes, alerts were set to come through to all ports (i.e. to every wall unit/pager in the building simultaneously) rather than being isolated to a particular wall unit or pager (e.g. in the area of the home in which the alert was generated). A minority of staff felt that this openness of alerts could be problematic because it could reduce how seriously staff took an alert:

> *"it is ridiculous. It never used to be like that, when we first started it used to be to each household, to each floor… it gets to the point where no-one cares any more...it used to be a lot better when it was each floor cos people cared then more"*
>
> (Olivia, RN, Conifer Gardens, interview)

Another member of staff at Conifer Gardens reflected on how when the home first opened, some staff would simply cancel alerts if the room was not within their area of the home:

> Staff on the nursing floor used to turn off alerts via their wall unit when they saw that the room number was not on the nursing floor. Staff on the residential floor would then be walking over to the wall unit to see which room was calling, only for the room number to disappear before they got there.
>
> (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)

Data presented earlier in this chapter pointed to a frequency of inadvertent alerts. There was a sense that these inadvertent alerts might lead to a danger of staff not taking subsequent alerts seriously:

> *"because the emergency button [on the LBS pager] got pressed so much through leaning over… if you actually did press it [deliberately] not many people would come cos they'd think 'oh she's just caught it on the cupboard again'*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

The Occupational Therapist at Conifer Gardens cited a frequency of false alerts to pagers as being a possible reason why staff lost interest in the LBS:

> *"in the end it was probably just another hassle, because they knew it was buzzing but it wasn't actually buzzing for a reason… people just become disheartened with it, it's like, well, what's the point in it?"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

Other staff at Sycamore Lane referred to the impact of inadvertent alerts generated by residents:

> *"if the emergency button goes off now and you find out it was just a resident, the next two or three times it's going off you're thinking to yourself 'it's nothing important, it's probably [name of resident] pressing it in the bedroom cos she's gone to the toilet'"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

At Sycamore Lane, one relative seemed concerned that false positive alerts might lead staff to ignore further alerts:

> *"I don't know how many, how often it reacts falsely and then they ignore them, that's what I'd like to know, if people are moving around a lot, does it [the bed sensor] keep going off?"*
>
> (Alice, daughter, Sycamore Lane, interview)

There seemed to be a risk of a scenario in which many inadvertent alerts were being received all around the building, which could lead to staff assuming that the next alert was also inadvertent. The managers at Conifer Gardens felt that the decision to open alerts to all ports was an imperfect solution:

> *"it's a difficult one... you risk the staff becoming blasé about buzzers... [sighs, pause] I think it is a difficult one"*
>
> (Philippa, Registered Manager, Conifer Gardens, joint interview with Deputy Manager Ben)

> *"the pros side of it is that it does let everybody in the building know... the negative side of it is it can just drop into background noise"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

Nevertheless, most staff felt that the advantages of the openness of alerts throughout the building outweighed disadvantages of the frequency of alerts:

> Pagers could be *"constantly buzzing"* but it was helpful to be alerted to movement on other floors because staff on those floors could be tied up dealing with an emergency and might not be able to respond to another alert.
>
> (Ernie, Care Worker, Sycamore Lane, informal interview)

> *"I will ring the staff [on another household] and say 'this buzzer is going for so long, why's nobody attended yet?'… if it's only on here [on one household], I can't do that"*
>
> (Rochelle, Senior Care Worker, Conifer Gardens, interview)

> *"if the alarm's gone off twice on the pager and no-one's answered the call, we ring up to the other floor and say 'will you go and check in room so-and-so, the alarm's going off'... and if they're busy and we can't get through, we'll run up*
>
> (Emma, Senior Care Worker, Sycamore Lane, interview)

At Conifer Gardens the Deputy Manager stressed the importance of a widespread awareness of emergency alerts:

> *"I routinely go round and just hit two [both buttons, to generate emergency alert] and sit down next to the buzzer and wait to see how many staff turn up, cos you need to make sure that they're always responding to those emergency buzzers"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

The alert sound of the nurse call at Conifer Gardens and Heather Grove distinguished between a help call and an emergency call:

> *"you press the two [buttons] together and it's a different sound, the emergency button, so then it alerts the other staff that you need help immediately"*
>
> (Tracy, Care Worker, Heather Grove, interview)

This differentiation appeared to be lacking in the system at Sycamore Lane:

> *"I think if the staff had something to call for help [in emergency] that's different from the call alerts then people would know then that there was a serious matter"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

Some staff cited an important role for tacit or local knowledge about residents which seemed to help govern their response to alerts. I often observed staff not responding to alerts from wall units:

> There were half a dozen residents sitting round the tables and staff were preparing for lunch. The wall unit beeped a couple of times. Nobody went to check the unit.
>
> (Conifer Gardens, field visit 18)

I asked staff about this non-response in interviews, and they pointed to their knowledge of the residents as influencing their response to the alerts:

> *"you've also got to understand that everybody knows who's here... so on our floor we'd know whose alarm could go off and if they're not in their room then you wouldn't bother looking"*
>
> (Olivia, RN, Conifer Gardens, interview)

This application of knowledge was not held up as a fool-proof strategy for governing response to alerts, but it was felt to be a useful heuristic:

> *"you do think, like, 'oh it won't be us', or if you don't have anyone in bed who you know has got a pressure mat you'll think 'oh it's not my mat, it's not my mat' and then you'll go and check it and someone's stood on it, but as long as you know where your residents are... you kind of get the gist of whether it is your floor or not"*
>
> (Simone, Senior Care Worker, Conifer Gardens, interview)

Knowledge about particular issues regarding individual residents on certain floors might also have encouraged staff from other floors to be temporarily more vigilant to alerts that might be from outside their immediate area of work:

> *"a lady downstairs, when she first came in, we had a number of issues with her and people were quite aware of that, so if [room number] flashed up people were going to respond to that to make sure everything was OK"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

This knowledge therefore appeared to be useful for staff in judging whether or not the alert had been generated by a resident in their area of care. There were also suggestions that staff also seemed to apply tacit or local knowledge about whether alerts activated within their area of the home would require a prompt response:

> *"it'll be room [X] that's bleeping, and you know that that person doesn't need your assistance, 'cos they're there... so you just kind of keep flicking it off on your pager until you get chance to go round and switch it off"*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

However, due to the open delivery of alerts to all ports, any such alert would be received by all pagers in the building. Therefore, even though staff on the relevant floor may be calling upon their local knowledge that the alert was not urgent and did not need deactivating quickly, the alert might be irritating staff on other floors:

> *"if it's not switched off straight away it's going off… then you're ringing each other 'can you turn that bloody pager [alert] off, it's driving us mad, it's constantly bleeping on ours' "*
>
> (Aggie, Senior Care Worker, Sycamore Lane, interview)

The bed sensors and headboard units at Sycamore Lane were portable and could be transferred between rooms (c.f. Appendix 14), for example, if a sensor had broken and needed replacing quickly. However, this portability also risked sending misinformation to staff:

> *"if the bed sensor goes faulty, which is very rare, we might have to take it off another bed that is empty... instead of room [X] would come up on your pager, it would come up as room [Y] until it's reprogrammed"*
>
> (Emma, Senior Care Worker, Sycamore Lane, interview)

Staff therefore required knowledge that the bed sensor had been moved to a different room to understand that room number X now referred to room number Y. This knowledge might not be communicated to all staff:

> *"it's only when you go to these bedrooms and have to try and check them, cos Nigel used to go round and check all the buzzers used to correspond, that you'd find out if they were right or wrong"*
>
> (Doug, Care Worker, Sycamore Lane, interview)

Reprogramming the system to display the new number was not straightforward, and required input from the company who supplied the system:

> Not sure if you had to physically reprogram the nurse call unit or whether this was accessed on a computer system… suspected it was the latter… needs to talk to the company who installed the system to find out how to do this.
>
> (Noel, Facilities Manager, Sycamore Lane, informal interview)

> *"I think it's more us managing the process and getting tighter control of the pagers and also, maybe looking at the company who's supplying them and coming in to audit the bed sensors… they just seem to get it all up and running and fixed.. and then a month, two months down the line it'll be like why isn't that one, why isn't that one working?"*
>
> (Erica, Registered Manger, Sycamore Lane, interview)

Both Noel and Erica here suggested that the supplier's role was inefficient, and that it would be preferable if Sycamore Lane itself had more control over the maintenance of the technology.

Having considered both the activation/deactivation of technological alerts, and the delivery mechanisms and responses to the alerts, I will now turn to explore if the use of the monitoring technologies helped staff to understand the needs of residents.

8.4 Did the technologies help enhance understanding of resident needs?

The nurse call technologies, the LBS and the activity tracker all had the potential to enhance understanding of the care needs of residents, but there was a mixed picture about how clearly this understanding seemed to be realised in practice. The bed sensors and pressure mats seemed to be used to identify patterns in resident behaviour and mobility:

"with the pressure mats it gives me information on you know how much they are walking around, and how much care people need… it helps build a picture of individuals"

(Kathy, Deputy Manager, Heather Grove, interview)

This picture of individuals could help staff to identify opportunities for intervention:

"[alerts help staff to see] what time it's happening, why it's happening, how many times during the night, why she's having this urge of getting up, what's triggering the person to get up or what triggering the person to have this many falls, so we can see the patterns and the behaviours in that way"

(Rochelle, Senior Care Worker, Conifer Gardens, interview)

Patterns of movement identified from alerts activated by these technologies could possibly be used to indicate underlying health issues for which support could then be sought:

"bed alarms, again they're brilliant... if they're having sleeping problems, then maybe we need to look at the medication, have they got a urine infection, have they got a chest infection, is there something underlying, so then you're getting them the help that they need"

(Aggie, Senior Care Worker, Sycamore Lane, interview)

At Sycamore Lane, the clinical data directly recorded by the bed sensors had the additional potential to enhance clinical understanding of residents. However this functionality did not appear to have been used:

"I'm really not sure whether it does [record clinical data] but apparently it's all recorded on a computerised system... if we want a report, [owner] Nigel can access it and print it off for us... but it's not something that we use readily"

(Erica, Registered Manager, Sycamore Lane, interview)

Head Nurse Tiffany suggested that the reason why these data had not been used was due to the numbers of residents receiving nursing care who had complex health needs:

> *"we should now be looking with Nigel and getting, say, maybe the weekly printout… sometimes at night time things happen with your body that wouldn't normally happen during the day time, so it would be something worth looking at... up until recently we've not had the volume of nursing clients to warrant the printout"*
>
> (Tiffany, Head RN, Sycamore Lane, interview)

At Conifer Gardens, the LBS was capable of recording a range of quantitative data about resident and staff mobility. However these data required a member of staff to conduct a level of analysis and interpretation, which seemed to be too demanding on staff time:

> *"We can look into it… we can see if there's any patterns over their behaviour patterns, but we didn't have chance to look into those things"*
>
> (Rochelle, Senior Care Worker, Conifer Gardens, interview)

Taking this time to explore the data might not actually have been deemed necessary:

> *"it was adding another layer of… assessment to make a decision when you didn't necessarily need that data to make your decision… there's nothing wrong with traditional observation... we're not being replaced by a machine"*
>
> (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)

Ben's quote pointed to another aspect of the philosophy of care which emphasised human contact and personal skills in the delivery of care. This view was supported by Registered Manager Philippa who felt that enhanced potential for quantitative data was not a justification it its own right for use of monitoring technologies:

> *"dementia care fundamentally it is about people and interaction... I don't want to rely on a piece of data… I want to go over to someone and give them a bit of a hug and say 'are you alright?'"*

(Philippa, Manager, Conifer Gardens, joint interview with Deputy Manager Ben)

The partial installation of the LBS was felt to undermine the quality of the data that could be collected:

> *"in residential [area of service] you need coverage across the entire floor, because as soon as somebody [resident] went over the other side [household where LBS was not installed] you get a big gap in your data… somebody might be having a great time and really involved in things on the other side, but you're not registering anything"*
>
> (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)

The impact of this partial installation was felt to have caused staff to become underwhelmed by the LBS:

> *"I don't know who else was monitoring the system and I think that's probably why it failed… staff didn't find it useful… they was just asked to wear a pager, and it'd keep buzzing…the staff would just be saying 'well why are we doing it, it's not working, it's not working properly'"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

The Occupational Therapist had received the most training and assumed a de facto level of responsibility regarding the implementation of the LBS. She seemed to feel that this responsibility had been in danger of consuming her wider role:

> *"you had to change it all the time… it was becoming a big part of my role… when I look back now I think yeah it did take up quite a lot of my time, which would've been beneficial for the home, but you needed other people on board"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

Beatrice here seemed to suggest that this workload could have been shared by other staff also assuming responsibility for the operation of the LBS. She concluded that:

> *"it's a job in itself… you could have somebody just, that could be their job, just to monitor it"*
>
> (Beatrice, Occupational Therapist, Conifer Gardens, interview)

The LBS also did not seem to be a justifiable investment due to its cost in relation to similar technologies more widely available on the market:

> *"if I wanted to know how many steps people need I don't need a £25,000 pound… tracking system, I can just buy a £4 pedometer"*
>
> (Ben, Deputy Manager, Conifer Gardens, interview)

This lack of justification was reinforced when considering the impact of investing in the LBS from a business perspective:

> *"people pay £[X] to live here, if they're private, most of the people that live here come through as local authority [funded], so we're getting [less than X] quid a week... we don't charge [name of affluent locality] rates... so what my passion is and our passion is, is looking for innovation through people"*
>
> (Philippa, Manager, Conifer Gardens, joint interview with Deputy Manager Ben)

It therefore seemed that a high cost of full installation of the LBS, which would have hopefully generated more accurate data, was deemed unaffordable and not worth the expense given the relative lack of importance placed on quantitative data gleaned from the system in relation to traditional observational practice.

In the following section I will consider the usability of the nurse call systems since this type of technology was common to all three homes.

8.5 System Usability Scale: nurse call systems

All staff who were interviewed (n=24) completed the System Usability Scale [SUS] for the nurse call system in their home: the bed sensors and pagers at Sycamore Lane, and the pressure mats and wall units at Conifer Gardens and Heather Grove. Mean and median scores for the SUS were calculated for the two different nurse call systems. Differences in mean scores between the two systems were tested for statistical significance using the Mann-Whitney U test. Results are presented in Table 8.1:

Table 8.1: System Usability Scale scores for nurse call systems

	Nurse call system		**Mann-Whitney U between means (two-tailed; p-value)**
	Bed sensors & pagers	**Pressure mats & wall units**	
***n* respondents**	10	14	
Mean SUS score*	71.25	88.04	**.007**
95% CI for mean	61.37 – 81.13	88.18 – 94.19	
Median SUS score	71.25	90.00	
Interquartile range	19	15	

*highest possible score (i.e. highest usability rating) = 100

The SUS score out of 100 can be erroneously interpreted as a percentage, when a score of around 70 has been found to be around the 50th percentile (see Brooke, 2013). Table 8.1 shows that staff rated both nurse call systems as having higher than average usability scores. It also shows that there was a significantly higher mean score for the pressure mat and wall unit system used at Conifer Gardens and Heather Grove than for the bed sensor and pager system used at Sycamore Lane. However, these scores do not provide nuanced detail about components of the different systems (i.e. the type of sensor – pressure mat or bed sensor; and the type of alert device – wall unit or pager).

8.6 Summary

In this chapter I have explored what happened when the technologies were used in practice:

- Bed sensors and pressure mats were both sensitive to activate. Although they possibly generated false alerts, these seemed to be very minimal
- Bed sensors at Sycamore Lane could be set to a delay according to resident need but there seemed to be a lack of understanding amongst staff about this functionality
- Staff in all three homes seemed unsure about how to fully operate the nurse call systems. Colour-coded buttons did not seem to aid this understanding
- Staff might forget to deactivate alert technologies when delivering care to residents because the resident was the focus of attention rather than the technology
- False alerts could be triggered by residents inadvertently pressing buttons and by lacking capacity to understand how to use the buttons. Location of the nurse call buttons may have been more important than the physical properties alone
- The LBS at Conifer Gardens appeared to generate a high number of false alerts and staff became frustrated with its erratic functionality
- Staff seemed to prefer wall units over pagers as the mechanism for receiving alerts. The physical environment of the care home together with the visibility of the alert mechanism seemed to have important influence on staff response
- In all three homes, alerts were sent to all ports rather than isolated to certain areas. This openness was perceived to be preferable to isolation, especially for emergency alerts, although there was acknowledgement that there was a risk of staff not taking alerts seriously
- Staff appeared to use tacit or local knowledge about residents to influence their response to alerts
- The pressure mats and bed sensors could help staff identify patterns in resident behaviour and possibly underlying health problems causing these behaviours. The bed sensors at Sycamore Lane could record vital signs but at the time of fieldwork these data did not appear to be analysed

- The LBS at Conifer Gardens was able to record data about resident and staff location and mobility, but the time needed to analyse and interpret this data did not seem to be workable, and there were questions about how useful these data actually were in clinical decision-making. These questions appeared to become more pronounced when considering the expense of the LBS.

In the final chapter I provide discussion of the findings and reflections upon the study.

Chapter 9: Discussion

9.1 Summary of research question, methodology, and findings

For this study I proposed the research question **'how does the use of monitoring technologies become part of routine practice in care homes for people with dementia?'** with the aim of understanding factors which appear to help or hinder the implementation of these technologies in practice. The rationale for the study arose from consideration that care homes are supporting increasingly older, frailer adults with higher levels of cognitive impairments; that use of monitoring technologies may help to enhance quality of care, but that implementation of technologies in practice is often extremely challenging.

I employed an embedded multiple-case study design (Yin, 2009) within three dementia-specialist care homes in the North West of England, which in this study I re-named Sycamore Lane, Conifer Gardens and Heather Grove. Sycamore Lane and Conifer Gardens were purpose-built 60-bed homes providing residential care with nursing. Heather Grove was a 27-bed converted Victorian house providing residential care without nursing. At the time of fieldwork, each home was meeting all standards in all areas of inspection by the Care Quality Commission. Each home was using a nurse call system which included bed-exit monitoring capability via bed sensors (Sycamore Lane) or pressure mats (Conifer Gardens and Heather Grove). Each home also had experience of using other monitoring technologies: Sycamore Lane was trialing an activity tracker with one resident; Heather Grove was using door monitoring technology to record night-time checks on residents by staff; and prior to the study Conifer Gardens had used a radio frequency location-based system.

In the main, I applied qualitative methods; primarily non-participant observations and semi-structured interviews with staff, relatives and residents. Interviews were informed by Normalization Process Theory [NPT] (May and Finch, 2009; May *et al.*, 2015). I also

collected data from care home documentation (e.g. care records) and technology manufacturer literature. I analysed these qualitative data via inductive framework analysis (Ritchie, Spencer and O'Connor, 2003). I also used two questionnaires: the Media and Technology Usage and Attitudes Scale [MTUAS] (Rosen *et al.*, 2013), which provided contextual information about staff members' and relatives' usage of and attitudes towards everyday technologies; and the System Usability Scale [SUS] (Brooke, 1996), which helped to understand how usable staff found the nurse call systems. I tested differences in mean scores for statistical significance. I provide methodological reflections in section 9.4.

Findings highlighted the following:

- An emphasis upon safety and mitigation of risk of physical harm seemed to override other potential benefits (such as freedom of movement for residents) or ethical concerns (such as negative impact upon resident privacy) as a reason for using monitoring technologies
- This emphasis appeared to be related to monitoring technologies being understood as fundamentally different to other interventions, which had potential implications for involvement in implementation: staff, relatives and residents did not always seem to be involved in discussions and decision-making regarding implementation, and at times seemed to lack knowledge about the status of technologies
- Staff training in the use of the technologies appeared mainly informal and based upon assumptions of simplicity of use, which might not have been sufficient to ensure that staff fully understood the technologies
- Technical performance of the technologies looked to be partly subject to a relationship between their physical properties and the physical environments of the homes, which suggested that there may not be any ideal set of properties for any particular monitoring technology
- Some technologies offered a range of functional and information-gathering capabilities, which at times were perceived to be useful complements to the delivery of care, but at other times were perceived as less useful, particularly if

they were imbued with a financial cost that was not justifiable from a business perspective.

In section 9.2 I discuss the findings, highlighting the contribution they make to the existing literature; in section 9.3 I draw out the new knowledge added by the study; in section 9.4 I reflect upon the study, including methodological strengths and limitations; in section 9.5 I offer recommendations for practice, research and policy; and in section 9.6 I conclude the thesis.

9.2 Discussion of findings

9.2.1 Framing the discussion

In his case study methodology, Yin (2009) advocates the formulation of *a priori* theoretical propositions. In Chapter 4 I outlined the following related theoretical propositions which arose from the literature review:

- There will be more emphasis placed upon the ability of the technologies to enhance safety than to enhance any other aspects of care. If other aspects of care are emphasised ahead of safety, the technologies may be unlikely to be implemented as part of routine practice
- There is likely to be a varied picture regarding the ethical considerations of the use of these technologies. Ethical acceptance is likely to come from relativist positions such as a lack of objection or awareness from residents, the intention behind the use, or from priorities of staff roles
- The technologies may help to increase staff confidence about the safety of residents, and free up their time to complete other tasks. If the technologies do not increase staff confidence and are too time-consuming to use, they will be unlikely to be implemented as part of routine practice
- The majority of technologies are likely to generate false alarms or 'alarm fatigue', however staff will be likely to continue to use existing practices alongside the technologies, or use alternative strategies to mitigate this overburden of alarms.

The extent to which this overburden will impact upon the implementation of the technologies as part of routine practice is unclear.

I frame the discussion in this chapter by considering to what extent these propositions were borne out by the findings of the study. In Chapter 2 I outlined that I would draw primarily upon Normalization Process Theory [NPT] as a lens to interpret facilitators and barriers to the implementation of the technologies as part of routine practice. NPT contains four generative mechanisms, summarised in Table 9.1 (based upon May *et al.*, 2015; c.f. Chapter 2 for more detail):

Table 9.1: Mechanisms of Normalization Process Theory

Coherence: understanding	**Cognitive Participation: involvement**
• Is it different from our other interventions? • Do we agree on the anticipated benefits? • Is it compatible with our broader values, ethics and priorities? • Do we understand what we have to do to use it?	• Are there key people influencing it? • Do we feel we can and should contribute? • Can we organise ourselves to contribute? • Can we define how we will use it?
Collective Action: 'doing' in practice	**Reflexive Monitoring: appraisal**
• How successfully can we work with it? • Do we have the right training and skills? • Does our organisation support its use? • Do we trust the technology?	• Can we see its impact? • Do we think its impact is useful? • How do we evaluate it? (i.e. practice and process of evaluation) • Can we adapt it to suit our needs, or adapt our practice as a result of using it?

At the time I undertook this PhD, NPT did not appear to have been used in relation to implementation within care homes for people with dementia, and in the following discussion I include comment on its suitability in a new field of application. I was also mindful that it has been advocated by its developers to combine with other theories (May, 2013); where relevant I consider how two such theories (Actor-Network Theory; Theory of Planned Behavior) may potentially offer further interpretation of findings.

It is important to remember that NPT views implementation as a continuous process rather than a final outcome. **'Successful' implementation might thus be considered the**

point at which the intervention becomes routine practice - 'the way we do things here' (May, 2013, p.14). Table 9.2 summarises the apparent implementation status of each technology according to this definition.

Table 9.2: Apparent implementation status of technologies

Care home	Technology	Implementation status
Sycamore Lane	Nurse call/bed monitoring (bed sensor)	Partially successful: used as part of practice, although use and understanding appeared inconsistent
	Activity tracker	Idea in test with one resident
Conifer Gardens	Nurse call/bed monitoring (pressure mat)	Successful
	LBS	Unsuccessful: withdrawn
Heather Grove	Nurse call/bed monitoring (pressure mat)	Successful
	Door monitors	Successful

Nurse call technologies are well established within healthcare (e.g. Miller, Deets and Miller, 1997); Table 9.2 shows that nurse call systems were largely successfully implemented in all three homes. There was a mixed picture regarding the other technologies: the Wi-Fi-based door monitors at Heather Grove were successfully implemented, but the radio-frequency based LBS at Conifer Gardens was unsuccessful. Judgements of success about the activity tracker at Sycamore Lane cannot be made with confidence since it was being tested out with one resident only.

9.2.2 An emphasis upon safety, and varied consideration of ethical issues

Findings from Chapter 6 showed that there was some recognition of a range of benefits and ethical challenges that arose from use of monitoring technologies (e.g. enhanced safety; enhanced freedom of movement for residents; positive or negative impact upon resident privacy; potential to highlight underlying health issues), but that all of the technologies seemed to be primarily understood and appraised as able to enhance safety, with limited recognition of ethical challenges from their use. These findings suggest a

dominant model of care which accepts the monitoring of residents as a core part of practice, and ascribes less value to developing a shared understanding of additional benefits from the use of technologies, or of ethical issues surrounding their use. They support a mixed picture from the literature which highlighted some understanding of a range of simultaneous potential benefits such as increased safety and resident freedom (Engström *et al.*, 2005; Engström *et al.*, 2009; Godwin et al, 2012; Kearns *et al.*, 2007; Niemeijer *et al.*, 2011; Niemeijer *et al.*, 2015; Sugihara *et al.* 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014; Zwijsen *et al.*, 2012), but which emphasised a perception that the primary (or only) role for monitoring technologies should be to enhance safety (Aud, 2004; Holmes *et al.*, 2007; Müller, Lin and Wulf, 2013; Niemeijer *et al.*, 2014; Zwijsen *et al.*, 2011; Zwijsen *et al.*, 2012). The present findings also add to previous literature reviews (Robinson *et al.*, 2007; Niemeijer *et al.*, 2010) which emphasised that fears of blame and litigation amongst care staff underpinned their justification for use of monitoring technologies, and add to suggestions that care staff might be less likely than managers to question the use of monitoring technologies on ethical grounds because of their relatively lower hierarchical position coupled with their immediate role in ensuring safety of residents (Müller, Lin and Wulf, 2013; Zwijsen *et al.*, 2011; Zwijsen *et al.*, 2012).

The first two related propositions developed from the literature thus appear to be borne out: (1) successful implementation of monitoring technologies in practice seems likely to be facilitated by the greater extent to which they are perceived to enhance safety, and (2) this focus upon safety may override or obscure detailed consideration of ethical challenges. Findings from Chapter 7 develop these propositions by making three further related suggestions:

i. Detailed understanding and appraisal of a variety of benefits and ethical challenges appears to be contingent upon a higher level of involvement in the implementation process. This involvement and understanding may be enabled by clarity of a philosophy of care which values such detail as important

ii. Egalitarian attempts to enhance understanding and appraisal may be overridden by a powerful, normative fear of blame culture within social care

iii. This fear of blame culture may influence a philosophy of care in which higher involvement and/or detailed understanding may not always be deemed necessary within implementation, but which ultimately may hinder implementation.

In NPT terms, the findings highlight the role played by the mechanism of Cognitive Participation (involvement) within successful implementation, and its relationship in establishing Coherence (understanding) about the technologies, and positive Reflexive Monitoring (appraisal).

At Conifer Gardens, staff, residents and relatives appeared to have reasonably high involvement in the discussion and decision-making process regarding pressure mats within their nurse call system (i.e. high Cognitive Participation), underpinned by regular recording and appraisal of use (i.e. comprehensive Reflexive Monitoring practice). This involvement, recording and appraisal appeared to support an understanding of the technology in which benefits, rationale for use, and ethical considerations were thoroughly explored (i.e. there was a well-developed sense of Coherence). Successful implementation thus seemed to be predicated upon higher levels of involvement and understandings, aided by the presence of a clear philosophy of a home that was its parent company's flagship for specialist dementia care, which (i) emphasised that interventions and support should be tailored to and make sense for individual residents; (ii) reflected ethical apprehensions of the managers about monitoring technologies; and (iii) attempted to ensure that as far as possible, the care home was akin to the residents' own homes (c.f. Chapter 5).

In contrast, at Sycamore Lane, staff, residents and relatives did not seem to make much contribution to implementation decisions about bed sensors within their nurse call system (i.e. there was a lack of Cognitive Participation), and there did not seem to be a clear formal method of recording use or appraising impact (i.e. there was a lack of clear Reflexive Monitoring practice). This lack of involvement, recording and appraisal appeared to contribute to a partially successful implementation, in which bed sensors

seemed to be implemented throughout the home but were undermined by uncertain knowledge about the status, impact or capability of the technology, and a lack of ethical debate (i.e. there was an uncertain, fragmented Coherence). This picture seemed to exemplify some of the challenges for the home in realising its philosophy of care (i.e. its broader Coherence about values and priorities in care, c.f. Chapter 5).

Successful implementation of monitoring technologies may therefore have been facilitated by a clear philosophy of care promoting higher levels of involvement in discussions and decision-making to enable a deeper understanding of the benefits and challenges from use. However, the picture might not be quite so straightforward, since higher involvement did not always seem to facilitate deeper understanding. Despite involvement in discussions and decision-making, some relatives reportedly struggled to understand (or acknowledge) that monitoring technologies might not guarantee safety, many staff apparently feared negative personal repercussions if a resident came to physical harm, and many participants seemed uncomfortable at the thought of withdrawing monitoring technology. Complications thus seemed to arise from a perception of monitoring technologies as intrinsically different to other interventions because of their perceived potential to enhance safety. In NPT terms, this picture suggested a very powerful normative Coherence of a fear of blame culture in social care (see Baker, 2015), which seemed difficult to challenge even through high levels of Cognitive Participation. In Box 9.1 I examine the influence of this normative Coherence via the LBS at Conifer Gardens.

Box 9.1: The power of a normative Coherence of blame culture

A clear example of the power of a normative Coherence of blame culture came from the suggestion of the Conifer Gardens managers that the LBS manufacturer had altered its sales pitch to foreground the potential of the technology as a line of defence against accusations of negligence. Analysis of this example may be better interpreted by drawing upon Actor-Network Theory [ANT], advocated to combine with NPT by furthering analysis beyond the immediate context of implementation (c.f. Chapter 2).

The basic maxim of ANT is to 'follow the actors' (Latour, 2005, p.12), which may be human and non-human. Following the actors around the LBS suggests that a developing narrative around the technology may have involved mediation by multiple actors who extended beyond the specific organisational context, including: (i) the manufacturer; (ii) the LBS technology itself; (iii) staff; (iv) relatives; (v) residents (vi) philosophies of care; (vii) care homes who were potential customers; (viii) the media narrative of scandals in care and accompanying blame culture.

It appeared as though the manufacturer had initially attempted to shape a narrative emphasising the potential of the LBS to enhance freedom of movement for residents, believing that these outcomes might be desirable for staff, relatives, and residents working to philosophies of care which prized such an outcome. The manufacturer appeared to have discovered an alternative narrative coming back at them from their potential customers, desiring defence against potential litigation shaped by a fear of blame culture in social care that has at least partly been perpetuated by media coverage of high profile scandals. This alternative narrative may have been accepted and subsequently promoted by the manufacturer, keen to match their product to the apparent needs of its customer base. Any subsequent care homes would thus receive an sales pitch which helped to reinforce a narrative that specialist monitoring technologies may primarily serve as a defence within a culture of blame rather than as able to enhance freedom for residents.

This analysis is a very simple interpretation following a basic maxim of a diverse and enigmatic theory. Nevertheless, it shows the importance of looking beyond immediate boundaries to highlight the nebulous, influential nature of a normative Coherence of a blame culture within social care.

This normative Coherence appeared powerful enough to justify exclusion from discussions and the decision-making process. Staff, residents and relatives at Heather Grove appeared to have been deliberately uninformed about the door monitors, due to the desire of management to obtain staff performance data together with fears of creating a poor impression about quality of care within the home. The lack of involvement of staff, relatives and residents seemed to be supported by a philosophy of care with a largely top-down leadership approach in which interventions were implemented in the 'best interest' of residents (c.f. Chapter 5). The door monitors were successfully implemented, and from an NPT standpoint these findings suggest that successful

implementation could occur with a deliberate prevention of Cognitive Participation of participants who could be positioned as non-essential agents (i.e. the door monitors were only actively used by management). Yet despite this apparent success, prevention of Cognitive Participation might not be fruitful as a long-term implementation strategy. Implementation of the LBS at Conifer Gardens, and the activity tracker at Sycamore Lane, also appeared to involve low levels of Cognitive Participation for most staff; some findings around the door monitors, LBS, and activity tracker seemed to suggest that staff may want to be involved and informed, and if they are not, they may be disposed toward rumours about the motivation behind technologies they perceive have potential to monitor their own activities (Beckwith, 2003; Grunerbl *et al.*, 2011; Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011; Sugihara *et al.*, 2014). Findings also suggested that staff may question data or exaggerate technical problems with technologies they perceive to be used in this manner, particularly with the LBS at Conifer Gardens which was implemented unsuccessfully. A lack of Cognitive Participation might thus reinforce the powerful normative Coherence of blame culture, promoting problems of trust within the organisational culture which hinder successful implementation. An increase in technological monitoring of staff in the workplace more generally highlights the potential importance for higher involvement in discussions and decisions to avoid creating a negative culture of 'eavesdropping employer' (Ciocchetti, 2011).

In summary, successful implementation of monitoring technologies may be facilitated by higher levels of involvement in discussions and decision-making regarding implementation to enable a deeper understanding of the benefits and challenges from using the technologies and their compatibility with values and priorities of care. The importance of high levels of involvement seemed to be further emphasised by the presence of a powerful normative understanding of blame culture within the care sector.

9.2.3 Technologies may increase staff confidence and save time, but there may be burden from false alarms or alarm fatigue

Findings from Chapter 8 suggested that the nurse call systems, which had been implemented successfully (or at least partially successfully), contributed to an increase in staff confidence and helped to free up their time to perform other tasks. There seemed to be a sense that there was some burden of false alarms and alarm fatigue arising from the systems, but this burden appeared to be primarily a manageable side-effect of the building-wide distribution of alarms. The door monitors at Heather Grove also appeared to have increased the managers' confidence and appeared to have been reliable and straightforward to use. In contrast, the LBS at Conifer Gardens, which had been implemented unsuccessfully, seemed to have been beleaguered by false alarms and technical problems, and its full range of data collection capabilities appeared to have been considered too time-consuming to add value to practice. These findings echo the overall picture in the literature suggesting there is a balance between increase in confidence, control and coordination in practice (Engström *et al.*, 2005; Engström *et al.*, 2006; Engström *et al.*, 2009; Nijhof *et al.*, 2012; Schikhof, Mulder and Choenni, 2010; Sugihara *et al.*, 2008; Sugihara and Fujinami, 2011) with overburden from alarm fatigue (Engström *et al.*, 2009; Niemeijer *et al.*, 2010; Niemeijer *et al.*, 2014; Zwijsen *et al.*, 2012). Responses to alerts were also partly governed by knowledge about residents, which supports previous literature (Aud, 2004; Zwijsen *et al.*, 2012).

The third and fourth related propositions developed from the literature thus appear to be borne out: (3) the implementation of monitoring technologies as part of routine practice seems likely to be facilitated by the greater extent to which they are perceived to enhance staff confidence and free up staff time, and (4) successful implementation will require any false alarms and alarm fatigue to be outweighed by the strength of judgement relating to proposition 3. The present study develops these propositions by highlighting the influence upon these propositions of:

i. resident cognition

ii. staff ability to use technologies

iii. training implications.

In NPT terms, findings highlight the role played by the mechanism of Collective Action (the 'doing' work of actually using the technologies) within implementation, and its relationship with Coherence (understanding) and Reflexive Monitoring (appraisal).

False alarms, which had potential adverse impacts upon the workability of the technology (i.e. impeded Collective Action), appeared to be generated by residents' apparent understandings of the technologies (i.e. their level of Coherence). These understandings seemed to arise either from confusion about physical properties of the technologies (confounded by their locations within the homes), or from deliberate false activation. This interpretation is made with the acknowledgement that offering nuanced judgments about the Coherence of residents with cognitive impairments feels a little unsatisfactory; yet it seemed that the Coherence of residents with various levels of severity of dementia was a contributor to false alarms. These findings develop speculations that monitoring technologies might only improve quality of life for residents with high levels of mobility (te Boekhorst *et al.*, 2013) by highlighting that there may be challenges in helping residents to understand and accept such technologies, and support suggestions that one-size-fits-all designs might not be appropriate for either technical performance or acceptance (Abbate, Avvenuti and Light, 2014; Aloulou *et al.*, 2013; Aud, 2004; Capezuti *et al.*, 2009; Charlon *et al.*, 2013; Kearns *et al.*, 2007; Niemeijer *et al.*, 2015; Nijhof *et al.*, 2012).

Staff members themselves also appeared to be the source of false alarms. At times staff appeared unable to enact all the components of the nurse call systems and often seemed to generate false alarms. Staff appeared to find the more modern, advanced nurse call system of Sycamore Lane more challenging than the systems of Conifer Gardens and Heather Grove. The ad hoc and informal nature of training in all three homes seemed to be predicated upon assumptions that staff would have existing knowledge (i.e. prior Coherence) of these technologies or that they would be straightforward for them to

understand. This finding appear to concur with the little detail in the literature which found that training for new staff around monitoring technologies was brief, and that staff would have preferred more (Engström *et al.*, 2009; Niemeijer *et al.*, 2014). At a basic level, these findings seemed to suggest that organisational support via the provision of further training (Collective Action) might enhance knowledge and skills about how to fully use the technologies (i.e. would have enhanced staff Coherence and Collective Action in practice).

This suggestion seems appealing in its simplicity, yet it requires further analysis. It should again be highlighted that the nurse call systems in all three homes seemed to be implemented with some success, particularly in Conifer Gardens and Heather Grove. At each home, the vast majority of staff felt that a building-wide distribution of alerts increased their knowledge of events throughout the building, and outweighed the fatigue that seemed to arise from this distribution. Staff were able to draw upon knowledge of their local context to render any high frequency of alerts as being a workable burden. From an NPT perspective, it seems that staff held sufficient technical knowledge (i.e. sufficient Coherence), which was enhanced by skilled adaptations to their practice from intimate contextual knowledge (i.e. adaptive Reflexive Monitoring), to promote a sufficient workability of the technology (i.e. sufficient Collective Action). Instances of staff inadvertently generating alert during the delivery of care suggested that their priority in that moment was attention to residents rather than the technology. It does not therefore seem entirely clear that simply increasing quantities of training would help staff retain more information about the technology or render the technology any more workable in practice. I return to this issue in section 9.4.1.

Findings also suggested that a greater amount of formal training around the LBS might have supported implementation by promoting a greater understanding amongst the staff of its capabilities. Yet staff also seemed to perceived the LBS as adding little value mainly due to workability challenges caused by technical problems from an incomplete installation (i.e. Collective Action was hampered by technical issues, which led to negative Reflexive Monitoring) within an open-plan building design that may have lessened its

capabilities (Wigg, 2010; Suighara *et al.,* 2014). This incomplete installation was underpinned by a Coherence amongst management that full installation cost was infeasible, particularly since they deemed the complex capabilities of the system as largely incompatible with their values about care (c.f. Chapter 5). It seems reasonable to question how far an increased amount of formal training would have overcome the influence of technical challenges, financial implications, and fundamental unease of managers, which seemed more influential in the failure of implementation than a lack of staff knowledge.

It would thus appear that staff may have found fairly commonplace monitoring technologies more challenging to use than expected, and appeared to struggle with more advanced technologies. Yet staff also showed innovative adaptations to daily practice in order to make some of these technologies sufficiently workable, which may be further aided by post-installation customisability of technologies. It would appear that simple discrete provision of performative training may be insufficient to enhance staff knowledge about how to use such technologies in daily practice. It would seem sensible to link the propositions in this section with the propositions in the previous section, and to suggest that in order for organisations to further staff knowledge about how to use monitoring technologies (Coherence and Collective Action), training provision (Collective Action) may need to include clear discussion about the alignment between the technologies and the values and practices of care within the home (Coherence).

9.2.4 A new proposition: staff design preferences may influence implementation

Some qualitative and quantitative findings pointed to an apparent dislike of pagers, and a preferences for systems which used wall display units. This finding appeared to be related to the construct of Collective Action since staff largely suggested they found the wall units more compatible to use in practice, and better suited to the physical environment of the care home. Yet qualitative data also suggested an aesthetic component to this preference; that staff maybe disrespected the pagers as an antiquated design and would

have preferred a more contemporary smartphone-like design. Quantitative data supported this suggestion since staff appeared to hold reasonably positive attitudes towards new technologies. Other findings showing that some staff actively used their own mobile phones to communicate with one another about resident activity further suggest a preference for smartphone technologies. A recent literature review (Hawley-Hague *et al.*, 2014) explored the influence of aesthetic preferences of cognitively unimpaired older adults towards their uptake of monitoring technologies, but there appears to be little work exploring staff preferences. Findings from the present study tentatively suggest the development of a new, fifth proposition: the implementation of monitoring technologies may be influenced by design preferences of staff members. The accommodation of design preferences of staff within organisational contexts may be challenging: there are serious concerns regarding privacy and data protection from the use of devices which can access external internet networks, and smartphones may be a distraction in the delivery of care (Gill, Kamath and Gill, 2012). The influence of staff preferences could thus plausibly relate to the Collective Action or Reflexive Monitoring mechanisms of NPT, but data from the present study appear to invoke more aesthetic judgments that do not seem to relate clearly to evaluations of the actual impact of the technologies upon practice (Reflexive Monitoring) or functional workability (Collective Action).

Such preferences may be better explored by turning to psychological theories of behaviour such as the Theory of Planned Behavior [TPB] (Ajzen, 1991; 2015), suggested to combine with NPT by helping to explore people's motivations and intentions behind their use of technologies (c.f. Chapter 2). It seems plausible to invoke TPB to suggest that an apparent preference for modern design form and functionality may have been influenced by desirability of behaviour, contemporary social norms, and familiarity of use. However, this analysis does not feel wholly convincing; as outlined in Chapter 2, TPB does not seem to be able to fully account for emotional processes such as aesthetic preferences. Modern technologies have blurred the line between technology user and technology consumer, and emotional responses to technologies are increasingly recognised as important in their use and acceptance (Kim, Chan and Chan, 2007). At the time I undertook this PhD, development to account for emotional factors in psychological behavioural theories of

technology acceptance appears to be in progress (Goh and Karimi, 2014) and the findings from the present further highlight the need for such development and exploration.

Suggestions that contemporaneous design might facilitate implementation also need to be tempered by consideration that the technologies most successfully implemented within the present study were the older, more familiar technologies (i.e. the nurse call systems, particularly those at Conifer Gardens and Heather Grove). Emerging, novel technologies which may be of potential value to care homes include advanced, self-learning nurse call systems (e.g. Ongenae *et al.*, 2014) and increased availability of wearable personal technologies like the LBS or the activity tracker at Sycamore Lane. Yet staff overall appeared to be more challenged by the relatively novel bed sensors at Sycamore Lane, challenged by and less interested in the capabilities of the LBS at Conifer Gardens; and less interested in the activity tracker at Sycamore Lane, all of which were less successfully implemented. There is also potential for 'exergame' interventions to enhance strength and balance of residents via gaming consoles such as Nintendo Wii or Xbox Kinect (e.g. van Diest *et al.*, 2013), but the gym equipment installed at Conifer Gardens seemed to be largely unused (c.f. Chapter 5). It is therefore possible that technologies which may be aesthetically attractive to staff might be perceived as unsuitable for a client group that is increasingly older, more cognitively impaired, and more immobile requiring high levels of care (c.f. Chapter 1). Such a perception would be captured by the NPT mechanism of Coherence since it refers to a lack of anticipated benefit from using these technologies. It seems sensible once again to return to the suggestion made earlier in this section, that involvement in discussions and evaluation of novel technologies would appear to be crucial to enhance understanding and consideration of potential benefits and chances of successful implementation.

9.3 Summary: what has the study added?

The present study has added to our understanding of how concerns about risk and safety continue to dominate long-term care settings. It has shown that monitoring technologies are primarily understood by care home managers, staff members and relatives as being

able to enhance safety and accountability. For managers, the understanding would appear to be centred upon compliance with the inspection and regulatory focus of the CQC, which emphasises resident safety (and the punitive measures which might be taken against homes that transgress; see Chapter 1). For staff members, the understanding would appear to include a fear of personal repercussions should residents come to harm. These understandings exist despite widespread acknowledgment of the limitations of monitoring technologies as alert systems rather than prevention systems. For relatives, the understanding would often appear to include some unrealistic expectations of the ability of the homes to protect residents against physical injury. These understandings seem to be ascribed such weight that they may require explicit acknowledgement before any additional potential benefits and ethical challenges from monitoring technologies are genuinely explored.

The genuine exploration of the range of benefits and challenges from using technologies may require higher levels of involvement of staff and relatives in discussions and decision-making regarding implementation. This 'higher involvement' may manifest itself in different ways, for example: comprehensive documentation of implementation decisions within individual residents care records; incorporation of discussion about technologies amongst staff at regular team meetings and shift handovers; inclusion of technologies within regular updates about resident care with relatives; staff training which includes clear elucidation of the alignment between the technologies and the values and practices of care within the home. The involvement of care home management and staff has been shown to be an important factor in successful implementation of a wide range of interventions including models of person-centred care, and psychosocial intervention, when they are a departure from traditional workplace routines and priorities that are often stubbornly resistant to change (e.g. Brodaty *et al.*, 2014; Chenoweth *et al.*, 2014; Moyle *et al.*, 2013). It is reasonable to suggest that it is likely to apply to other novel technological interventions aimed at care homes, such as robotic pets for social interaction (for which clinical trials are in progress; Moyle *et al.*, 2015), and it may also be important in the use of more socially ubiquitous technologies, such as iPads (Evans, Bray and Evans, 2015). As the use of technologies in long-term care is anticipated to increase, a higher level of involvement of staff in their implementation may help to enable an

organisational culture conducive to good practice around technologies, in which values held by individual staff and espoused by the organisation are coherent and shared at all levels within care homes (Killett *et al.*, 2016).

9.4 Recommendations for practice, research, and policy

9.4.1 Recommendations for practice

Findings from this study reinforce the importance identified in the ideal model for implementation proposed by Niemeijer *et al.* (2011) of clear communication about the purpose and functionality of monitoring technologies. The present study has highlighted that the power of a normative blame culture within social care may emphasise the appeal of technologies perceived to enhance safety and protection against litigation, to the detriment of considering other benefits or challenges from their use. Successful implementation of monitoring technologies may be dependent upon a deeper understanding of a range of benefits and challenges from using the technologies, and their compatibility with values and priorities of care. This depth of understanding is likely to be facilitated by:

- higher levels of involvement of staff, relatives and residents in discussions and decision-making regarding monitoring technologies
- clear, regular evaluation and appraisal of impact of monitoring technologies
- Introductions and training around monitoring technologies that go beyond simple performative instruction to include issues about alignment between the technology and values of care within the home.

Other factors also seem likely to facilitate successful implementation:

- Higher levels of customisability of technologies to suit the physical environment of the home

- A fuller understanding of the financial implications of implementation, including any contractual arrangement with suppliers
- Recognition that cost and complexity may not necessarily positively relate to performance and suitability
- Alignment of technologies with staff design preferences (although the extent of this influence is unclear and may be tempered by considerations of perceived technological suitability to the client group).

These recommendations are captured in Figure 9.1. I provided feedback to the three care homes involved in the study in the form of considerations and recommendations for implementation (Appendix 15).

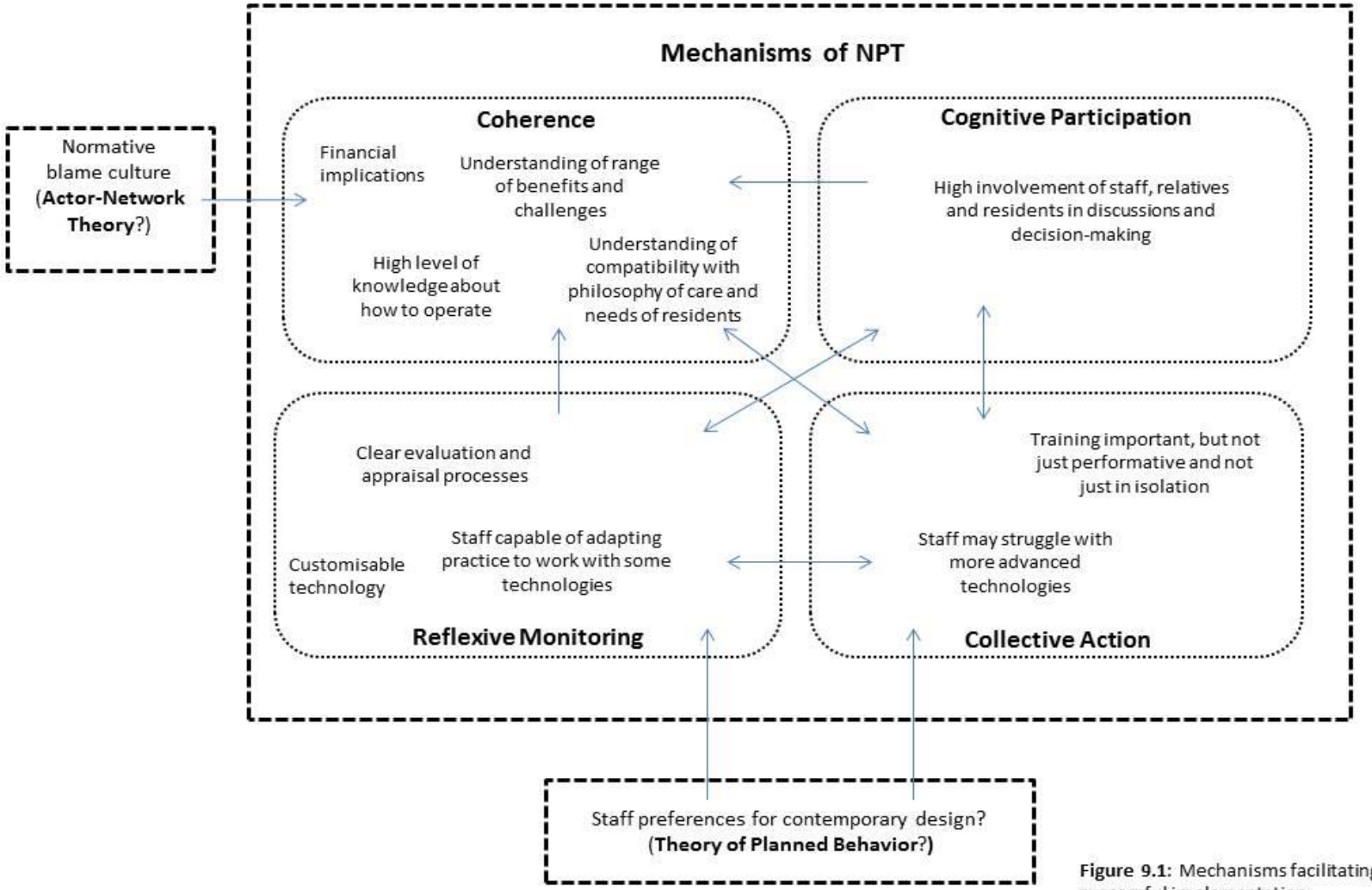

Figure 9.1: Mechanisms facilitating successful implementation

9.4.2 Recommendations for research

Findings from this study suggest at least the following further avenues for research:

- To further explore how monitoring technologies with such capabilities compare with traditional practice (e.g. observational data collection by staff members), both in terms of resident outcomes and implementation feasability
- To conduct a longintudinal tracking of an implementation process in 'real time', i.e. from initial discussions within a care home about investing in a technology, through introduction of it into practice, and evaluations of its impact
- To attempt to explore in more depth the perspectives of residents with dementia upon these technologies. It may be fruitful to undertake more ethnographic studies with resident perspectives at the fulcrum of the research question, rather than attempting to include these perspectives within broader research questions
- To explore manufacturer perceptions of the technologies to find out more about how technologies are marketed to care homes, which may include further exploration of the normative Coherence of blame culture within the sector
- To explore the influence of staff design preferences upon successful implementation.

In the present study I have shown that NPT appears to have applicability in implementation research within care homes for people with dementia. I may develop the theory with the following suggestions for refinement:

- To be more ethically inclusive regarding the involvement of actors who may not be deemed essential in a rational model of 'successful' implementation. This suggestion would seem particularly important where NPT is promoted as a practical tool to help guide real-world implementation (May *et al.*, 2015) rather than as a post-hoc academic interpretive lens

- To find room for judgments about interventions or components of interventions that are based on more emotional considerations, such as aesthetic preferences, rather than more rational considerations about utility and workability
- To test mechanisms to see which are the most influential within successful implementation.

9.4.3 Recommendations for policy

National care home quality and safety standards state that residents (and relatives for residents lacking capacity) should be involved in discussions about care and be asked whether they agree to any 'examination, care, treatment or support' prior to its implementation (CQC, 2015b, p.4). Findings from the present study suggest that there might be an understanding of monitoring technologies as something other than an 'examination, care, treatment or support', which together with a fear of a blame culture and negative public perception of social care could lead care homes to overlook the involvement of residents and relatives in the implementation of these technologies. It also seems possible that this kind of oversight might extend to care home inspection authorities: at the time of fieldwork in the present study, all three care homes were meeting all standards in their CQC inspections (c.f. Chapter 5), yet findings from the present study have shown that there was at times a lack of detailed understanding and democracy in the implementation of monitoring technologies.

At the time I was writing up this thesis, the one publication from the CQC about the implementation of monitoring technologies (primarily hidden cameras; CQC, 2015a) highlighted that their use presents both an ethical challenge and a legal grey area. Building on Fisk's (2015) proposed principles for the use of monitoring technologies, it seems pressing that further attention is given to the complex implementation challenges regarding the use of monitoring technologies in care homes, not least when there is a general trend for such technologies to become increasingly affordable and available, and when care homes appear to be increasingly supporting residents with cognitive impairments. Any such attention might include potential implications of the technologies

for the care home sector workforce, particularly given recruitment challenges currently faced by the sector (c.f. Chapter 1). It seems pertinent to question what might be the impact of technological monitoring upon feelings of trust, respect, the apparent continuing problem of a blame culture within social care, and the attactiveness of the sector as a career option. An ageing population sees the UK care sector facing increasing demand for relatively low-skilled care workers (rather than professionally-qualified staff) (Skills for Care, 2015b). This demand supports a trend of increased recruitment of overseas care workers into the UK (Skills for Care, 2010), which is likely to present an increasing challenge for the resources of less wealthy countries as they face greater rises in prevalence of dementia (ADI, 2015; c.f. Chapter 1). Technologies may help the delivery of innovative care in a mileu of limited resources (c.f. Chapter 1) and clear policy guidance around their implementation is needed to ensure that the UK does not drain resources from elsewhere.

9.5 Quality assessment and reflections upon the study

9.5.1 A realist reflection

In Chapter 4 I outlined that judgements about quality of research undertaken from a realist position would be invited when the reader is able to consider the findings and conclusions drawn from the research, rather than focusing upon methodological procedural fidelity alone (Maxwell, 2012). I outlined the following questions to help explore the quality of realist research (Mays and Pope, 2000):

- Was the research worth doing, and has it has contributed usefully to knowledge?
- Was there a clear research question?
- Was the design appropriate to the question?
- Was the context described well enough to relate the findings to other settings?
- Was there use of more than just convenience sampling approaches?
- Was there clarity about the data collection and analysis methods?
- Were there sufficient data presented in the findings of the study, and reflections upon the impact of the methods used upon the data obtained?

The reader is invited to consider these questions during the following reflections upon my study.

9.5.2 Reflections on design and methods

This research aimed to explore the question "How does the use of monitoring technologies become part of routine practice in care homes for people with dementia?" with the aim of understanding factors which appear to help or hinder implementation. In Chapter 4 I argued clearly for the appropriateness of a realist philosophical position and an embedded multiple-case study design to guide this exploration. I defined the case as the process of implementation of monitoring technologies, which occurs within the context of a particular care home. In Chapter 5 I provided detailed contextual descriptions of each of the care homes and the technologies involved in this study.

I adopted the use of multiple methods of data collection from different sources, and endeavoured to triangulate the findings. For example, I conducted interviews and observations iteratively, asking participants in interviews about phenomena that I had observed. This iterative process also served as a form of 'member checking' in which I compared my own accounts to participants' perspectives. Member checking has been heavily emphasised by constructivist authors (e.g. Lincoln and Guba, 1985) as an essential technique to provide convergence of findings, but this emphasis has been criticised as being fundamentally at odds with the relativist staple of constructivism, and thus its value not without debate (Porter, 2007; Seale, 1999). The 'member checking' in my study provided further data, e.g. an interview in which I checked an observation gave rise to further data that I sought to triangulate through further observation or interviews with other participants. From a realist position, triangulation and member checking may be thought of as ways of enhancing comprehensiveness and reflexivity rather than providing convergence and validity (Mays and Pope, 2000).

The use of multiple methods was particularly fruitful at Sycamore Lane, where through a combination of observations, informal conversations, formal interviews, and care record

exploration, I compiled a complex picture which revealed a dischordant knowledge and understanding regarding the bed sensors. The use of multiple methods also helped me to understand the physical environment of the care homes, and how this environment might impact upon the workability of the technologies in practice. Both of these findings would not have been easily accessible if I had not used a range of methods and taken the time to explore the issues.

The MTUAS was a useful tool in gauging participants' more general feelings towards technologies. The tool can be used in its component parts rather than as a whole (Rosen *et al.*, 2013) and perhaps the Attitudes scale alone might have been the most useful component. The System Usability Scale [SUS] appeared to support the qualitative data by revealing a significant preference for the pressure mat and wall unit nurse call system. However, the scores did not provide granularity about components of the systems (i.e. the type of sensor – pressure mat or bed sensor; and the type of alert device – wall unit or pager), and it may have been useful to use quantitative methods that could establish this level of granularity.

Normalization Process Theory helped me to retain my focus during data collection upon issues pertinent to implementation, highlighted by the depth of data in Chapters 5-8. As a tool to aid the discussion of findings in this current chapter, I found NPT useful to help foreground mechanisms which appeared to be influential in success or failure of implementation. The use of Actor-Network Theory and the Theory of Planned Behavior in this thesis suggests that NPT may combine well with other theoretical perspectives.

9.5.3 Reflections on sampling, recruitment, and ethics issues

I used convenience sampling for the care homes, which is recognised within realist research (Maxwell, 2012), but I was able to recruit homes with variation in size, ownership structure, physical layout, care offered, and technologies used; all of which seem to have generated rich and diverse data about the implementation of monitoring technologies. The homes arguably lacked variation in setting and demographic, as they

were all based in urban locations with predominantly White British staff and residents, and it may have been interesting to have recruited homes with more diversity.

I employed purposive sampling of broad range of participants, that was subsequently theoretically-informed by my emerging findings. This approach was fruitful but at times quite challenging. Upon my introduction to all three homes, it quickly became clear that adherence to any kind of ideal model of formal briefings and distribution of information at the outset of the study was infeasible. I had hoped that senior staff would disseminate information about me and my study amongst their teams, however this dissemination did not seem to happen. Attempts I made at widespread distribution of information sheets also floundered when staff openly admitted they did not have time to read more paperwork; in one home some of these sheets ended up being thrown away by a member of staff after they had been lying untouched for some time upon a workstation. The traditional model of seeking consent appears to be anti-realist; it does not seem to fully respect the setting of the study, as it is imbued with the implicit assumption that participants will be able to stop what they are doing and devote their full attention to the researcher and the consent process at the outset of a study. Although well-intended, this model appears to contain somewhat elevated assumptions about the perceived importance of research in the lives of participants; perceptions which have been criticised elsewhere (Hammersley, 1995).

As my knowledge of the care homes and my relationships with staff developed, I was able to make judgements about which relevant staff might be more receptive to an invitation to participate more fully in the study, and developed an intuitive sense for how and when it might be best to approach these staff members. I was keen to approach staff myself, rather than risk them feeling pressured in any way by management to participate. I found that a suitable approach was to raise the idea of participation with staff members individually, ideally at a moment when they did not seem to be too busy. Once I had established their interest, I would 'forewarn' them that I would need to obtain their written consent on a later occasion prior to their involvement. Some staff seemed

bemused as to why this bureaucracy was necessary, so I was able to draw a parallel with the paperwork that they had to complete in their own roles to help them understand.

My recruitment of relatives occasionally met with some unanticipated ethical challenges. After receiving permission to telephone one relative, I called her to give a brief introduction to myself and my study, and to arrange to meet with her at the care home. She began a detailed disclosure about her father's care over the telephone, and I felt that I had to stop her by saying that I needed to meet with her first to provide her with full information and to obtain her written consent. When I met her with the information sheets and consent forms, she appeared to be dissuaded by their detail and declined both her own participation and, as a personal consultee, permission for me to approach her father. Another relative similarly keen to talk about his mother's care appeared to become anxious when I produced the paperwork, saying that it seemed a big commitment and that he wanted to discuss it with his wife. I suggested that he take the information home and telephone me if he wished to take part, and I did not hear from him again. There are two ways of assessing these situations. First, the consent process fulfilled its role and prevented these people from participating before they had been in receipt of full information about the study. Second, lengthy information sheets (including sections of dubious relevance, such as 'risk of harm') exaggerated the commitment required, and thus the consent process seemed stressful for these people and appeared to dissuade them from taking part in research to which they had initially been happy to make a contribution. I am satisfied that I acted ethically throughout my study, but as a neophyte researcher I found these situations challenging; I feel it is important to offer reflections upon a research ethics and governance process in which a clinical trial model appears to resonate (Newnham, Pincombe and McKellar, 2013), and which might not offer the necessary flexibility for qualitative research.

During recruitment and ongoing involvement of residents I felt confident in following the process model of consent (Dewing, 2007). There were some residents whom I wanted but was unable to include; notably the resident with the door sensor at Sycamore Lane whose relative did not grant me permission to approach, and a resident at Conifer Gardens who

appeared to have active involvement in decisions about pressure mats in her care but who refused to speak with me, stating that she did not use a pressure mat (which was not the case). The vast majority of residents eligible for participation lacked capacity to provide written consent independently, and lacked the capacity to hold even brief focused conversations, but I attempted to sample a wide range of residents and I was able to include those with different levels of impairment and entitlement of care.

Some conversations seemed to generate thinking about technologies which may not previously have been openly discussed. Of particular note seemed to be talk about the use of video cameras, which I never prompted explicitly because there was no such technology in any of the care homes in the study. Some relatives seemed to suggest video cameras for a number of reasons, including raising awareness that falls had occurred, but also that they might be able to provide evidence of residents attacking other residents which might then force the home to take action against the aggressor (c.f. Chapter 6). This suggestion would appear to relate to findings suggesting that aggressive behaviour between residents may be frequent and unwitnessed (Yang *et al.,* 2015). In all three homes, the idea of video cameras did not appear to have been discussed. It is therefore possible that my study prompted different thinking about monitoring technologies with the potential to raise complex ethical and legal questions for the care homes.

In Chapters 5-8 I have provided substantial amounts of data, including every participant's voice in an attempt to ensure 'fair dealing' (Mays and Pope, 2000) of a wide range of perspectives. Case study research holds that findings are generalisable to theoretical propositions (Yin, 2009). Findings from my study about the strength of a normative understanding of a blame culture in social care, the potential value in involving stakeholders in implementation decisions, the relationship between physical layout of a building and the impact of monitoring technologies, and staff design preferences, would all seem likely to apply beyond a specific care home setting.

9.6 Final conclusion

This research has contributed to understanding about factors that are likely to facilitate or hinder the implementation of monitoring technologies in care homes for people with dementia. Implementation is likely to be influenced strongly by a normative blame culture within social care. The key conclusion arising from this study is that involvement of staff, residents and relatives within the implementation process may help to develop a deeper understanding of a range of benefits and challenges from using monitoring technologies in practice, and should be considered to be an important factor to align implementation strategies with person-centred philosophies of care. The research is exploratory work which offers a valuable contribution to practice, policy and research, as well as to considerations about technological design, in a field which seems destined to become of increasing importance.

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Zwijsen, S. A., Gerritsen, D. L., Eefsting, J. A., Smalbrugge, M., Hertogh, C. M. P. M. & Pot, A. M. (2015) Coming to grips with challenging behaviour: A cluster randomised controlled trial on the effects of a new care programme for challenging behaviour on burnout, job satisfaction and job demands of care staff on dementia special care units. *International Journal of Nursing Studies,* 52(1)*,* pp. 68-74. doi:10.1016/j.ijnurstu.2014.10.003.

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Appendix 1

Literature search terms

Search terms for health and social sciences databases

PICo term	Search Term: MeSH or Subject Heading*; keyword (UK/US English variations and grammatical variations used)		Combined with	Combined with
Population: dementia	Alzheimer's Disease*	Dementia, Multi-Infarct*	OR	AND
	Lewy Body Disease*	Dementia, Senile*		
	Dementia*	Dementia with Lewy Bodies*		
	Dementia, Vascular*			
Phenomenon of interest: technology	Assistive Technology*	Patient Identification*	OR	
	Technical Aid*	Wireless Communications*		
	Information Technology*	Audiovisuals*		
	Educational Technology*	Telenursing*		
	Internet*	Adaptation, Occupational*		
	Reminder System*	Internet		
	Wandering Behavior*	Assistive Technology Devices*		
	Telephone*	Computer Assisted Therapy*		
	Mobile Phone*	Online Therapy*		
	Audiovisual Equipment*	Telephone Systems*		
	Communication Aid*	Assistive technology		
	Telecommunication*	Technical aid		
	Telemedicine*	Assistive devices		
	Telemonitoring*	Self-help technology		
	Ambulatory Monitoring*	Information technology		
	Telehealth*	Educational technology		
	Audiovisual Aids*	E-health		
	Communication Aids for Disabled*	Emergency Medical Service* Communication Systems		
	Telecommunications*	Online support		
	Monitoring, Physiologic*	Reminder systems		
	Remote Consultation*	Memory aid		
	Security Measures*	Security measures		
	Patient Identification Systems*	Electronic tracking		
	Cellular Phone*	Prevention of wandering		
	Therapy, Computer-Assisted*	Identification systems		
	Technology in Healthcare*	Patient identification systems		
Phenomenon of interest: implementation	Normalisation	Implementation	OR	
	Adoption	Process		
	Uptake	Training		
	Embed	Diffusion		
	Perception	Systemic		
	Evaluation	Operational		
	Viewpoint	Integration		
	Appraisal	Engagement		
	Organisation	Routine		
	Strategic	Workable		
	Management	Feasible		
	Planning			
Context: care homes	Nursing Homes*	Residential homes	OR	
	Long Term Care*	Residential aged care		
	Nursing Home Patients*	Residential aged care facility		
	Residential Care Institutions*	Senior living		
	Care homes	Senior housing		
	Aged care	Sheltered housing		
		Extra care housing		

Search terms for engineering and computer sciences databases

Search terms were applied in a similar fashion to the health and social science databases, however the 'implementation' search string was omitted for two related reasons:

1. Initial searches revealed that words such as 'implementation' often seem to be used in this literature to refer to tests of prototype products in laboratory conditions (e.g. with healthy subjects: once the components are assembled the early test is an 'implementation' to ensure the product works from a technical point of view. Use of this string would therefore have risked focussing the search upon literature at TRLs 4 and 5 (NATO, 2010), below the level of real-world environment field test required for this literature review question.

2. Unlike the health and social science databases, the engineering and computer science databases are not designed to be searched with large combinations of search terms as they enforce a 50-key-word search limit. This limit makes the searching for large search strings challenging, and an implementation string would have exponentially added to the number of search combinations that would be required. It was decided that the priority for the search for these databases was to focus upon the technologies, and that the search could be run more effectively and efficiently if the implementation string was screened for during title and abstract review.

Institute of Electrical and Electronics Engineers [IEEE]

PICo term	Search Term: MeSH/Subject Heading/Keyword*; all-fields word		Combined with	Combined with
Population: dementia	Alzheimer's Disease*	Dementia, Multi-Infarct*	OR	AND
	Lewy Body Disease*	Dementia, Senile*		
	Dementia*	Dementia		
	Dementia, Vascular*	Alzheimer's		
Phenomenon of interest: technology	Assistive Technology*	Patient Identification*	OR	
	Technical Aid*	Wireless Communications*		
	Information Technology*	Audiovisuals*		
	Educational Technology*	Telenursing*		
	Internet*	Adaptation, Occupational*		
	Reminder System*	Emergency Medical Service* Communication Systems		
	Wandering Behavior*	Assistive Technology Devices*		
	Telephone*	Computer Assisted Therapy*		
	Mobile Phone*	Online Therapy*		
	Audiovisual Equipment*	Telephone Systems*		
	Communication Aid*	Assistive technology		
	Telecommunication*	Technical aid		
	Telemedicine*	Assistive devices		
	Telemonitoring*	Self-help technology		
	Ambulatory Monitoring*	Information technology		
	Telehealth*	Educational technology		
	Audiovisual Aids*	E-health		
	Communication Aids for Disabled*	Internet		
	Telecommunications*	Online support		
	Monitoring, Physiologic*	Reminder systems		
	Remote Consultation*	Memory aid		
	Security Measures*	Security measures		
	Patient Identification Systems*	Electronic tracking		
	Cellular Phone*	Prevention of wandering		
	Therapy, Computer-Assisted*	Identification systems		
	Technology in Healthcare*	Patient identification systems		
Context: care homes	Nursing Homes	Residential homes	OR	
	Residential Care	Senior living		
	Care homes	Senior housing		

Unlike IEEE, the Engineering Village search engine (for Compendex and Inspec databases) does not allow for use of MeSH terms. It does have an auto-suggest facility for its own keywords, which was used wherever possible.

Engineering Village (for Compendex and Inspec)

PICo term	Search Term: Keyword*; all-fields word	Combined with	Combined with
Population: dementia	Alzheimer's*	OR	AND
	Lewy Body*		
	Dementia*		
	Vascular*		
	Dementia, Senile*		
Phenomenon of interest: technology	Assistive Technology*	OR	
	Technical Aid*		
	Information Technology*		
	Educational Technology*		
	Internet*		
	Reminder System*		
	Wandering*		
	Telephone exchanges, mobile*		
	Audiovisual*		
	Communication *		
	Telecommunication*		
	Telemedicine*		
	Telemonitoring*		
	Ambulatory Monitoring*		
	Telehealth*		
	Telenursing*		
	Occupational Therapy*		
	Remote Consultation*		
	Security Systems*		
	Patient Identification*		
	Wireless Communications*		
	Audiovisuals*		
	Telenursing*		
	Adaptation, Occupational*		
	Emergency Medical Service*		
	Assistive Technology Devices*		
	Computer Assisted Therapy*		
	Online Therapy*		
	Telephone Systems*		
	E-Health*		
	Tracking position*		
	Radio frequency identification RFID*		
	Global positioning system*		
Context: care homes	Nursing Home	OR	
	Aged care		
	Care home		
	Residential		
	Senior		

Appendix 2

Literature review data extraction form

Literature review data extraction form

Paper (Author, date, country)	
Technology	
Question	
Design	
Participants, sample and setting	
Methods	
Findings	
Discussion points	
Strengths and limitations	
Implementation research theory?	
Research field	

Appendix 3

Summary tables of included papers

Summary of qualitative papers

Authors (year); country	Technology	Question & design	Setting & sample	Methods	Main findings	Use of theory relevant to implementation research	Quality rating (see also Appendix 4)
Abbate *et al.* (2014); Canada	Fall detection with 4 systems: SYSTEM 1: Day system - fall detector (accelerometer) worn round waist; SYSTEM 2: night system - electrophysiology sensor worn in headband, measures brain activity via digital electrodes; heart activity; eye movement; SYSTEM 3: ambient sensors (pressure pads, door sensors, toilet mat sensor, emergency buttons) SYSTEM 4: video cameras, real-time streaming of visual motion detection	Usability and acceptability of systems 1 and 2 only. Did not consider usability and acceptability of systems 3 and 4 because 'major concerns are intrusion and privacy rather than usability' Exploratory	Convenience sample of 4 residents in one nursing home. Ages 75 - 92, different stages of dementia	Month-long field test 7 metrics for usability and acceptability, ranked low, med or high: willingness to use; easiness to learn; time to accept; willingness to keep; number of errors due to incorrect interactions; level of satisfaction; interference with ADL	**System 1** - high usability and acceptability. Considered it an everyday accessory, required adjustment to suit male and female dress. Little resistance to wearing it. One subject did not want to give it back at end of the day. **System 2** - lower usability and acceptability. Residents often removed it or did not like it Reflect on attempts to ensure resident compliance with wearing - e.g. one family told resident system 1 was to provide stomach pain relief - with no ethical commentary	No	Lower quality
Aud (2004); USA	Door alarms (sound upon opening; sound upon activation by sensor worn by resident)	Understand elopement incidents Exploratory	62 elopement incidents from 50 facilities. All residents aged > 60, with dementia	Retrospective review of incidents described in non-compliance notices issued to facilities.	Residents purposely interfered with alarm (e.g. covering up body worn sensor); Staff did not hear alarm; Staff did not check when alarm sounded (assumed someone else would check; attributed alarm to residents who often opened doors but did not	No	Higher quality

					leave the building); Alarm not turned on; Alarm faulty		
Beckwith (2003); USA	Sensors for lighting, fans, heating, vents, aircon; monitor whether door is open or closed; motion sensors in public and private areas to monitor human movement; load cells (attached to bed legs) to monitor weight and movement; ID badges for all residents and staff with infrared for indoor and radio frequency for outdoor monitoring, also with call button	Issues of privacy around embedded or invisible technologies Exploratory	9 residents (varying levels of dementia), 10 relatives, 8 staff, 2 managers	Observations and semi-structured interviews focused on daily routines and views on technologies. Focused on ID badges and load cells as they were most visible	Participants did not mention technology's risks and benefits - considered it a 'black box'.. Resident thought badge a call button, not aware of monitoring capabilities; did not understand load cells. Staff had better understanding of location tracking but thought they could trick system by leaving badge inside whilst going outside, didn't realise motion sensors still monitor movement of people; Most participants unaware of who sees any data collected by the technologies	No	Lower quality
Engström *et al.* (2009); Sweden	Passage alarms activated by sensor worn by resident; by pressure sensor; sensor activated night lights; fall detectors (pressure mats)	Staff perceptions during implementation Exploratory	15 staff from same home as Engström *et al.* (2005) & (2006)	Semi-structured interviews conducted before implementation, twice during, and once after	**Moving from fear of losing control to perceived increase in control and security**: hesitating; desire to change; perceiving advantages;. **Struggling with insufficient/deficient systems:** perceiving shortcomings; perceiving insufficient knowledge and difficulties in not knowing how it could be used	Diffusion of Innovations	Higher quality
Godwin (2012); UK	Building exit sensor (magnets attached to shoes); Bedroom door	Whether the technology contributes to	Convenience sample referred by Community Mental Health Team. 4	Identifying tailored technology, trying	**Building exit sensor:** magnets reacted to other metal stimuli; not practical. Welcomed by the	No	Mid-to-high quality

sensor; Gate exit sensor; Pressure mat to activate bedside lamp	person-centred care Participatory /exploratory	'triads' of resident, relative and staff member. All had agreed to try technologies.	out technology, then semi-structured interviews	home to avoid locking door which they were not legally allowed to do. Unsuccessful - resident transferred to a locked home. **Bedroom door sensor:** very good, leaving bedroom door open exhausted battery but easily rectified - however 'irrevocable' plans to move resident to locked home had already been made; **Personal exit gate:** hypersensitive, 6x more false alarms than genuine; blind spots in building. Unsuccessful - resident transferred to locked home; **Pressure mat & bedside lamp:** reduced falls and resident confusion and shouting but would not turn lamp off. Successful, although resident had no recollection of nocturnal events
	Ethical issues		As above	Most staff and relatives felt that ethical acceptability depended on its consequences (i.e. whether it worked). A minority suggested once residents had forgotten the device, it became ethical. Devices which promoted autonomy felt to be more ethical
	Whether people with dementia		Vignettes in simple language	Relatives usually predicted that residents would be incapable of

		can be involved in ethical discussions about technologies		depicting confused and muddled residents with technologies	participating but residents often defied this expectation and seemed able to offer some insight. 2/4 residents felt it might be good for staff to see what residents were doing but seemed aware that some residents might object		
Kearns *et al.* (2007) USA	Elopement management systems. 7 subtypes: pressure activated; pull tabs; audible alarms; optically activated alarms; visual deterrents (not electronic); tracking systems; advanced systems with multifunctional devices	User preference and needs Exploratory	Convenience sample of 42 participants: 6 family caregivers; 9 home healthcare staff; 7 long term care staff; 7 medical surgical staff; 7 nursing home residents with no cognitive decline; 6 engineers	6 focus groups according to participant 'type'	Only nursing home residents and long term care staff reported experience with wandering technologies and only in institutional settings, but there was consensus amongst all groups: Advocated overlapping elopement tracking and management systems rather than isolated systems. No technology could replace human caregiver. Low level tech would quickly become ineffective. Should be waterproof, portable, adaptable, flexible, and easy to use. Easy to turn on and off. For people with early stage dementia, devices should be inconspicuous, avoid stigma; for people with moderate and late stage dementia, keeping the device on was more important. "Implantable" devices acceptable, including to most nursing home residents who drew parallels with implanted defibrillator	No	Mid-to-high quality

Müller *et al.* (2013); Germany	Video cameras, door safety systems with body-worn sensors e.g. wristbands or chips in shoes, pressure mats beside beds, GPS	Insight into practical problems of wandering and how homes manage Exploratory	15 participants (no sampling information) 12 staff; 3 relatives 3 different settings (care homes, geriatric hospital wards, assisted living) Total number of facilities is unspecified and unclear in methods which participants are from which setting	15 interviews & 17 hours' observation	**Video cameras:** in one care home they are installed but not being used as currently looking into legal implications; another home installed in entrance to protect from intruders but resident still anxious so home agreed to lock front door. **Door safety systems:** sensor and wristbands - poor reliability and battery problems. Only shows 'door open' and not which resident, which is a problem for staff but was manager's decision to retain anonymity; Chips and shoes - staff have to constantly check residents are wearing shoes; **Pressure mat** – one manager felt bedroom is the only private space and shouldn't be monitored; **GPS** - used with one resident at relative's request when care home said they couldn't manage wandering. Care home agreed as long as relatives took responsibility for operation	Situated Action	Lower quality
Niemeijer *et al.* (2011); Netherlands	General 'surveillance' technologies, not described	How surveillance technology is viewed by professionals; what might an ideal application in residential	Convenience sample of 15 participant: 9 nursing staff (3 nurses, 6 nursing assistants) who were direct users of surveillance technologies; 6 academics	Concept mapping (contains quantitative analysis, but is designed to elucidate wide-ranging qualitative data	Ideal application would involve: balance between freedom and security; beneficial and tailored to resident; clearly defined practical procedures; competent and caring personnel (in which technology does not replace care); actively monitored	No	Mid-to-high quality

		dementia care look like Exploratory		re. opinions on a complex subject in a short space of time)	application; clearly defined normative guidance. Carers prioritised safety, academics prioritised freedom		
Niemeijer *et al.* (2014); Netherlands	Motion and acoustic sensors which sent alerts to cordless phones; Electronic bracelets to open doors; Hallway video and centrally located monitor	Experiences of staff Exploratory	22 staff (6 nurses; 16 support staff) & 43 residents of a dementia care unit within a nursing home	Ethnographic design of observations and interviews	**Continuing to do rounds** - rather than waiting to be prompted by alerts; management felt staff should be able to rely on technologies but staff wary; **Alarm fatigue** - sometimes led to staff turning technologies off temporarily until residents back in bed, staff might sit nearer to bedroom whilst technology turned off; **Keeping clients in close proximity** - due to technology failure, sometimes not seen as improvement upon existing practice; **Locking doors** - although technologies introduced to reduce restraint, staff still locked certain doors at night and during rounds on grounds of safety; **Forgetting to take devices off** - staff didn't remove devices e.g. bracelet from residents even if no longer using the technology	No	Higher quality
Niemeijer *et al.* (2015) Netherlands	Motion and acoustic sensors which sent alerts to cordless phones; Electronic bracelets to open doors; Hallway video and centrally	Experiences of residents to see how technologies might influence autonomy	8 staff of varying roles (clinicians, support staff, managers, resident board representative) & 43 residents of a dementia care unit of a	Ethnographic design with 200 hours observation and informal interviews, plus formal interviews	**Coping with new spaces** - wandering around more to ease restlessness as a result of new space; getting lost which required staff to alert other staff (e.g. kitchen to tell nurse); other	No	Higher quality

	located monitor	Exploratory	nursing home	with the 8 staff	residents who didn't have the technology would try to slip through doors opened by residents with technology; finding extra private space other than own bedroom; **Resisting** – felt stigmatised and refused by one resident		
Sugihara *et al.* (2008); Japan	'Mimamori' care system with cameras in communal areas, and monitors	Staff perceptions of the system Exploratory	11 staff from 2 homes System in Home B could record video, Home A did not have this capability	Interviews after system installation	Eliminated blind spots, removed concern and afforded focus on other tasks e.g. writing reports. Reduced work stress and altered interaction with residents: prior to system staff disturbed residents by constantly asking them where they were going. Feel residents are more independent Home B staff felt that video recordings enabled them to check back to see where residents are hit if they fell, but staff felt more stressed and under constant surveillance	No	Lower quality
Sugihara *et al.* (2014); Japan	'Mimamori' care system with cameras in communal areas, and monitors	How does video monitoring system affect collaboration between caregivers? How do spatial layouts in	Home C (purpose built): 5 staff & 2 managers; Home D (renovated): 9 staff & 1 manager	"Case Study 1" - interviews before and after implementation,; video recording activities on one night pre and one night post installation.	**Case Study 1** - Establishing roles of 'watcher' of the monitor and 'doer' of the care. One staff would watch whilst others did chores. Easier because they could see residents without having to physically be in the area. Reduced staff stress. Repetition of findings from other Sugihara *et al.* papers.	No	Lower quality

		conventional care homes affect care? How does video monitoring enable people with dementia and caregivers to change spatial layout to strengthen care? Exploratory		"Case Study 2" - comparison of spatial layout of Homes C and D using 'space syntax' methodology	**Case Study 2** - layout of renovated Home D problematic pre-intervention due to blind spots from corridor alignment. Staff kept residents close by. Staff prefer layouts like Home C because they can see residents more easily. However, Home D afforded more spontaneous interaction between residents in 'gray' areas which are public spaces that are concealed e.g. nooks in corridor – purpose-built homes tend not to have these spaces		
Wigg (2010); USA	Motion detector on main exit door to outside walkways	Impact of locked door environment on residents in comparison to unlocked environment with motion detector Exploratory	2 facilities 'Locked' facility: 30 residents, aged late 60s - 90s. 1 staff : 8 residents. Unit design incorporated continuous loop round perimeter of living and dining space. Key coded doors 'Unlocked' facility: about 30 residents over course of study; at any one time it housed 8 residents, ages 63-95. 1 staff : 4 residents. Unit design incorporated bedrooms	Locked facility: 400hrs observation over 7 months Unlocked facility: observations conducted over 10 years as an employee, also video recording of wandering	**Locked facility:** residents frustrated at not being able to find or open exit doors; behaviours suggested panic, anxiety or anger. Staff would try to redirect residents near doors and were cautious about passing through doorways when residents were near. Resident egress was stressful for staff. **Unlocked facility** included philosophy of not locking doors in mission statement. Staff counselled relatives on this approach -redefining wandering as necessary exercise. Structure of building necessary in this redefinition. Alert would sound	Foucauldian concepts of surveillance	Lower quality

			around living space, outdoor walking areas accessible to residents by crossing threshold equipped with motion detector		when resident crossed threshold and staff would observe or accompany. If staff could not accommodate this need (rare), residents became anxious. Some residents repeatedly exited meaning staff had to change duties with co-workers to provide support. Discussed in meetings. New residents coming from other facilities were surprised by unlocked door and would ask if it was OK to go out		
Zwijsen *et al.* (2012) Netherlands	GPS, movement sensors, acoustic monitoring, chips worn in clothing, bed pressure sensors, door sensors, inactivity sensors	Staff perceptions of whether the technologies would be a suitable alternative to physical restraint Exploratory	7 nursing homes (3 with policy for technology, 4 with no policy). Smallest home 60 bed, largest home 142 bed	Interviews (7 relatives; 9 key staff); Focus groups (8 groups comprised of 6-8 staff participants)	Staff felt surveillance technologies are supplementary to physical restraint rather than alternatives **Uses of surveillance technologies:** general safety – fundamental function rather than to reduce physical restraint; additional safety – supplementary; providing more freedom for residents – staff don't have to disturb residents; **Limitations of use:** can't prevent falling – therefore rather pointless; can't guarantee quick help – number of alerts might overwhelm staff capacity to respond; doesn't always work – faulty, sensitive, staff walk extra rounds to check on the technology; could violate privacy	No	Higher quality

Summary of quantitative papers

Authors (year); country	Technology	Question & design	Setting & sample	Methods	Main findings	Use of theory relevant to implementation research	Quality rating (see also Appendix 4)
Capezuti *et al.* (2009); USA	Two types of bed exit alarm: single pressure sensor under mattress; 'dual sensor' of pressure sensor under mattress and horizontal infrared beam 2 feet above bed	Describe the accuracy of the two types of alarms; describe nuisance alarms; describe how residents attempt to get out of bed Quasi-experimental one-group post-test only	14 residents in a 120-bed nursing home, identified by Manager as meeting inclusion criteria (cognitive impairment; mobility difficulty; high falls risk)	Both types of alarms implemented simultaneously with all participants Video in bedroom; human observer taking log of movement	Residents observed for 256 nights (combined total for all residents) Dual sensor might be more effective than single sensor (on both more true positives and fewer false positives) but sample size too small. Three distinct styles of bed exit (swing legs off bed; elevate trunk by pushing up with arms prior to swinging legs off bed; roll trunk to bed edge and slide legs off bed). Bed exit alarm choice requires individual assessment of bed exit style	No	Weak
Engström *et al.* (2005); Sweden	Passage alarms activated by sensor worn by resident; by pressure sensor; sensor activated night lights; fall detectors (pressure mats)	Staff perceptions of job satisfaction and life situation after implementation of technologies	33 staff from one residential home (17 experimental group, 16 control group) (31 Female, 2 Male, mean age 41, range 22-62, most part-time)	Satisfaction with Work Questionnaires (SWQ); Life Satisfaction Questionnaire (LSQ); Sense of Coherence scale (SOC-13)	**SWQ**: Psychosocial aspects (personal development, workload, expectations and demands, internal motivation) and quality of care all significantly improved by 12 month follow-up for experimental group	No	Weak

		Quasi-experimental non-equivalent groups		Baseline, 6 month follow-up, 12 month follow-up	**LSQ:** no significant differences **SOC-13:** no significant differences		
Engström *et al.* (2006); Sweden	As per Engström *et al.* (2005)	Relatives' opinions of technological support Quasi-experimental non-equivalent groups	22 relatives from same home as Engström *et al.* (2005) : 14 experimental group (8 female, 6 male, mean age 66) 8 control group (4 female, 4 male, mean age 68)	Questionnaire with 10 items for opinions on IT support; Nursing Home Hassles Scale (NHHS); Life Satisfaction Questionnaire (LSQ) Baseline, 3 month follow-up; 7 month follow-up; 12 month follow-up	Opinions generally positive NHSS: experimental group significantly more positive in overall score at 3 month follow up, but differences non-significant at 7 and 12 month follow-up. LSQ: no significant differences	No	Weak
Holmes *et al.* (2007); USA	"Vigil" - bed exit sensor under bed; bathroom and bedroom exit monitors. Alert staff via silent pager and records caregiver response times	**Hypothesis 1: resident outcomes** - A: technology will lead to reduction of falls, accidents and injuries and improve QoL; B: sleep will improve and deviant behaviours will decrease	1 x 50-bed unit as experimental group (mean age 87.43); 1 x 50-bed unit as control group (mean age 87.55); matched for case mix and cognitive impairment	**Residents** - Social Contacts/ Activities scale from Multidimensional Observational Scale for Elderly Subjects; Performance Activities of Daily Living; Feeling-Tone Questionnaire; Behavior	66 residents completed all three waves of data collection **Hypothesis 1:** No difference in odds of falling or rates of injuries.. No difference in observed behaviour but resident-reported affective disorder decreased significantly in the experimental group. **Hypothesis 2:** Nursing staff spent significantly more time in direct care for the experimental group	No	Moderate

		because of absence of noise and light from routine rounds; **Hypothesis 2: staff outcomes** - reduce number of checks on residents thus decreasing staff time in direct care and decreasing burden Quasi-experimental variant of cluster RCT		Observation Checklist; audit summary of falls, accidents and incidents. **Staff** - weekly log sheets for sleep of each resident, amount of time spent (12-30 weeks of data at each wave), staff burden on a 7-item scale. Baseline, 12 month follow-up, 15 month follow-up	than the control group. Reported staff burden was significantly higher at the beginning of the project for experimental group; however, this burden on the nurses did not get worse over the project, and there was no significant difference in burden between the groups. Provides discussion on how results may have been related to implementation challenges including resistance of staff to the technology and a reluctance to alter their usual routines		
te Boekhorst *et al.* (2013); Netherlands	GPS, movement sensors, acoustic monitoring, chips worn in clothing, bed pressure sensors, door sensors, inactivity sensors	Impact of surveillance technology and physical restraint on resident QoL. **Hypothesis**: technology would be associated with higher QoL	6 nursing homes purposively sampled for policy-led use of surveillance technology (3) and sporadic use of surveillance technology (3). All residents eligible if they used surveillance technology or physical restrained (n=192 completing baseline assessment: 170 with technology, 22 with	Resident characteristics: GDS for severity of dementia; Barthel Index for ADLs, Neuropsychiatric Inventory Questionnaire - Nursing Homes (NIQ-NH) for behavioural disturbances;	Barthel scores showed huge differences in ADLs: surveillance technologies used with medium dependent residents whereas physical restraint used with highly dependent residents. Controlling for these confounders left 35 residents with surveillance technology, 18 with physical restraint. Surveillance technology group had significantly higher positive affect than physical	No	Moderate

	Quasi-experimental non-equivalent groups	physical restraint).	Mood and Behaviour subscales of Minimum Data Set of Resident Assessment Instrument; **QoL:** QUALIDEM QoL measured at baseline, 2 month follow-up, 4-month follow-up	restraint group, but once age and sex were adjusted for this difference was **non-significant.**	

Summary of mixed methods papers

Authors (year); country	Technology	Question & design	Setting & sample	Methods	Main findings	Use of theory relevant to implementation research	Quality rating (see also Appendix 4)
Aloulou *et al.* (2013); Singapore	Integrated system including various pressure, proximity, vibration, motion sensors; interaction devices e.g. speakers, smartphone	Present methods of deployment and lessons learned Mix of sequential and concomitant: 1. Pre-deployment qual discussions with staff 2. Deployment phases involving concomitant quan-qual followed by qual feedback from staff	8 residents in one nursing home with moderate dementia needing minimal-moderate assistance, ages 78-92; staff (*n* unclear)	1. Weekly observations for 3 months following 2-3 residents; focus groups with 5 staff 2. Deployment phases involving concomitant quan system	**HUMAN REQUIREMENTS: Staff relief** - reminders about how residents are performing ADLs should occur only when input from staff is required; **Independent ageing** - send reminders to residents to encourage them to think and retain independence; **Personalised assistance** - reminders based on individual resident behaviour **TECHNOLOGICAL REQUIREMENTS: Privacy** - non intrusive, no video; **Multiple people management** - tried RFID tags via plastic bracelets to identify individual residents; **Design for failure** - crashes are inevitable; **Dynamic and adaptable –** can be reconfigured after installation to suit resident behaviour First deployment phase: 29% false alarms - human error or other residents using bathroom; also technology failures.	No theory explicitly referenced, but states importance of gaining user perceptions during design phase	CASP: Mid-quality EPHPP: Weak MMAT: Higher quality

				performance and quantised versions of qual ground truth staff logs; followed by qual feedback from staff	Performance raised to 83% match with ground truth in last phase of deployment. Staff became adept at using smartphones and appreciated the underlying value; would like it in every room Data from ground truth log sheets was as valuable as data captured by system – using same algorithms, researchers could extract meaningful information about resident habits and health. Would be useful to provide a more automated, electronic, pervasive manner of gathering these data from staff, with algorithms to analyse the data		
Bressler *et al.* (2011); USA	Bed-exit alarms which sound alarm throughout building. Built-in bed alarms, bed alarm pads, tabs clipped to residents, chair alarm pads	Attempt to implement removal and elimination of the technologies Sequential qual-quan: qualitative introductory discussions followed by quasi-	60 bed non-profit dementia specialist home. 31 residents observed for entire study. 87% female, mean age 85.9, 55 staff members	Qual: Staff heavily involved in planning of implementation. Introduced gradually in staff meeting and 3 more meetings over 7 months before phasing out. Staff retrained in communication with each other.	Authors reflect that qualitative introduction and discussions had a crucial bearing on quantitative outcomes. Staff were not just informed, but were invited to discuss and contribute to developing alternative ways of working which they would employ following the removal of alarms.	No	CASP: Lower quality EPHPP: Strong MMAT: Higher quality

		experimental interrupted time series		Relatives able to discuss one-to-one about removal of alarms Quant: Monthly data collection for 4 months pre-intervention, 3 months during intervention, 4 months post-intervention. Data collected: number of falls in the month; number of residents involved in reported incidents; type of fall.	**Falls**: No significant difference in mean number of falls per 1000 patient days between the intervention stage and the pre- or post-intervention stage. Mean falls during pre-intervention stage significantly higher than mean falls post. **Residents**: No significant difference in mean % of residents falling when comparing intervention stage with either pre-intervention stage or post-intervention stage; mean % of residents who fell during pre-intervention stage significantly higher than post. **Conclusion:** removal of bed-exit and chair alarms directly related to decrease in number of falls and % of residents involved in falls		
Charlon *et al.* (2013); France	Body worn patch to identify and monitor residents via infrared sensors. 'Behavioural model' established from 30 days' use which can then calculate danger	Design and testing plus deployment in a care facility Sequential quan-qual:	2 residents (female, ages 84 & 88) in an Alzheimer's long term care unit	Discussion with staff regarding implementation; Un-validated questionnaire to explore resident tolerance of	Staff suggested hydrocolloid dressing to attach patch to resident's back. Dressing avoids redness and is in a place where resident can't remove it; location makes for better fall detection because it is close to the body.	No	CASP: Lower quality EPHPP: Weak MMAT: Lower quality

	detection thresholds used in real-time monitoring - i.e. tailored to the individual. Generates alerts sent to mobile phone carried by staff (medical or nurse) Recipient of alert depends on the event. - e.g. nurse in charge of monitoring receives alert about a fall	perfomance testing followed by questionnaire exploring usability and acceptance		patch	Residents did not try to remove patch. No red marks, no complaints of discomfort. Relatives wanted respect for anonymity of resident in data collection and were most interested in real-time monitoring. Patch was checked morning and night to make sure it had not come off. Changed once a week. 7/8 falls detected correctly which is better than alternatives, but 1 false alarm every 4 days on average per resident which is more than alternative systems.		
Grunerbl *et al.* (2011); Austria	Tracking system with tags and sensors to collect data relating to resident behavioural and psychological states	Performance testing Mix of sequential and concomitant: 1. Initial qual discussions with staff followed by concomitant qual-quan to test system performance for location 2. Concomitant qual-quan to test performance for	6 residents at varying stages of dementia in one nursing home	1. Qual - discussions with home and with staff regarding implementation. Concomitant – qual observations of location of residents correlated with data from system 2. Ground truth from care records regarding entries	1. Core requirement was no additional burden to be placed upon staff. Infrastructure should not look different as this might negatively influence residents, had to expect some residents to refuse to wear tags. Some staff also worried about being monitored so were not given tags themselves. 95.7% average correlation between observations and system data regarding location and movement of residents 2. 14-day periods: 92.6% average recognition of positive/negative state; 80.64% average	No	CASP: Lower quality EPHPP: Weak MMAT: Higher quality

		state recognition		about physical state, mental state, and sociableness, quantised to positive/negative /neutral and corresponding to location and movement parameters recorded by tracking system	recognition of positive/negative/neutral state. Conclusion: well-suited for a rough (small number of states) assessment of dementia patients, on a user-specific basis over periods of several days.		
Nijhof *et al.* (2012); Netherlands	'IST Vivago' watch measuring movement, skin temperature and conductivity, to measure sleep pattern; computer system for data	Introduction of watch, usage and usability, interventions based on using the watch, effects on sleeping behaviour Sequential qual-quant	1 nursing home. 7 residents wore watch for 6 months (all female, ages 71-95, average 87). Selected by staff for dementia, disturbed sleep and living with one specific group in the facility. 5 staff (all female, ages 45-57, average 51)	Qual: Range of data collection methods and sources - staff diary; non-participant observation between 10am-4pm shadowing staff; semi-structured interviews with 5 staff Quan: monitoring data collected by the watch about sleep duration and circadian rhythm	**Introduction**: planned to take place at regular team meeting. All staff sceptical and didn't think it would be useful. 2 staff became opinion leaders and taught others how to use it. **Usage**: Didn't discuss the watch in regular team meetings. **Usability:** appearance not user friendly, too big, strap irritates skin, removable. Computer system easy to read and interpret; location of printer was poor. **Interventions introduced intuitively as a result of data**: multidisciplinary discussion based on data. Change sleep position, quality of life e.g. taking a bath before bed, medication time change. Intuitive decisions based on outcomes from watch and not done	Discussion framed by Diffusion of Innovations	CASP: Higher quality EPHPP: Weak MMAT: Higher quality

					systematically. Medication time change significantly improved sleep time. **Effects on caregiving process:** easier to coordinate care during day and night		
Schikhof *et al.* (2010); Netherlands	Monitoring system with cameras, door sensor and infrared beam, alerts sent to PDAs	Development of system for remote monitoring Mix of sequential and concomitant: 1. Sequential qual-quan to ascertain understandings and values 2. Concomitant qual-quan to test system performance	21 participants in one home: 8 staff, 13 relatives	1. Acceptance of design tested by two meetings, one for staff), one for relatives. Pre- and post-meeting 4-point Likert scale about acceptance of cameras in bedrooms. Interviews with 3 relatives to distinguish needs of relatives from needs of resident. 2. System designed and evaluated by performance test and practice trial with 4 residents during evening and night shift for 4 weeks. Staff completed questionnaire every shift.	1. Change from some finding camera unacceptable before meetings to all finding camera acceptable after meetings. Relatives referred to safety and better surveillance as grounds for the acceptance of limited camera use in the bedroom. Terms for acceptance were informed consent and that only staff members were allowed to see the live images. 'Trust' seemed to be important. Relatives worried that all night staff would be replaced; staff worried about their activities being controlled 2. Major problems identified in performance test that hadn't come up in lab test e.g. placement, signal reception. comfortable with the system within the first shift. Rated the system as satisfactory and disappointed that it had to be removed after the test phase	Human-centred design & Value-sensitive design	CASP: Higher quality EPHPP: Weak MMAT: Mid-quality

Sugihara *et al.* (2011); Japan	'Mimamori' care system with cameras in communal areas, and monitors	Staff perceptions of the system Concomitant qual-quan	As per Sugihara *et al.* (2008): 11 staff from 2 homes, plus 5 staff from a third home (Home C)	1. Qual: (only Home C) interviews pre- and post-installation	1. As per Sugihara *et al.* (2008): Eliminated blind spots, removed concern and afforded focus on other tasks e.g. writing reports. Reduced work stress and altered interaction with residents: prior to system staff disturbed residents by constantly asking them where they were going. Feel residents are more independent	No	CASP: Lower quality EPHPP: Weak MMAT: Mid-quality
				2. Quan: video analysis of resident and staff behaviour for 2 days pre- and 2 days post-installation from 4pm to 5:30am	2. Video analysis suggested that staff made better judgments about whether to assist residents who really needed help, rather than over-assisting out of concern (although difference between pre- and post-judgments not statistically tested)		

Appendix 4

Quality appraisal of included papers

Appraisal of qualitative papers

	CASP item								
Study	**Clear statement of aims?**	**Qualitative methodology appropriate?**	**Research design appropriate to aims?**	**Recruitment strategy appropriate to aims?**	**Data collected in a way that addressed research issue?**	**Consideration of researcher-participant relationship?**	**Consideration of ethical issues?**	**Rigorous data analysis?**	**Clear statement of findings?**
Abbate *et al.* (2014)	Y	Y	?	?	?	N	N	?	Y
Aud (2004)	Y	Y	Y	Y	Y	n/a	Y	?	Y
Beckwith (2003)	Y	Y	Y	?	?	N	N	?	Y
Engström *et al.* (2009)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Godwin (2012)	Y	Y	Y	Y	Y	N	Y	?	Y
Kearns *et al.* (2007)	Y	Y	Y	Y	Y	N	?	Y	Y
Müller *et al.* (2013)	Y	Y	Y	?	?	N	N	?	Y
Niemeijer *et al.* (2011)	Y	Y	Y	Y	Y	?	N	Y	Y
Niemeijer *et al.* (2014)	Y	Y	Y	?	Y	Y	Y	Y	Y
Niemeijer *et al.* (2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sugihara *et al.* (2008)	Y	Y	Y	?	?	N	N	?	Y
Sugihara *et al.* (2014)	Y	Y	Y	?	?	N	Y	?	Y
Wigg (2010)	Y	Y	Y	?	?	Y	?	?	Y
Zwijsen *et al.* (2012)	Y	Y	Y	Y	Y	?	Y	Y	Y

Appraisal of quantitative papers

	EPHPP item						
Paper	**Selection bias**	**Study design**	**Confounders**	**Blinding**	**Data collection methods**	**Withdrawals and drop-outs**	**Global Rating**
Capezuti *et al.* (2009)	M	W	W	M	W	S	**W**
Engström *et al.* (2005)	M	S	S	W	M	W	**W**
Engström *et al.* (2006)	W	S	S	W	M	W	**W**
Holmes *et al.* (2007)	M	S	S	W	S	M	**M**
te Boekhorst *et al.* (2013)	M	W	S	M	S	M	**M**

Key: S = Strong; M = Moderate; W = Weak
Global rating: S = no weak items; M = one weak item ; W = two or more weak items

Appraisal of mixed methods papers

	EPHPP Items							CASP items									MMAT mixed methods items		
Paper	Selection bias	Study design	Confounders	Blinding	Data collection methods	Withdrawals and drop-outs	Global EPHPP rating	Clear statement of aims?	Qualitative methodology appropriate?	Research design appropriate to aims?	Recruitment strategy appropriate to aims?	Data collected in a way that addressed research issue?	Consideration of researcher-participant relationship?	Consideration of ethical issues?	Rigorous data analysis?	Clear statement of findings?	'Mixed methods' design relevant?	Integration of quantitative and qualitative relevant?	Appropriate consideration given to limitations associated with integration?
Aloulou *et al.* (2013)	W	W	W	W	W	n/a	W	Y	Y	Y	?	Y	N	Y	N	Y	Y	Y	Y
Bressler *et al.* (2011)	M	M	S	S	M	S	S	Y	Y	Y	Y	?	N	N	?	?	Y	Y	?
Charlon *et al.* (2013)	W	W	W	W	W	n/a	W	Y	Y	Y	?	?	N	N	N	Y	?	Y	N
Grunerbl *et al.* (2011)	W	W	W	W	W	n/a	W	Y	Y	Y	Y	?	N	N	?	?	Y	Y	Y
Nijhof *et al.* (2012)	W	M	W	W	W	S	W	Y	Y	Y	Y	Y	?	Y	?	Y	Y	Y	Y
Schikhof *et al.* (2010)	W	W	W	W	W	W	W	Y	Y	Y	?	Y	Y	Y	Y	Y	Y	Y	?
Sugihara & Fujinami (2011)	W	W	W	W	W	n/a	W	Y	Y	?	?	Y	N	Y	?	Y	Y	Y	N
Wai *et al.* (2010)	W	W	W	W	W	n/a	W	Y	Y	?	Y	?	N	N	?	Y	?	Y	N
Zwijsen *et al.* (2011)	W	W	W	M	M	n/a	W	Y	Y	Y	Y	Y	?	Y	Y	Y	Y	Y	Y
Ratings key	*S = Strong; M = Moderate; W = Weak*							*Y = clearly met item; ? = can't tell; N = did not meet item*											

Appendix 5

Study information sheets and consent forms

Technology in Care Homes Project

Staff Participant Information Sheet

Research Ethics Committee Reference no: 13/NW/0752

I am conducting a study exploring the use of technologies within care homes. I would like to invite you to take part in the study.

The following information is presented in two parts:

Part 1 tells you the purpose of the study and what will happen if you decide to take part.

Part 2 gives you more detailed information about the conduct of the study.

Please ask me if anything is not clear.

I would be happy to go through the information sheet with you and answer any questions that you may have. This would take about 30 minutes.

Contact details of researchers:

PhD Researcher: Mr Alex Hall, University of Manchester, School of Nursing, Midwifery & Social Work, Jean McFarlane Building, Oxford Road, Manchester M13 9PL. Telephone number: 0161 306 7860 or 07565 099663.

Primary PhD Supervisor: Professor Chris Todd, University of Manchester, School of Nursing, Midwifery & Social Work, Jean McFarlane Building, Room 6.314b, Oxford Road, Manchester, M13 9PL. Telephone number: 0161 306 7865. Alternative telephone number (PA Mrs Stacey Body): 0161 306 7860.

Part 1

What is the purpose of the research study?

- The study aims to find out about people's experiences of technologies that are used within care homes
- The study wishes to examine what happens when technologies are introduced into care homes
- The study also wishes to find out how technologies are used in everyday care

The study will do this by observing daily routines within the care home for a few hours a day. I am interested in observing routines covering the whole 24-hour period. I will carry out observations in communal areas of the home. I may also seek to make some brief observations in residents' rooms, but only where relevant and only if the resident indicates they are comfortable with my presence. An example of a relevant observation within a resident's room would be observing how a bed-exit alert system is used. I will not be present during any instances of personal care.

The study will also do this by talking to staff within the care home, to residents, and to the relatives and next of kin of residents.

The study will also look at relevant sections of care files and records kept by the care home, for example, records of decisions made to use a technology to aid a resident's care.

The study will provide recommendations for service improvement and also give examples of good practice where possible.

This study is being conducted by Alex Hall as part of his PhD.

Why have you been invited?
You have been invited to take part because you are a staff member of the care home in which I am carrying out my study.

Do you have to take part?
No.

It is up to you whether or not you would like to take part. You can go through this information sheet and ask me any questions that you may have. If you advise me that you would like to take part, I will ask you to sign a consent form. You are free to withdraw at any time without giving a reason. This will not affect any future service provision, care or legal rights in any way.

What will happen to you if you take part?
I would like to observe what happens on a normal, every day basis in the care home. I am particularly interested in observing how technology is used within

resident care. Please note that any observation will **not** include observation of personal care routines.

In the second stage of the study I will be asking a smaller number of people to take part in in-depth conversations with me. These will be held in a private space within the care home. These conversations may be conducted on an individual basis or with a small group of staff members. I will audio-record these conversations. In these conversations I will ask you more about your opinions on the technology that is used within the care home. I will also ask you to complete questionnaires regarding your use of technologies both in the care home and in your everyday life.

Part 2

Information about the researcher
Alex Hall is an experienced researcher who has also worked directly in providing care and support to people with memory problems and communication difficulties.

Expenses and payments
There is no payment for taking part in this study.

Will taking part in the research be kept confidential?
Yes. All data generated by the research will be anonymised.

All the information that is given to me, including audio recordings of our conversations, will be stored securely at the University of Manchester either in encrypted computer files or in locked cabinets accessible only by the Project team.

Data will be held for at least 10 years after final publication of the study. This length of time is sufficient to allow reconstruction of the study for reanalysis and audit if required. Data will then be destroyed in accordance with the guidance and standards specified by the IT Security Coordinator (see www.its.manchester.ac.uk/secure-it).

To make sure that the study is being carried out properly, individuals from the University of Manchester and regulatory authorities may need to carry out checks on the study data. Some of the documents that might need to be checked could include your personal data (for example your name). All the individuals carrying out the checks have a duty of confidentiality to you as a research participant. You can indicate on the consent form if you do not wish any of your personal data to be looked during these checks.

Reporting the findings
Your experiences will be grouped together with other people that I speak to. No individual will be identifiable in any findings that are published from this study.

In the event that any bad practice is disclosed to me, this information will be fed back to the care home management to be dealt with through appropriate systems.

If information concerning abuse or other criminal activity is disclosed to me then I am required to pass this information to the police.

What will happen when the research stops?
I anticipate that I will be finished gathering information in the care home by December 2014. The whole study is due to be completed by September 2016.

The findings from the research will be written up into a short report that will be distributed to all participating organisations. It is hoped that the findings will also help care homes understand better how to use technologies.

The research team will submit papers about the research and findings to relevant research journals. The research team will also apply to talk about the research and the findings at relevant conferences and events.

What are the possible benefits of taking part?
There are no direct benefits from taking part in this research, but you will be contributing to the development and continuation of understanding about how to use technologies in care homes.

What are the possible disadvantages and risks of taking part?
I do not anticipate any disadvantages or risks in being involved in this project. If however anyone has a complaint or suffers any unforeseen harm, this will be addressed as follows:

Complaints

If you have a concern about any aspect of this study, you should ask to speak to Alex Hall who will do his best to answer your questions. If he is unable to resolve your concern or you wish to make a complaint regarding the study, please contact a University Research Practice and Governance Co-ordinator on 0161 2757583 or 0161 275 8093 or by email to research.complaints@manchester.ac.uk.

Harm

In the unlikely event that something does go wrong and you are harmed during the research you may have grounds for a legal action for compensation against the University of Manchester or Care Home but you may have to pay your legal costs.

Who is organising and funding the research project?
The research is being funded by the Medical Research Council and it is being carried out by the University of Manchester.

Who has reviewed the research project?
The research has been given a favourable ethical opinion for conduct by the National Research Ethics Committee North West – Haydock.

Participant ID:

Staff Participant Consent Form

Title of Project: Technology in Care Homes

Researcher: Alex Hall

	Please initial
I confirm that I have read and understood the information sheet version 1.4 dated 16.05.2014 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
I understand that participation in the project is voluntary and I am free to withdraw if I do not wish to continue participating and without giving a reason.	
I understand that conversations between me and the researcher may	

be audio-recorded. These recordings may be transcribed by a third party company approved by the University of Manchester.	
I understand that the anonymised quotes will be used in publications. This means that before anything that I say is used in published work, it will be completely anonymised so that I will not be able to be identified.	
I understand that relevant sections of data collected during the study may be looked for research and audit purposes by responsible individuals from the University of Manchester, from regulatory authorities or from the NHS Trust, where it is relevant to their taking part in this research. I give permission for these individuals to have access to these data.	
I agree to take part in the above study	

_____ _____ _____

Name of Participant Date Signature

_____ _____ _____

Name of Researcher Date Signature

Research Ethics Committee Reference number: 13/NW/0752

Technology in Care Homes Project

Invitation to Participate

My name is Alex Hall and I am a PhD student at the University of Manchester. I am conducting a study exploring use of technologies within care homes. I would like to invite you to take part in the study because your relative is a resident of one of the care homes in which I am conducting my study. I have asked the staff at [name of care home] to send you this letter.

The sorts of technologies I am interest in include alert systems, and systems which monitor the movement and general status of residents.

What is the purpose of the research study?

- There is great potential for technologies to enhance the quality of care for people who live in care homes. However, relatively little is known about how technologies are used in practice, or what people think of them.

- This study aims to explore what happens when technologies are used within care homes and to see how residents, relatives and staff members feel about the technologies.

- These sorts of issues are important because technologies can offer numerous benefits for care home residents, their families, and care staff. It is important to understand how best to use technologies in care so that they can be applied for maximum benefit.

- The study will explore these questions in a number of different ways. These ways include observations of daily routines in the care home, and conversations with residents, relatives and staff members to explore their thoughts and opinions about technologies.

- The study will provide recommendations for service improvement and also give examples of good practice where possible.

What should you do next?

If you are interested in taking part in this study and would like further information, please complete the enclosed form and return it in the stamped addressed envelope to Alex Hall at the University of Manchester. Alex will then contact you with full information about the project which will help you to decide if you would like to take part.

Thank you.

Reply Slip

Title of Project: Technology in Care Homes

I, ……....., am interested in taking part in your study and I would like to be contacted with further information.

Address: _____

_____

Town: _____

Postcode: _____

Telephone: _____

Email: _____

Preferred contact (please tick):

Telephone ☐ Email ☐

Signed _____

Date _____

Technology in Care Homes Project

Relative Participant Information Sheet

Research Ethics Committee Reference no: 13/NW/0752

I am conducting a study exploring use of technologies within care homes. I would like to invite you to take part in the study because your relative is a resident of one of the care homes in which I am conducting my study.

The following information is presented in two parts:

Part 1 tells you the purpose of the study and what will happen if you decide to take part.

Part 2 gives you more detailed information about the conduct of the study.

Please ask me if anything is not clear.

I would be happy to go through the information sheet with you and answer any questions that you may have. This would take about 30 minutes.

Contact details of researchers:

PhD Researcher: Mr Alex Hall, University of Manchester, School of Nursing, Midwifery & Social Work, Jean McFarlane Building, Oxford Road, Manchester M13 9PL. Telephone number: 0161 306 7860 or 07565 099663.

Primary PhD Supervisor: Professor Chris Todd, University of Manchester, School of Nursing, Midwifery & Social Work, Jean McFarlane Building, Room 6.314b, Oxford Road, Manchester, M13 9PL. Telephone number: 0161 306 7865. Alternative telephone number (PA Mrs Stacey Body): 0161 306 7860.

Part 1

What is the purpose of the research study?

- The study aims to find out about people's experiences of technologies that are used within care homes
- The study wishes to examine what happens when technologies are introduced into care homes
- The study also wishes to find out how technologies are used in everyday care

The sorts of technologies I am interest in include alert systems, and systems which monitor the movement and general status of residents.

The study will do this by observing daily routines within the care home for a few hours a day. I am interested in observing routines covering the whole 24-hour period. I will carry out observations in communal areas of the home. I may also seek to make some brief observations in residents' rooms, but only where relevant and only if the resident indicates they are comfortable with my presence. An example of a relevant observation within a resident's room would be observing how a bed-exit alert system is used. I will not be present during any instances of personal care.

The study will also do this by talking to staff within the care home, to residents, and to the relatives and next of kin of residents.

The study will also look at relevant sections of care files and records kept by the care home, for example, records of decisions made to use a technology to aid a resident's care.

The study will provide recommendations for service improvement and also give examples of good practice where possible.

This study is being conducted by Alex Hall as part of his PhD.

Why have you been invited?
You have been invited to take part because you are a relative/significant other of a resident of the care home in which I am carrying out my study.

Do you have to take part?
No.

It is up to you whether or not you would like to take part. You can go through this information sheet and ask me any questions that you may have. If you advise me that you would like to take part, I will ask you to sign a consent form. You are free to withdraw at any time without giving a reason. This will not affect any future service provision, care or legal rights in any way.

What will happen to you if you take part?
I would like to speak with you about the use of technology within the care of your relative. This conversation may be held in a location of your choice: either within the care home, within your own home, or within the University of Manchester. It is also possible that I may invite you to take part in a group discussion with a few relatives of other residents of the care home. I will audio-record any conversations. In these conversations I will ask you about your opinions on the technology that is used within the care home. I will also invite you to complete questionnaires about your use of everyday technologies such as mobile phones and computers.

Part 2

Information about the researcher
Alex Hall is an experienced researcher who has worked directly in providing care and support to people with memory problems and communication difficulties.

Expenses and payments
There is no payment for taking part in this study. However, if you wish for conversations to be conducted at the University of Manchester, your travel expenses will be reimbursed.

Will taking part in the research be kept confidential?
Yes. All data generated by the research will be anonymised.

All the information that is given to me, including audio recordings of our conversations, will be stored securely at the University of Manchester either in encrypted computer files or in locked cabinets accessible only by the Project team.

Data will be held for at least 10 years after final publication of the study. This length of time is sufficient to allow reconstruction of the study for reanalysis and audit if required. Data will then be destroyed in accordance with the guidance and standards specified by the IT Security Coordinator (see www.its.manchester.ac.uk/secure-it).

To make sure that the study is being carried out properly, individuals from the University of Manchester and regulatory authorities may need to carry out checks on the study data. Some of the documents that might need to be checked could include your personal data (for example your name). All the individuals carrying out the checks have a duty of confidentiality to you as a research participant. You can indicate on the consent form if you do not wish any of your personal data to be looked during these checks.

Reporting the findings
Your experiences will be grouped together with other people that I speak to. No individual will be identifiable in any findings that are published from this study.

In the event that any bad practice is disclosed to me, this information will be fed back to the care home management to be dealt with through appropriate systems.

If information concerning abuse or other criminal activity is disclosed to me then I am required to pass this information to the police.

What will happen when the research stops?
I anticipate that I will be finished gathering information in the care home by December 2014. The whole study is due to be completed by September 2016.

The findings from the research will be written up into a short report that will be distributed to all participating organisations. It is hoped that the findings will also help care homes understand better how to use technologies.

The research team will submit papers about the research and findings to relevant research journals. The research team will also apply to talk about the research and the findings at relevant conferences and events.

What are the possible benefits of taking part?
There are no direct benefits from taking part in this research, but you will be contributing to the development and continuation of understanding about how to use technologies in care homes.

What are the possible disadvantages and risks of taking part?
I do not anticipate any disadvantages or risks in being involved in this project. If however anyone has a complaint or suffers any unforeseen harm, this will be addressed as follows:

Complaints
If you have a concern about any aspect of this study, you should ask to speak to Alex Hall who will do his best to answer your questions. If he is unable to resolve your concern or you wish to make a complaint regarding the study, please contact a University Research Practice and Governance Co-ordinator on 0161 2757583 or 0161 275 8093 or by email to research.complaints@manchester.ac.uk.

Harm
In the unlikely event that something does go wrong and you are harmed during the research you may have grounds for a legal action for compensation against the University of Manchester or Care Home but you may have to pay your legal costs.

Who is organising and funding the research project?
The research is being funded by the Medical Research Council and it is being carried out by the University of Manchester.

Who has reviewed the research project?
The research has been given a favourable ethical opinion for conduct by the National Research Ethics Service Committee North West - Haydock.

Participant ID:

Relative Participant Consent Form

Title of Project: Technology in Care Homes

Researcher: Alex Hall

	Please initial
I confirm that I have read and understood the information sheet version 1.3 dated 16.05.2014 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
I understand that participation in the project is voluntary and I am free to withdraw if I do not wish to continue participating and without giving a reason.	

I understand that conversations between me and the researcher will be audio-recorded. These recordings may be transcribed by a third party company approved by the University of Manchester.	
I understand that anonymised quotes from these conversations may be used in publications. This means that before anything that I say is used in published work, it will be completely anonymised so that I will not be able to be identified.	
I understand that relevant sections of my relative/friend's care records and data collected during the study may be looked at for research and audit purposes by responsible individuals from the University of Manchester, from regulatory authorities or from the NHS Trust, where it is relevant to their taking part in this research. I give permission for these individuals to have access to my relative/friend's records.	
I agree to take part in the above study	

_____ _____ _____

Name of Participant Date Signature

_____ _____ _____

Name of Researcher Date Signature

Research Ethics Committee Reference number: 13/NW/0752

Technology in Care Homes Project

Personal Consultee Information Sheet

Research Ethics Committee Reference no: 13/NW/0752

Why have you been approached?

I am conducting a study exploring uses of technology within care homes. I would like to invite your relative/friend to participate in this study but I believe that they are unable to decide for themselves whether or not to participate. I am contacting you because you have an interest in their well-being. You may have been given a Lasting Power of Attorney to make personal welfare decisions on their behalf. A 'Personal Consultee' is a partner, relative or friend who provides the research team with advice about a particular person who does not have capacity to do so themselves.

I would like to discuss with you whether or not you think your relative/friend would have wanted to take part in my study. I ask you to consider what you know of their wishes and feelings, and to consider their interests. It is important that you think about the likely views and wishes of your relative/friend rather than your own views about the study. You may be aware of any views your relative/friend has on taking part in research projects. You may also know if they have made an Advance Decision.

If you think that your relative/friend would be interested in taking part, you may be able to tell me about any possible difficulties they may have. You may also be able to tell me how they might communicate that they want to stop being involved with the study.

What do you need to do now?

If you think that your relative/friend **would** be interested in taking part, please complete the attached form and send this back to Alex Hall using the stamped-addressed envelope.

If you think your relative/friend **would not** be interested in taking part, it is important that you still complete and return the form so that I can update my records. If you do think that your relative/friend would not want to take part it will not affect the care they receive in any way.

Will information be kept confidential?
Information you supply about yourself and your relative/friend will only be available to members of the project team. This information will be locked in a secure filing cabinet at the University of Manchester.

Seeking advice
If you are unsure about taking on the role of Consultee, you may seek independent advice. For example, you could contact INVOLVE, a national advisory group supporting greater public involvement in NHS, public health and social care research. Their telephone number is 02380 651088 and their e-mail address is: admin@invo.org.uk.

I will understand if you do not wish to take on this responsibility.

The following information is the same as would have been provided to your relative/friend. It is presented in two parts:

Part 1 tells you the purpose of the study and what will happen to your relative/friend if they take part.

Part 2 gives you more detailed information about the conduct of the study.

Please ask me if anything is not clear. I would be happy to go through the information sheet with you and answer any questions that you may have. This would take about 30 minutes.

Contact details of researchers:

PhD Researcher: Mr Alex Hall, University of Manchester, School of Nursing, Midwifery & Social Work, Jean McFarlane Building, Oxford Road, Manchester M13 9PL. Telephone number: 0161 306 7860 or 07565 099663.

Primary PhD Supervisor: Professor Chris Todd, University of Manchester, School of Nursing, Midwifery & Social Work, Jean McFarlane Building, Room 6.314b, Oxford Road, Manchester, M13 9PL. Telephone number: 0161 306 7865. Alternative telephone number (PA Mrs Stacey Body): 0161 306 7860.

Part 1

What is the purpose of the research study?

- The study aims to find out about people's experiences of technologies that are used within care homes
- The study wishes to examine what happens when technologies are introduced into care homes
- The study also wishes to find out how technologies are used in everyday care

The study will do this by observing daily routines within the care home for a few hours a day. I am interested in observing routines covering the whole 24-hour period. I will carry out observations in communal areas of the home. I may also seek to make some brief observations in residents' rooms, but only where relevant and only if the resident indicates they are comfortable with my presence. An example of a relevant observation within a resident's room would be observing how a bed-exit alert system is used. I will not be present during any instances of personal care.

The study will also do this by talking to residents, to staff within the care home and to the relatives and next of kin of residents.

The study will also look at relevant sections of care files and records kept by the care home, for example, records of decisions made to use a technology to aid a resident's care.

The study will provide recommendations for service improvement and also give examples of good practice where possible.

This study is being conducted by Alex Hall as part of his PhD.

Why has your relative/friend been invited?
Your relative/friend has been invited to take part because they are a resident of the care home in which I am carrying out my research. They are also someone whose care may be supported by technology.

Do they have to take part?
No.

It is up to you to advise me your relative/friend's likely view about whether or not they would wish to take part. You can go through this information sheet and ask me any questions that you may have. If you advise that they would like to take part, I will ask you to sign a declaration form. Your relative/friend is free to withdraw at any time without giving a reason. This will not affect any future service provision, care or legal rights in any way.

What will happen to your relative/friend if they take part?

I would like to observe what happens on a normal, every day basis in the care of your relative/friend. I am particularly interested in observing how technology is used within their care. Please note that any observation would **not** include observation of personal care routines.

I would also like to speak informally to your relative/friend to get to know them better and to see how they feel about living in the care home.

In the second stage of the study I will be asking a smaller number of people to take part in in-depth conversations with me. These people will include care home staff. In these conversations I will ask more questions about technology and the care provided to your relative/friend. These interviews will be audio recorded.

Part 2

Information about the researcher
Alex Hall is an experienced researcher who has worked directly in providing care and support to people with memory problems and communication difficulties.

Expenses and payments
There is no payment for taking part in this study.

Will taking part in the research be kept confidential?
Yes. All data generated by the research will be anonymised.

All the information that is given to me, including audio recordings of conversations, will be stored securely at the University of Manchester either in encrypted computer files or in locked cabinets accessible only by the Project team.

Data will be held for at least 10 years after final publication of the study. This length of time is sufficient to allow reconstruction of the study for reanalysis and audit if required. Data will then be destroyed in accordance with the guidance and standards specified by the IT Security Coordinator (see www.its.manchester.ac.uk/secure-it).

To make sure that the study is being carried out properly, individuals from the University of Manchester and regulatory authorities may need to carry out checks on the study data. Some of the documents that might need to be checked could include your personal data (for example your name). All the individuals carrying out the checks have a duty of confidentiality to you as a research participant. You can indicate on the consent form if you do not wish any of your personal data to be looked during these checks.

Reporting the findings
The experiences of your relative/friend will be grouped together with other people that I speak to. No individual will be identifiable in any findings that are published from this study.

In the event that any bad practice is disclosed to me, this information will be fed back to the care home management to be dealt with through appropriate systems.

If information concerning abuse or other criminal activity is disclosed to me then I am required to pass this information to the police.

What will happen when the research stops?
I anticipate that I will be finished gathering information in the care home by December 2014. The whole study is due to be completed by September 2016.

The findings from the study will be written up into a short report that will be distributed to all participating organisations. It is hoped that the findings will also help care homes understand better how to use technologies.

The research team will submit papers about the research and findings to relevant research journals. The research team will also apply to talk about the research and the findings at relevant conferences and events.

What are the possible benefits of taking part?
There are no direct benefits to taking part in this research, but your relative/friend will be contributing to the development of understanding about how to use technologies in care homes. You will be ensuring that any changes to existing provision will have taken into account your relative/friend's views.

What are the possible disadvantages and risks of taking part?
I do not anticipate any disadvantages or risks in being involved in this project. If however anyone has a complaint or suffers any unforeseen harm, this will be addressed as follows:

Complaints
If you have a concern about any aspect of this study, you should ask to speak to Alex Hall who will do his best to answer your questions. If he is unable to resolve your concern or you wish to make a complaint regarding the study, please contact a University Research Practice and Governance Co-ordinator on 0161 2757583 or 0161 275 8093 or by email to research.complaints@manchester.ac.uk.

Harm
In the unlikely event that something does go wrong and you are harmed during the research you may have grounds for a legal action for compensation against the University of Manchester or Care Home but you may have to pay your legal costs.

Who is organising and funding the research project?
The research is being funded by the Medical Research Council and it is being carried out by the University of Manchester.

Who has reviewed the research project?
The research has been given a favourable ethical opinion for conduct the National Research Ethics Service Committee North West - Haydock.

Personal Consultee Declaration Form

Title of Project: Technology in Care Homes

Researcher: Alex Hall

I, …… (name of Personal Consultee) have been consulted about

……..…….(name of person)'s participation in this research study.

In my opinion he/she would have no objection to taking part in the above study.

	Please initial
I confirm that I have read and understood the information sheet version 1.3 dated 25.11.2013 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered to my satisfaction.	
I understand that participation in the project is voluntary. The person would be withdrawn if they do not wish to continue participating and without giving a reason. This would not result in his/her care or legal rights being affected.	

I understand that Alex Hall may take notes about any conversations he has with the person and about any observations he makes regarding the person's care.	
I understand that the anonymised quotes from these notes may be used in publications. This means that before anything that the person says is used in published work it will be completely anonymised so that he/she will not be able to be identified. In my opinion the person would be willing to consent to this.	
I understand that relevant sections of the person's care records and data collected during the study may be looked at for research and audit purposes by responsible individuals from the University of Manchester, from regulatory authorities or from the NHS Trust, where it is relevant to their taking part in this research. I give permission for these individuals to have access to the person's records.	
I am prepared to give a telephone number in order to receive a telephone call from the researcher if he needs to discuss any aspect of the study with me.	

_____ _____ _____

Name of Personal Consultee | Date | Signature

Telephone: _____

_____ _____ _____

Name of Researcher | Date | Signature

Research Ethics Committee Reference number: 13/NW/0752

Technology in Care Homes Project

Nominated Consultee Information Sheet

Research Ethics Committee Reference no: 13/NW/0752

I am conducting a research study exploring uses of technology within care homes. I intend to involve people who may not have the capacity to consent. This means that they may not be able to judge for themselves whether they should take part or refuse. The study includes such people because I am exploring people's experiences of technologies used to support the delivery of care. I also believe that it is important for people with dementia to have the chance to take part in the research study, particularly since the views of people with dementia are lacking in previous research in this area.

I will make sure that the study is safe for each person and does not cause them undue distress. To help me do this, I need information from people who have known the person for some time, or from those who have agreed to be consulted on such matters.

Why have you been approached?

You may be someone who already knows the person, working with them as a paid carer or in a professional capacity, such as a doctor or a solicitor. Alternatively, you may already have been approached by a care organisation, Trust or research organisation and agreed to act as a Consultee.

If you do know the person, you may be able to advise me about any difficulties they may have in taking part. You also may be able to tell me how they might communicate that they want to stop being involved with the study. It is important that you think about the likely views and wishes of the person themselves rather than your own views about the study.

What do you need to do now?

If you think that the person **would** be interested in taking part, please complete the attached form and send this back to Alex Hall using the stamped-addressed envelope.

If you think that the person would be interested, but you are not sure whether you would like to talk about this with the researcher, then please suggest somebody else who I could approach.

If you think that the person **would not** be interested in taking part, it is important that you still complete and return the form so that I can update my records.

Will information be kept confidential?

Information you supply about yourself, such as address and telephone number, will only be available to members of the project team. This information will be locked in a secure filing cabinet at the University of Manchester.

Seeking advice

If you are unsure about taking on the role of Consultee, you may seek independent advice. For example, you could contact INVOLVE, a national advisory group supporting greater public involvement in NHS, public health and social care research. Their telephone number is 02380 651088 and their e-mail address is: admin@invo.org.uk.

I will understand if you do not wish to take on this responsibility.

The following information is the same as would have been provided to the person themselves. It is presented in two parts:

Part 1 tells you the purpose of the study and what will happen to the person if they take part.

Part 2 gives you more detailed information about the conduct of the study.

Please ask me if anything is not clear. I would be happy to go through the information sheet with you and answer any questions that you may have. This would take about 30 minutes.

Contact details of researchers:

PhD Researcher: Mr Alex Hall, University of Manchester, School of Nursing, Midwifery & Social Work, Jean McFarlane Building, Oxford Road, Manchester M13 9PL. Telephone number: 0161 306 7860 or 07565 099663.

Primary PhD Supervisor: Professor Chris Todd, University of Manchester, School of Nursing, Midwifery & Social Work, Jean McFarlane Building, Room 6.314b, Oxford Road, Manchester, M13 9PL. Telephone number: 0161 306 7865. Alternative telephone number (PA Mrs Stacey Body): 0161 306 7860.

Part 1

What is the purpose of the study?

- The study aims to find out about people's experiences of technologies that are used within care homes
- The study wishes to examine what happens when technologies are introduced into care homes
- The study wishes to find out how technologies are used in everyday care

The study will do this by observing daily routines within the care home for a few hours a day. I am interested in observing routines covering the whole 24-hour period. I will carry out observations in communal areas of the home. I may also seek to make some brief observations in residents' rooms, but only where relevant and only if the resident indicates they are comfortable with my presence. An example of a relevant observation within a resident's room would be observing how a bed-exit alert system is used. I will not be present during any instances of personal care.

The study will also do this by talking to residents, to staff within the care home and to the relatives and next of kin of residents.

The study will also look at relevant sections of care files and records kept by the care home, for example, records of decisions made to use a technology to support a person's care.

The study will provide recommendations for service improvement and also give examples of good practice where possible.

This study is being conducted by Alex Hall as part of his PhD.

Why has the person been invited?
The person has been invited to take part because they are a resident of the care home in which I am carrying out my research.

Do they have to take part?
No.

It is up to you to advise me the person's likely view about whether or not they would wish to take part. You can go through this information sheet and ask me any questions that you may have. If you advise that they would like to take part, I will

ask you to sign a declaration form. The person is free to withdraw at any time without giving a reason. This will not affect any future service provision, care or legal rights in any way.

What will happen to the person if they take part?
I would like to observe what happens on a normal, everyday basis in the care of the person. I am particularly interested in observing how technology is used within their care. Please note that any observation would **not** include observation of personal care routines.

I would also like to speak informally to the person to get to know them better and to see how they feel about living in the care home.

In the second stage of the study I will be asking a smaller number of people to take part in in-depth conversations with me. These people will include care home staff. In these conversations I will ask more questions about technology and the care provided to the person. These conversations will be audio recorded.

Part 2

Information about the researcher
Alex Hall is an experienced researcher who has worked directly in providing care and support to people with memory problems and communication difficulties.

Expenses and payments
There is no payment for taking part in this study.

Will taking part in the study be kept confidential?
Yes. All data generated by the study will be anonymised.

All the information that is given to me, including audio recordings of conversations, will be stored securely at the University of Manchester either in encrypted computer files or in locked cabinets accessible only by the Project team.

Data will be held for at least 10 years after final publication of the study. This length of time is sufficient to allow reconstruction of the study for reanalysis and audit if required. Data will then be destroyed in accordance with the guidance and standards specified by the IT Security Coordinator (see www.its.manchester.ac.uk/secure-it).

To make sure that the study is being carried out properly, individuals from the University of Manchester and regulatory authorities may need to carry out checks on the study data. Some of the documents that might need to be checked could include your personal data (for example your name). All the individuals carrying out the checks have a duty of confidentiality to you as a research participant. You can indicate on the consent form if you do not wish any of your personal data to be looked during these checks.

Reporting the findings
The experiences of the person will be grouped together with other people that I speak to. No individual will be identifiable in any findings that are published from this study.

In the event that any bad practice is disclosed to me, this information will be fed back to the care home management to be dealt with through appropriate systems.

If information concerning abuse or other criminal activity is disclosed to me then I am required to pass this information to the police.

What will happen when the study stops?
I anticipate that I will be finished gathering information in the care home by December 2014. The whole study is due to be completed by September 2016.

The findings from the study will be written up into a short report that will be distributed to all participating care homes. It is hoped that the findings will also help care homes understand better how to use monitoring technologies.

The research team will submit papers about the research and findings to relevant research journals. The research team will also apply to talk about the research and the findings at relevant conferences and events.

What are the possible benefits of taking part?
There are no direct benefits from taking part in this research, but the person will be contributing to the development of understanding about how to use technologies in care homes. You will be ensuring that any changes to existing provision will have taken into account the person's views.

What are the possible disadvantages and risks of taking part?
I do not anticipate any disadvantages or risks in being involved. If however anyone has a complaint or suffers any unforeseen harm, this will be addressed as follows:

> **Complaints**
> If you have a concern about any aspect of this study, you should ask to speak to Alex Hall and I will do my best to answer your questions. If I am unable to resolve your concern or you wish to make a complaint regarding the study, please contact a University Research Practice and Governance Co-ordinator on 0161 2757583 or 0161 275 8093 or by email to research.complaints@manchester.ac.uk.
>
> **Harm**
> In the unlikely event that something does go wrong and you are harmed during the research you may have grounds for a legal action for compensation against the University of Manchester or Care Home but you may have to pay your legal costs.

Who is organising and funding the research project?
The research is being funded by the Medical Research Council and it is being carried out by the University of Manchester.

Who has reviewed the research project?
The research has been given a favourable ethical opinion for conduct by the National Research Ethics Service Committee North West - Haydock.

Nominated Consultee Declaration Form

Title of Project: Technology in Care Homes

Researcher: Alex Hall

I, …… (name of Nominated Consultee) have been consulted about ……..…….(name of person)'s participation in this research study.

In my opinion he/she would have no objection to taking part in the above study.

	Please initial
I confirm that I have read and understood the information sheet version 1.3 dated 25.11.2013 for the above study. I have had the opportunity to consider the information, ask questions and have had these answered to my satisfaction.	
I understand that participation in the project is voluntary. The person would be withdrawn if they do not wish to continue participating and without giving a reason. This would not result in his/her care or legal rights being affected.	

I understand that Alex Hall may take notes about any conversations he has with the person and about any observations he makes regarding the person's care.	
I understand that the anonymised quotes from these notes may be used in publications. This means that before anything that the person says is used in published work it will be completely anonymised so that he/she will not be able to be identified. In my opinion the person would be willing to consent to this.	
I understand that relevant sections of the person's care records and data collected during the study may be looked at for research and audit purposes by responsible individuals from the University of Manchester, from regulatory authorities or from the NHS Trust, where it is relevant to their taking part in this research. I give permission for these individuals to have access to the person's records.	
I am prepared to give a telephone number in order to receive a telephone call from the researcher if he needs to discuss any aspect of the study with me.	

_____ _____ _____

Name of Nominated Consultee Date Signature

Telephone: _____

_____ _____ _____

Name of Researcher Date Signature

Research Ethics Committee Reference number: 13/NW/0752

Technology in Care Homes Project

Resident Participant Information Sheet

Research Ethics Committee Reference no: 13/NW/0752

Hello!

My name is Alex Hall and I am from the University of Manchester. I am conducting a study for my PhD. In my study I am exploring use of technologies in care homes. I would like to invite you to take part in the study.

The following information is presented in two parts:

Part 1 tells you about the study and what will happen if you choose to take part.

Part 2 tells you more information about the study.

Please ask me if anything is not clear. I would be happy to go through the information sheet with you and answer any questions that you may have. This would take about half an hour.

Part 1

What is the purpose of the research study?

- I want to find out how you feel about technologies that are used within care homes
- I want to learn more about how to use technologies in your care
- The sorts of technologies I am interested in include things which alert staff that you may need some help.

Why have you been invited?
You have been invited to take part because you live in a care home in which I am carrying out my study.

Do you have to take part?
No. It is up to you whether or not you would like to take part. You can go through this information sheet and ask me any questions that you may have. If you tell me that you would like to take part, I will ask you to sign a consent form. If you do sign this form and then later decide you don't want to take part, you can change your mind at any time without giving a reason. This will not affect your care or legal rights in any way.

What will happen to you if you take part?

I would like to see what happens on a normal, everyday basis in the care home. I would like to do this by watching what happens for a few hours a day, both during the day time and at night time. I would like to see what happens in open areas of the home. I may also like to see what happens with technology in your own room, but only if you tell me you are happy for me to be there.

I would also like to talk to you to find out more about you.

I would like to look at relevant sections of your care files and records. For example, I am interested in any reasons why technology may be used in your care.

Part 2

Information about me
I am experienced researcher who has also worked directly in providing care and support to people with memory problems and communication difficulties.

Expenses and payments
There is no payment for taking part in this study.

Will taking part in the research be kept confidential?
Yes. All data generated by the research will be anonymised. This means that people's names will be removed from the data so that they are not able to be identified.

All the information that is given to me will be stored securely at the University of Manchester. Only myself or my supervisors will be able to access it.

Data will be held for at least 10 years after final publication of the study. This is to allow other people to check that I have done the study properly if they wish.

Reporting the findings

I will group anything you tell me together with things that other people tell me. This means that no individual person will be identifiable in any findings that are published from this study.

If you tell me about an experience of bad practice then I will have to tell the care home management.

If you tell me about any abuse or other criminal activity then I will have to pass this information to the police.

What will happen when the research stops?

I should be finished gathering information by December 2014. The whole study is due to be completed by September 2016.

I will write up my findings into a short report that will be presented to the care home. I hope that the findings will help care homes understand better how to use technologies.

My supervisors and I will submit papers about the research and findings to research journals. We will also talk about the research and the findings at relevant conferences and events.

What are the possible benefits of taking part?

There are no direct benefits from taking part in this research, but I hope that you will enjoy talking to me and telling me all about yourself. You will be contributing to our understanding about how to use technologies in care homes.

What are the possible disadvantages and risks of taking part?
I do not think that there are any disadvantages or risks for you being involved in this study.

If however you do feel there is something wrong, please tell me and I will do my best to answer your questions.

If I am not able to answer your question or you still feel unhappy, please talk to a member of staff.

Who is organising and funding the research project?
The research is being funded by the Medical Research Council and it is being carried out by the University of Manchester.

Who has reviewed the research project?
The research has been given a favourable ethical opinion for conduct by the National Research Ethics Service Committee North West - Haydock.

Participant ID:

Resident Participant Consent Form

Title of Project: Technology in Care Homes

Researcher: Alex Hall

	Please initial
I have read and understood the information sheet version 1.2 dated 25.11.2013 for the above study. I have had the chance to think about whether I would like to take part. I have had the chance to ask questions and have had these answered satisfactorily.	
I understand that I am volunteering to take part. I am free to withdraw if I do not wish to continue taking part and I don't have to give a reason.	
I understand that Alex Hall may take notes about things that I talk to him about.	

I understand that anonymised quotes from these conversations may be used in publications. This means that before anything that I say is used in published work, it will be completely anonymised so that I will not be able to be identified.	
I understand that relevant sections of my care records and data collected during the study may be looked at for research and audit purposes by responsible individuals from the University of Manchester, from regulatory authorities or from the NHS Trust, where it is relevant to their taking part in this research. I give permission for these individuals to have access to my records.	
If I lose the capacity to make decisions for myself during the study, I would like to stay involved in the study.	
I agree to take part in the above study.	

_____ _____ _____

Name of Participant Date Signature

_____ _____ _____

Name of Researcher Date Signature

Research Ethics Committee Reference number: 13/NW/0752

Appendix 6

Ethics approval

NHS
Health Research Authority
National Research Ethics Service
NRES Committee North West - Haydock
HRA NRES Centre - Manchester
3rd Floor - Barlow House
4 Minshull Street
Manchester
M1 3DZ
Telephone: 0161 625 7835

24 December 2013

Mr Alex Hall, PhD Student
University of Manchester
School of Nursing, Midwifery & Social Work
Jean McFarlane Building
Oxford Road
Manchester, M13 9PL

Dear Mr Hall,

Study title: **An exploration into the implementation of surveillance and monitoring technology in care homes for people with dementia**
REC reference: **13/NW/0752**
IRAS project ID: **136811**

Thank you for your email of 25 November 2013. I can confirm the REC has received the documents listed below and that these comply with the approval conditions detailed in our letter dated 20 November 2013

Documents received

The documents received were as follows:

Document	*Version*	*Date*
Participant Consent Form: Resident Participant	1.2	25 November 2013
Participant Information Sheet: Nominated Consultee	1.3	25 November 2013
Participant Information Sheet: Personal Consultee	1.3	25 November 2013
Participant Information Sheet: Relative Participant	1.2	09 October 2013
Participant Information Sheet: Resident Participant	1.2	25 November 2013
Participant Information Sheet: Staff Participant	1.3	25 November 2013

Approved documents

The final list of approved documentation for the study is therefore as follows:

Document	*Version*	*Date*
Evidence of insurance or indemnity	letter from Lynne MacRae	10 October 2013
Evidence of insurance or indemnity	Certificate of Employers" Liability Insurance	01 June 2013

Evidence of insurance or indemnity	Professional Indemnity	30 May 2013
Evidence of insurance or indemnity	Public/Products Liability Insurance	04 June 2013
Interview Schedules/Topic Guides	1	09 October 2013
Investigator CV	Alex Hall	15 October 2013
Investigator CV	Christopher James Todd	
Investigator CV	Christine Brown Wilson	18 October 2013
Investigator CV	Emma Stanmore	01 August 2013
Letter from Sponsor	from Lynne MacRae	10 October 2013
Letter of invitation to participant	1	09 October 2013
Other: Reply Slip	1	09 October 2013
Other: Observation in Progress notice	1	09 October 2013
Other: Distress Protocol	1	29 August 2013
Other: Care Home Resident Distress Protocol	1	29 August 2013
Other: conditions of Sponsor's sign-off		
Other: Good Clinical Practice Online - certificate of completion		11 October 2012
Participant Consent Form: Relative Participant	1.2	09 October 2013
Participant Consent Form: Staff Participant	1.2	09 October 2013
Participant Consent Form: Nominated Consultee	1.2	09 October 2013
Participant Consent Form: Personal Consultee	1.2	09 October 2013
Participant Consent Form: Resident Participant	1.2	25 November 2013
Participant Information Sheet: Nominated Consultee	1.3	25 November 2013
Participant Information Sheet: Personal Consultee	1.3	25 November 2013
Participant Information Sheet: Relative Participant	1.2	09 October 2013
Participant Information Sheet: Resident Participant	1.2	25 November 2013
Participant Information Sheet: Staff Participant	1.3	25 November 2013
Protocol	1.2	09 October 2013
Questionnaire: Participant Questionnaire	1	09 October 2013
Questionnaire: Care Record Data Extraction Form	1	29 August 2013
REC application	136811/514586/1/687	16 October 2013

You should ensure that the sponsor has a copy of the final documentation for the study. It is the sponsor's responsibility to ensure that the documentation is made available to R&D offices at all participating sites.

13/NW/0752	**Please quote this number on all correspondence**

Yours sincerely

Mrs Rinat Jibli
REC Manager

E-mail: nrescommittee.northwest-haydock@nhs.net

Copy to: *Ms Catherine Barrow, University of Manchester*

Appendix 7

Background demographic questionnaire

Technology in Care Homes Project

Participant questionnaire

Name: _____

1. Are you? ☐ 1 Male ☐ 2 Female

2. Date of birth: _____(day) / _____ (month) / _____ (year)

3. Please tick the appropriate box which best describes your ethnic origin.

(a) Black or Black British

- ☐ 1 Caribbean
- ☐ 2 African
- ☐ 3 Any other Black background within (a)

(b) White

- ☐ 4 British
- ☐ 5 Irish
- ☐ 6 Any other White background

(c) Asian or Asian British

- ☐ 7 Indian
- ☐ 8 Pakistani
- ☐ 9 Bangladeshi
- ☐ 10 Any other Asian background within (c)

(d) Mixed

- ☐ 11 White & Black Caribbean
- ☐ 12 White & Black African
- ☐ 13 White & Asian
- ☐ 14 Any other Mixed background

(e) Other ethnic groups

- ☐ 15 Chinese
- ☐ 16 Any other ethnic group
- ☐ 17 Not stated

4. How old were you when you left school? _____ years old.
(Please write '0' if you did not go to school)

5. Have you had any full or part time further or higher education since you left school?

☐ 1 Yes ☐ 2 No

6. How long have you been employed within this care home?

_____ years _____ months

Thank you for filling in this questionnaire. Please return it to Alex Hall either in person or by using the pre paid envelope provided.

Appendix 8

Observation notice

Observation in progress:
Technology in Care Homes Project

My name is Alex Hall and I am from the University of Manchester. I am conducting a study for my PhD. In my study I am exploring use of technologies in care homes.

I am currently conducting observational research within [care home]. If you have any questions about this research, or if you do not wish for your activities to be included, please speak to me.

Appendix 9

Example interview prompts

MANCHESTER 1824

The University of Manchester

Technology in Care Homes Project

Example interview prompts

- Can you describe what you thought [name of technology] was?
- Did you get a sense that [name of technology] was different to anything you had done previously in [name of organisation]?
- Did you believe there was a place for [name of technology] within [name of organisation]?
- What did you think that your role might be in using [name of technology]?
- How did you think that [name of technology] would affect you?
- What was the general feeling amongst people at that time regarding [name of technology]?
- Can you describe how people felt when they learned about [name of technology]?
- Who did you think would benefit from [name of technology]? And how?
- What do you believe in most about caring for people with dementia and how do you feel about the use of [name of technology] in relation to this?
- Does [name of organisation] have particular values that it promotes? How do you feel about the use of [name of technology] in relation to these values?
- What role did you see for [name of technology] within [name of organisation]?
- Can you describe how [name of technology] was put into practice?
- Whose involvement do you see as being necessary for [name of technology] to have high impact?
- Was anyone in charge of [name of technology]?

- Did your role change as use of [name of technology] got underway?
- Whose involvement do you see as necessary for using [name of technology]?
- How did you feel about getting involved in using [name of technology]?
- How do you find using [name of technology]? Is there anything easy or anything difficult about using it?
- Does [name of technology] make your life easier?
- Can you describe how you use [name of technology] on a day to day basis?
- Does everybody know what their responsibilities are around [name of technology]?
- Do you trust [name of technology]?
- Have you had any problems with faulty technology?
- Do you feel that [name of organisation] supports the use of [name of technology]?
- Tell me about the information and training you have received around [name of technology]
- What do you think about [name of technology] now that you have been involved with it?
- Can you see what impact [name of technology] is having?
- Describe for me what you think is the impact of [name of technology]?
- Do you feel that people generally think that [name of technology] is having this impact?
- How do you evaluate [name of technology]?
- Do you talk about [name of technology]?
- Can you tell me about team meetings and any discussions regarding residents' care?
- Has anything changed because of [name of technology]?
- Is there anything that you would change about [name of technology]?
- Is there anything that you would change about the way that [name of technology] is being used?

Appendix 10

Care record data extraction form

MANCHESTER 1824

The University of Manchester

Technology in Care Homes Project

Care Record Data Extraction Form

Name of person completing form _____ **Position** _____

Date _____ **Resident ID** _____

Period of care from which data are extracted From _____ To _____

Technologies used in care

(please tick all that apply)

Location tracking e.g. GPS/Radio Frequency ☐ Bed exit alarm ☐ Bathroom entrance/exit monitor ☐

Video ☐ Sound monitor ☐ Door alarms (activated on opening) ☐ Fall detector ☐

Other (please give details) _____

Record of decisions made regarding use of technology

Technology	**Decision** (please tick)		**Date of decision**	**Who made the decision?** Please indicate all people involved. Do not use names, but rather state people's job role or their relationship to the resident. Please also state whether or not the resident was involved.	**Reasons given for decision**
	Use	Withdraw			

Appendix 11

Media and Technology Usage and Attitudes Scale & System Usability Scale

Media and Technology Usage and Attitudes Scale

Media and technology usage questions

This section contains 44 questions. For most of these questions, you are asked to indicate how often you do things using a range of different media and technologies. You can indicate your answer by circling a number between 1 and 10 as follows:

1	Never
2	Once a month
3	Several times a month
4	Once a week
5	Several times a week
6	Once a day
7	Several times a day
8	Once an hour
9	Several times an hour
10	All the time

Please indicate how often you do each of the following e-mail activities on any device (mobile phone, laptop, desktop, etc.)

1. Send, receive and read e-mails (not including spam or junk mail).

1 2 3 4 5 6 7 8 9 10

2. Check your personal e-mail.

1 2 3 4 5 6 7 8 9 10

3. Check your work or school e-mail.

1 2 3 4 5 6 7 8 9 10

4. Send or receive files via e-mail.

1 2 3 4 5 6 7 8 9 10

Please indicate how often you do each of the following activities on your mobile phone.

5. Send and receive text messages on a mobile phone.

1 2 3 4 5 6 7 8 9 10

6. Make and receive mobile phone calls.

1 2 3 4 5 6 7 8 9 10

7. Check for text messages on a mobile phone.

1 2 3 4 5 6 7 8 9 10

8. Check for voice calls on a mobile phone.

1 2 3 4 5 6 7 8 9 10

9. Read e-mail on a mobile phone.

1 2 3 4 5 6 7 8 9 10

10. Get directions or use GPS on a mobile phone.

1 2 3 4 5 6 7 8 9 10

11. Browse the web on a mobile phone.

1 2 3 4 5 6 7 8 9 10

12. Listen to music on a mobile phone.

1 2 3 4 5 6 7 8 9 10

13. Take pictures using a mobile phone.

1 2 3 4 5 6 7 8 9 10

14. Check the news on a mobile phone.

1 2 3 4 5 6 7 8 9 10

15. Record video on a mobile phone.

1 2 3 4 5 6 7 8 9 10

16. Use apps (for any purpose) on a mobile phone.

1 2 3 4 5 6 7 8 9 10

17. Search for information with a mobile phone.

1 2 3 4 5 6 7 8 9 10

18. Use your mobile phone during class or work time.

1 2 3 4 5 6 7 8 9 10

How often do you do each of the following activities?

19. Watch TV shows, movies, etc. on a TV set.

1 2 3 4 5 6 7 8 9 10

20. Watch video clips on a TV set.

1 2 3 4 5 6 7 8 9 10

21. Watch TV shows, movies, etc. on a computer.

1 2 3 4 5 6 7 8 9 10

22. Watch video clips on a computer.

1 2 3 4 5 6 7 8 9 10

23. Download media files from other people on a computer.

1 2 3 4 5 6 7 8 9 10

24. Share your own media files on a computer.

1 2 3 4 5 6 7 8 9 10

25. Search the Internet for news on any device.

1 2 3 4 5 6 7 8 9 10

26. Search the Internet for information on any device.

1 2 3 4 5 6 7 8 9 10

27. Search the Internet for videos on any device.

1 2 3 4 5 6 7 8 9 10

28. Search the Internet for images or photos on any device.

1 2 3 4 5 6 7 8 9 10

29. Play games on a computer, video game console or smartphone BY YOURSELF.

1 2 3 4 5 6 7 8 9 10

30. Play games on a computer, video game console or smartphone WITH OTHER PEOPLE IN THE SAME ROOM.

1 2 3 4 5 6 7 8 9 10

31. Play games on a computer, video game console or smartphone WITH OTHER PEOPLE ONLINE.

1 2 3 4 5 6 7 8 9 10

Do you have a Facebook account?

If the answer is ‘‘yes,’’ continue with item 32.

If the answer is ‘‘no’’, skip to the ‘Attitudes’ questions.

How often do you do each of the following activities on social networking sites such as Facebook?

32. Check your Facebook page or other social networks.

1 2 3 4 5 6 7 8 9 10

33. Check your Facebook page from your smartphone.

1 2 3 4 5 6 7 8 9 10

34. Check Facebook at work or school.

1 2 3 4 5 6 7 8 9 10

35. Post status updates.

1 2 3 4 5 6 7 8 9 10

36. Post photos.

1 2 3 4 5 6 7 8 9 10

37. Browse profiles and photos.

1 2 3 4 5 6 7 8 9 10

38. Read postings.

1 2 3 4 5 6 7 8 9 10

39. Comment on postings, status updates, photos, etc.

1 2 3 4 5 6 7 8 9 10

40. Click ‘‘Like’’ to a posting, photo, etc.

1 2 3 4 5 6 7 8 9 10

Please answer the following questions about your Facebook and other online friends.

41. How many friends do you have on Facebook?

0		251-375	
1-50		376-500	
51-100		501-750	
101-175		751 or more	
176-250			

42. How many of your Facebook friends do you know in person?

0		251-375	
1-50		376-500	
51-100		501-750	
101-175		751 or more	
176-250			

43. How many people have you met online that you have never met in person?

0		251-375	
1-50		376-500	
51-100		501-750	
101-175		751 or more	
176-250			

44. How many people do you regularly interact with online that you have never met in person?

0		251-375	
1-50		376-500	
51-100		501-750	
101-175		751 or more	
176-250			

Media and Technology attitudes questions

Please indicate how much you agree or disagree with the following statements. For each statement place a tick in ONE column.

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I feel it is important to be able to find any information whenever I want online					
I feel it is important to be able to access the Internet any time I want					
I think it is important to keep up with the latest trends in technology					
I get anxious when I don't have my cell phone					
I get anxious when I don't have the Internet available to me					
I am dependent on my technology					
Technology will provide solutions to many of our problems					
With technology anything is possible					
I feel that I get more accomplished because of technology					
New technology makes people waste too much time					
New technology makes life more complicated					
New technology makes people more isolated					
I prefer to work on several projects in a day, rather than completing one project and then switching to another					
When doing a number of assignments, I like to switch back and forth between them rather than do one at a time					
I like to finish one task completely before focusing on anything else					
When I have a task to complete, I like to break it up by switching to other tasks intermittently					

System Usability Scale

Please indicate how much you agree or disagree with the following statements. For each statement place a tick in ONE column.

		Strongly disagree				**Strongly agree**
1.	I think that I would like to use this system frequently	1	2	3	4	5
2.	I found the system unnecessarily complex	1	2	3	4	5
3.	I thought the system was easy to use	1	2	3	4	5
4.	I think that I would need the support of a technical person to be able to use this system	1	2	3	4	5
5.	I found the various functions in this system were well integrated	1	2	3	4	5
6.	I thought there was too much inconsistency in this system	1	2	3	4	5
7.	I imagine that most people would learn to use this system very quickly	1	2	3	4	5
8.	I found the system very cumbersome to use	1	2	3	4	5
9.	I felt very confident using the system	1	2	3	4	5
10.	I needed to learn a lot of things before I could get going with this system	1	2	3	4	5

Appendix 12

Example of coding refinement

Extract from analysis memo in NVivo regarding development of the subtheme 'Justification for Use'

26/08/2014

I revisited the codes generated from 3 transcripts and 3 field notes after a few days away from the data.

CG and HG appear to have a clear rationale and grasp of justification for why they might use technology (especially pressure mats - which are the same in both sites). Both sites justify use of pressure mats if the resident is at risk. However, at CG, Ben and Philippa are prepared to tolerate a level of risk which is linked to ethical values about individual privacy and freedom and the belief that an individual resident retains the right to make a poor decision if they are assessed as having capacity to make that decision. At HG, Kathy openly states that if there is a hint of risk of someone getting out of bed at night they will use a mat. For her, this is a clear justification of being in the resident's best interest.

28/8/2014

After having another couple of days away from the data I revisited the coding list. Reading through the 'Justification for use' code again, I decided that this may end up as a category [i.e. theme or subtheme] rather than a code. I decided therefore to redistribute the data which included developing some new codes to give a higher level of granularity. I developed the following codes:

Legal

Enough reason to use

Priorities - comfort & safety

Resident best interest

Risk – unsteady, rolls, falling

Risk - to other people

Risk – wandering

17/9/14

Following supervision with CT [supervisor] on 9/9/14 I removed the code *Legal* from the Justification... category to the Business... category.

03/10/14

I combined the different *risk* codes under one main risk code, as some of the risks are very similar - e.g. risk of falling and risk of being unsteady.

Appendix 13

Analytic framework and definition of codes

Analytic framework: sub-themes and codes

	Sub-theme							
	Frame of Understanding	**Societal Narratives & Stereotypes**	**Business Considerations**	**Environmental Factors**	**Justification for Use**	**Discussion & Consultation**	**Functional Properties of the Technology**	**Day-to-day Working**
Code	First impressions	Age relating to technology	Purchasing, obtaining, installing	Location & movement of people	Comparing technology to something else	Family involvement & knowledge about care	Alert: activation or de-activation	Alert: response to or impact of
	Ideal or preferred technology	CCTV	Manufacturer or 3rd party involvement or influence	Night vs. Day	Enough reason to use	Formal knowledge exchange	Alert – delivery	Avoidance
	Knowledge of products	Reification of technology	Distribution of resources	Nursing vs. Residential	Resident best interest	Rumours	Physical properties	Workarounds
	Priorities: comfort / safety (without reference to technology)	The media	Understanding of philosophy of care (if explicitly related to business)	Sight lines	Priorities: comfort / safety	Staff awareness		Knowing what to do
	Technology in other homes		Legal	Size of home	Risk	Staff involvement in decisions		Distribution of resources

What people think the technology does	Being discreet	Reviewing, adjusting provision	Resident involvement	Staff role & responsibility
Understanding of philosophy of care		Intrusive or invasive	Staff training	Time & attention demands
		Use of data or information		Resident awareness
		Capability or potential of the technology		Trust
		Reliance or dependence upon technology		Testing

Definitions of Codes

Name of Code Subcode	Description	Example
Age relating to technology	Any sense of a relationship between age and technology	*"I couldn't even use a computer up until a few years ago, you know, because it's not my age group"* (Tiffany, Head RN, Sycamore Lane, Interview)
Alert – activation or deactivation	References to the activation or deactivation of the technology	*"it will buzz through on the pager when the patient moves"* (Emma, Senior Care Worker, Sycamore Lane, interview)
Inadvertent alert	Suggestions that the alert has been activated/deactivated inadvertently, either by human hand or technical fault	Some of the residents would leave the fob in various places around the household, and then the alert would go off. Staff could be 'completely baffled' as to why the alert was going off when they could clearly see the particular resident sitting in the lounge (Judy, Care Worker (night), Conifer Gardens, informal interview)
Alert – delivery	References to the delivery mechanism of the alert	*"some of the time it's not clear because whether the battery's fading on it or the display fades or it breaks up"* (Doug, Care Worker, Sycamore Lane, interview)
Alert – response to or impact of		
Aware of the alert	Whether or not staff seem to be aware of the alert	*"sometimes if it's on our floor I'll go in and say "you've not turned the buzzer off" and they'll all go "oh sorry", but you know, they're halfway through chatting, to getting somebody up"* (Olivia, RN, Conifer Gardens, interview)
Irritation, annoyance, overburden	Whether staff seem to feel that the alert is either an irritation or annoyance, or if they seem to feel overburdened by the alerts	It kept going off, emitting a rather piercing beep… Eventually Matt picked it up saying it was 'doing his head in' (Sycamore Lane, field visit 4)
Manner of response	The manner in which staff respond to alert e.g. the way in which they might enter a resident's room	staff now open the doors wide and with some degree of force to ensure that the monitor is picking up that the door has been opened (Natalie, Care Worker (night), Heather Grove, informal interview)
Non-response or over-response	References to either nobody at all responding to an alert, or many staff responding at the same time	*"in the nursing home with the pagers … you couldn't tell anyone you'd seen it and you were going, so you'd go there and then like two other people would come at the same time"* (Kathy, Deputy Manager, Heather Grove, interview)

Not taking seriously	References indicating where staff might have 'alarm fatigue' or don't take alerts seriously	the alert was going off with this (erroneous) room number all the time whilst he was testing it. He said that this is like 'crying wolf' which could lead to staff not responding to that room number in future (Noel, Facilities Manager, Sycamore Lane, informal interview)
Speed of response	References indicating how quickly an alert is responded to	*"they come to him as quickly as they can…but… if in the night if they're in somebody else's room, erm, they can't be there immediately which I understand"* (Geraldine, Wife, Conifer Gardens, interview)
Tacit knowledge	How staff response to an alert may be influenced by their knowledge of the local context, which may not be immediately obvious to a naive observer	*"But you've also got to understand that everybody knows who's here, so on our floor we'd know whose alarm could go off and if they're not in their room then you wouldn't bother looking"* (Olivia, RN, Conifer Gardens, interview)
Avoidance	Indications of staff avoiding doing something, either directly avoiding working with the technology or avoiding doing any other aspect of work	*"I think because staff aren't keen on the pager alerts, from what I can gather, they would be quite happy if they weren't using them… so, sometimes they'll say like "oh it's not working, it's not working" when it's simply the battery that's not working"* (Erica, Registered Manager, Sycamore Lane, interview)
Being discreet	References indicating staff communicating or working (in)discreetly	Amber was talking quite loudly. A couple of ladies in the lounge were looking in and telling us to be quiet, saying it was very loud. One of them kept calling 'nurse' and summoning Amber over to tell her she was being too loud. (Heather Grove, field visit 4)
Capability or potential of the technology	References to what people feel the technology may be capable of, or how they might use it, even if it is not currently being used in this way	He said that the bed sensors were only used for pressure and felt that the home should use it more for health of the residents. He said that the sensor can be used for epilepsy. (Stuart, Care Worker (night) Sycamore Lane, informal interview
CCTV	Any references at all to CCTV or cameras	"*if you have good practice you've nothing to hide"*. He said he had seen the recent "horror stories" on Panorama etc and felt that CCTV could improve the quality of care. (Ernie, Care Worker, Sycamore Lane, informal interview)
Comparing the technology to something else	Comparison of the technology to another intervention or practice	*"because she's a small lady if you didn't position it right it'd miss her, so then you couldn't even know it was in there, in fact I think we removed it because it was better to physically check on her than to trust the technology"* (Olivia, RN, Conifer Gardens, interview) He (the MD) said the door monitor

		technology is less intrusive than CCTV, not about spying on people but about getting the staff to work with them. (Heather Grove, preliminary conversation with MD) *"when I'm thinking of [name of tracking technology] now and what's available on, my iPhone, there's pedometers built into iPhones, you can use that"* (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)
Distribution of resources	Indications of how the resources in the home are distributed. This includes technological resources and human resources	I then went back up to the second floor as I hoped that the meds round would have finished. I got talking to Lorraine and asked her for the information. She told me that every resident on the floor has a bed sensor, which confirms what Ian had told me on my previous visit. (Sycamore Lane, field visit 8)
Enough reason to use	General data about technologies being used with people 'who need it'. More specific justifications (e.g. falls risk) are coded separately for the specific reason.	*"sometimes it's around saying you know if you're saying you need one, can you give me the rationale, and well, this person might do this isn't a particularly strong rationale, especially if they haven't exhibited any behaviour that would worry you around that, so, so it's, it's, it's using them appropriately with people"* (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)
Family involvement and knowledge about care	Families' involvement, either specifically in the decisions to use technologies, or in more general discussions about care	RE whether there is a sensor in her mum Karen's bed: *"I don't know…I presume so"* (Alice, Daughter, Sycamore Lane, interview) After I turned the recorder off Tiffany carried on talking for a minute or so. She said that families know about the bed sensor but that they aren't involved in the finer details such as how long a delay is set on the alert. (Tiffany, Head RN, Sycamore Lane, interview)
First impressions	People's first impressions of something, e.g. a technology or the care home itself	*"I thought that's pretty rubbish, you know, for a care home not to have cot sides on, but now having, you know, over a year's gone by, and seeing what, I un- totally understand why they don't have them"* (Caroline, daughter, Conifer Gardens, joint interview with daughter Amy)
Formal knowledge exchange	References regarding formal processes within the home	*"if I changed the mats I'd document that in that communication book and then the nurse would hand over to all the carers on the next shift"* (Olivia, RN, Conifer Gardens, interview)
Ideal or preferred	References to any technology	*what would be better than a mobility*

technology	that may be preferred, which may or may not exist on the market. These references are concerned with technologies that the home does not have. References about how to improve the home's existing technology are coded under the particular aspect of the technology, e.g. physical properties.	*tracker would be a system to tell staff where he was. He said if George goes outside and falls down behind the vegetable trays you wouldn't be able to see him. He said 'no-one cares how far you've walked, they care where you are'.* (Noel, Facilities Manager, Sycamore Lane, informal interview)
Intrusive or invasive	Whether or not a technology seems to be considered intrusive or invasive	*"I don't think there'll be anyone that disagrees with someone having a pressure mat cos it's not invasive"* (Kathy, Deputy Manager, Heather Grove, interview)
Knowing what to do	Whether people seem to know what to do in using a technology	*"I'd be worried if you couldn't figure it out [laughs]"* (Eleanor, Care Worker (night), Conifer Gardens, interview)
Knowledge of products	People's knowledge of products that actually currently exist on the market	*"[name of female resident] needs something totally different and it needs to be around her door really, erm, and I don't know how you'd do that, whether it'd have to be like erm, a burglar alarm system where, I don't know how you'd do that"* (Olivia, RN, Conifer Gardens, interview)
Legal	Any reference to legal issues or laws which the home is required to adhere to	*"she maintains legal capacity to make a bad decision"* (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)
Location & movement of people	References including information about where people are in the building	*"the people on that floor respond to it. If there was an emergency on the ground floor we'd stay up here...you've got to have 2 staff on the floor at all times, you can't leave the floor unmanned"* (Doug, Care Worker, Sycamore Lane, interview)
Manufacturer or third party involvement/influence	Role of manufacturers of the technology e.g. how they sell the product to the home, contracts etc.	*they're selling the system much more for those safeguarding perspectives...it's like "oh here's your get-out-of-jail card which you can prove now"* (Philippa, Registered Manager, joint interview with Clinical Lead Harry)
Night vs day	References comparing day and night	*"I asked her if there had been any discussion between the day and the night staff about the LBS system whilst it was in use. She said there was no real discussion"* (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)
Nursing vs residential	References comparing nursing care with residential care	*"we don't really, like, we work down here they work up there, even though we're one building we're two completely separate"* (Simone, Senior Care Worker, Conifer Gardens, interview)
Physical properties	References to physical properties of the technology	He felt that the pagers should be Smartphones and that if they were, *"people would have more respect for them and take more care of them".* (Stuart, Care Worker, Sycamore Lane,

		informal interview)
Priorities	Aspects and issues which appear to be important to people in the care of residents	
Activities		Sheryl was complaining that it is really hard to get the residents to do anything, but that they get complaints from families about a lack of activity for the residents. (Conifer Gardens, field visit 12)
Comfort or safety		*"I'd say risk for me, like reducing, managing risks...reducing risks, that's a big one for me personally"* (Sonia, RN, Conifer Gardens, interview)
Privacy or independence		*"he has fell...because he's trying to get out himself or do something himself, he's always been very independent, so, he will try"* (Tabatha, daughter, Conifer Gardens, interview)
Purchasing, obtaining, installing	References to financial or business aspects of obtaining the technology or components of the technology	*"technically you've got seven staff on a day shift so you should have seven pagers, that's two grand, two and half grand's worth of kit just attached to someone's hip, that gets put in the bath, go down toilets, get smashed"* (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)
Reification of technology	Any use of common parlance expressing the notion of technology a homogenous entity	Leah wasn't totally sure how the call system worked and asked Louise, who said *"technology's nothing to do with me"* (Heather Grove, field visit 2)
Reliance or dependence upon technology	Whether people seem to have become reliant upon technology for something	*"we rely on the bed sensor, so if they move out of bed we are alerted to that so we can go straight and assist"* (Aggie, Senior Care Worker, Sycamore Lane, interview)
Resident awareness	General references revealing the level of cognitive awareness that residents have. Resident awareness in relation to the technology is coded more specifically (e.g. whether they are aware of how to *activate the alert*, or whether their perception of the *physical properties* of the technology affects their actions)	George was complaining that £16 an hour for someone to take him into town was not value for money. He said *"I don't need anyone to take me" and "I'll go myself. I'll get in a taxi."* ...He said to me something along the lines of the care home being like a hotel except it can't be a hotel if you have to pay £16 to get out of the front door. (Sycamore Lane, field visit 9)
Resident best interest	Any general reference implying technologies being used 'in best interest' or 'to benefit them' etc.	*"I'd make whatever decision was best for my mum, what would be best for my mum and that's the decision I'd make…in terms of her, yeah safety"* (Colin, son, Conifer Gardens, interview)
Resident involvement	Data showing the extent to which the resident has been actively involved about aspects	*"you can tell them and you explain to them and you can show them…but will they remember when it comes to going to bed"*

	of their care, including technologies	(Aggie, Senior Care Worker, Sycamore Lane, interview)
Reviewing, adjusting provision	Data regarding the reviewing of the use of technology, and any changes that may be made. This might include removing a technology, putting something in place temporarily, or any kind of adjustment to the provision	*"we will review on a regular basis and see whether it's risk, reduced it"* (Rochelle, Senior Care Worker, Conifer Gardens, interview)
Risk	Data about risks to residents - usually as a justification for why a technology is used	
To other people	'Social risk' – risks a resident may pose to other residents e.g. through aggression or entering others' private spaces	*"there's certain residents who'll get up and have a wander round and go in the wrong rooms, so we've put them on the side of their beds so as soon as they get up we know to divert them back to their own bedroom in the middle of the night, instead of waking someone else up"* (Harry, Clinical Lead, Conifer Gardens, joint interview with Registered Manager Philippa)
Unsteady, falls, rolling	Residents at risk of injury due to being unsteady, falling, or rolling out of bed	"if someone's never had falls or they're mobile or they're steady on their feet, there's no reason to put one in place" (Sonia, RN, Conifer Gardens, interview)
Wandering or disorientated	Residents wandering or being disorientated	*"sometimes during the day if nobody was with him he liked to go and have a lie down, and then again consequently he could get up, a bit disorientated, so with this pressure mat, if he obviously gets up and he's a little bit woozy, erm, it triggers off to the central system to the carers and they realise that Jack, my dad's trying to get out of bed, and just to be on the safe side they go and check on him"* (Lucy, daughter, Heather Grove, interview)
Rumours	Talk amongst staff about what a technology is for	*"I <u>had</u> to set the staff straight...some of the impressions that the staff were getting that it's to see how active the staff are, because there was reports that the staff are being lazy"* (Aggie, Senior Care Worker, Sycamore Lane, interview)
Sight lines	Data suggesting people's awareness of what is going on around them due to the layout of the home	"if it was for nursing, and residential, and it's separate systems, then I think people would have more ownership of it and more importance for turning it off and having respect for their colleagues who they can see...that's basically what people are about, they respect what's in their vicinity rather than the wider community" (Olivia, RN, Conifer Gardens, interview)
Size of home	Any data incorporating the	*"here, you could walk into the dining room*

	physical size of the home	*and you could hear a buzzer going off, cos it echoes, you know, beep, you can hear it faintly, so no matter where you are you can pretty much hear a beep, plus no matter which floor you're on it beeps on every floor, whereas in a bigger home you'd need a pager cos you could walk into the dining room and you'd have no idea that anybody was calling for you"* (Kathy, Deputy Manager, Heather Grove, interview)
Staff awareness	The level of awareness amongst staff of what technology (or other practices) there are in the home	*"I don't understand why it's all installed downstairs and not up here"* (Eleanor, Care Worker, Conifer Gardens, interview)
Staff involvement in decisions	Data suggesting the extent to which staff are involved in decisions made in the home	*"you think it's just another one of these ideas he's had and it's just another flash in the pan"* (Doug, Care Worker, Sycamore Lane, interview)
Staff role & responsibility	Roles and responsibilities of staff members, in relation to technology and wider practice	*"We have to sign for it on that day and that's my responsibility, if anything happens to that pager, that's me"* (Aggie, Senior Care Worker, Sycamore Lane, interview)
Staff training	Data referring to staff training	*"we didn't have any training for* [LBS]*, we got told what it was about but we didn't get training, we basically got given the pagers, we had to sign them in and sign them out in a book...we were told how it worked but we never had any training ourselves on how to use it"* (Simone, Senior Care Worker, Conifer Gardens, interview)
Technology in other homes	References to technology in other homes, either other care homes (e.g. where staff have worked previously) or own homes (e.g. anything families had in place at home before the resident needed to move to a care home)	He had also worked in a secure unit which he described as 'the next level up' from Sycamore Lane. This unit had made use of door alarms and bed alarms. (Ernie, Care Worker, Sycamore Lane, informal interview)
Testing	Whether the technology is tested or tried out in any way	*"we'll test the doors and the bed sensors, like we'll make someone lie on the bed and get off the bed and see how long it's gonna take for it to get to the pager to us"* (Jodie, Care Worker, Sycamore Lane, interview)
The Media	References to anything media-related e.g. news bulletins, Panorama documentaries about care homes, films	*"it's so emotional I think when you see it on the news and things, people whose parents haven't been looked after in the homes and they've been cruelly treated"* (Alice, Daughter, Sycamore Lane, interview)
Time & attention demands	Descriptions of demands upon people's time and attention, which may come from any aspect of work e.g. residents, multi-tasking, or specifically from the technology etc.	[name of resident] required 2 members of staff to help him have his breakfast. Abi was feeding him whilst Suzy was sitting on the other side of him giving him reassurance. During this time, Angie was ensuring that his medication was administered in with his

		breakfast. This whole process was laborious; it took around 20-30 minutes before he had finished eating. (Conifer Gardens, field visit 3)
Trust	Any data about trust, either in people or in technology	She said that the night staff felt like the LBS was being used as a Big Brother tool for management to watch over staff. She said they were *'quite relieved when it did start playing up'* and ultimately dropped from use. (Judy, Senior Care Worker (night), Conifer Gardens, informal interview)
Understanding of philosophy of care	References to the philosophy of care that the home is aiming to uphold	*"we should be using what's available to the population, because, again, just because people are in a specialist "care home", doesn't mean they need specialist products to keep them "safe", because they still live in essentially their own house, it's just a bigger house now"* (Ben, Deputy Manager, Conifer Gardens, joint interview with Registered Manager Philippa)
Use of data or information	How information or data generated by/in relation to use of the technology is subsequently used	*"if somebody's having trouble sleeping and they're getting out of bed that's alerting us to let us know they're not sleeping very well, so again you can draw this pattern across a week and say well they were up at 5, they were up at, you know, whatever time, you can log down what times they were up because their bed sensor's alerted you to that"* (Aggie, Senior Care Worker, Sycamore Lane, interview)
What people think the technology does	How people appear to make sense of the technology, i.e. what they seem to think it actually does or is	*"I don't think everyone understands that a pressure mat doesn't stop falls out of bed, it simply just alerts you to the fact that it's happened"* (Ben, Deputy Manager, Conifer Gardens, joint interview with Philippa)
Workarounds	How staff adapted their practice to work around a perceived problem	"*they just text me, so, you know, number's going off… we text each other, we just say so and so's number's going off and that's it"* (Nicky, RN, Sycamore Lane, interview)

Appendix 14

Descriptors domain of FARSEEING taxonomy applied to technologies in participating care homes

Descriptors domain of FARSEEING taxonomy applied to care home technologies

Technology	Care Home	Domain D1 Technology Location	D1 Note	Domain D2 Technology Type	D2 Note	Domain D3 Functionality	D3 Note	Domain D4 Method	D4 Note
Nurse call with bed monitor (bed sensors) and door sensor	Sycamore Lane	D1.2 Located in environment	Does not move around with person. Bed sensor installed underneath mattress and plugged into unit affixed to headboard. Nurse call buttons affixed to walls . Door sensor affixed to door	D2.1 System	System comprised of nurse call buttons, bed sensors, 1 x door sensor, pagers to which all alerts are sent, and central computer which records data about alerts and resident vital signs	D3.1 Alert	Primary function to allow communication between user and external assistance	D4.2 Kinaesthetic	Requires touch or pressure from user (active or passive)
		D1.3 Portable	Bed sensor and unit can be moved into alternative bedroom. Door sensor can be attached to any door. Nurse call buttons in communal areas can be moved and attached to different walls. Pagers carried by staff	D2.1.4 Wireless Sensor Network	Bed sensors plug into unit affixed to headboard, but all units, nurse call buttons and door sensor wirelessly transmit to central computer and to pagers	D3.2 Monitoring	Bed sensor can record continuous observation of vital signs		
				D2.1.5 Monitoring & Positioning	Observing status or location of a specific person (resident or staff member)	D3.7.1 Automatic	Bed sensor activates upon movement; non-movement e.g. seizure; can be set to timed delay to account for mobility level of resident		
						D3.7.2 Manual	Nurse call buttons can be pushed		

Nurse call with bed monitor (pressure mats)	Conifer Gardens & Heather Grove	D1.2 Located in environment	Does not move around with person. Wall units hardwired into walls and cannot be moved	D2.1 System	System comprised of nurse call buttons, pressure mats, wall units to which alerts are sent, and central computer which records data about alerts	D3.1 Alert	Primary function to allow communication between user and external assistance	D4.2 Kinaesthetic	Requires touch or pressure from user (active or passive)
Nurse call with bed monitor (pressure mats) *(continued)*		D1.3 Portable	Pressure mat can be moved within bedroom e.g. placed by bed or in front of chair, but cannot be moved from bedroom due to wired connection to socket installed in bedroom wall	D2.1.5 Monitoring & Positioning	Observing status or location of a specific person (resident or staff member)	D3.7.1 Automatic	Pressure mat activates upon contact		
						D3.7.2 Manual	Pull chords and buttons		
Location Based System (LBS)	Conifer Gardens	D1.1 Body worn	Fobs worn by residents; pagers carried by staff	D2.1 System	Set of interacting components consisting of fobs, sensors, pagers, and central computer	D3.1 Alert	Emergency communication between user (resident or staff) and staff (external assistance)	D4.2 Kinaesthetic	Sensors detect location of fobs and pagers
		D1.2 Located in environment	Sensors installed in ceiling	D2.1.4 Wireless Sensor Network	Radio Frequency Identification (RFID)	D3.2 Monitoring	Continuous observation of fobs and pagers		
				D2.1.5 Monitoring & Positioning	Observing status or location of residents and staff	D3.7.1 Automatic	Automatically detects location of fobs and pagers		
Activity tracker	Sycamore Lane	D1.1 Body worn	Clipped to clothing or carried in pocket	D2.3.5 Sensor – accelerometer	Accelerometer	D3.2 Monitoring	Continuous monitoring of user activity	D4.2 Kinaesthetic	Gathers data arising from movement
Door monitors	Heather Grove	D1.2 Located in environment	Affixed to bedroom doors and do not move around with people	D2.3 Sensor	Record time and duration of opening of each door. Data logged in 'cloud', accessible from laptop	D3.2 Monitoring	Record time and duration of opening	D4.2 Kinaesthetic	Require movement of door to activate
				D2.3.7 Magnetometer	Magnetic sensor	D3.7.1 Automatic	Automatically detect opening		

Appendix 15

Feedback to participating care homes

MANCHESTER 1824
The University of Manchester

Technology in Care Homes PhD Research Project

Feedback to Participating Care Homes

February 2016

This document provides a summary of the findings from my PhD research project. In my research I wanted to explore how 'monitoring' technologies (e.g. nurse call systems; wearable tracking devices) are used within care homes, in order to understand what is likely to influence the uptake of these technologies into routine practice. Between March and November 2014 I conducted fieldwork within three dementia-specialist care homes in the North West of England. At the time of my fieldwork, each home was using a nurse call system throughout their premises, which included bed-monitoring capabilities (e.g. via bed sensors or pressure mats). Each home also had experience of using other technologies which could monitor both resident and staff activity. During my fieldwork I observed everyday practice within the homes, and spoke with a broad range of staff, residents and relatives to explore their views about the use of these technologies. Based on the findings from this fieldwork, I offer the following feedback as points to consider regarding the use of monitoring technologies in practice.

If thinking about investing in a technology:

- How does the technology align with your philosophy of care? Would its use help you deliver your philosophy of care, or seem to be challenging to reconcile with your philosophy? Monitoring technologies are likely to be universally understood primarily as enhancing safety. There may be some consideration of additional benefits (e.g. enhanced freedom of movement or privacy for residents), or of potential ethical challenges (e.g.potential intrusion upon residents), but there is

likely to be an emphasis upon enhanced safety which may obscure other considerations and which may inadvertantly challenge your philosophy of care;

- What are the legal implications of using remote monitoring technologies? Consider seeking professional legal advice, and think about issues of data protection and storage;

- How expensive and intricate is it? Cost and complexity may not necessarily be positively correlated with performance and suitability;

- Do the full capabilities of a technology seem likely to enhance the care of your residents beyond your existing practice?;

- Is there a contract with the manufacturer/supplier, and what might be the implications of this contract? Exclusivity contracts might mean that you would be restricted in your choice of equipment or options for servicing and maintenance. However, technologies made by different manufacturers may not be mutually operationally compatible;

- How easily customisable is it? You may find that after installation, you need to adjust the set-up to resolve early teething problems and tailor its use to your needs. If it is not customisable, you might be stuck with an inadequate set-up;

- Think through the various components (e.g. the sensors, the receivers, the user interface) and how they work together (e.g. radio-frequency, wifi, satellite, hard-wired). What might be the relationship of these factors with the physical environment of your care home (e.g. signal strength, range, portability, the visibility and 'sight lines' within your buildings)? Some of these issues might not become clear until you start working with a technology, but it will be useful to think carefully about them before you invest;

- Are there technologies widely used within society which might be more suitable than 'specialist' technologies promoted to care homes?;

- Staff may prefer to work with technologies that are similar to those they use outside work (e.g. smartphone-like designs);

- What are likely to be the demands upon staff time when using it? Whilst a lot of technologies may be able to help save time, there may also be unanticipated demands upon time, either initially (e.g. getting used to working with a new technology), or as part of continued implementation (e.g. analysing data and evaluating the impact of the technology).

When implementing a technology:

- Be wary of assuming that staff will find a technology simple or familiar. Think about training implications, including a balance between classroom-style learning and on-the-job learning; who is going to be responsible for delivering training; how any new staff members will be trained in future; where/when training is going to be provided (e.g. as part of induction training; alongside statutory and mandatory training; any 'refresher' training);

- Who is going to assume responsibility for making implementation decisions? Consider the need to keep your staff regularly informed and involved in decision-making regarding use of technologies with individual residents. This involvement may help them better understand the purpose of the technology and ensure that focus remains upon how the technology can support your philosophy of care. It may also help avoid rumours that a technology is being used to monitor staff activity;

- If you *are* using a technology to monitor staff activity, it may be better to involve staff in discussions about why you are doing so;

- Try to involve relatives and residents in discussions and decisions, in keeping with a person-centred philosophy of care. Involvement of residents should include assessments of their capacity to decide upon the use of a technology, which should respect their right to make a 'bad' decision that may be at odds with relatives' preferences, or your own preferences;

- Monitoring technologies should be treated no differently to any other type of intervention or support that you provide. As with any other intervention, ensure that there is ongoing documenation of their use and assessment of their impact

within resident care records, and consider withrawal of a technology from a resident's care if it is appraised as unnecessary or ineffective.

I would like to express my sincere thanks to each home for granting me access to conduct this research, and to all staff, residents and relatives who participated. The development of knowledge and understanding about social care practice depends upon your generous and enthusiastic participation in research projects such as this.

If you have any questions, please contact me at:

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