

# **An exploration of the prescribing and administration of medicines in a sample of UK care homes**

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by

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## Summary

Residents of care homes are some of the most vulnerable members of society and are particularly susceptible to medicines harm. The safe and effective management of medicines helps to maintain or improve the quality of life of residents. However, there have been concerns surrounding poor prescribing and medicines administration practices within the setting. The aim of this thesis was to explore current prescribing and medicines administration practices in a sample of UK care homes, and to understand whether senior carers could administer medicines safely and effectively.

Medicines administration data was extracted from a digital medication management system (PCS™) to explore prescribing patterns, and medicines administration by staff in nursing homes. Semi-structured interviews and surveys were used to explore staff perceptions of senior carers administering medicines under the delegation of nurses.

Analysis showed that a significant number of residents were prescribed medicines commonly associated with adverse outcomes in older adults. These included anticholinergic drugs (50%), hypnotics and/or anxiolytics (30%), analgesics (49%), and antimicrobials (24%). Although senior carers were at least as competent as nurses in administering medicines (no statistically significant differences in error rates;  $p$ -value > 0.05), 92% of residents were exposed to medication administration errors during the three-month study period. Interviews and surveys explored staff perceptions of medication administration errors in care homes and a number of themes were identified notably the need for medicines training by senior carers.

The findings from this thesis have highlighted that the quality of prescribing and medicines administration remains suboptimal in care homes, and the issues identified may ultimately cause resident harm. New models of care, such as senior carers administering medicines in nursing homes may fail if systemic issues which give rise to such issues are not addressed. Therefore, exploring strategies to efficiently safeguard the quality of medicines management in this setting should be prioritised.

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## **Chapter 1    General Introduction**

## **1.1 Chapter summary**

The present chapter will establish the context of the research that has been conducted in this thesis. In particular, this chapter will describe the study setting (care homes in the UK) and the study population (care home staff and residents), followed by the current challenges faced by the care homes sector. In addition, the processes related to the prescribing and administration of medicines in care homes will be described. To conclude, a summary of the scope of the thesis will be provided at the end of the chapter.

## **1.2 Care homes in the UK**

Although care homes or long-term care facilities in the UK have been historically referred to as either 'nursing homes,' or 'residential homes' (Grant Thornton 2018), the Care Standards Act 2000 does not specify a legal difference between these two settings which provide differing levels of care to older adults. According to the Care Standards Act 2000, the care homes sector primarily provides accommodation and personal care to support individuals with learning difficulties, physical disabilities, and those with a history of mental health conditions, an acute illness, chronic diseases or dependency on alcohol or drugs.

However, with the exception of Scotland which uses the overarching term, 'care homes for older people' (Care Inspectorate 2020), independent health and social care regulators for the remaining three nations in the UK (England, Wales, and Northern Ireland) continue to use different terms to categorise the types of care homes that they regulate. More specifically, England and Northern Ireland classify care homes as either 'residential homes' or 'nursing homes' (Care Quality Commission 2020b; The Regulation and Quality Improvement Authority 2020), and Wales uses the terms, 'care homes for adults with nursing' and 'care homes for adults with personal care' (Care Inspectorate Wales 2020). In common with the UK, a variety of terms have also been adopted in other territories to denote the types of long-term care facilities which provide differing levels of care and support to older adults. For example, 'nursing homes' are sometimes referred to as skilled-nursing facilities, whilst 'residential homes' are also known as

assisted-living facilities, supported-living facilities, and residential-aged care facilities. In this thesis, 'long-term care facilities' will be used to represent literature on 'care homes' worldwide, whilst 'care homes' will be used to denote research conducted specifically within the UK. However, where references are made to specific types of long-term care facilities, 'nursing homes,' 'residential homes' or the term that have been used by the original researchers will be used instead.

Despite the absence of legal differences between 'residential homes' and 'nursing homes' in the UK, the level of nursing care provided by registered nurses is substantially greater in nursing homes (Bebbington et al. 2001). Given that registered nurses are more commonly referred to as 'nurses,' the term 'nurse' will be used to represent nurses throughout this thesis.

In residential homes, carers are usually responsible for providing personal care, whilst nurses (usually district nurses) will attend the home when nursing care is needed on an 'as required' basis. In comparison, nursing homes cater for residents who are typically more complex in their health needs and therefore require nurses to deliver nursing care continuously in addition to the routine personal care provided by carers (NHS 2019a).

Owing to an ageing population with an increased level of medical needs and dependency on others to help with activities of daily living, there have been suggestions that residential homes are now supporting residents who would have historically resided in nursing homes, and that nursing homes are now providing care to those who would have been previously cared for in hospitals (Owen et al. 2012). The replacement of the terms 'nursing homes' and 'residential homes' with 'care homes' has enabled a degree of flexibility in the types of care that can be offered in these environments. Other than the accommodation, personal care and nursing care that have been traditionally offered in 'nursing homes' and 'residential homes,' some care homes also offer specialist services for residents that may require an increased level of care and support. These may include care homes which provide specialist support to residents with physical disabilities, sensory impairments, and mental health conditions which include dementia (Competition & Markets Authority 2017).

### **1.2.1 The care home population**

There are approximately 463,000 care home residents aged 65 years and over in the UK, with more than one-half of these residents living in 4,053 nursing homes (Grant Thornton 2018; LaingBuisson 2019). Of note, it is estimated that there are currently around three times as many care home residents as there are NHS hospital beds across the UK (Iliffe et al. 2016). This means that care home residents represent a significant population who require health and care support.

Whilst the services offered by all care homes in the UK are regulated by health and social care regulators to ensure that minimum safety and quality standards of care are met, care homes can vary considerably in terms of their ownership, geographic location and bed capacity for older adults. Care homes in the UK are owned/operated by one of three entities namely; i) private care companies, ii) voluntary/not-for-profit charity organisations, and iii) the local authority/council (Competition & Markets Authority 2017). Although care homes are present across the UK, care home provision is almost two-fold greater in North East England compared to other regions of the UK (Care Quality Commission 2019b). In addition, whilst there is currently an average of 52 beds per nursing home in the UK (Grant Thornton 2018), nursing home sizes range from anywhere between less than 10 beds in small homes to more than 50 beds in larger homes (Care Quality Commission 2017b).

### **1.2.2 Regulation of care homes**

Following the introduction of a series of legislative acts across the four UK nations, independent health and social care regulators have been established in each nation to regulate their own health and social care services (including care homes). Specifically:

- the Health and Social Care Act 2008 established the Care Quality Commission as the regulator of all health and social care services in England,
- the Public Services Reform (Scotland) Act 2010 established the Care Inspectorate (formerly known as the Social Care and Social Work Improvement Scotland) as the regulator of care services in Scotland,

- the Regulation and Inspection of Social Care (Wales) Act 2016 established the Care Inspectorate Wales as the regulator of social care and childcare in Wales,
- and the Health and Personal Social Services (Quality Improvement and Regulation) (Northern Ireland) Order 2003 established the Regulation and Quality Improvement Authority as the regulator of health and social care services in Northern Ireland.

Whilst each of these regulators operate independently within their own nation, collectively, they ensure that safe and high-quality care is delivered consistently across health and social care services in the UK.

A series of regulations sets out the responsibilities and duties of health and social care services, and regulators monitor that service providers comply with these regulations during inspection visits. For example, the Care Quality Commission monitors adult care services (including care homes) in England to ensure they comply with the regulations set out in the Care Quality Commission (Registration) Regulations 2009 and the Health and Social Care Act 2008 (Regulated Activities) Regulations 2014 (Care Quality Commission 2017a). Similarly, the Care Inspectorate Wales monitors adult care services (including care homes) in Wales according to the regulations established in the Regulated Services (Service Providers and Responsible Individuals) (Wales) Regulations 2017 (Welsh Government 2019). For the purposes of this thesis, key regulations that are monitored in care homes include staffing (see section 1.4) and medicines management (see section 1.6).

Where regulators identify cases of non-compliance with regulations, they have a series of enforcement powers to safeguard service users from harm and hold service providers accountable for failures in safe care provision. Depending on the severity of the breach of regulations, the enforcement powers range from issuing warning notices, to terminating the registration of the care provider, and in the most serious safety incidents, the prosecution of individuals responsible for causing harm to others (Care Quality Commission 2015a; Care Inspectorate Wales 2018).

Aside from operating in accordance with health and social care regulations, care homes in the UK are required to adhere to other standards related to health and safety, data protection and the conduct and performance of staff. For example, healthcare professionals working within care homes are required to meet the professional standards set out by their governing professional regulatory body. In nursing homes, this particularly applies to nurses who must operate in accordance with the standards established by the Nursing and Midwifery Council (NMC). Given that care homes are not only a place of work for staff but also homes for residents, care home providers are also required to safeguard staff and residents by complying with relevant legislation associated with health and safety (e.g. Health and Safety at Work Act 1974 and the Management of Health and Safety at Work Regulations 1999) (Health and Safety Executive 2014). In addition, care home providers must also protect the confidentiality of residents by adhering to legislation related to the handling of personal information (e.g. the Data Protection Act 2018).

### **1.3 Residents in care homes**

The 2011 UK Census found that 3.2% of the older adult population (aged 65 years and over) resided in care homes in England and Wales, and that almost 60% of the residents were aged 85 years and over (Smith 2014). It's currently predicted that there will be a two-fold increase in the number of older adults aged 85 years and over who will have a high level of dependency by 2035, and that this vulnerable group will ultimately require some form of care home provision to address their health and care needs (Kingston et al. 2018). As a consequence, the demand for care homes in the UK is predicted to increase substantially in the future, with forecasts of at least a ~58% increase in care home beds needed from 2020 to 2035 (Wittenberg and Hu 2015).

It is generally acknowledged that an admission to a care home in the UK is not usually expected or planned, with recent hospital admission identified as the most common route of admission into long-term institutional care (Bebbington et al. 2001). Whilst this may be partly driven by the pressure on residents and families to arrange appropriate interim care post-hospital discharge as a result of current initiatives to release occupied beds within the NHS (Ipsos MORI Social Research Institute 2017), residents admitted

into care homes in the UK typically have a range of medical and healthcare needs which means that they are no longer able to live in their own homes and therefore require an increased level of support that care homes could provide. The reason for a care home admission is likely to be multifactorial including mobility and mental health issues, loneliness, an individual's current home is physically unsuitable, and stress on carers or family no longer able to take care of an individual (Bebbington et al. 2001; Darton 2011). A study by Bebbington et al. (2001) aimed to understand the needs and outcomes associated with care home admission in the UK and identified that the most common reason for admission is usually due to a decline in physical and/or mental health status in residents. In another cross-sectional survey study on older adults' expectations and experiences of living in UK care homes, health issues were similarly featured as the most common reason for care home admission. Of note, 79% of respondents ( $n=81$ ) cited that a decline in physical health was the most important contributing factor which led to care home residence (Darton 2011). Other studies in the UK have also sought to determine diagnoses of residents associated with care home admission (Challis et al. 2000; Bowman et al. 2004; Lievesley et al. 2011). These studies have identified that dementia and stroke are usually the most common reasons for care home admission in the UK. In addition, Challis et al. (2000) found that residents with a dementia diagnosis were more likely to be associated with nursing home admission as opposed to residential home admission in the UK ( $p$ -value=0.003).

Care home residents in the UK are on average 85 years old, female, with six co-morbidities (Gordon et al. 2013). More specifically, previous work has consistently shown that neurological or mental disorders (e.g. stroke, dementia, depression, and Parkinson's disease), cardiovascular diseases (e.g. hypertension, coronary heart disease, and heart failure), asthma and chronic obstructive pulmonary disease, and diabetes are prevalent diagnoses amongst UK care home residents (Shah et al. 2010; Lievesley et al. 2011; Shah et al. 2012; Gordon et al. 2013). In addition, the estimated average length of stay of care home residents in the UK is less than 15 months from admission into these facilities (Forder and Fernandez 2011). The study by Bebbington et al. (2001) found that individuals tend to stay within a care home once admitted and for the few individuals who decide to leave, generally leave the care home environment during the first few



months of initial admission. Also, whilst the report by Forder and Fernandez found that some residents may live in care homes for up to a maximum of 23 years before death, statistics indicate that the majority of residents die within six years of stay. In 2014, care homes were reported to be the place of death for 22% of individuals who died in England (Public Health England 2017). In line with the common reasons for admission into care homes, the report highlighted that the top three causes of death within the setting in 2014 were dementia, cerebrovascular disease and cardiovascular disease.

A number of studies have also identified that dementia is the most common clinical diagnosis in care homes with nursing care (Shah et al. 2010; Lievesley et al. 2011; Shah et al. 2012), and it is currently estimated that as many as 73% of nursing home residents in the UK are diagnosed with this condition (Prince et al. 2014). There has been a gradual increase in the number of care home residents with dementia in the UK (Lievesley et al. 2011), and this trend is set to continue. Of note, there are forecasts that the prevalence of dementia in the UK will increase by two-fold from 1million individuals in 2025 to over 2million by 2051 (Prince et al. 2014). Whilst there are many subtypes of dementia, Alzheimer's disease is the most common type of dementia and represents 62% of all dementia diagnoses in the UK (Prince et al. 2014). There is a degree of overlap in symptoms amongst all dementia subtypes and these symptoms typically include; cognitive impairment, problems with reasoning and communication, changes in mood and behaviour, and a reduced ability to carry out daily activities (National Institute for Health and Care Excellence 2018a). In care homes, communication issues in residents with dementia makes it even more challenging for staff to accurately assess and respond to the health and care needs of residents in a timely manner. This is particularly relevant in regard to the management of medicines as some studies have shown that communication issues associated with dementia often result in reduced prescribing and administration of medicines such as analgesics (Stokes et al. 2004; Neumann-Podczaska et al. 2016). Such practices are clearly concerning for residents who require these medicines to address medical needs, and if not recognised can ultimately impact on the health and wellbeing of residents living within care homes. For this reason, the NICE guidance on the assessment and management of dementia has highlighted the importance of providing appropriate training on effective communication techniques

for those caring for individuals with dementia (National Institute for Health and Care Excellence 2018a).

Other than the diagnosis of multiple co-morbidities, older adults (including those in nursing homes) also typically present with a number of clinical conditions that do not fit into distinct disease categories. These clinical conditions are collectively known as 'geriatric syndromes' which encompass; cognitive impairment, immobility, urinary incontinence, dizziness, delirium, falls, and unintentional weight loss (Inouye et al. 2007). In recent years, there has also been an increasing interest amongst geriatricians on frailty, and it is believed that a high burden of geriatric syndromes contribute towards this clinical state (Turner 2014). Geriatric syndromes and frailty in older adults have been linked with adverse outcomes including hospitalisation, admission into institutional care, lower levels of quality of life and increased mortality (Puts et al. 2007; Anpalahan and Gibson 2008; Hubbard et al. 2017). The NHS long term plan highlights the importance of supporting the health of older adults with multiple clinical conditions in addition to identifying frailty to improve quality of life within this population. As a consequence, plans are currently underway to provide specialist care to this vulnerable group through the establishment of acute frailty services within all major A&E departments in the UK (NHS 2019b).

Given that residents in care homes often present with a variety of geriatric syndromes and a number of co-morbidities, the prescribing of multiple medicines, commonly known as polypharmacy, has been an apparently inevitable consequence in order to manage disease and symptoms within this population (Masnoon et al. 2017). Indeed, studies in the UK indicate that care home residents are prescribed an average of seven to nine medicines (Alldred et al. 2009; Barber et al. 2009; Szczepura et al. 2011; Shah et al. 2012; Gordon et al. 2013). Whilst polypharmacy may be entirely appropriate to manage disease and symptoms, it can also arise from poor management of medicines where many medicines are inappropriately prescribed in a cascade and are essentially not required by the individual. Regardless of whether polypharmacy is appropriate or inappropriate, the prescribing of multiple medicines to care home residents ultimately exposes them to an increased risk of drug-drug interactions which could contribute towards adverse drug events. In addition, age-related pharmacodynamic and

pharmacokinetic changes in care home residents also mean that this population is particularly vulnerable to medicines-related harm and adverse effects. Age-related pharmacodynamic changes are generally described using specific drug examples. For example, older adults (cf. to younger individuals) are known to be particularly sensitive to the sedative effects of benzodiazepines and these medicines have been shown to be associated with an increased risk of falls when prescribed at higher licensed doses (Ray et al. 2000). In terms of the age-related pharmacokinetic changes, hepatic and renal blood flow is usually reduced. This impacts on the hepatic first pass metabolism and renal elimination of drugs in older adults which could ultimately lead to an increased risk of drug toxicity via drug accumulation (Shi et al. 2008). Given that the World Health Organization aims to reduce avoidable medicines-related harm by 50% over the next 5 years (World Health Organization 2017), priority should be made to ensure that medicines are managed appropriately within care home residents who are increasingly older in age and known to be particularly susceptible to medicines-related harm.

#### **1.4 Staff in care homes**

Care provision is primarily delivered by nurses and carers in care homes in the UK, with carers representing the majority of the adult social care workforce in these environments. More specifically, measurement of the average staff ratios during 'day shifts' have indicated that there are approximately six residents served by one carer compared to 17 residents served by one nurse in care homes (Royal College of Nursing 2010b). In addition, workforce trends indicate that there has been a reduction in the skills-mix of nurses working in care homes, down from 34% of the care homes workforce in 2007 to 25% by 2009 (Royal College of Nursing 2010a).

Health and social care regulators in each nation in the UK are required to monitor care homes to ensure that staffing arrangements comply with relevant regulations. In England, the responsibilities of service providers for staff management are outlined under Regulation 18 of the Health and Social Care Act 2008 (Regulated Activities) Regulations 2014 (Care Quality Commission 2015c). In Wales, regulations associated with staffing are described under Regulation 34 to 39 of the Regulated Services (Service Providers and Responsible Individuals) (Wales) Regulations 2017 (Welsh Government

2019). Both the Care Quality Commission and Care Inspectorate Wales have published written guidance for health and social care providers (including care home providers) on meeting the regulations (Care Quality Commission 2015b; Welsh Government 2019). Regulations related to staffing are broadly divided into three themes: i) staffing levels, ii) the qualifications of staff, and iii) staff training.

In order to comply with the regulations, care home providers must demonstrate that they have logical procedures in place to determine the skills mix of staff in addition to the number of staff required within the home to provide safe and high-quality care. Although relevant guidance is available to support care home providers in determining adequate staffing levels (Royal College of Nursing 2010a; Skills for Care 2018a), the responsibility lies with the registered manager to ensure that appropriate levels of staff are employed at all times and can adapt to meet the changing needs of residents in care homes.

Whilst publications from the Royal College of Nursing have consistently highlighted that inadequate numbers of staff can ultimately impact on patient outcomes and care quality (Royal College of Nursing 2010b; Royal College of Nursing 2017; Royal College of Nursing 2018), a systematic review of 50 research articles explored this relationship in nursing homes and found conflicting results (Spilsbury et al. 2011). Specifically, whilst some studies showed that increased staffing was associated with improved quality of resident care when indicators such as pressure ulcers, functional decline, weight loss and malnutrition were used to measure care quality, other studies failed to establish these relationships (Spilsbury et al. 2011). Spilsbury and colleagues indicate that these conflicting results may be partly driven by the variety of methods used to measure i) care quality, and ii) staffing levels in the nursing homes that were studied. More importantly, Spilsbury et al. (2011) suggests that other staffing factors (such as the level of training and experience of staff) will likely impact on the quality of resident care in this setting and could have also contributed to the variability in results.

Secondly, care home providers must also demonstrate that staff with the appropriate qualifications are employed to meet the needs of residents. In order to register as a nurse in the UK, candidates are required to obtain a nursing degree at an accredited

University, and upon successful completion of the programme they can then register as a qualified nurse with the Nursing and Midwifery Council (Royal College of Nursing 2015a). Conversely, carers are unregistered staff who are not required to have formal qualifications to work in the care home setting (Royal College of Nursing 2015b). Although adult social care qualifications (e.g. level 2 or 3 diploma in health and social care for adults) are available as programmes of study for those who wish to work as a carer, these are not considered to be essential for employment in care homes. Instead, a survey conducted with adult social care employers found that the ability to demonstrate the right values and behaviours are considered of higher importance during recruitment as opposed to those who already hold adult social care qualifications (Skills for Care 2017a). More specifically, these values and behaviours include a commitment to quality care, showing respect for others, supporting others within a team, and a dedication to learning and self-development (Skills for Care 2017b). Usually, it is only upon successful recruitment to a care home post that carers undertake relevant qualifications to meet the job requirements of their role. This may include enrolment onto courses to obtain adult social care qualifications, and it is currently estimated that around 50% of carers who provide direct care in the adult social care sector hold a level 2 or 3 diploma in health and social for adults (Skills for Care 2018b).

As part of the regulations related to staffing, care home providers must also routinely assess the training needs of staff during the course of their employment. Where learning and knowledge gaps are identified, staff must undertake additional training in order to fulfil their job requirements at work. The type of training provided to staff is dependent on their roles in the care home and may encompass (but not limited to); medicines management, infection prevention and control, dementia care, nutrition and hydration (Skills for Care 2019). Of note, training on medicines management is one of the top ten types of training provided within adult social care settings (including care homes) in England (Skills for Care 2018b).

Medicines management training is considered important in preventing medicines-related harm in care homes (National Institute for Health and Care Excellence 2018b) and research, including the seminal Care Home Use of Medicines Study (CHUMS) in the UK (Allred et al. 2009), has previously highlighted that inadequate medicines training

can lead to medication errors (Barber et al. 2009; Zimmerman et al. 2011). For example, Allred and colleagues provided case examples where insufficient training had contributed towards some of the medication administration errors that occurred in the CHUMS study (e.g. administration of flucloxacillin after food rather than on an empty stomach).

In care homes, the registered manager possesses the overall responsibility for organising and maintaining appropriate training for staff on medicines management, and an 'accredited training provider' is usually engaged to ensure that appropriate training is provided (National Institute for Health and Care Excellence 2018b; Care Quality Commission 2018). More specifically, it is recommended that training should encompass the supply, storage and disposal of medicines, the safe administration of medicines, quality assurance and record-keeping as well as accountability, responsibility and confidentiality (Royal Pharmaceutical Society of Great Britain 2007). In order to ensure the safety and quality of medicines management, it is also recommended that the competency of all staff should be reviewed at least annually or more frequently if issues are identified that require further training and assessment (National Institute for Health and Care Excellence 2018b).

## **1.5 Challenges in the care homes sector**

The older adult population in the UK is increasing at a considerable rate, with the most recent UK Census highlighting an 11% increase in the population of older adults aged 65 years and over between 2001 and 2011 (Smith 2014). Given that an increasing number of older adults are living longer with current estimates that more than 25% of babies born in 2020 will become centenarians, it is inevitable that the population of older adults in the UK will continue to rise (Storey 2018). Whilst the current UK population is ageing, growth within the population of older adults at increasingly older age is also expected to be the most significant. For example, the number of individuals aged 85 years and over is expected to double from 1.6million in 2016 to 3.2million by 2041 (Nash 2017). With a growing population of older adults and a higher proportion of individuals living to an increasingly older age, it is predicted that this vulnerable group will create

substantial demand and subsequent pressure on health and social services including within care homes.

Currently, the UK is also experiencing challenges associated with a national shortage of nurses whereby 36,000 vacant nurse posts were reported in the UK in 2017 (NHS 2017). As part of the ageing population, it is currently estimated that 950,000 more jobs are required in the social care workforce to meet the needs of those aged 75 years and over by 2035 (Skills for Care 2018b), therefore plans are in place to fund additional undergraduate nursing degree places to resolve such workforce issues (NHS 2019b). However, this issue may not be adequately addressed in nursing homes as it is believed that nurses generally prefer to work in primary or secondary care rather than the care homes sector (Cousins et al. 2016). Nursing workforce shortages within care homes inevitably means that there will be continued challenges to respond to the increased care needs of older adults as a result of an ageing population. This is particularly concerning for the care homes sector as there is currently evidence from the Royal College of Nursing which highlights the importance of adequate staffing to address resident needs within the sector (Royal College of Nursing 2010b; Royal College of Nursing 2017; Royal College of Nursing 2018). For example, a care homes survey conducted by the Royal College of Nursing found that 20% of respondents (care home staff) raised concerns that the complex needs of residents could not be addressed due to staff shortages (Royal College of Nursing 2010b).

A further pressure on the UK care homes sector relates to the gradual decline in adult social care funding over the last decade, where it has been reported that more than 80% of local authorities in England had reduced expenditure between 2009 and 2015 (Humphries et al. 2016). Financial constraints in the sector have ultimately led to a number of care home closures in the UK, with for example one of the larger care home providers, Four Seasons Healthcare Group which has a resident capacity of up to 17,504 beds across 340 care homes (Harker and Jarrett 2019), recently collapsing into administration in 2019 (Age UK 2019). An independent market study into the UK care homes sector in 2017 found that care home fees paid for by the local authority are at least 10% below the full operating costs of care within these environments (Competition & Markets Authority 2017). Given that almost all residents in 25% of care homes in the

UK receive care funded by the local authority, the market study concluded that these homes are at highest risk of closure amidst ongoing government funding cuts. Ultimately, reductions in adult social care funding at a time where demographic changes in the older adult population in the UK are leading to an increase in care needs have led to concerns that care homes are operating at capacity, and that this sector may not be sustainable in the foreseeable future.

The increased demand for care home beds as a result of the ageing population in the UK means that there is currently a greater need than ever to ensure older adults living in this setting are provided with the best quality of care. However, nurse staffing shortages and financial cuts within adult social care creates further challenges to maintain good quality of care in this environment. A measure of good quality care in this setting involves safe and effective medicines management (Care Quality Commission 2015b; Welsh Government 2019) as it is undeniably an important aspect of a resident's care in helping to ameliorate disease, control symptoms and maintain or improve quality of life.

## **1.6 Medicines management in care homes**

Medicines management in care homes comprises six key stages relating to; i) the ordering of the residents' medicine(s), ii) the prescribing of the medicine(s) by a clinician, iii) the dispensing of the prescribed medicine(s) by a community pharmacy, iv) the delivery and subsequent storage of the medicine(s) at the care home, v) the administration of the medicine(s) to the resident, vi) and the review and monitoring of the effects of the medicine(s) (Allred et al. 2009).

Allred and colleagues in 2009 recommended that one individual should possess overall ownership for overseeing the entire medicines management system in care homes. Given that pharmacists have a good knowledge of medicines use, it has been recommended that this individual could be a pharmacist. As a result, both primary and secondary care sectors in England have subsequently made attempts to integrate pharmacy services into care homes. For example, some clinical commissioning groups across England had previously commissioned pharmacy services into care homes where pharmacists conducted care home medication reviews and supported care home staff



to improve on their medicines management systems within the home (Saeed and Stretch 2010; Bower and Whiteside 2015; Swift 2018). Specifically, these case studies found that pharmacist-led medication reviews supported improved resident outcomes through a 20% reduction in hospital admissions in one year (Saeed and Stretch 2010) and cost-savings of approximately £110 per medication review per resident (Bower and Whiteside 2015). Care home medication reviews conducted by pharmacists employed by an NHS hospital Trust in the North East of England was also examined (The Health Foundation 2014). In line with the outcomes reported by the clinical commissioning groups, the project by the Health Foundation in 2014 found cost-savings of around £184 per resident and improved resident outcomes through a reduction in polypharmacy.

Whilst previous attempts to integrate pharmacy services into care homes often varied across different geographic locations in the UK, by 2016, a national programme of six vanguard sites in England was introduced as part of the enhanced health in care homes care model (NHS 2016). The programme aimed to offer care home residents with joined up health and social care services and one of the aspects of this new care model involved integrating pharmacists into multi-disciplinary teams to improve the clinical outcomes of residents through medication reviews. More recently, some primary care pharmacists have been deployed to improve the safety and quality of medicines use in care homes with for example the roll out of the care home support and medicines optimisation as part of the community pharmacy national enhanced services developed in Wales (NHS Wales 2018), the medicines optimisation in care homes programme in England (NHS England 2018) and the subsequent continuation of this model of care that is now outlined in the new five-year GP contract in England (Primary Care Strategy and NHS Contracts Group 2020). As part of these programmes, pharmacists aim to improve the clinical outcomes of residents by conducting medication reviews, and support care home staff in ensuring that medicines management processes are compliant with current legislation and guidance where appropriate. However, despite the integration of pharmacy teams into care homes, a variety of individuals remain responsible for the different aspects of medicines management in care homes. Currently, staff (mainly nurses and carers) working in care homes are responsible for the ordering, storage and administration of medicines, whilst the residents' GP is responsible for the appropriate

prescribing of medicines, and the pharmacy team is responsible for the supply of medicines to the home. In regard to the monitoring of medicines in care homes, this is usually a shared responsibility between clinicians and care home staff.

In terms of the regulations associated with the use of medicines in care homes, evidence of safe and effective medicines management, features as one of the key activities which health and social care regulators inspect when monitoring these settings. In England, the responsibilities of care homes for medicines management is described under Regulation 12 of the Health and Social Care Act 2008 (Regulated Activities) Regulations 2014 (Care Quality Commission 2020a). In Wales, the equivalent responsibilities of care homes for medicines management is set out under Regulation 58 of the Regulated Services (Service Providers and Responsible Individuals) (Wales) Regulations 2017 (Welsh Government 2019). Essentially, these regulations mean that care homes must have written procedures in place to ensure that medicines are stored and administered safely. In addition, these procedures must be written in alignment with relevant legislation and professional guidance, and that staff operating within the home must adhere to these written procedures (Care Quality Commission 2015b; Welsh Government 2019). In inspection reports, health and social care regulators in the UK have consistently highlighted issues related to poor medicines management across all health and social care services. Of note, over 5,000 cases of medicines-related incidents which led to either death, injury, abuse or police investigation were reported by adult social care providers (including care homes) in England between March 2017 and April 2018 alone (Care Quality Commission 2019a).

Whilst medication errors in care homes can occur at any stage of the medicines management process, it is estimated that the majority of medication errors (92.8%) in English care homes happen during medicines administration, with 7% of these errors deemed to have potential to cause moderate to severe harm (Elliott et al. 2018). On the other hand, Elliot and colleagues estimate that a small proportion of medication errors in English care homes occur during prescribing (3%), but as much as 52% of these errors could result in moderate to severe harm. In the seminal CHUMS study, the medication error rate associated with prescribing and medicines administration were roughly the same (8.3% for prescribing and 8.4% for medicines administration) (Allred et al. 2009).

### 1.6.1 Prescribing in care homes

The prescribing of medicines to care home residents typically follows one of two processes. One of the prescribing processes occurs as a result of an acute requirement to prescribe a new medicine (e.g. to manage an acute illness where antimicrobials are needed). Under these circumstances, the GP usually takes into account the principles of safe and effective prescribing before issuing a prescription to the resident. These principles include; considering the resident's current health status and needs, ensuring that the decision to prescribe a medicine is based on best available evidence, and any new medicine is compatible with the resident's existing medicines regimen (General Medical Council 2013).

Another process relates to the prescribing of medicines that are required by residents on a regular (monthly) basis to manage chronic diseases. This process usually begins when the nurse or carer at the care home contacts the GP surgery towards the end of a monthly medicines cycle and requests the resident's current medicines are issued on a prescription (commonly referred to as repeat medication ordering). Given that care home residents are typically prescribed several medicines to manage chronic diseases and therefore require the same medicines on a regular (monthly) basis, GPs tend to authorise those medicines from repeat medication templates on the GP clinical system. This means that a consultation with the resident is generally not necessary before a prescription is issued for these medicines. Providing that the medicines requested are listed as repeat medication templates on the GP clinical system and that the resident is not yet due for a medication review (usually conducted annually), the prescription clerk at the GP surgery generates a prescription (with the medicines requested by the care home) for the GP to sign. The principles of safe and effective prescribing are not generally actively considered during the signing of prescriptions issued under repeat medication ordering. Of note, an ethnographic case study which explored the processes of repeat medication ordering across eight general practices across England and Scotland found that the GP who signs for the prescriptions may not be the original clinician who initially prescribed these medicines (Grant et al. 2016). Due to the volume of prescriptions issued via repeat medication ordering on a daily basis, Grant and colleagues also found that the GP may not double-check the information of every

prescription against the patient's clinical record before signing them. Similar findings were noted in another ethnographic case study of four UK general practices where receptionists raised concerns that some GPs did not check prescriptions thoroughly before signing them (Swinglehurst et al. 2011).

Any failure to adhere to the principles of safe and effective prescribing may ultimately result in the inappropriate prescribing of a medicine. Inappropriate prescribing essentially occurs when individuals are: i) 'over-prescribed' medicines at either higher doses or for longer periods than needed; ii) concomitantly prescribed multiple medicines with established drug-drug interactions or drug-disease interactions, or iii) are not prescribed medicines that are in fact clinically indicated to treat or manage diseases (Gallagher et al. 2007). High levels of inappropriate prescribing for older adults residing in long-term care facilities is well-established and has been previously identified in several studies conducted worldwide (Sloane et al. 2002; Fialová et al. 2005; Ruggiero et al. 2010; Barnett et al. 2011; Stafford et al. 2011; Shah et al. 2012; Vieira De Lima et al. 2013; Beuscart et al. 2014; Hwang et al. 2015; Moriarty et al. 2015; Morin et al. 2016; Nothelle et al. 2017). Of note, Morin et al. (2016) conducted a systematic review of 48 studies to establish the prevalence of potentially inappropriate medicines prescribed to nursing home residents, and found that almost half (43.2%) of all residents were exposed to potentially inappropriate prescribing. More importantly, the researchers found that the prevalence of potentially inappropriate prescribing increased significantly from the studies conducted between 1990 to 1999 when compared to the studies conducted after 2005 (49.8% in 2005 vs. 30.3% in 1990 to 1999,  $p$ -value<0.01) (Morin et al. 2016). Whilst Morin et al. (2016) indicate that this result is concerning, they suggest that the rise in potentially inappropriate prescribing between the 1990s to 2005 may be partly influenced by the development of an increasing number of tools to detect inappropriate prescribing in the older adult population.

Ultimately, the inappropriate prescribing of medicines in care homes could lead to adverse outcomes where an increase in unintended hospitalisations, visits to emergency departments, falls or injuries or mortality have been previously documented (Lau et al. 2005; Perri et al. 2005; Ruggiero et al. 2010; Grace et al. 2014). In a study conducted by Ruggiero et al. (2010), it was found that nursing home residents who were prescribed

two or more potentially inappropriate medicines had a significantly higher probability of hospitalisation when compared to residents without prescriptions for potentially inappropriate medicines after 12 months (HR=1.73, 95% CI=1.14-2.60). Similarly, Perri and colleagues found in 2005 that the inappropriate use of medicines doubled the likelihood of nursing home residents aged over 65 years old experiencing at least one adverse outcome associated with either mortality, hospitalisation or visits to emergency departments (OR=2.34, 95% CI=1.61-3.40).

Other studies have also highlighted that the inappropriate prescribing of medicines is associated with significant economic costs to healthcare systems (Cahir et al. 2010; Chiatti et al. 2012). The study conducted by Cahir et al. (2010) in Ireland found that the prescribing of potentially inappropriate medicines in older adults aged 70 years and older accounted for a total expenditure of €45,631,319 in 2007, and that this was equivalent to almost one-tenth of the overall expenditure on medicines in those aged 70 years and older in the same year. Aside from the direct costs related to the prescribing of inappropriate medicines, hospital costs as a result of the management of adverse outcomes associated with inappropriate prescribing in older adults have also been recognised to contribute towards the economic burden on healthcare systems (Chiatti et al. 2012). Of note, the Royal Pharmaceutical Society estimates that pharmacists are well-equipped to optimise medicines use in care homes, reduce preventable hospital admissions and save at least £75million a year for the NHS (Royal Pharmaceutical Society 2016).

Various methods have been used to identify the potentially inappropriate prescribing of medicines in older adults, and these are typically classified into either i) the implicit review of an individual's list of medicines by a clinician, or ii) explicit criteria which usually comprises a list of specific medicines or classes of medicines that should be avoided in older adults (Elliott and Stehlik 2013). Whilst Elliott and Stehlik (2013) highlight the utility of implicit reviews of medicines in addressing all medicines prescribed, the method is time consuming and outcomes can be highly variable based on the professional judgement and clinical expertise of the clinician responsible for conducting the medication review. Conversely, a list of explicit criteria used for medication review is quick to apply. Therefore, internationally recognised explicit tools used to identify

inappropriate prescribing like the Beers criteria (The 2019 American Geriatrics Society Beers Criteria Update Expert Panel 2019) and STOPP/START criteria (O'Mahony et al. 2015) have been widely adopted in practice (Cross et al. 2016).

However, a recent systematic review of explicit tools used to identify potentially inappropriate prescribing in older people with dementia highlighted that 17 of the 26 studies included had reported several issues associated with their use (Hukins et al. 2019). Documented issues associated with explicit tools included, i) the inability to apply the entire explicit tool or some elements of the tool due to the unavailability of clinical and diagnostic information, ii) some of the medicines included within the tools were only available in the country where the tool was developed and was therefore not readily transferable to other countries, iii) some tools were not regularly updated to reflect new evidence, iv) few tools like the STOPP/START criteria include medicines that should be started in older adults upon diagnosis of specific clinical conditions, and v) some tools like the Beers criteria are not comprehensive enough in identifying anticholinergic drugs when compared to other established tools in specifically identifying harm from anticholinergic drugs.

Hukins et al. (2019) suggest that the currently available explicit tools should be more comprehensive so that all potentially inappropriate medicines are included. In addition, it may be perhaps more useful in practice to initially review medicines like anticholinergic drugs which are most often identified as potentially inappropriate with significant potential to cause patient harm (Hukins et al. 2019). The systematic review by Morin et al. (2016) also identified that anticholinergic drugs, anxiolytics and hypnotics, analgesics, and antimicrobials are most frequently associated as potentially inappropriate medicines prescribed to older adults residing in nursing homes (see chapter 2). National Prescribing Indicators, published annually, are evidence based standards used to promote rational prescribing in Wales, and have also focussed on reviewing the prescribing of medicines including anticholinergic drugs, anxiolytics and hypnotics, analgesics, and antimicrobials (All Wales Medicines Strategy Group 2019). A similar set of indicators have also been published in England to reduce medication errors and ensure that medicines are used safely and effectively (NHS Digital and NHS Business Services Authority 2019).

### 1.6.2 Medicines administration in care homes

Wherever possible, care home residents should be enabled and supported to administer and look after their own medicines (National Institute for Health and Care Excellence 2018b). However, where residents do not have or lose the capacity to manage their own medicines, staff will support residents with medicines administration. Specifically, nurses and trained carers traditionally undertake medicines administration in nursing homes and residential homes respectively, however, senior carers have been recently permitted to administer medicines under the delegation of nurses in nursing homes (see chapter 3) (Care Inspectorate 2016; Care Inspectorate Wales 2016; Department of Health 2016).

Allred and colleagues in 2009 estimated that care home staff typically spend around 40% to 50% of their time on medicines related tasks. The duration of a medication round in care homes is dependent on the size of the home, the number of staff assigned to administer, the number of medicines that have been prescribed at different times of the day as well as interruptions to staff whilst administering medicines. Research into the duration of medication rounds in UK care homes suggests that they typically last around 65 minutes, with the morning round generally taking up the most time requiring two hours or more to complete (Gilmartin-Thomas et al. 2017).

In order to ensure that medicines are administered safely and accurately in care homes, NICE guidance on managing medicines in care homes provides key recommendations associated with good medicines administration practice in this setting (National Institute for Health and Care Excellence 2018b). In accordance with the NICE guidance, staff are usually trained to administer medicines according to the 6R's of administration. This means that upon administering a medicine to a resident, the member of staff should confirm i) the right resident, ii) the right medicine, iii) the right administration route, iv) the right dose, v) the right time, and accept that vi) the resident has a right to refuse the medicine if the situation arises (National Institute for Health and Care Excellence 2018b). Residents who are prescribed 'as required' medicines will have an individualised medicines protocol which advises staff the circumstances where the administration of these medicines are appropriate for the individual. When the resident has taken the

medicine dose, the member of staff responsible for administering the medicine will record this on the Medicines Administration Record (MAR) chart. If the medicine dose is either not administered or not taken by the resident, the reason for this will also be recorded on the MAR chart.

Other guidance documents have also been published by the government and professional bodies which advise on good medicines administration practice in care homes (Royal Pharmaceutical Society of Great Britain 2007; National Care Forum 2015; Department of Health 2016). Collectively, these guidelines highlight the importance of staff training which includes the necessity to follow procedures when administering medicines, minimising disruptions during the medication round, ensuring the availability of adequate members of staff, obtaining advice from appropriate individuals (e.g. pharmacists) on medicines-related issues, and sharing lessons learnt from medication administration errors. Despite the availability of guidelines which advise on good medicines administration practice in care homes, the complexity of the medicines administration process have led to the identification of a high prevalence of medication administration errors in this setting (Pierson et al. 2007; Alldred et al. 2009; Barber et al. 2009; van den Bemt et al. 2009; Greene et al. 2010; Alldred et al. 2011; Wild et al. 2011; Szczepura et al. 2011; Desai et al. 2013; Gilmartin-Thomas et al. 2017).

Of note, the landmark UK study on medicines use in care homes was published by Alldred and colleagues in 2009. This study, commonly known as the CHUMS study, explored the use of medicines amongst 256 residents living in 55 care homes across three areas of England (Cambridge, Bradford, and London). With respect to medicines administration, the researchers observed two medication rounds per resident and found that 22.3% of all residents were exposed to a total of 116 medication administration errors during the course of the study. Specifically, just over one-fifth of these errors ( $n=25$ ) were due to the administration of a medicine at the 'wrong dose,' and the most common type of error which accounted for almost one-half of all error types was associated with dose 'omissions.'

Unlike the CHUMS study where only two medication rounds were observed per resident, a later care homes study in the UK examined medication administration errors



using a digital medication management system that covered a continuous time period of three-months (see section 1.6.2.1 on further details about this system) (Szczepura et al. 2011). The study sample was slightly larger but covered fewer care homes compared to the CHUMS study whereby a total of 345 residents who lived in 13 care homes across South West, Mid West and North West England took part in the study. Again, the researchers highlighted a high prevalence of medication administration errors in UK care homes as 90% of residents were found to be exposed to 2,289 potential medication administration errors during the study period. In this study, the most common type of error was associated with attempts to administer medicines at the wrong time (45% of all error types). More concerningly, the researchers found that 52% of residents were exposed to serious errors such as being administered another resident's medicine and/or a medicine that they were no longer prescribed.

A significant number of medication administration errors have also been observed in countries other than the UK. For example, the study by van den Bemt et al. (2009) explored the frequency of medication administration errors and the possible risk factors associated with these using a sample of 180 residents from three nursing homes in the Netherlands, over a two-week study period. The researchers identified errors were associated with 21.2% of medicine administrations ( $n=428$ ) and that almost 73% of these errors occurred due to the incorrect administration technique (e.g. crushing an enteric-coated tablet for administration). Van den Bemt and colleagues also found that medicines administered between the hours of 7am and 10am were associated with a two-fold increased risk of error (OR=2.28, 95% CI 1.50-3.47), and therefore recommended that pharmacists may have a role in reducing these errors by advising care home staff on medicines which can be safely administered at other times of the day.

In another study, Pierson et al. (2007) explored the prevalence and types of medication errors that were entered into a web-based reporting system over a one-year period in North Carolina, United States. The researchers analysed medication error reports from a total of 23 nursing homes and found that almost 50% of the errors occurred during medicines administration. In agreement with the CHUMS study, Pierson and colleagues found the most common errors were omissions followed by incorrect dose which

accounted for 32% and 21% of all errors respectively. Here, the researchers also established that specific medicines, which included hypnotics and anxiolytics, opioids, insulin, furosemide and warfarin were associated with almost one-third of all medication errors (including those that occurred during medicines administration). A study by Desai et al. (2013) similarly examined specific classes of medicines commonly associated with medication administration errors within all nursing homes in North Carolina, United States. Of note, Desai and colleagues identified that analgesics, hypnotics and anxiolytics, antidiabetic drugs like insulin, and antiepileptics featured as the classes of medicines that were commonly associated with medication errors and that these errors most often occurred during the medicines administration stage.

Given the high prevalence of medication administration errors in care homes, some community pharmacies supply medicines to care homes in monitored-dosage systems as a way of simplifying the medicines administration process for staff working in these settings in the UK. For medicines that are supplied in monitored-dosage systems, these systems conveniently arrange a resident's medicines according to the day of the week and time of the day to be administered. Research in UK care homes has previously examined the relationship between medication administration error rates and medicines delivery system (i.e. medicines administered in original-packs versus medicines in monitored-dosage systems) but findings are inconclusive (Alldred et al. 2009; Alldred et al. 2011; Gilmartin-Thomas et al. 2017). For example, although Alldred and colleagues in 2009 reported that there were no statistically significant differences between the rates of medication administration errors administered using the two types of medicines delivery systems ( $p$ -value=0.36), a more recent study by Gilmartin-Thomas and colleagues found almost a four-fold increased risk of medication administration errors for medicines administered from the original-pack compared to monitored-dosage systems (RR=3.9, 95% CI=2.4-6.1).

Whilst there is some evidence to support a reduction in the number of medication administration errors when medicines are administered using monitored-dosage systems, it must be noted that not all medicines can be appropriately re-packaged into these systems. Medicines which are inappropriate for use in monitored-dosage systems include; medicines with physico-chemical stability issues, medicines where the dose is

likely to change (e.g. warfarin), medicines prescribed for acute illnesses, medicines which are not formulated as solid oral dosage medicines (e.g. liquids, inhalers, creams, and injections) and 'as required' medicines. As a result, a combination of medicine delivery systems will be used in the majority of cases. In addition, there are concerns that the utilisation of monitored-dosage systems in care homes can potentially de-skill care home staff, and enable medication administration errors to occur (Morrison 2014). In light of the concerns associated with medicines administered in monitored-dosage systems and that not all medicines are suitable for re-packaging, it is recommended that medicines should be supplied in original packs as a national standard in the UK (Royal Pharmaceutical Society 2012).

Consistent with UK government recommendations to make better use of technology in care homes (NHS 2016; NHS England 2018), recent developments have also observed the rise in the use of digital medication management systems to improve the safety of medicines administration (Scott-Cawiezell et al. 2009; Wild et al. 2011; Szczepura et al. 2011; Qian et al. 2015; Agbesanwa et al. 2018). Previous research has reported a number of benefits associated with the use of digital medication management systems in the care homes setting. These benefits include improvements in staff compliance to regulations surrounding the documentation of medicines administration (Qian et al. 2015), reduced work stress amongst staff administering medicines (Wild et al. 2011), and improvements in medicines safety by preventing medication administration errors via safety alerts (Szczepura et al. 2011; Agbesanwa et al. 2018).

In the UK, examples of digital medication management systems which are commercially available to support medicines management within care homes include Biodose Connect™ (by Vaica), and the Proactive Care System™ (PCS™) (by Invatech Health Ltd) (Szczepura et al. 2011; Agbesanwa et al. 2018). Whilst both digital medication management systems use both audio and visual safety alerts to warn the user (i.e. staff responsible for administering medicines) of potential medication administration errors during a medication round, the method of medicines administration are distinctly different between the two. Specifically, Biodose Connect™ is an electronic monitored-dosage system and unlike traditional monitored-dosage systems, can hold both liquid and solid oral dosage medicines (Agbesanwa et al. 2018). On the other hand, the PCS™

is a barcode medication administration system built within a handheld device, and staff are required to administer medicines from original packs (Szczepura et al. 2011). The present research described in this thesis utilises the medicines administration data stored on the PCS™ in care homes and a description of the medicines administration process using the PCS™ is described below in section 1.6.2.1.

### **1.6.2.1 The Proactive Care System™ (PCS™)**

The PCS™ utilises a double barcode technology to ensure that residents in care homes are administered the correct medicine at the right time. Invatech Health Ltd provides training on the use of the PCS™ to care home staff who use the system to administer medicines. This training consists of an e-learning package about medicines administration when using the system and a face-to-face session on using PCS™.

Care homes that use the PCS™ are required to have all of their residents' medicines dispensed as original packs by their dispensing pharmacy with unique barcodes printed on the dispensing labels. The dispensing pharmacy is responsible for inputting the data related to the medicines prescribed and information about the residents on the PCS™. However, where medicines have been obtained from another pharmacy (e.g. for an out-of-hours prescription), a member of staff in the care home will manually input information related to the newly prescribed medicine into the PCS™, prior to attempting administration.

Each resident also has a designated drawer in which their medicines are stored within the care home's medication trolley. A unique barcode is also found on the outside of each drawer. This barcode is printed by the dispensing pharmacy and contains information about the resident which the drawer of medicines belongs to.

**Figure 1.1** illustrates the process of medicines administration using PCS™ during a medication round for one resident. All members of staff who are signed off as competent to administer medicines are provided with password protected usernames to log into PCS™. During an attempt to administer medicines to a particular resident in a medication round, the member of staff uses the PCS™ to scan the barcode on the relevant resident's drawer. The PCS™ will then display the resident's record which

consists of a photograph of the resident alongside other personal information which includes date of birth, details of the medicine(s) prescribed, and allergy information. The purpose of the photograph is to allow the member of staff to conduct a visual check whereby the photograph matches the appearance of the resident for whom they wish to administer medicines to. Following confirmation that the correct resident's record is displayed on the PCS™, the member of staff will proceed to scan the barcodes located on the dispensing labels of the medicines that are due for the resident. The scanning of the dispensing label allows the PCS™ to perform a series of safety checks in order to verify that the medicine(s) 'belongs' to the resident AND is due for administration. A total of four different safety alerts could be prompted on the PCS™ if an inappropriate medicine has been selected or the medicine selected or is not yet due for administration. These safety alerts are:

**i) Attempting to give a medicine to the wrong resident**

This means that the member of staff has selected a medicine for administration for one resident, that belonged to a different resident. For example, an alert would be triggered if a nurse selected the box of ramipril 5mg capsules for administration to resident A, when the ramipril belonged to resident B.

**ii) Attempting to give a medicine that had been discontinued by the prescriber**

This means that the member of staff has selected a medicine that has been stopped by either the care home or dispensing pharmacy following instruction from a prescribing clinician. For example, the GP may attend a care home to conduct a medication review for a resident. He/she decides to stop statin therapy (e.g. simvastatin) for the resident and nurse A subsequently updates this information on the PCS™. An alert would be triggered when nurse B attempts to select the box of simvastatin 40mg tablets for administration to the resident.

**iii) Attempting to give a medicine more than two hours early**

This means that the member of staff has selected a medicine more than two hours before it is due for administration. For example, an alert would be triggered if the medicine selected was not due (e.g. alendronic acid was attempted for administration on the wrong day), a medicine was already given from an earlier medication round and has been attempted for administration

again in error, or a medicine from a later medication round has been attempted for administration in error (e.g. senna was attempted for administration in the morning when it is due for night time).

**iv) Attempting to give a paracetamol containing medicine within four hours of the last administered dose**

This means that the member of staff has attempted to select a paracetamol containing medicine for administration within four hours of the last administered dose. For example, an alert would be triggered if paracetamol 500mg tablets were last administered to a resident at 12:00 but a nurse selected the box of paracetamol 500mg tablets for administration before 16:00.

Where a safety alert is prompted on the system, the member of staff will rectify the issue before re-attempting the administration. These 'near miss' safety alerts are recorded as potential medication administration errors and the PCS™ is able to record the number and types of potential medication administration errors made by each member of staff.

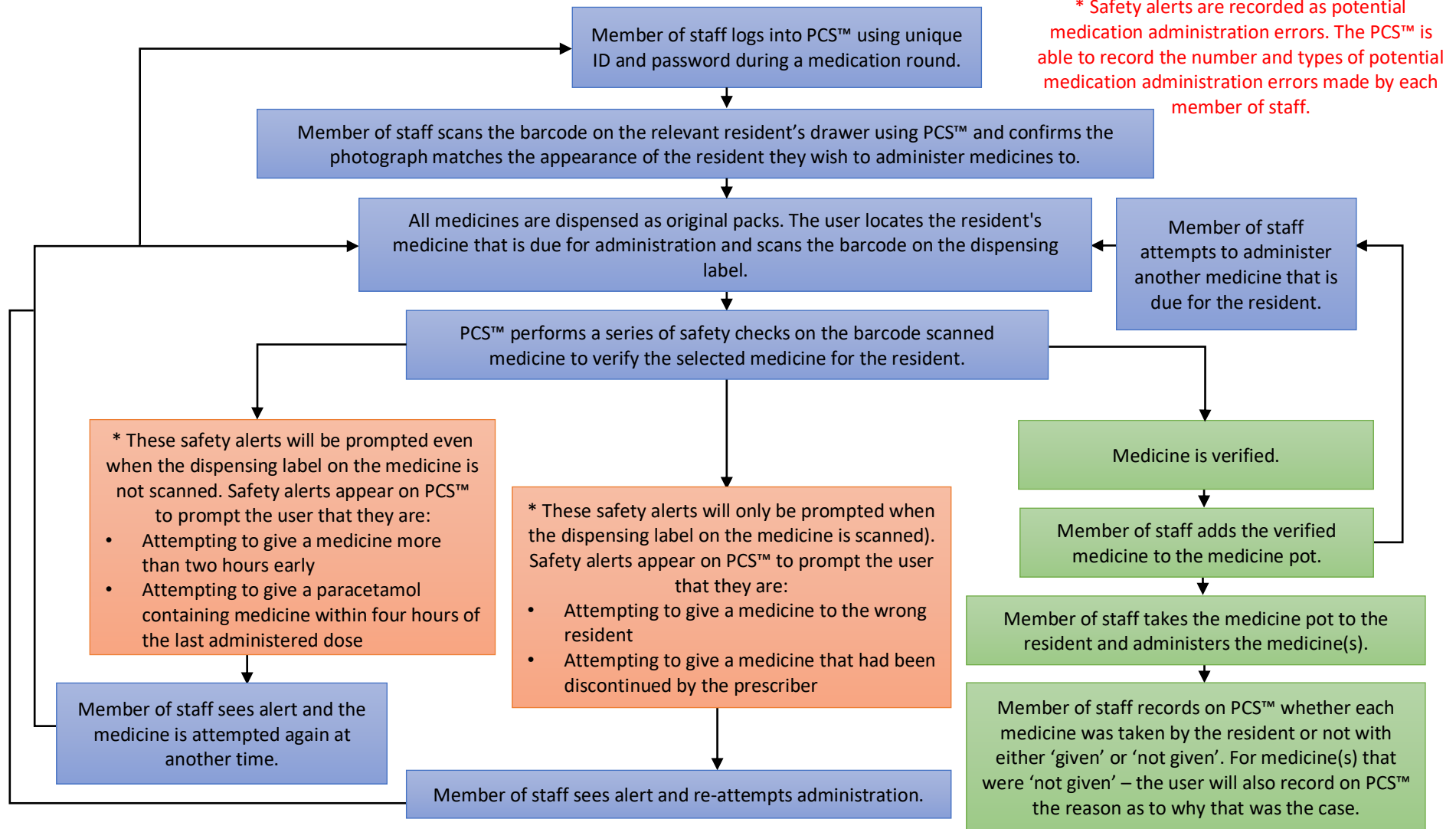
Although barcode scanning is part of the standard operating procedure for medicines administration in nursing homes using PCS™, staff are able to proceed with attempts to administer medicines without scanning medicines. Whilst some safety alerts such as i) attempting to give a medicine more than two hours early and ii) attempting to give a paracetamol containing medicine within four hours of the last administered dose, are still prompted when medicines are not scanned, other safety alerts are not. Safety alerts which are not prompted when medicines are not scanned include i) attempting to give a medicine to the wrong resident or ii) attempting to give a medicine that had been discontinued by the prescriber.

Following attempts to administer medicines to a particular resident, the member of staff is required to document the medicines that were taken by the resident (i.e. if the medicines were 'given' or 'not given' to the resident). Where a medicine is 'not given' to a resident, the member of staff will be required to record the reason (e.g. resident refused, is asleep etc). For each medicine that was documented as 'given' or 'not given,' the details of the administration attempt (i.e. the username of the member of staff

responsible for the attempt, the medicine, dose, date and time in which the medicines were attempted for administration) will also be recorded.

The PCS™ also produces a list of medicines at the end of the medication round to indicate the medicines that have not been documented as either 'given' or 'not given.' Consequently, staff are given the opportunity to review this list of medicines and retrospectively document whether the medicines were 'given,' 'not given,' or 'missing (reviewed)' (i.e. it is unknown whether the medicine was administered or not). Where an individual fails to review the list of medicines that have not been documented these medicines would appear as 'missing (not reviewed).'

**Figure 1.1** Process of medicines administration using PCS™ during a medication round for one resident





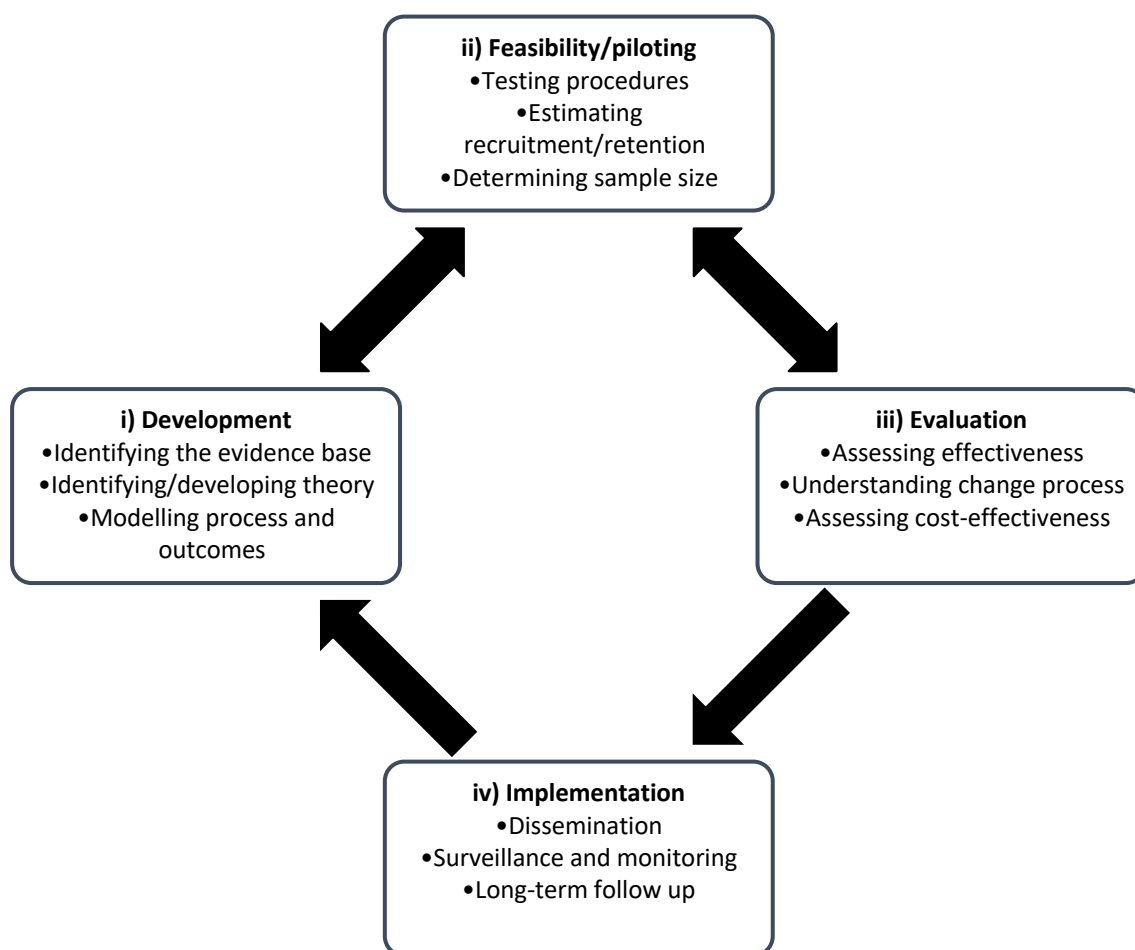
## 1.7 Scope of thesis

Amidst the current challenges faced by the care homes sector in the UK (described in section 1.5), it is important to ensure that the quality of care provided to residents in this setting is not compromised. Whilst a measure of good quality of care involves safe and effective medicines management, it is concerning that previous research has often highlighted areas of poor prescribing and medicines administration within long-term care facilities, both in the UK but also worldwide. In response to this, a rise in the development of new models of care to support improved medicines management practices in UK care homes have been implemented in recent years. For example, these include the initial implementation of the medicines optimisation in care homes programme (NHS England 2018) and the subsequent continuation of this model of care that is now outlined in the new five-year GP contract (Primary Care Strategy and NHS Contracts Group 2020) (see section 1.6). Other advancements in the UK include the utilisation of technology systems to support medicines administration in care homes (Szczepura et al. 2011; Wild et al. 2011), in addition to the implementation of a model of nurse-delegated medicines administration by senior carers in nursing homes (Care Inspectorate 2016; Care Inspectorate Wales 2016; Department of Health 2016). Given that a number of changes in regard to the management of medicines in UK care homes have occurred since the seminal CHUMS study, the current thesis aims to identify the current evidence base surrounding the complexity and challenges of prescribing and medicines administration in this setting, with a view to developing a nurse-delegated medicines administration by senior carers intervention model to address some of these issues and improve the quality of resident care. Of note, the current thesis uses a digital medication management system (PCS™) to examine medicines management practices in care homes and whilst the results here may not be representative of other homes which do not use the PCS™ system, the results identified are valuable given that the UK government had proposed for more research into the use of technology in this setting (NHS 2016; NHS England 2018).

Developing new models of care within health and social care often requires the development and evaluation of complex interventions (Craig et al. 2019). Complex

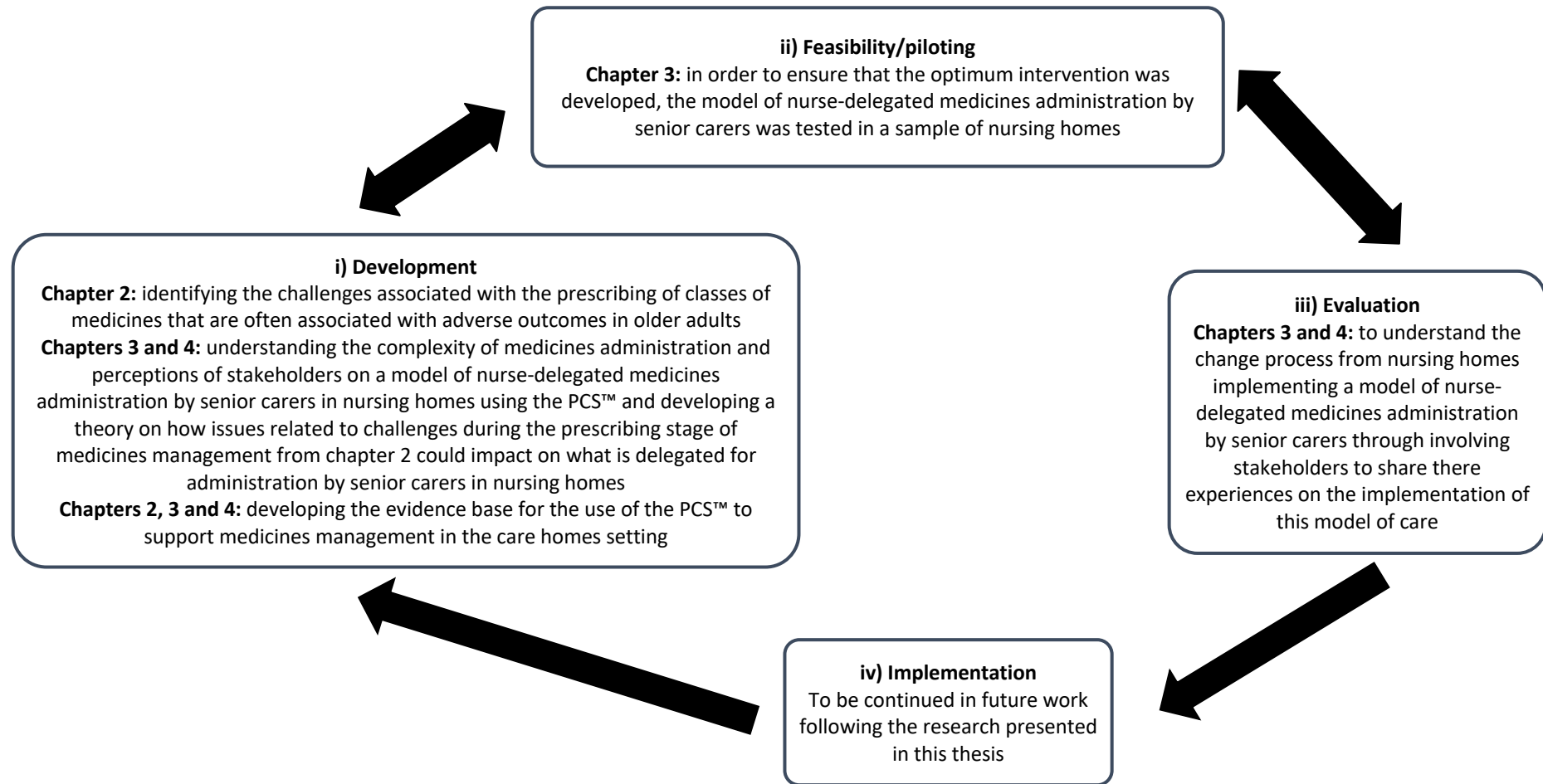
interventions are those that have several interacting components, and the evaluation of these are often challenging given that researchers often commence the process without having fully defined the complex intervention, hence making it difficult to develop, document and reproduce (Campbell et al. 2000). For this reason, the Medical Research Council's guidance on developing and evaluating complex interventions published a framework to help researchers adopt appropriate methods when developing a complex intervention (Craig et al. 2019). In addition, the framework helps researchers to identify the stages they are at within the research process, and therefore ensures that appropriate progress is being made in regards to the development of the complex intervention (Campbell et al. 2000). Specifically, this framework consists of four stages and these are; i) developing an intervention, ii) conducting feasibility or pilot studies, iii) evaluating the intervention, and iv) implementation (see **Figure 1.2**). Of note, the guidance highlights that progression from one stage to another may not be one cyclical process, instead the development of complex interventions is likely to be iterative. Therefore, previous stages of the framework may need to be revisited upon identification of issues, with for example during feasibility testing or the evaluation of the intervention (Campbell et al. 2000).

**Figure 1.2** Key stages of the Medical Research Council's framework on developing and evaluating complex interventions (adapted from Craig et al. 2019)



A complex intervention was proposed to be developed as part of this thesis, and this is the development and evaluation of a nurse-delegated medicines administration by senior carers intervention model. To do this, the evidence base related to the current challenges associated with the prescribing and medicines administration in care homes was needed to be addressed, together with understanding the perceptions of stakeholders about implementing a model of nurse-delegated medicines administration by senior carers in nursing homes. In addition, testing the feasibility and then evaluating the nurse-delegated medicines administration by senior carers intervention model is needed to ensure that the intervention is fit for purpose and effective for successful implementation in the future. The present thesis is made up of three studies that are described in chapters 2, 3 and 4. These studies are mapped to the early stages (stage i, ii and iii) of the Medical Research Council's framework (see **Figure 1.3**).

**Figure 1.3** Schematic diagram to show how the studies from chapters 2, 3 and 4 align to the Medical Research Council’s framework on developing and evaluating complex interventions



The basis of the research conducted in this thesis only focus on care homes which use PCS™, therefore all studies presented here supports the development of an evidence base for the use of the PCS™ to support medicines management in the care homes setting. However, each experimental chapter (chapters 2, 3 and 4) plays a role towards developing a model of nurse-delegated medicines administration by senior carers in care homes.

More specifically, an in-depth exploration of the use of classes of medicines that are often associated with adverse outcomes in nursing home residents is undertaken in chapter 2. This includes medicines that are likely to cause falls and/or cognitive impairment (relating to anticholinergic drugs, anxiolytics, hypnotics and analgesics) as well as those that are subject to wider public health issues like antimicrobial resistance (relating to antimicrobials). Medicines administration data was extracted from the PCS™ of eight nursing homes in the UK, and was used to deduce the information relating to the medicines prescribed to residents within those recruited homes over a one-month period. Specifically, chapter 2 explores: the number of residents prescribed these classes of medicines, the number of residents at risk of clinically relevant anticholinergic cognitive effects from medicines, the number of residents prescribed potentially inappropriate analgesics, anxiolytics and hypnotics, and the prescribing of multiple courses of antimicrobials to residents. This differs to the previous research where studies have often illustrated a general overview of the prescribing patterns in long-term care facilities before highlighting subsequent areas of prescribing concerns. Finally, the administration practices of anxiolytics, hypnotics and analgesics that were prescribed 'as required', in addition to the administration patterns of antimicrobials was also explored.

Chapter 3 moves on to explore the quality and feasibility of a model of nurse-delegated medicines administration by senior carers in nursing homes in the UK nursing homes that used the PCS™ over a three-month study period. These were the same nursing homes which participated in the study described in chapter 2. Given that the prescribing concerns identified in chapter 2 could ultimately cause harm when these medicines are administered to residents at the nursing homes, chapter 3 also helps to develop theory by understanding how medicines including those that were identified to be commonly

associated with adverse outcomes from chapter 2 impacts on the types of medicines that are delegated for administration by senior carers and also gathers evidence associated with the challenges of administering medicines within this setting. Specifically, using the medicines administration data that was extracted from PCS™ within eight nursing homes, part 1 of this study explored the quality of this new model of care in the UK where comparisons were made to determine the types of medicines administered and the types of potential medication administration errors made by nurses and senior carers. Potential medication administration errors were classified into four categories: i) attempting to give a medication to the wrong resident, ii) attempting to give a medication that had been discontinued by the prescriber, iii) attempting to give a medication more than two hours early, and iv) attempting to give a paracetamol containing medication within four hours of the last administered dose. Part 2 involved conducting semi-structured interviews with care home managers, nurses, and care staff in two nursing homes to explore their perceptions on the feasibility of this new model of care. Here the inductive thematic analysis of the interviews supported the development of theory by identifying the perceived appropriateness of senior carers administering medicines in nursing homes. In addition, more understanding was provided about the change process associated with a nurse-delegated medicines administration model as information related to the expectations of staff, challenges in senior carers administering medicines, and the positive outcomes from senior carers administering medicines was evaluated.

Chapter 4 builds on the findings from chapter 3 by understanding the views of a wider population of nursing homes regarding a model of nurse-delegated medicines administration by senior carers in nursing homes in the UK who currently use PCS™ for medicines administration. A cross-sectional survey design was used in this study and care home managers or another member of staff who worked at nursing homes that used the PCS™ to support medicines administration were invited to complete a survey (either via mail or telephone). The study aimed to ascertain the number of nursing homes that currently permit senior carers to administer medicines within this setting. In addition, the demographic data of homes that delegated medicines administration to be undertaken by senior carers were compared against the demographic data of homes

that did not delegate medicines administration to senior carers. For nursing homes that delegated medicines administration to be undertaken by senior carers, information was collected in regard to the training requirements of senior carers, the types of medicines that could be administered by them, in addition to the perceptions of staff on this new model of care in order to gather further information about the change process. The perceptions of staff in nursing homes that do not currently delegate medicines administration to carers was also examined here. This was an area that was not previously explored in the study conducted in chapter 3, and therefore further builds evidence related to the perceptions of staff about this model of care.

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## **Chapter 2    The Use of Medicines Commonly Associated with Adverse Outcomes in Older Adults**



## 2.1 Chapter summary

Chapter 2 is a quantitative study which explores the prescribing of i) anticholinergic drugs, ii) anxiolytics, hypnotics and analgesics, and iii) antimicrobials in nursing homes in the UK utilising data extracted from a digital medication management system (PCS™). In addition, anxiolytics, hypnotics and analgesics that were prescribed to be administered to residents on an ‘as required’ basis, and the administration of antimicrobials is examined. The chapter will begin with an introduction explaining why these classes of medicines were chosen for exploration, followed by the aims and objectives of the present study, the methods, results, and then a discussion of the key findings at the end of the chapter.

## 2.2 Introduction

Older adults residing in long-term care facilities tend to be older in age and have diagnoses of multiple chronic diseases in which the prescribing of complex medicine regimens would be common (Lane et al. 2004; Olsen et al. 2016). In a recent report published by Age UK, the authors highlight that prescribing more medicines to older adults isn’t always ideal given the high risk of adverse outcomes following inappropriate prescribing (see chapter 1, section 1.6.1) (Petchey et al. 2019).

In the UK, care home residents are, on average, prescribed between seven to nine medicines (Allred et al. 2009; Barber et al. 2009; Szczepura et al. 2011), and it is understood that the total number of medicines prescribed in itself is a key predictor of inappropriate prescribing (Dhall et al. 2002; Sloane et al. 2002; Fialová et al. 2005; Perri et al. 2005; Ruggiero et al. 2010; Stafford et al. 2011; Vieira De Lima et al. 2013; Hwang et al. 2015; Morin et al. 2016). In particular, anticholinergic drugs, anxiolytics and hypnotics, analgesics, and antimicrobials are often cited to be inappropriately prescribed to long-term care residents (Morin et al. 2016; Hukins et al. 2019) and commonly associated with adverse outcomes (Gurwitz et al. 2005). As a result, the prescribing of these medicines has been subject to increasing scrutiny in recent years and national guidelines has subsequently highlighted the importance of reviewing these classes of medicines (All Wales Medicines Strategy Group 2019; NHS Digital and NHS

Business Services Authority 2019). Sections 2.2.1 to 2.2.3 will now explore the literature that has previously examined the use of anticholinergic drugs, anxiolytics and hypnotics, analgesics, and antimicrobials within long-term care facilities, in addition to highlighting why the exploration of the prescribing and administration of these medicines remains an important and underexplored research area for care homes in the UK.

### **2.2.1 Anticholinergic drugs in care homes**

A number of studies have found that anticholinergic drugs are frequently prescribed in long-term care facilities, with over 50% of residents prescribed at least one anticholinergic drug (Kumpula et al. 2011; Palmer et al. 2014; Niznik et al. 2017). Although research conducted in the community setting also shows that anticholinergic drugs are frequently prescribed in the older adult population (Fox et al. 2011a; Richardson et al. 2018), studies which compare the prevalence of anticholinergic drug exposure between settings have found that the prescribing is often higher in long-term care facilities than in the community (Blazer et al. 1983; Beuscart et al. 2014; Sumukadas et al. 2014). For example, Blazer et al. (1983) found that 60% of nursing home residents compared to 23% of older adults in the general population were prescribed anticholinergic drugs. Again, Beuscart et al. (2014) also found similar results in which 24.7% of nursing home residents were prescribed a combination of medicines with highly potent anticholinergic activity compared to 9% of older adults living in their own homes.

Anticholinergic drugs exert their effects by non-selectively blocking muscarinic receptors found in various organs of the human body including the brain, gastrointestinal tract, lungs and urinary tract (PrescQIPP 2016). As anticholinergic drugs are able to act at many different sites around the human body, they are often prescribed in the management of a variety of conditions including; depression, gastrointestinal disorders, Parkinson's disease, urinary incontinence, epilepsy, and allergies (Richardson et al. 2018). Long-term care residents are generally recognised to have a higher number of co-morbidities and subsequent polypharmacy (Lane et al. 2004; Shah et al. 2012; Olsen et al. 2016), therefore these factors may account for the high prevalence of anticholinergic drug exposure in this cohort. Indeed, factors which have been found to

be associated with higher anticholinergic drug exposure include polypharmacy, increasing co-morbidities, and older age (Fox et al. 2011a; Sumukadas et al. 2014).

Due to the extensive distribution of muscarinic receptors around the human body and the non-selective nature by which anticholinergic drugs inhibit muscarinic receptors, anticholinergic drugs act at multiple organ systems which can lead to the production of a range of adverse effects including central effects (e.g. sedation, confusion and delirium) and peripheral effects (e.g. dry mouth, dry eyes, constipation, urinary retention and blurred vision) (Peters 1989). These adverse effects are thought to be particularly prominent in older adults due to age-related pharmacokinetic and pharmacodynamic changes that increases the permeability of anticholinergic drugs across the blood-brain barrier and slows drug elimination leading to enhanced accumulation (Ray et al. 1992). More importantly, the risk of adverse effects associated with anticholinergic drug exposure is possibly increased in long-term care residents as they represent one of the frailest cohorts in society that tend to be increasingly older in age compared to their counterparts living in the community (Lane et al. 2004). It is therefore particularly concerning that the prevalence of anticholinergic drug prescribing is highest for those residing in long-term care.

The inappropriate prescribing of anticholinergic drugs in older adults has been recognised as a potentially modifiable factor to decrease the risk of adverse outcomes including mortality (Chatterjee et al. 2017). There has also been an increasing interest amongst researchers in exploring anticholinergic drug exposure and dementia risk (Chatterjee et al. 2016; Richardson et al. 2018). In particular, a recent large scale case-control study consisting of a total of 324,703 patients aged between 65 and 99 years old living in the UK found that antidepressants, urological, and antiparkinson drugs with a definite anticholinergic activity were linked to dementia incidence (Richardson et al. 2018). Consequently, recent efforts have been made in the UK to encourage the review of anticholinergic drugs in this population through various national prescribing guidelines (All Wales Medicines Strategy Group 2014; PrescQIPP 2016; Business Services Authority 2017; All Wales Medicines Strategy Group 2019). Furthermore, in light of the evidence to support dementia incidence and anticholinergic drug exposure, dementia

management guidelines in the UK have also recommended the review of anticholinergic drugs in dementia patients (Royal Pharmaceutical Society 2017; Banks 2018).

The cumulative effects from all the medicines with anticholinergic properties within a patient's medicines regimen is termed the 'anticholinergic burden' (Salahudeen et al. 2015a). Various rating scales have been developed to measure anticholinergic burden in clinical practice, and they often feature in UK prescribing guidelines to support medication reviews. More specifically, a recent systematic review identified a total of 18 different anticholinergic rating scales used internationally across various clinical settings including hospitals, long-term care and community settings (Welsh et al. 2018). Only systematic review articles that described the use of anticholinergic rating scales to measure anticholinergic burden and published up until 24<sup>th</sup> October 2016 were included in this systematic review. A total of five systematic review articles were found and subsequently analysed. The authors found that the anticholinergic rating scales that were most often used to quantify anticholinergic burden were the drug burden index (DBI), anticholinergic risk scale (ARS), anticholinergic drug scale (ADS), and anticholinergic cognitive burden scale (ACB). Of note, the ARS was identified as the rating scale that was often used in studies that explored anticholinergic drug exposure in long-term care facilities and hospitals.

More recently, the anticholinergic effect on cognition (AEC) scale was developed in the UK by Bishara and colleagues in 2016. Whilst the AEC scale has only been developed relatively recently, the rating scale is recommended in Wales as part of the National Prescribing Indicators to review anticholinergic drugs in older adults aged 75 years and over (All Wales Medicines Strategy Group 2019). An overview of the scoring criteria of the common anticholinergic rating scales identified by Welsh et al. (2018) and the AEC scale that is developed in the UK by Bishara et al. (2016) is illustrated in **Table 2.1**.

**Table 2.1** Overview of common anticholinergic rating scales and AEC scale adapted from Welsh et al. (2018)

Scale, country	Classification of points	Number of medicines included in the scale	Scoring criteria		
			Receptor bonding/serum anticholinergic activity	Anticholinergic effect	Expert opinion
ADS (Carnahan et al. 2006), USA	0 = no known anticholinergic properties 1 = potentially anticholinergic 2 = anticholinergic adverse outcomes sometimes noted 3 = markedly anticholinergic	117		x	
DBI (Hilmer et al. 2007) <sup>a</sup> , USA	0-1 = increasing score equates to poorer functional outcomes	128			
ARS (Rudolph et al. 2008) <sup>b</sup> , USA	0 = limited or no anticholinergic potential 1 = moderate anticholinergic potential 2 = strong anticholinergic potential 3 = very strong anticholinergic potential	49		x	x
ACB (Boustani et al. 2008), USA	0 = no anticholinergic effects 1 = mild cognitive anticholinergic effects (not clinically relevant) 2 = moderate cognitive anticholinergic effects (established and clinically relevant) 3 = severe cognitive anticholinergic effects (established and clinically relevant)	88	x	x	x
AEC (Bishara et al. 2016), UK	0 = safe to use 1 = caution required 2 = review and withdraw/switch 3 = review and withdraw/switch	60	x		

ADS=anticholinergic drug scale; DBI=drug burden index; ARS=anticholinergic risk scale; ACB=anticholinergic cognitive burden; AEC=anticholinergic effect on cognition. <sup>a</sup>The DBI is calculated using a pharmacological equation of prescribed and recommended doses of both sedative and anticholinergic drugs. The medicines composing the anticholinergic component of the scale were identified using Mosby's Drug Consult and the Physicians' Desk Reference. <sup>b</sup>Sumukadas et al. (2014) created a modified version of the ARS called mARS to include anticholinergic drugs available in the UK.

**Table 2.1** demonstrates that the rationale behind the scoring criteria of anticholinergic rating scales varies considerably, so it is therefore unsurprising that there are some differences in the total number of medicines included within each rating scale. Due to the availability of different anticholinergic rating scales, a population-based study was conducted in New Zealand to explore adverse outcomes associated with anticholinergic

drug exposure in patients aged 65 years and older using nine different anticholinergic rating scales to determine anticholinergic burden (Salahudeen et al. 2015b). The researchers found varying levels of exposure to anticholinergic drugs using the different scales (range=22.8% to 55.9%), with the ACB scale rendering the highest percentage for exposure to anticholinergic drugs (55.9%) but the ADS producing the highest mean anticholinergic exposure ( $0.34\pm 0.65$ ) amongst the study population. However, despite differences in anticholinergic drug exposure between the various rating scales, the study demonstrated that all nine anticholinergic rating scales were significantly associated with adverse outcomes relating to hospitalisations, falls, and GP visits ( $p$ -value $<0.001$ ).

Despite an increasing recognition that the use of anticholinergic drugs in older adults is associated with a variety of adverse outcomes, the prevalence of anticholinergic drug prescribing remains high within this population. In particular, a Scottish study conducted by Sumukadas and colleagues in 2014 found an increase in the prescribing of anticholinergic drugs between 1995 and 2010 in all patients aged 65 years and older within Tayside. Although there have been some studies that explored the prescribing of anticholinergic drugs in the UK within older adults, (Fox et al. 2011a; Fox et al. 2011b; Sumukadas et al. 2014; Richardson et al. 2018), there remains a limited number of studies in the UK that specifically examine the current state of anticholinergic drug prescribing for residents of care homes. Given the risks associated with anticholinergic drugs and current evidence to indicate that anticholinergic drug prescribing is more prevalent for long-term care residents (Blazer et al. 1983; Beuscart et al. 2014; Sumukadas et al. 2014), a current snapshot of anticholinergic drug prescribing in care home residents within the UK is needed.

### **2.2.2 Analgesics, anxiolytics and hypnotics in care homes**

Medicines which act on the central nervous system primarily include analgesics and psychotropics (Azermai et al. 2017). Psychotropics encompass a broad range of medicines including anxiolytics, hypnotics, antidepressants, antipsychotics, anti-dementia drugs and anticonvulsants (Wetzels et al. 2011; Azermai et al. 2017).

National statistics in the UK indicate that deaths from anxiolytics, hypnotics and analgesics have increased more than 30% between 1997 and 2017 (Office for National Statistics 2018). More specifically, there is research to show that there is a high incidence of adverse drug events in long-term care facilities, and these are often associated with the prescribing of anxiolytics, hypnotics and analgesics (Field et al. 2001; Gurwitz et al. 2005; Desai et al. 2013). In particular, a nine-month cohort study investigated the incidence of adverse drug events amongst 1,247 long-term care residents in Canada and defined errors relating to the prescribing, dispensing, administration and monitoring of drugs to be classified as, 'preventable adverse drug events' (Gurwitz et al. 2005). Gurwitz and colleagues found that prescribing errors led to the majority ( $n=198$ , 59%) of preventable adverse drug events, and that neuropsychiatric reactions (i.e. excessive sedation, hallucinations and delirium) were associated with the most common type of preventable adverse drug event ( $n=97$ , 29%). More importantly, Gurwitz et al. (2005) found that the most frequently prescribed medicines which accounted for preventable adverse drug events involved anxiolytics, hypnotics and opioid analgesics ( $n=69$ , 20%). Consequently, this highlights the necessity to focus on the appropriate prescribing of anxiolytics, hypnotics and opioid analgesics in long-term care residents to minimise the occurrence of preventable adverse drug events.

Analgesics are recommended for the management of painful conditions which impact physical function and quality of life, and are broadly classified into two classes: opioids and non-opioid analgesics (American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons 2009). Pain is prevalent in long-term care residents and is most often associated with musculoskeletal disorders, but also common amongst residents with cancer, pressure sores and nerve pain (Ferrell et al. 1990; Cramer et al. 2000; Won et al. 2004; Ahn et al. 2015). Specifically, one cross-sectional study which examined pain management in nursing homes across seven countries in Europe found a high prevalence (48.4% of residents;  $n=1,900$ ) of pain in residents (Lukas et al. 2013a). Despite this high prevalence of pain in long-term care residents and the availability of prescribing guidelines on pain management (American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older

Persons 2009; British Geriatrics Society 2013), studies have established that pain management in long-term care facilities is suboptimal, with many studies finding that more than 20% of residents with a pain diagnosis were not prescribed or administered any analgesics (Won et al. 1999; Won et al. 2004; Boerlage et al. 2008; Maxwell et al. 2008; De Souto Barreto et al. 2013; Lapane et al. 2013; Lukas et al. 2013a; Lukas et al. 2013b).

Both the British Geriatrics Society and American Geriatrics Society highlights the importance of the timely administration of analgesics (American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons 2009; British Geriatrics Society 2013). Specifically, the American Geriatrics Society recommends that older adults with cognitive impairment who require pain management should receive scheduled or 'regular' analgesics due to concerns that this population may struggle to request analgesia that is prescribed 'as required.' Despite this, various studies have identified the inappropriate prescribing of 'as required' analgesics in long-term care facilities (Cramer et al. 2000; Won et al. 2004; Boerlage et al. 2008; Lukas et al. 2013b; Barry et al. 2015). In particular, one study that assessed the medical files of 392 residents in Polish nursing homes highlighted the risk of the undertreatment of pain in residents with dementia as the researchers found that 10% ( $n=10$ ) of residents with severe dementia were prescribed 'as required' analgesia only, and that residents with severe dementia ( $n=99$ ) were less likely to be prescribed analgesics compared to residents without dementia ( $n=82$ ) ( $p$ -value=0.02) (Neumann-Podczaska et al. 2016).

The undertreatment of pain is concerning as the effects of inappropriate pain management in older adults can result in sleeping disorders, poor quality of life, decline in physical performance and cognition, and decreased social engagement (Won et al. 1999; Katz 2002; Won et al. 2004; Won et al. 2006; Boerlage et al. 2008; Lukas et al. 2013a; Lukas et al. 2013b; Corbett et al. 2014). In addition, studies have also found that pain is associated with agitation and aggression in long-term care residents with dementia (Zieber et al. 2005; Ahn and Horgas 2013; Corbett et al. 2014). Of note, a randomised clinical trial of 352 residents with dementia from 18 nursing homes in Norway found that appropriate pain management using a stepwise protocol for the prescribing of analgesics improved aggression and agitation amongst residents (Husebo



et al. 2011). Agitation and aggression are symptoms associated with behavioural and psychological symptoms of dementia (BPSD), and studies indicate that BPSD is prevalent amongst long-term care residents with dementia (Margallo-Lana et al. 2001; Makimoto et al. 2018). The effects of poorly managed pain in BPSD is concerning as antipsychotic drugs are often used to manage BPSD (Szczepura et al. 2016), despite recommendations to review the prescribing of these medicines due to a lack of clinical efficacy for BPSD and increased risk of cardiovascular events and mortality in older adults (Banerjee 2009; All Wales Medicines Strategy Group 2014; All Wales Medicines Strategy Group 2019). For this reason, Corbett et al. (2014) highlight the importance of effective pain management in long-term care residents with dementia to reduce both polypharmacy and the inappropriate prescribing of antipsychotic drugs for BPSD.

Benzodiazepines which exhibit hypnotic properties may be prescribed for the short-term management of insomnia, and these may also sometimes be prescribed in the management of sleeping disorders associated with pain (Bourgeois et al. 2012). Given that benzodiazepines also exhibit anxiolytic properties, some of these medicines are licensed for short-term use in individuals with anxiety and acute panic attacks in addition to other indications including in the management of epileptic seizures and muscle spasms. Of note, other anxiolytics and hypnotics which are not benzodiazepines are also licensed specifically in the UK for the short-term management of anxiety and insomnia. For example, whilst buspirone is an anxiolytic prescribed typically for short-term use in individuals with anxiety, other hypnotics used for insomnia include Z-hypnotics, clomethiazole, promethazine and melatonin (Joint Formulary Committee 2019).

Although national guidelines recommend that anxiolytics and hypnotics should be avoided where possible in older adults due to an increased risk of falls leading to injury and potential acceleration of cognitive impairment (PrescQIPP 2017), studies consistently highlight a high level of anxiolytic and hypnotic prescribing amongst older adults in long-term care facilities, with over 20% of residents prescribed at least one anxiolytic or hypnotic (Svarstad and Mount 2001; Westbury et al. 2010; Petek Šter and Cedilnik Gorup 2011; Bourgeois et al. 2012; Johnson et al. 2016; Helvik et al. 2017). In particular, one cohort study found that care home residents in Scotland were significantly more likely to be older in age (greater than 85 years old) and prescribed

anxiolytics and hypnotics compared to their counterparts living in the community ( $p$ -value $<0.0001$ ) (Johnson et al. 2016).

Whilst the indications for the prescribing of anxiolytics and hypnotics are diverse, these medicines are commonly used in the management of insomnia or symptoms associated with anxiety in long-term care facilities, and could be prescribed on a 'regular' and/or 'as required' basis (Griffiths et al. 2019). Of note, Bourgeois et al. (2012) found that insomnia and anxiety accounted for more than 75% of the indications amongst residents prescribed either benzodiazepines or Z-hypnotics. Given that older adults may sometimes require the occasional prescribing of anxiolytics and hypnotics to manage sleeping disorders or symptoms associated with anxiety, national guidelines recommend that these medicines should only be prescribed for short courses due to an increased risk of dependence, but more importantly a lack of clinical efficacy beyond four weeks use (National Institute for Health and Care Excellence 2004; National Institute for Health and Care Excellence 2011; PrescQIPP 2017). However, research indicates that this recommendation is often not applied in practice (Svarstad and Mount 2001; Bourgeois et al. 2012). Of note, Svarstad and Mount in 2001 found that almost 10% of nursing home residents who took part in their study were prescribed benzodiazepines chronically for more than four months across 16 randomly selected skilled-nursing facilities in Wisconsin, USA. Bourgeois et al. (2012) also showed that older adults were often prescribed benzodiazepines and Z-hypnotics for prolonged periods. Specifically, Bourgeois and colleagues found that 50% of the residents who took part in their study in 2012 were prescribed benzodiazepines and Z-hypnotics for at least three months across 76 nursing homes in Belgium.

Several studies have also shown that anxiolytics and hypnotics are often concomitantly prescribed with analgesics in long-term care facilities (Cramer et al. 2000; Veal et al. 2014; Barry et al. 2015; Veal et al. 2015). Given that there is research to support the association of falls with the prescribing of analgesics (Saunders et al. 2010; Rolita et al. 2013; Kosse et al. 2015) as well as hypnotics and anxiolytics in older adults (Mustard and Mayer 1997; Ray et al. 2000; Neutel et al. 2002; Lawlor et al. 2003; Khong et al. 2012), there are concerns that the combined administration of these medicines further increases the risk of falls and subsequent fractures in older adults.

Although studies have highlighted concerns regarding the prescribing patterns of analgesics, hypnotics and anxiolytics, few studies in the UK have specifically focussed on both the prescribing and administration of these medicines within care homes. Where one study has examined the prescribing and administration of analgesics, the study sample was small (prescribing and administration data from 113 residents) and only focussed on one geographical area within the UK (Leeds, England) (Closs et al. 2004). Since it is known that there are intra-country variations in the prescribing of analgesics (Ruscitto et al. 2015), hypnotics and anxiolytics (Johnson et al. 2016; Westbury et al. 2019) within long-term care facilities, the findings by Closs and colleagues in 2004 may not be generalisable to other areas of the UK. Further studies are required to explore the prescribing and subsequent administration of medicines and this is particularly important for medicines that are prescribed 'as required' (i.e. analgesics, hypnotics and anxiolytics). This is because the frequency of administration of these medicines when prescribed 'as required' ultimately impacts on the risk of adverse outcomes to residents.

### **2.2.3 Antimicrobials in care homes**

Older adults residing in long-term care facilities are particularly susceptible to infections due to several age-related factors relating to immunological changes, the presence of multiple co-morbidities, decline in physical performance leading to falls and injuries, and the use of invasive medical devices such as urinary catheters (Juthani-Mehta and Quagliarello 2010).

The literature suggests that intra- and inter- country variations exists with regard to the prevalence of antimicrobial prescribing in long-term care facilities (Mylotte and Keagle 2005; McClean et al. 2011; McClean et al. 2012; Daneman et al. 2015; Ricchizzi et al. 2018; Selcuk et al. 2019; Smith et al. 2020), and this may be due to variations in national and regional guidelines as well as the availability of antimicrobials in different territories (Rummukainen et al. 2013). Despite these differences, a structured literature review conducted in 2016 noted that antimicrobial prescribing is common in long term care settings with approximately 50% to 75% of residents prescribed at least one course of antimicrobials annually (Morrill et al. 2016).

Given that urinary-tract infections (UTIs) (Thornley et al. 2019), respiratory-tract infections (Stevenson et al. 2005), and skin and soft tissue infections (Selcuk et al. 2019) have all featured as common infections in the prescribing of antimicrobials in long-term care facilities, a limited number of studies have individually focussed on exploring the prescribing patterns of antimicrobials for each of these infections within the setting (Eriksen et al. 2004; Fagan et al. 2012; Pulia et al. 2018). Although long-term care residents are susceptible to infections and therefore treatment with antimicrobials may be necessary, it is of concern that a considerable amount of literature has been published worldwide highlighting the inappropriate prescribing of antimicrobials that conflicts with country-specific recommendations and guidelines (Rotjanapan et al. 2011; Lim et al. 2012; McClean et al. 2012; Stuart et al. 2012; van Buul et al. 2015; Pulia et al. 2018).

The inappropriate use of antimicrobials is one of the key driving factors which contributes towards the growing public health threat of antimicrobial resistance (Department of Health and Social Care 2019), which is estimated to result in a minimum of 700,000 deaths each year worldwide (O'Neill 2016). In addition, the inappropriate prescribing of antimicrobials exposes individuals to additional adverse effects which can be potentially prevented through the prudent use of antimicrobials. In particular, these adverse effects include drug-interactions, antimicrobial allergies, and further complications like *Clostridioides difficile* infection (van Buul et al. 2012; Daneman et al. 2015; Gillespie et al. 2015). These adverse effects including antimicrobial resistance, ultimately impacting on health through increased morbidity and mortality, which inevitably adds to the economic burden of healthcare (van Buul et al. 2012). For this reason, a variety of national and international initiatives are currently in operation to reduce inappropriate antimicrobial prescribing across all healthcare settings including long-term care facilities (World Health Organization 2015; Welsh Government 2016).

Where the prescribing of an antimicrobial is deemed necessary, timely administration and completion of the course is generally accepted to be critical in ensuring that individuals obtain the therapeutic effect that was intended by the prescriber. However, it is concerning that studies conducted within care homes in the UK have found that

residents usually complete the course of their antimicrobials irrespective of whether it was prescribed appropriately or not (McClellan et al. 2012; Thornley et al. 2019).

More recently, Thornley and colleagues in 2019 published a research paper that investigated antimicrobial prescribing in 644 care homes across the UK using a point-prevalence survey. Given that there are variations in guidelines and the availability of antimicrobials in different countries, this study provided some current insights into issues around the prescribing of antimicrobials in care homes that was specifically relevant to the UK. In particular, the researchers highlighted that pharmacists who conducted the data collection phases of this study identified issues in almost 10% ( $n=118$ ) of the antimicrobials prescribed, and that the majority ( $n=63$ , 53.4%) of these were due to the clinical inappropriateness of the choice of medicine prescribed. Whilst the study was conducted as a single day point-prevalence survey and this method has been traditionally used by many previous studies to investigate antimicrobial use (McClellan et al. 2011; McClellan et al. 2012; Boivin et al. 2013; Ricchizzi et al. 2018; Selcuk et al. 2019; Thornley et al. 2019), this method tends to be limited to providing information on prescribing patterns within a short time-frame (usually on one day) and therefore does not account for antimicrobials prescribed recently in the past which could potentially impact on the appropriateness of medicines prescribed for future infections.

As part of one of the strategies to target antimicrobial resistance in the UK, there is currently a national target to halve the number of inappropriate antimicrobial prescriptions by 2024 (Department of Health and Social Care 2019). As long-term care residents are recipients of inappropriate antimicrobial prescribing and often transfer between healthcare settings fairly frequently, there are concerns that this movement leads to the transfer of resistant microorganisms from one environment to another (Bonomo 2002). The understanding of antimicrobial prescribing in care homes in the UK should therefore be prioritised. Following the study by Thornley et al. (2019), further studies are needed to understand the prescribing of antimicrobials in care homes in the UK within a wider timeframe.

### 2.2.4 Aims and objectives

The present study has two key aims. Firstly, to explore the quality of prescribing of i) anticholinergic drugs, ii) anxiolytics, hypnotics and analgesics, and iii) antimicrobials in a sample of UK nursing homes that use a digital medication management system (PCS™). Secondly, to examine the administration patterns of anxiolytics, hypnotics and analgesics that are prescribed 'as required', in addition to the administration patterns of antimicrobials. The specific objectives of the study are to:

- i) Identify the number of residents prescribed i) anticholinergic drugs, ii) anxiolytics, hypnotics and analgesics, and iii) antimicrobials in nursing homes.
- ii) Determine the number of residents at risk of clinically relevant anticholinergic cognitive effects using the anticholinergic effect on cognition (AEC) scale in nursing homes.
- iii) Assess the number of residents prescribed potentially inappropriate i) analgesics using the World Health Organization (WHO) pain ladder, and potentially inappropriate ii) anxiolytics and hypnotics using the criteria developed by Franchi and colleagues in 2019 in nursing homes.
- iv) Assess the number of residents prescribed 'as required' i) analgesics, and ii) anxiolytics and hypnotics and the associated administration patterns of these medicines in nursing homes.
- v) Quantify the number of antimicrobial courses that were fully administered to nursing home residents, including for the management of urinary-tract infections (UTIs).
- vi) Explore the prescribing patterns of residents who were prescribed more than two antimicrobials within one calendar month in nursing homes.

## **2.3 Methods**

### **2.3.1 Ethical considerations**

The study was reviewed and approved by Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee prior to commencing any studies (see appendix 1). The nursing homes that participated in this study utilised the PCS™ to support medicines administration within their homes and gave consent for their data to be used for research as part of their end-user license agreement with Invatech Health Ltd. To maintain the confidentiality of the nursing homes recruited to this study, the nursing homes were coded as NH1, followed by a number according to the order in which the nursing home was recruited. For example, the first nursing home recruited to the study was assigned the reference code, NH1-1. Medicines administration data was extracted from PCS™ and used to deduce information relating to the medicines prescribed to residents within the recruited homes. The medicines administration data was anonymised with residents and staff identifiable by codes only known to Invatech Health Ltd. All data was stored on password protected computers, and only the researchers had access to this information.

### **2.3.2 Participants and setting**

This study formed part of a wider project to determine the quality and feasibility of a model of nurse-delegated medicines administration by senior carers that utilised a digital medication management system (PCS™) in a sample of nursing homes in the UK (see chapter 3).

Nursing homes were recruited using a purposive non-randomised sampling method (Patton 2002). Purposive sampling is a non-probability sampling method usually chosen for practical reasons. It represents a technique which involves selecting subjects from a target population with specified inclusion and exclusion criteria in order to fit the purposes of a given study (Patton 2002; Bowling 2014).

The inclusion criteria for this part of the study were: i) the provider was a registered nursing home, ii) both nurses and senior carers (under delegation) administer medicines within the nursing home, iii) medicines have previously been administered to residents

using PCS™ for at least three months and iv) there is interest within the nursing home in evaluating nurse-delegated medicines administration by senior carers.

Nursing homes that met the inclusion criteria were recruited through Invatech Health Ltd from their existing list of clients. Once Invatech Health Ltd had identified nursing homes that met the inclusion criteria, the researcher sent e-mails to the care home managers in these homes and informed them of the project. Nursing homes that expressed interest in the proposed project were subsequently recruited to the study.

### **2.3.3 Data collection and extraction**

All the homes were provided training by Invatech Health Ltd on the use of the PCS™ and had administered medicines using PCS™ for at least three months prior to data collection (see chapter 1, section 1.6.2.1 for further information about PCS™). PCS™ was used to collect the data relating to medicines administration attempts made by staff during the study. For the nursing homes that were recruited, Invatech Health Ltd extracted the most recent three months of anonymised medicines administration data from the digital medicines administration records stored within the PCS™. The medicines administration data from each nursing home was provided to the researcher in the form of Microsoft Excel spreadsheets. The researcher subsequently imported these spreadsheets into IBM SPSS statistics version 23 to produce a single SPSS file.

The single SPSS file contained data relating to the parties involved in each administration attempt during the three-month period and this included i) the resident that the medicine was being administered to (unique code allocated by Invatech Health Ltd), ii) the member of staff attempting to administer medicine (unique code allocated by Invatech Health Ltd), and iii) the nursing home where the administration took place (unique code allocated by the researcher). This dataset also contained information about the administration outcome of each of the administration attempts made to residents (i.e. whether the medicine was 'given,' 'not given (with a specified reason),' 'missing (reviewed),' or 'missing (not reviewed)' by staff (see chapter 1, section 1.6.2.1 for further information about PCS™ and the definitions of 'missing' entries). In addition, the SPSS file contained data relating to characteristics of each medicine that was



attempted for administration to residents and this included i) the medicine name, ii) the strength and formulation of the medicine, iii) the BNF drug category (Joint Formulary Committee 2019), and iv) the dosage regimen (i.e. if the medicine was prescribed as a 'regular,' 'as required,' or 'as directed' medicine for administration). Given that all these variables appeared as string data on the SPSS file, the researcher was required to physically clean the data in preparation for data analysis. Specifically, these variable were recoded into numeric variables (e.g. for dosage regimen, 'regular' was recoded as '1,' 'as required' was '2' and 'as directed' was '3').

For this study, medicines administration data which covered a one-month period (1<sup>st</sup> November 2017 to 30<sup>th</sup> November 2017) was extracted from the SPSS file; dressings and catheters were excluded in this present study. A one-month medicines cycle was chosen to analyse the prescribing trends in nursing home residents to minimise the possibility of changes to medicine regimens within this cohort.

Furthermore, the three classes of medicines which included i) anticholinergic drugs, ii) analgesics, anxiolytics and hypnotics, and iii) antimicrobials were specifically explored in the present study. Anticholinergic drugs were identified using the medicines listed in the AEC scale (Bishara et al. 2016) (see appendix 2). Medicines which were listed under the section of 'hypnotics and anxiolytics' in the BNF were identified as anxiolytics and hypnotics in this study (Joint Formulary Committee 2019). Adjuvant drugs were excluded and only non-opioid analgesics, opioid analgesics, and non-steroidal anti-inflammatory drugs were identified as analgesics from the BNF (Joint Formulary Committee 2019). Similarly, medicines which were listed under the 'infection' section of the BNF were identified as antimicrobials in this study (Joint Formulary Committee 2019). Topical creams and ointments that contained antimicrobials were excluded in this present study. For the purposes of this study, once daily dosing of nitrofurantoin, trimethoprim, cefalexin in addition to methenamine was identified as a prophylaxis regimen for UTIs. However, i) the prescribing of nitrofurantoin, trimethoprim and cefalexin to be administered more than once a day, ii) the prescribing of the modified-release formulation of nitrofurantoin, and iii) the prescribing of pivmecillinam, was classified as a treatment regimen for UTIs.

### **2.3.4 Data analysis**

The analysis of the one-month medicines cycle for residents residing in the recruited homes was undertaken in IBM SPSS statistics version 23. Descriptive statistics were generated to determine the characteristics of the residents in the study. Briefly, descriptive statistics was performed to explore i) the average number of unique medicines prescribed to residents, and ii) the number of residents prescribed dementia drugs (i.e. donepezil, rivastigmine, galantamine, and memantine) as a proxy measure for dementia diagnosis. In addition, descriptive statistics were generated to determine the characteristics of the medicines prescribed to the study population. More specifically, descriptive statistics were generated to categorise the medicines prescribed to residents according to i) the dosage regimen (i.e. regular, 'as required,' or 'as directed'), ii) the BNF drug category (Joint Formulary Committee 2019), and iii) the type of medicine formulation.

The researcher also obtained statistical advice from a statistician within the Doctoral Academy at Cardiff University regarding the relevant statistical tests to be used for the analysis of the data. The analysis of the data to achieve the research objectives is described below (section 2.3.4.1 to 2.3.4.3).

#### ***2.3.4.1 Anticholinergic drugs***

The medicine regimens prescribed to residents in this study were reviewed to identify anticholinergic drugs (see section 2.3.3 for further information) and were subsequently allocated scores from the AEC scale (1 to 3) (see appendix 2). The AEC scale was chosen for the analysis of anticholinergic drugs in this study because it is the most recent anticholinergic rating scale that was developed in the UK, and it is used as a national measure as part of the National Prescribing Indicators 2019-2020 in Wales (All Wales Medicines Strategy Group 2019).

The anticholinergic burden was calculated as the sum of the individual AEC scores of anticholinergic drugs prescribed for each resident to produce a cumulative AEC score. Residents were identified to be at risk of clinically relevant anticholinergic cognitive effects from anticholinergic drugs listed in the AEC scale if i) the resident was prescribed

an anticholinergic drug with an individual AEC score of 2 or more, or if ii) the resident had a cumulative AEC score of 3 or more (Bishara et al. 2016; Bishara et al. 2020).

Descriptive statistics were used to determine i) the proportion of residents prescribed anticholinergic drugs, ii) the number of anticholinergic drugs prescribed to residents, iii) the number of residents at risk of clinically relevant anticholinergic cognitive effects, and iv) the number of anticholinergic drugs categorised according to individual AEC scores that made up each cumulative AEC score in the study.

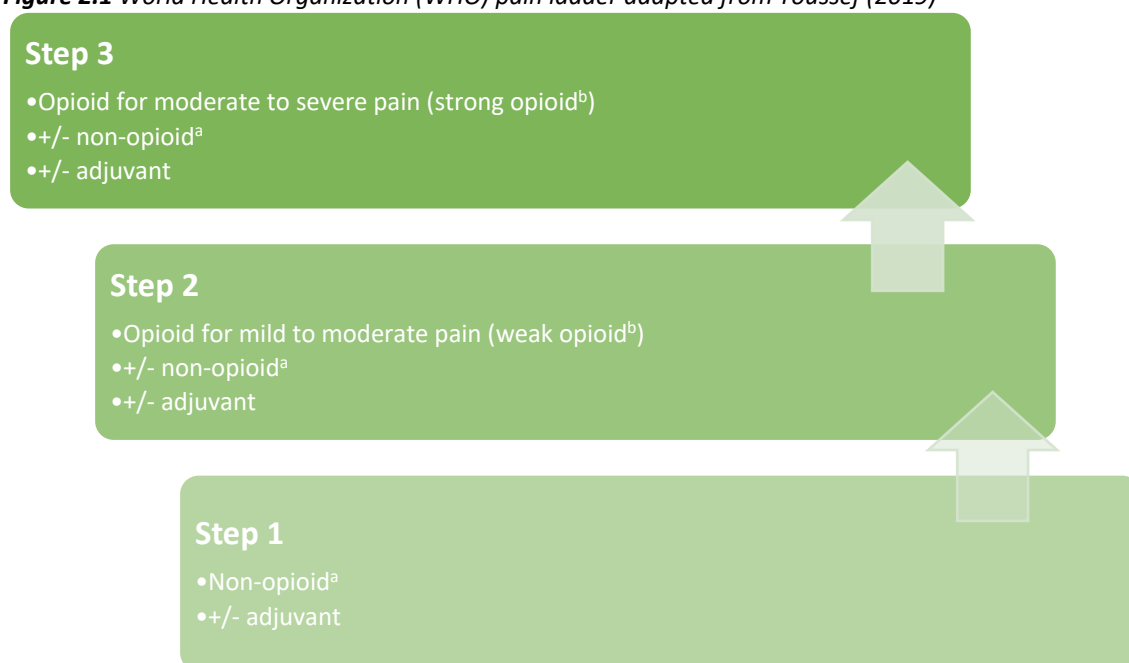
Statistical analysis was performed to compare the characteristics of the residents (using Chi-square tests and Mann-Whitney *U*-test), and the characteristics of the medicines prescribed to residents (using Chi-square tests) who were prescribed anticholinergic drugs compared to those who were not. The level of statistical significance was set at  $p$ -value < 0.05 for the Mann-Whitney *U*-tests. However, due to multiple Chi-square tests that were conducted, the level of statistical significance for the Chi-square tests was adjusted according to the Bonferroni correction and set at  $p$ -value < 0.01. In addition, effect size was determined using the Cramer's *V* value and *r* value for the Chi-square tests and Mann-Whitney *U*-tests respectively. Specifically, a value of 0.1 was considered a small effect, whereas 0.3 was considered a medium effect, and 0.5 was a large effect (Pallant 2016).

#### ***2.3.4.2 Analgesics, anxiolytics and hypnotics***

As the principles of the World Health Organization (WHO) pain ladder (**Figure 2.1**) have been previously used to develop guidelines for the management of both chronic and acute pain (Youssef 2019), the WHO pain ladder was chosen as a basis for the analysis of the appropriateness of analgesics prescribed to residents in the present study. For each of the residents prescribed analgesics (see section 2.3.3), their medicines regimen was analysed individually and subsequently classified as 'potentially appropriate' if the analgesics were prescribed in accordance with the WHO pain ladder (in addition to some modifications). Specifically, the medicines regimen was classified as 'potentially appropriate' if residents were prescribed:

- i) paracetamol to be administered 'as required' on its own, or
- ii) analgesics (either a weak opioid, short-acting strong opioid or non-opioid) to be administered regularly, or
- iii) paracetamol to be given regularly in addition to another analgesic (either a weak or a short-acting strong opioid) prescribed to be administered 'as required,' or
- iv) paracetamol to be given regularly in addition to another analgesic (either a weak or short-acting strong opioid) prescribed to be administered regularly (NHS Wales Aneurin Bevan Health Board 2012), or
- v) long-acting strong opioids to be administered regularly in addition to anticipatory short-acting opioid doses prescribed for breakthrough pain (American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons 2009).

**Figure 2.1** World Health Organization (WHO) pain ladder adapted from Youssef (2019)



<sup>a</sup>non-opioid; paracetamol, non-steroidal anti-inflammatory drug (NSAID)

<sup>b</sup>weak opioid; codeine, dihydrocodeine, tramadol

<sup>c</sup>strong opioid; morphine, oxycodone, fentanyl, buprenorphine

For each of the residents prescribed anxiolytics and/or hypnotics (see section 2.3.3), their medicines regimen was also analysed individually and classified according to the categories listed in the criteria developed for identifying the inappropriateness of anxiolytics and/or hypnotics (Franchi et al. 2019). Given that the dosage and clinical indication of the anxiolytics and/or hypnotics were unknown in the current study, only

three categories of the criteria developed by Franchi and colleagues in 2019 were used to identify potentially inappropriate anxiolytics and hypnotics in the present study. These three categories were: i) ‘always inappropriate’, ii) ‘inappropriate because it was co-prescribed with at least two other additional central nervous system-active drugs’, or iii) ‘inappropriate because it was co-prescribed with another anxiolytic or hypnotic.’ Anxiolytics and hypnotics which did not fit into one of these three categories were described as ‘appropriateness could not be determined,’ and therefore classified as ‘potentially appropriate.’

Furthermore, the administration of analgesics, anxiolytics and hypnotics prescribed on an ‘as required’ basis was also explored. **Equation 2.1** was used to calculate the percentage of ‘as required’ doses of i) analgesics and ii) anxiolytics and/or hypnotics that were administered to each resident based on the maximum number of ‘as required’ doses that could be administered for each resident. In addition, the reasons that were documented for ‘as required’ doses of analgesics, anxiolytics and hypnotics which were not administered during the study period was also explored.

**Equation 2.1** *General equation for calculating the percentage (%) of ‘as required’ (prn) doses of i) analgesics and ii) anxiolytics and/or hypnotics administered for each resident*

$$\% \text{ prn doses administered} = \frac{\text{No. of prn doses administered}}{\text{No. of prn doses that could be administered}} \times 100$$

Descriptive statistics were initially generated to determine i) the number of residents prescribed analgesics, and anxiolytics and/or hypnotics, ii) the number of analgesics, and anxiolytics and/or hypnotics prescribed to residents, iii) the number of residents prescribed inappropriate analgesics, and anxiolytics and/or hypnotics, iv) the number of residents prescribed ‘as required’ analgesics, and anxiolytics and/or hypnotics, v) the number of residents prescribed opioids with laxatives, vi) the number of residents prescribed NSAIDs with a proton-pump inhibitor, and vii) the average percentage of ‘as required’ doses of analgesics, and anxiolytics and/or hypnotics that were administered.

Statistical analysis was performed to compare the characteristics of the residents (using Chi-square tests and Mann-Whitney *U*-test) who were prescribed appropriate versus inappropriate i) analgesics and ii) anxiolytics and/or hypnotics. In addition, statistical

analysis was also performed to compare the characteristics of the residents (using Mann-Whitney *U*-tests) with the percentage of doses of 'as required' i) analgesics and ii) anxiolytics and/or hypnotics that were administered to residents. The level of statistical significance was set at  $p$ -value $<0.05$  for the Mann-Whitney *U*-tests. However, due to multiple Chi-square tests that were conducted, the level of statistical significance for the Chi-square tests was adjusted according to the Bonferroni correction and set at  $p$ -value $<0.01$ . In addition, effect size was determined using the Cramer's *V* value and *r* value for the Chi-square tests and Mann-Whitney *U*-tests respectively (Pallant 2016).

#### **2.3.4.3 Antimicrobials**

Only prescribing data within the month of November 2017 was extracted and used for the analysis of the duration of antimicrobial courses. This method is consistent with previous research which examined antimicrobial prescribing within a one month period (McClean et al. 2012). Therefore, if an antimicrobial was administered on the 1<sup>st</sup> November 2017, it was assumed that the course commenced from that date only (e.g. the administration of amoxicillin 500mg from 1<sup>st</sup> November to 4<sup>th</sup> November 2017 was identified as a four day antimicrobial course). Whilst this may not reflect the full duration of antimicrobial courses prescribed in this study, the researcher checked the number of antimicrobials that were prescribed during the beginning and end of November 2017 and found that only four antimicrobial courses were prescribed either during the beginning or end of November 2017. As such, the majority of course durations calculated in this study were an accurate reflection of the total course lengths that were prescribed.

The medicine regimens were examined for every resident to identify the types of antimicrobials that were prescribed according to the antimicrobial classes listed in the BNF (see section 2.3.3) (Joint Formulary Committee 2019). The administration patterns of each antimicrobial regimen were also examined to determine the extent to which they were administered according to the prescriber's intention. **Equation 2.2** was used to calculate the percentage of antimicrobial doses administered for each antimicrobial course that was prescribed during the study period.

**Equation 2.2** General equation for calculating the percentage (%) of antimicrobial (Abx) doses administered for each course that was prescribed

$$\% \text{ Abx doses administered} = \frac{\text{No. of Abx doses administered}}{\text{No. of Abx doses due to be administered}} \times 100$$

Descriptive statistics were initially generated to determine i) the number of residents prescribed antimicrobials, ii) the number of antimicrobials prescribed to residents, iii) the average duration of antimicrobials prescribed to residents, iv) the number of antimicrobial courses that were fully completed, and v) the reasons for non-administration of antimicrobial doses. Of note, when the number of antimicrobials prescribed per resident was calculated, antimicrobials prescribed for the prophylaxis of UTIs were counted as one antimicrobial course.

In addition, the antimicrobial regimens were reviewed individually for each resident prescribed more than two antimicrobial courses during the study period. Common prescribing patterns that occurred for these residents were subsequently grouped together under key themes.

Furthermore, the prescribing and administration of antimicrobials for the management (prophylaxis and/or treatment) of UTIs was examined. Descriptive statistics were generated to determine i) the number of residents prescribed antimicrobials for management of UTIs, ii) the number of antimicrobial courses prescribed for the management of UTIs that were fully completed, and iii) the reasons for non-administration of antimicrobial doses for UTIs. A Mann-Whitney *U*-test was also performed to detect for differences in the percentage of antimicrobial doses administered for courses prescribed for the prophylaxis versus treatment of UTIs. As per the previous Mann-Whitney *U*-tests that were performed,  $p$ -value < 0.05 was considered statistically significant. Again, effect size was also determined using the  $r$  value for the Mann-Whitney *U*-tests (Pallant 2016).

## 2.4 Results

This study sought to explore the prescribing of i) anticholinergic drugs, ii) anxiolytics, hypnotics and analgesics, and iii) antimicrobials in a sample of nursing homes in the UK. In addition, the administration of anxiolytics, hypnotics and analgesics that were prescribed ‘as required’, and administration of antimicrobials were examined. Prescribing and medicines administration data for a medicines cycle in November 2017 was extracted from the digital medicines administration records of nursing homes that utilised a digital medication management system (PCS™).

### 2.4.1 Demographics of nursing homes

The prescribing patterns of all residents ( $n=483$ ) residing in eight privately owned nursing homes in the UK were analysed in this present study. All residents in these nursing homes were aged 65 years and older. **Table 2.2** shows that the majority of the nursing homes were situated in a rural location ( $n=5$ ), with the remaining three nursing homes located in urban areas of the UK. Of note, nursing homes which had a higher bed capacity for residents tended to be located in a rural location (**Table 2.2**).

**Table 2.2** Information relating to the characteristics of the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All	Mean (range)
Location <sup>a</sup>	U	R	R	R	U	R	U	R	n/a	n/a
Beds, $n$	36	70	87	80	29	75	39	60	476	59.5 (29 - 87)
Residents, $n$	34	71	103	78	38	75	40	44	483	60.4 (34 - 103)

<sup>a</sup>classified in accordance with the 2011 Rural Urban Classification data from the Office for National Statistics; R=Rural, U=Urban

For some nursing homes, the number of beds were less than the number of residents. This is due to the movement of residents to and from the nursing homes during the study period (i.e. new residents were admitted whilst some residents were discharged from the homes)

**Table 2.3** summarises the characteristics of the residents of the eight nursing homes. The median number of medicines prescribed per resident in each nursing home varied between five to nine medicines. Residents from each of the nursing homes were mainly prescribed medicines scheduled for regular administration, ranging between a median



of four to seven regular medicines. The prescribing of 'as required' or 'as directed' medicines was much lower ranging between a median of zero to two medicines per resident. Whilst some residents (38.5%,  $n=186$ ) were not prescribed any medicines to be administered on an 'as required' or 'as directed' basis, four residents were prescribed five different medicines that were required to be given 'as required' or 'as directed.'

**Table 2.3** Information relating to the characteristics of the residents of the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
Residents, $n$	34	71	103	78	38	75	40	44	483
Median no. of medicines per resident, (interquartile range)	8 (7 - 11)	7 (5 - 9)	5 (3 - 7)	6 (5 - 9)	8 (4 - 10)	9 (6 - 13)	8 (4 - 10)	6 (3 - 9)	7 (4 - 9)
Median no. of regular medicines per resident, (interquartile range)	7 (5 - 9)	7 (5 - 9)	4 (2 - 6)	6 (4 - 9)	6 (4 - 9)	7 (5 - 10)	7 (4 - 8)	5 (3 - 8)	6 (4 - 8)
Median no. of 'as required' or 'as directed' medicines per resident, (interquartile range)	1 (1 - 2)	0 (0 - 1)	1 (0 - 2)	0 (0 - 1)	1 (0 - 1)	2 (1 - 2)	1 (0 - 2)	1 (0 - 1)	1 (0 - 2)

A total of 3,562 medicines were prescribed to 483 residents and these medicines were subsequently categorised according to the i) type of dosage regimen, ii) BNF category, and iii) the pharmaceutical formulation (see **Table 2.4**). The majority of the medicines were prescribed to be administered regularly (86.5%,  $n=3,082$ ), prescribed primarily for the nervous system (34.3%,  $n=1,222$ ), and prescribed in tablet/capsule form (74.7%,  $n=2,662$ ). As a whole, medicines prescribed for the nervous system, cardiovascular system, and gastrointestinal system accounted for more than two-thirds of the medicines prescribed (69.8%  $n=2,484$ ), and the least frequently prescribed medicines were prescribed for the immune system and malignancy (0.2%,  $n=8$ ). This pattern of prescribing was consistent across nursing homes.

**Table 2.4** Information relating to the i) type of dosage regimen prescribed, ii) type of medicine prescribed by BNF drug category, and iii) type of medicine formulation prescribed to residents of the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
<b>Medicines, n</b>	305	531	543	575	298	725	298	287	3,562
<b>Type of dosage regimen prescribed, n (%)</b>									
Regular	248 (81.3)	504 (94.9)	442 (81.4)	525 (91.3)	262 (87.9)	595 (82.1)	256 (85.9)	250 (87.1)	3,082 (86.5)
As required	53 (17.4)	27 (5.1)	100 (18.4)	42 (7.3)	35 (11.7)	92 (12.7)	38 (12.8)	34 (11.8)	421 (11.8)
As directed	4 (1.3)	0 (0.0)	1 (0.2)	8 (1.4)	1 (0.3)	38 (5.2)	4 (1.3)	3 (1.0)	59 (1.6)
<b>Type of medicine prescribed by BNF drug category, n (%)</b>									
Gastrointestinal system	62 (20.3)	97 (18.3)	115 (21.2)	82 (14.3)	54 (18.1)	136 (18.8)	56 (18.8)	52 (18.1)	654 (18.4)
Cardiovascular system	28 (9.2)	120 (22.6)	69 (12.7)	100 (17.4)	52 (17.4)	119 (16.4)	55 (18.5)	65 (22.6)	608 (17.1)
Respiratory system	2 (0.7)	9 (1.7)	15 (2.8)	13 (2.3)	8 (2.7)	30 (4.1)	8 (2.7)	14 (4.9)	99 (2.8)
Nervous system	146 (47.9)	112 (21.1)	232 (42.7)	233 (40.5)	105 (35.2)	213 (29.4)	108 (36.2)	73 (25.4)	1,222 (34.3)
Infection	4 (1.3)	29 (5.5)	10 (1.8)	40 (7.0)	7 (2.3)	4 (5.9)	18 (6.0)	7 (2.4)	158 (4.4)
Endocrine system	14 (4.6)	49 (9.2)	39 (7.2)	21 (3.7)	17 (5.7)	55 (7.6)	19 (6.4)	27 (9.4)	241 (6.8)
Genitourinary system	6 (2.0)	8 (1.5)	4 (0.7)	2 (0.3)	7 (2.3)	16 (2.2)	2 (0.7)	4 (1.4)	49 (1.4)
Immune system and malignancy	0 (0.0)	2 (0.4)	1 (0.2)	4 (0.7)	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)	8 (0.2)
Blood and nutrition	14 (4.6)	65 (12.2)	32 (5.9)	55 (9.6)	31 (10.4)	61 (8.4)	18 (6.0)	15 (5.2)	291 (8.2)
Musculoskeletal system	7 (2.3)	7 (1.3)	3 (0.6)	2 (0.3)	4 (1.3)	22 (3.0)	5 (1.7)	4 (1.4)	54 (1.5)
Eye	3 (1.0)	16 (3.0)	11 (2.0)	10 (1.7)	4 (1.3)	6 (0.8)	6 (2.0)	15 (5.2)	71 (2.0)
Ear, nose and oropharynx	5 (1.6)	3 (0.6)	1 (0.2)	3 (0.5)	1 (0.3)	9 (1.2)	0 (0.0)	1 (0.3)	23 (0.6)
Skin	14 (4.6)	14 (2.6)	11 (2.0)	10 (1.7)	8 (2.7)	15 (2.1)	2 (0.7)	10 (3.5)	84 (2.4)
<b>Type of medicine formulation prescribed, n (%)</b>									
Tablet/capsule	203 (66.6)	388 (73.1)	397 (73.1)	465 (80.9)	236 (79.2)	530 (73.1)	233 (78.2)	210 (73.2)	2,662 (74.7)
Liquid	73 (23.9)	82 (15.4)	96 (17.7)	59 (10.3)	36 (12.1)	108 (14.9)	40 (13.4)	32 (11.1)	526 (14.8)
Topical	22 (7.2)	38 (7.2)	24 (4.4)	22 (3.8)	16 (5.4)	55 (7.6)	9 (3.0)	31 (10.8)	217 (6.1)
Inhaler	2 (0.7)	3 (0.6)	4 (0.7)	4 (0.7)	5 (1.7)	14 (1.9)	4 (1.3)	5 (1.7)	41 (1.2)
Transdermal	2 (0.7)	13 (2.4)	11 (2.0)	15 (2.6)	3 (1.0)	14 (1.9)	9 (3.0)	7 (2.4)	74 (2.1)
Injection	3 (1)	7 (1.3)	11 (2.0)	10 (1.7)	2 (0.7)	4 (0.6)	3 (1.0)	2 (0.7)	42 (1.2)

In addition, the number of residents who were prescribed dementia drugs was used as a proxy measure for dementia diagnosis, and this varied across the homes (see **Table 2.5**). Overall, 31.3% of the residents ( $n=151$ ) were prescribed dementia drugs.

**Table 2.5** Information relating to the number of residents prescribed dementia drugs across the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
Residents, $n$	34	71	103	78	38	75	40	44	483
Residents prescribed dementia drugs, $n$ (%)	19 (55.9)	11 (15.5)	33 (32.0)	42 (53.8)	15 (39.5)	16 (21.3)	9 (22.5)	6 (13.6)	151 (31.3)

## 2.4.2 Anticholinergic drugs

### 2.4.2.1 Prescribing of anticholinergic drugs

A medicine was classified as an anticholinergic drug according to the AEC scale (appendix 2) and overall, a total of 241 residents (49.9%) were prescribed anticholinergic drugs (see **Table 2.6**). The percentage of residents prescribed anticholinergic drugs ranged from 38.0% to 64.7% across the homes. With the exception of NH1-6 where residents were prescribed a range of zero to five anticholinergic drugs, residents from the other homes were prescribed between zero and three anticholinergic drugs. Further analysis showed that a single resident from NH1-6 was prescribed five anticholinergic drugs during the study period, and excluding this resident brought the home into line with others i.e., zero to three anticholinergic drugs prescribed.

**Table 2.6** Proportion of residents prescribed anticholinergic drugs and the range in which these medicines were prescribed across the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
Residents prescribed anticholinergic drugs, <i>n</i> (%)	22 (64.7)	27 (38.0)	50 (48.5)	41 (52.6)	22 (57.9)	32 (42.7)	22 (55.0)	25 (56.8)	241 (49.9)
Number of anticholinergic drugs prescribed per resident, range	0 - 3	0 - 3	0 - 3	0 - 3	0 - 3	0 - 5	0 - 3	0 - 3	0 - 5

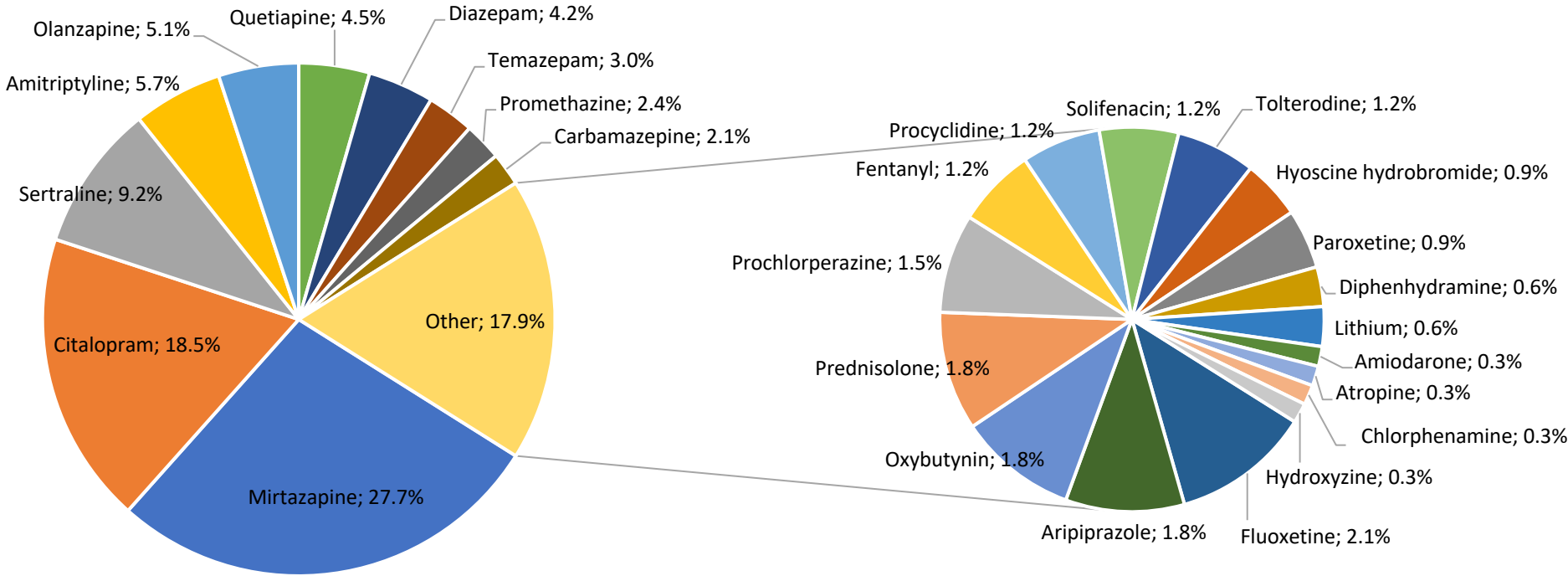
A total of 336 anticholinergic drugs were prescribed to the 241 residents, the majority of whom were prescribed medicines with an AEC score of 1 (73.8%  $n=248$ ) (see **Table 2.7**). This was consistent in each home, with the percentage of medicines with an AEC score of 1 ranging between 53.1% to 84.8%. With the exception of NH1-8, anticholinergic drugs that had an AEC score of 3 accounted for the least number of anticholinergic drugs prescribed across the homes (range=0% to 34.4%).

**Table 2.7** The types of anticholinergic drugs prescribed by AEC score across the eight nursing homes

Nursing home code	Anticholinergic drugs prescribed and categorised by AEC score, <i>n</i> (%)		
	AEC score of 1	AEC score of 2	AEC score of 3
NH1-1	28 (84.8)	5 (15.2)	0 (0.0)
NH1-2	30 (78.9)	5 (13.2)	3 (7.9)
NH1-3	53 (75.7)	9 (12.9)	8 (11.4)
NH1-4	42 (76.4)	8 (14.5)	5 (9.1)
NH1-5	23 (76.7)	4 (13.3)	3 (10.0)
NH1-6	33 (67.3)	8 (16.3)	8 (16.3)
NH1-7	22 (75.9)	4 (13.8)	3 (10.3)
NH1-8	17 (53.1)	4 (12.5)	11 (34.4)
<b>All</b>	<b>248 (73.8)</b>	<b>47 (14.0)</b>	<b>41 (12.2)</b>

A total of 27 unique anticholinergic drugs were prescribed (see **Figure 2.2**), with mirtazapine the most commonly prescribed anticholinergic drug (27.7%,  $n=93$ ). In addition, antidepressants including i) mirtazapine, ii) citalopram, and iii) sertraline accounted for over one-half (55.4%,  $n=186$ ) of the anticholinergic drugs prescribed over the study period.

Figure 2.2 Anticholinergic drugs (n=336) that were prescribed to residents



A further breakdown of the top 10 most prescribed anticholinergic drugs with their corresponding AEC score and the number of residents prescribed these medicines is shown in **Table 2.8**. Six of the top 10 most prescribed anticholinergic drugs had an AEC score of 1. Most of the residents who received prescriptions for anticholinergic drugs were prescribed mirtazapine (38.6%,  $n=93$ ). Of the top 10 most prescribed medicines, there were a total of four medicines that had either an AEC score of 2 (olanzapine and quetiapine) or AEC score of 3 (amitriptyline and promethazine).

**Table 2.8** *The top 10 most prescribed anticholinergic drugs with their corresponding AEC score and the number of residents that were prescribed these medicines*

Medicine name	AEC score	Residents prescribed this medicine (N=241), n (%)
Mirtazapine	1	93 (38.6)
Citalopram	1	62 (25.7)
Sertraline	1	31 (12.9)
Amitriptyline	3	19 (7.9)
Olanzapine	2	17 (7.1)
Quetiapine	2	15 (6.2)
Diazepam	1	14 (5.8)
Temazepam	1	10 (4.1)
Promethazine	3	8 (3.3)
Carbamazepine	1	7 (2.9)

Given that the top three most prescribed anticholinergic drugs were all antidepressants, a sub-analysis of these anticholinergics was conducted. It was found that mirtazapine, prescribed to 93 residents, was often prescribed concomitantly with either citalopram (10 residents; 10.6%), or sertraline (4 residents; 4.3%). For the residents who were co-prescribed mirtazapine and citalopram, three residents were prescribed the maximum geriatric doses of 45mg and 20mg respectively.

#### **2.4.2.2 Comparison of the characteristics of residents prescribed anticholinergic drugs (ACD+ve) compared with those who were not (ACD-ve)**

For this part of the analysis, the 483 residents were separated into residents prescribed anticholinergic drugs (ACD+ve) and those who weren't (ACD-ve). The two groups were then compared according to: i) the total number of medicines prescribed per resident, ii) number of residents with dementia (i.e. those prescribed dementia drugs), iii) the

type of dosage regimen prescribed, iv) the type of medicines prescribed by BNF category, and v) the type of formulations prescribed.

The 241 residents who were ACD+ve were on average prescribed a higher number of medicines ( $Md=8$ , interquartile range=6 to 11) compared to the 242 residents who were ACD-ve ( $Md=5$ , interquartile range=3 to 8). A Mann-Whitney  $U$ -test was conducted to test for differences in the total number of medicines prescribed to ACD+ve versus ACD-ve (see **Table 2.9**). The Mann-Whitney  $U$ -tests revealed a statistically significant difference ( $p$ -value<0.001) with a medium effect size ( $r=0.39$ ).

**Table 2.9** Results from the Mann-Whitney  $U$ -test to test for differences in the total number of medicines prescribed for ACD+ve versus ACD-ve

Mann-Whitney $U$ -test	Residents prescribed anticholinergic drugs ( $n$ )	$Md$ (IQR) <sup>a</sup>	$U$	$Z$	$r$	$p$ -value
Total number of medicines prescribed	ACD+ve <sup>b</sup> (241)	8 (6 to 11)	15916.00	-8.67	0.39	<0.001
	ACD-ve <sup>c</sup> (242)	5 (3 to 8)				

<sup>a</sup> $Md$  (IQR) = median (interquartile range)

<sup>b</sup>ACD+ve = residents prescribed anticholinergic drugs

<sup>c</sup>ACD-ve = residents not prescribed anticholinergic drugs

Of the 241 residents who were ACD+ve, 77 residents had a dementia diagnosis (32.0%) and 34 of these residents were managed with cholinesterase inhibitors (i.e. donepezil, rivastigmine, and galantamine). There was also approximately the same proportion of residents with dementia in the group of 242 residents who were ACD-ve (31.0%,  $n=74$ ) and 35 of these residents were managed with cholinesterase inhibitors. **Table 2.10** shows that analysis using the Chi-square test of independence indicated that there was no statistically significant association between residents with dementia and the prescribing of anticholinergic drugs ( $p$ -value=0.821).

**Table 2.10** Results from the Chi-square test of independence to test for the association between residents with dementia and the prescribing of anticholinergic drugs

Chi-square test of independence	df	$n$	Cramer's $V$	$p$ -value
Residents with dementia	1	483	0.1	0.821

**Table 2.11** shows the characteristics of the medicines prescribed to residents who were ACD+ve compared to those who were ACD-ve. Of note, similar medicines dosage regimens were prescribed to ACD+ve and ACD-ve. Whilst medicines were mainly

prescribed for the nervous system irrespective of whether residents were prescribed anticholinergic drugs or not, residents who were ACD-ve were prescribed slightly less medicines for the nervous system (27.7%,  $n=386$ ) compared to residents who were ACD+ve (38.6%,  $n=836$ ). Instead, it was found that ACD-ve residents were prescribed more medicines for the gastrointestinal system and cardiovascular system compared to the residents who were ACD+ve (39.5%,  $n=551$ , vs. 32.8%,  $n=711$ ). In addition, residents who were ACD-ve were prescribed more liquid medicines compared to the group of residents who were ACD+ve (17.6%,  $n=245$ , vs. 13.0%,  $n=281$ ).

**Table 2.11** Information relating to the i) type of dosage regimen prescribed, ii) type of medicine prescribed by BNF drug category, and iii) type of medicine formulation prescribed to residents categorised according to ACD+ve and ACD-ve

Characteristic of medicines prescribed	ACD+ve <sup>a</sup>	ACD-ve <sup>b</sup>
<b>Medicines, <i>n</i></b>	2,166	1,396
<b>Type of dosage regimen prescribed, <i>n</i> (%)</b>		
Regular	1,899 (87.7)	1,183 (84.7)
As required	236 (10.9)	185 (13.3)
As directed	31 (1.4)	28 (2.0)
<b>Type of medicine prescribed by BNF drug category, <i>n</i> (%)</b>		
Gastrointestinal system	369 (17.0)	285 (20.4)
Cardiovascular system	342 (15.8)	266 (19.1)
Respiratory system	59 (2.7)	40 (2.9)
Nervous system	836 (38.6)	386 (27.7)
Infection	82 (3.8)	76 (5.4)
Endocrine system	142 (6.6)	99 (7.1)
Genitourinary system	32 (1.5)	17 (1.2)
Immune system and malignancy	7 (0.3)	1 (0.1)
Blood and nutrition	149 (6.9)	142 (10.2)
Musculoskeletal system	37 (1.7)	17 (1.2)
Eye	43 (2.0)	28 (2.0)
Ear, nose and oropharynx	11 (0.5)	12 (0.9)
Skin	57 (2.6)	27 (1.9)
<b>Type of medicine formulation prescribed, <i>n</i> (%)</b>		
Tablet/capsule	1,655 (76.4)	1,007 (72.1)
Liquid	281 (13.0)	245 (17.6)
Topical	134 (6.2)	83 (5.9)
Inhaler	20 (0.9)	21 (1.5)
Transdermal	49 (2.3)	25 (1.8)
Injection	27 (1.2)	15 (1.1)

<sup>a</sup>ACD+ve = residents prescribed anticholinergic drugs

<sup>b</sup>ACD-ve = residents not prescribed anticholinergic drugs

Further analysis using the Chi-square test of independence indicated that there was no statistically significant association between the type of medicine dosage regimens



prescribed to residents and the prescribing of anticholinergic drugs (see **Table 2.12**). Two further tests using Chi-square test of independence indicated that there were statistically significant associations between the prescribing of anticholinergic drugs with i) the type of medicines prescribed to residents by BNF drug category ( $p$ -value<0.0001), and ii) the type of medicine formulations prescribed ( $p$ -value=0.003). Although statistically significant relationships were established for these two parameters, the Cramer's  $V$  values indicate that the effect sizes were small (see **Table 2.12**).

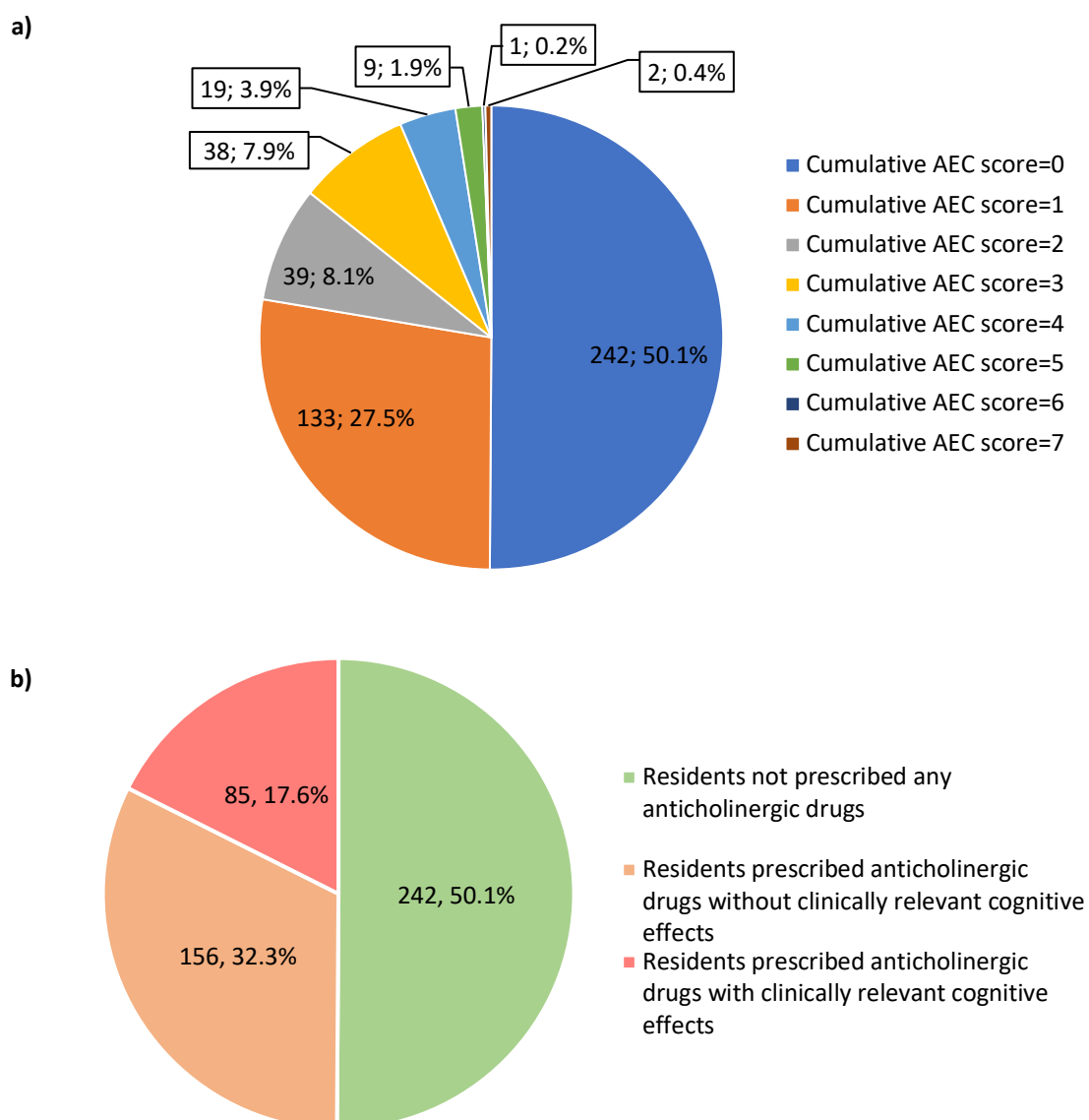
**Table 2.12** Results from the Chi-square test of independence to test for the association between the characteristics of medicines prescribed to residents and the prescribing of anticholinergic drugs

Characteristic of medicines prescribed	df	<i>n</i>	Cramer's <i>V</i>	<i>p</i> -value
Type of dosage regimen prescribed	2	3,562	0.043	0.038
Type of medicine prescribed by BNF drug category	12	3,562	0.135	<0.0001
Type of medicine formulation prescribed	5	3,562	0.071	0.003

#### 2.4.2.3 Anticholinergic burden

There was a considerable range of cumulative AEC scores calculated for the 483 residents in the study and these scores ranged between zero to seven (see **Figure 2.3**). The most common cumulative AEC score was 1 ( $n=133$ ), although 69 residents (14.3%) had a clinically relevant cumulative AEC score of 3 or more. In addition, of the 39 residents who had a cumulative AEC score of 2, 16 residents were prescribed an anticholinergic drug with a clinically relevant AEC score of 2. As shown in **Figure 2.3b**, 85 residents (17.6%) were at risk of clinically relevant anticholinergic cognitive effects from their medicines regimen.

**Figure 2.3** a) figure to show the cumulative AEC scores of the 483 residents studied, and b) figure to show percentage of the 483 residents who were prescribed anticholinergic drugs with clinically relevant cognitive effects



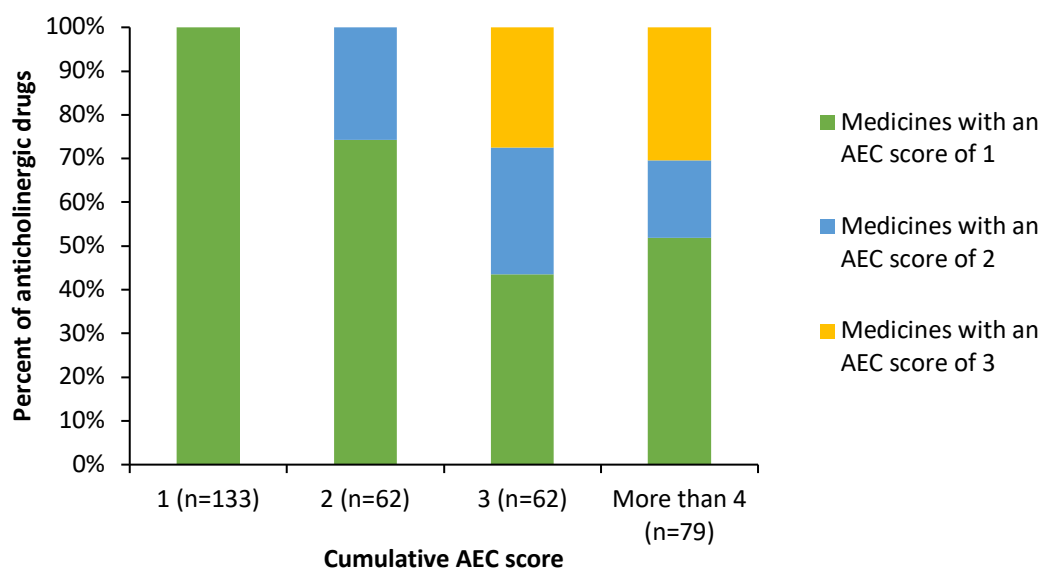
**Table 2.13** illustrates the breakdown of the cumulative AEC scores of residents prescribed anticholinergic drugs from each nursing home. The patterns of cumulative AEC scores across all the homes were fairly consistent. Whilst residents in NH1-6 and NH1-8 were mostly prescribed medicines with either a cumulative AEC score of 1 or cumulative AEC score of 3 or more, all other nursing home residents were mostly prescribed medicines which produced an overall cumulative AEC score of 1. Except for NH1-3 and NH1-4, residents of the other nursing homes were least commonly prescribed anticholinergic drugs that produced a cumulative AEC score of 2.

**Table 2.13** A breakdown of the cumulative AEC scores from each nursing home

Nursing home code	Residents (n)	Residents with a cumulative AEC score of 1, n (%)	Residents with a cumulative AEC score of 2, n (%)	Residents with a cumulative AEC score of 3 or more, n (%)
NH1-1	34	13 (38.3)	4 (11.8)	5 (14.7)
NH1-2	71	16 (22.5)	4 (5.6)	7 (9.8)
NH1-3	103	26 (25.2)	12 (11.7)	12 (11.7)
NH1-4	78	24 (30.8)	9 (11.5)	8 (10.3)
NH1-5	38	13 (34.2)	4 (10.5)	5 (13.2)
NH1-6	75	14 (18.7)	4 (5.3)	14 (18.7)
NH1-7	40	15 (37.5)	1 (2.5)	6 (15.0)
NH1-8	44	12 (27.3)	1 (2.3)	12 (27.3)
<b>All</b>	<b>483</b>	<b>133 (27.5)</b>	<b>39 (8.1)</b>	<b>69 (14.3)</b>

A sub-analysis was also conducted to understand the individual AEC scores of anticholinergic drugs ( $n=336$ ) which made up the relative cumulative AEC scores. **Figure 2.4** illustrates the relationship between the individual AEC scores of the 336 anticholinergic drugs prescribed and the cumulative AEC scores during the study. A cumulative AEC score of 2 or more was mostly made up of medicines with an AEC score of 1. There were a total of 62 medicines which contributed towards the cumulative AEC score of 2, and of which 74.2% of the medicines had an AEC score of 1 ( $n=46$ ). Similarly, a total of 62 medicines contributed towards the cumulative AEC score of 3, of which 43.5% had an AEC score of 1 ( $n=27$ ). Of note, even for a cumulative AEC score of 4 or more, 51.6% of the individual medicines prescribed had an AEC score of 1 ( $n=41$ ). These results suggest that cumulative AEC burden is a result of the concomitant prescribing of multiple medicines with a low individual AEC score rather than a single medicine with a high individual score.

**Figure 2.4** The relationship between the individual AEC score of anticholinergic drugs prescribed (n=336) and the cumulative AEC scores



### 2.4.3 Analgesics

#### 2.4.3.1 Prescribing of analgesics

Overall, there were a total of 235 residents (48.7%) prescribed analgesics. Considerable variations in the percentage of residents prescribed analgesics were identified across the homes during the study (see **Table 2.14**) ranging from 26.2% to 88.2%. As can be seen from **Table 2.14**, residents from NH1-6 were prescribed the highest number of analgesics. Except for NH1-4 and NH1-6 where residents were prescribed up to three and four analgesics respectively, residents from the other homes were prescribed up to two analgesics. Further analysis showed that there was only one resident from NH1-6 who was prescribed four analgesics.

**Table 2.14** Proportion of residents prescribed analgesics and the range in which these medicines were prescribed across the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
Residents, <i>n</i>	34	71	103	78	38	75	40	44	483
Residents prescribed analgesics, <i>n</i> (%)	30 (88.2)	26 (36.6)	27 (26.2)	38 (48.7)	20 (52.6)	62 (82.7)	17 (42.5)	15 (34.1)	235 (48.7)
Number of analgesics prescribed per resident, range	0 - 2	0 - 2	0 - 2	0 - 3	0 - 2	0 - 4	0 - 2	0 - 2	0 - 4

A total of 293 analgesics classified as either i) paracetamol, ii) combination preparations (i.e. a paracetamol and weak opioid preparation like co-codamol), iii) non-steroidal anti-inflammatory drugs (NSAIDs), and iv) opioids, were prescribed to 235 residents (see **Table 2.15**). Overall, paracetamol was the most prescribed analgesic accounting for more than one-half of the analgesics prescribed (63.1%, *n*=185). Except for NH1-2 in which buprenorphine was the most prescribed analgesic, paracetamol was the most prescribed analgesic in all other homes ranging between 42.1% to 87.0% of all analgesics prescribed. Buprenorphine was the most prescribed opioid in all homes and almost 1 in 5 analgesics prescribed over the study period was buprenorphine. Nevertheless, considerable variability in the prescribing of buprenorphine was found across the homes. Of note, only 3.1% of the analgesics prescribed in NH1-1 was buprenorphine, compared to 41.4% in NH1-2. All the prescribed buprenorphine were administered in the form of long-acting transdermal patches. NSAIDs accounted for the least number of analgesics prescribed. Only 8 NSAIDs were prescribed during the study and residents from NH1-1, NH1-5, NH1-7, NH1-8 were not prescribed any NSAIDs at all.

**Table 2.15** The types of analgesics prescribed across the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
<b>Analgesics prescribed, n</b>	32	29	30	47	23	90	23	19	293
<b>Paracetamol, n (%)</b>	27 (84.4)	11 (37.9)	20 (66.7)	29 (61.7)	20 (87.0)	55 (61.1)	15 (65.2)	8 (42.1)	185 (63.1)
<b>Combination preparations n (%)</b>									
Co-codamol	3 (9.4)	2 (6.9)	1 (3.3)	5 (10.6)	0 (0.0)	9 (10)	0 (0.0)	1 (5.3)	21 (7.2)
Co-dydramol	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.1)	0 (0.0)	0 (0.0)	1 (0.3)
<b>Non-steroidal anti-inflammatory drugs (NSAIDs), n (%)</b>									
Ibuprofen	0 (0.0)	1 (3.4)	0 (0.0)	1 (2.1)	0 (0.0)	2 (2.2)	0 (0.0)	0 (0.0)	4 (1.4)
Mefenamic acid	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.1)	0 (0.0)	0 (0.0)	1 (0.3)
Meloxicam	0 (0.0)	1 (3.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.3)
Naproxen	0 (0.0)	0 (0.0)	1 (3.3)	0 (0.0)	0 (0.0)	1 (1.1)	0 (0.0)	0 (0.0)	2 (0.7)
<b>Opioid analgesics, n (%)</b>									
Buprenorphine	1 (3.1)	12 (41.4)	5 (16.7)	11 (23.4)	2 (8.7)	10 (11.1)	7 (30.4)	6 (31.6)	54 (18.4)
Codeine	1 (3.1)	0 (0.0)	3 (10.0)	0 (0.0)	0 (0.0)	5 (5.6)	0 (0.0)	1 (5.3)	10 (3.4)
Fentanyl	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.1)	1 (4.3)	1 (1.1)	1 (4.3)	0 (0.0)	4 (1.4)
Morphine	0 (0.0)	1 (3.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (10.5)	3 (1.0)
Oxycodone	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (3.3)	0 (0.0)	0 (0.0)	3 (1.0)
Tramadol	0 (0.0)	1 (3.4)	0 (0.0)	0 (0.0)	0 (0.0)	2 (2.2)	0 (0.0)	1 (5.3)	4 (1.4)

### 2.4.3.2 The inappropriate prescribing of analgesics

The pain management of the 235 residents who were prescribed analgesics in this study were analysed individually and subsequently classified as 'appropriate' if their analgesia was prescribed in accordance with the World Health Organization (WHO) pain ladder in addition to some modifications as described in section 2.3.4.2. Of these 235 residents, only 160 residents (68.0%) were deemed to be managed appropriately within the guidelines (see **Table 2.16**).

The pain management of 75 residents (31.9%) was therefore deemed to be inappropriate. For more than 75% of these residents (58/75 residents = 77.3%) this was either because i) a long-acting strong opioid was prescribed to be administered regularly alone ( $n=28$ ), ii) a long-acting strong opioid was prescribed to be administered regularly with paracetamol to be given 'as required' ( $n=20$ ), or iii) a combination analgesic was prescribed to be administered 'as required' alone ( $n=10$ ). In addition, the pain management of more than one-half of the residents who were poorly managed involved the prescribing of strong opioids (52/75 residents = 69.3%) and in most cases involved buprenorphine (43 residents).

**Table 2.16** A breakdown of the incidences whereby the pain management schedule prescribed to residents failed to follow the recommendations of the WHO pain ladder in addition to the modifications as described in section 2.3.4.2

Description of the pain management schedule that was prescribed and did not follow WHO pain ladder recommendations	Number of residents affected, $n$	%
'Regular' long-acting strong opioid alone	28	37.3
'Regular' long-acting strong opioid + 'as required' paracetamol	20	26.7
'As required' combination analgesic alone	10	13.3
'As required' weak opioid alone	4	5.3
'As required' paracetamol + 'as required' combination analgesic	4	5.3
'As required' paracetamol + 'as required' weak opioid	3	4.0
'Regular' long-acting strong opioid + 'as required' paracetamol + 'as required' combination analgesic	2	2.7
'Regular' combination analgesic + 'as required' paracetamol	2	2.7
'Regular' long-acting strong opioid + 'as required' paracetamol + 'as required' weak opioid	1	1.3
'Regular' long-acting strong opioid + 'regular' weak opioid	1	1.3
<b>Total</b>	<b>75</b>	<b>100.0</b>

The 235 residents who were prescribed analgesia in this study were separated into those who were prescribed appropriate analgesia (A-Analg) and those who weren't (I-Analg) for further analysis. Comparisons were made with respect to: i) residents with dementia (i.e. those prescribed dementia drugs), ii) residents prescribed anxiolytics and/or hypnotics, and iii) the total number of medicines prescribed to residents.

When comparing A-Analg and I-Analg, it was found that there were similar proportions of residents i) with dementia, and ii) prescribed anxiolytics and/or hypnotics irrespective of whether residents were prescribed appropriate analgesia or not (**Table 2.17**).

**Table 2.17** Information relating to the characteristics of the residents regarding i) residents with dementia, and ii) residents prescribed anxiolytics and/or hypnotics categorised according to A-Analg and I-Analg

Characteristic of the residents	A-Analg <sup>a</sup> (n=160)	I-Analg <sup>b</sup> (n=75)
Residents with dementia, n (%)	61 (38.1)	20 (26.7)
Residents prescribed anxiolytics and/or hypnotics, n (%)	61 (38.1)	26 (34.7)

<sup>a</sup>A-Analg = residents prescribed appropriate analgesia

<sup>b</sup>I-Analg = residents prescribed inappropriate analgesia

Chi-square test of independence indicated that there were no statistically significant associations between i) dementia diagnosis ( $p$ -value=0.115), and ii) residents prescribed anxiolytics and/or hypnotics ( $p$ -value=0.714) with the prescribing of A-Analg versus I-Analg (**Table 2.18**).

**Table 2.18** Results from the Chi-square test of independence to test for the association between i) residents with dementia, and ii) residents prescribed anxiolytics and/or hypnotic medicines with A-Analg versus I-Analg

Characteristic of the residents	df	n	Cramer's V	p-value
Residents with dementia	1	235	0.112	0.115
Residents prescribed anxiolytics and/or hypnotics	1	235	0.033	0.714

It was also found that residents were prescribed a similar number of medicines irrespective of whether residents were prescribed appropriate analgesia or not. On average, 160 residents were prescribed a median of 8.5 medicines (interquartile range=6 to 10) in the A-Analg group compared to the 75 residents who were prescribed a median of 8 medicines (interquartile range=6 to 11) in the I-Analg group. Further analysis using a Mann-Whitney  $U$ -test revealed that there was no statistically significant



difference in the total number of medicines prescribed for A-Analg versus I-Analg ( $p$ -value=0.798) (Table 2.19).

**Table 2.19** Results from the Mann-Whitney U-test to test for differences in the total number of medicines prescribed for A-Analg versus I-Analg

Mann-Whitney U-test	Residents prescribed analgesia (n)	Md (IQR) <sup>a</sup>	U	Z	r	p-value
Total number of medicines prescribed per resident	A-Analg <sup>b</sup> (160)	8.5 (6 to 10)	5876.50	-0.26	0.02	0.798
	I-Analg <sup>c</sup> (75)	8 (6 to 11)				

<sup>a</sup>Md (IQR) = median (interquartile range)

<sup>b</sup>A-Analg = residents prescribed appropriate analgesia

<sup>c</sup>I-Analg = residents prescribed inappropriate analgesia

Furthermore, it was identified that more than one-third of the 235 residents prescribed analgesics were prescribed opioids as part of their pain management (38.3%,  $n=90$ ). Whilst current guidelines recommend older adults taking opioids should be prescribed laxative therapy for the prophylaxis of opioid-induced constipation (National Institute for Health and Care Excellence 2012; British Geriatrics Society 2013; National Institute for Health and Care Excellence 2019a), 28 residents (31.1%) were not prescribed any laxatives. Of the 90 residents who were prescribed opioids, 36 residents were prescribed osmotic laxatives, 7 residents were prescribed stimulant laxatives, and 19 residents were co-prescribed a stimulant laxative with an osmotic laxative.

A sub-analysis was also conducted for the eight residents who were prescribed NSAIDs. NICE recommends older adults are co-prescribed a proton-pump inhibitor for the prophylaxis of gastrointestinal adverse effects when NSAIDs are prescribed (National Institute for Health and Care Excellence 2019b). In this study, seven out of the eight residents prescribed NSAIDs were co-prescribed a proton-pump inhibitor. Of these, six residents were prescribed a proton-pump inhibitor at the highest prophylactic dose, whilst the remaining resident was prescribed a proton-pump inhibitor at a treatment dose.

### 2.4.3.3 The administration patterns of analgesics that were prescribed to be given on a 'as required' basis

Of the 483 residents in the present study, a total of 160 residents (33.1%) were prescribed 171 analgesics that were to be administered 'as required.' Most of these residents (87.7%,  $n=150$ ) were prescribed one 'as required' analgesic, nine residents (10.5%) were prescribed two 'as required' analgesics, and one resident was prescribed three 'as required' analgesics. Of these 160 residents who were prescribed 'as required' analgesia, 18.1% ( $n=29$ ) were also prescribed analgesics to be administered regularly.

**Table 2.20** provides a breakdown of the analgesics that were prescribed 'as required' during the study period. Of the 171 analgesics prescribed 'as required,' the majority of were paracetamol (85.4%,  $n=146$ ). The remainder of the medicines (14.6%) were co-codamol, codeine, tramadol, co-dydramol and mefenamic acid.

**Table 2.20** A breakdown of the analgesics that were prescribed to be given on a 'as required' basis

Analgesics that were prescribed 'as required'	<i>n</i>	%
Paracetamol	146	85.4
Co-codamol	14	8.8
Codeine	7	4.1
Tramadol	2	1.2
Co-dydramol	1	0.6
Mefenamic acid	1	0.6

On average, a median of 42.8% (interquartile range=23.3 to 61.7%) of doses that could be given on an 'as required' basis were administered to the 160 residents. The most common reason (94%) for these analgesics not being administered was due to the administration being 'clinically inappropriate.'

For the 160 residents who were prescribed 'as required' analgesics, the percentage of doses of 'as required' analgesics administered per resident were compared between i) residents with and without dementia, ii) residents prescribed anxiolytics and/or hypnotics versus those who were not, and iii) residents prescribed appropriate (A-Analg) versus inappropriate analgesics (I-Analg).

For dementia status ( $p$ -value=0.125) and the prescribing of anxiolytics and/or hypnotics ( $p$ -value=0.798), no significant differences were identified using Mann-Whitney  $U$ -test (**Table 2.21** and **Table 2.22** respectively).

**Table 2.21** Results from the Mann-Whitney  $U$ -test to test for differences in the percentage of doses of 'as required' analgesics administered per resident between residents with and without dementia

Mann-Whitney $U$ -test	Residents with dementia ( $n$ )	$Md$ (IQR) <sup>a</sup>	$U$	$Z$	$r$	$p$ -value
Percentage of doses of 'as required' analgesics administered per resident	Yes (53)	38.9 (19.2 to 51.7)	2412.50	-1.53	0.12	0.125
	No (107)	44.2 (24.2 to 66.7)				

<sup>a</sup> $Md$  (IQR) = median (interquartile range)

**Table 2.22** Results from the Mann-Whitney  $U$ -test to test for differences in the percentage of doses of 'as required' analgesics administered per resident between residents prescribed anxiolytics and/or hypnotics versus those who were not

Mann-Whitney $U$ -test	Residents prescribed anxiolytics and/or hypnotics ( $n$ )	$Md$ (IQR) <sup>a</sup>	$U$	$Z$	$r$	$p$ -value
Percentage of doses of 'as required' analgesics administered per resident	Yes (68)	37.8 (23.5 to 60.8)	3054.00	-0.26	0.02	0.798
	No (92)	45.0 (23.5 to 62.3)				

<sup>a</sup> $Md$  (IQR) = median (interquartile range)

Conversely, the 118 residents who were prescribed A-Analg, were, on average, administered a lower percentage of doses of 'as required' analgesics per resident ( $Md$ =39.1%, interquartile range=19.8 to 57.5%) compared to the 42 residents who were prescribed I-Analg ( $Md$ =54.8%, interquartile range=33.3 to 69.2%). Although Mann-Whitney  $U$ -tests indicated that this difference was statistically significant ( $p$ -value=0.041), the effect size was small ( $r$ =0.16) (see **Table 2.23**).

**Table 2.23** Results from the Mann-Whitney U-test to test for differences in the percentage of doses of 'as required' analgesics administered per resident between A-Analg versus I-Analg

Mann-Whitney U-test	Residents prescribed analgesics (n)	Md (IQR) <sup>a</sup>	U	Z	r	p-value
Percentage of doses of 'as required' analgesics administered per resident	A-Analg <sup>a</sup> (118)	39.1 (19.8 to 57.5)	1950.50	-2.05	0.16	0.041
	I-Analg <sup>b</sup> (42)	54.8 (33.3 to 69.2)				

<sup>a</sup>Md (IQR) = median (interquartile range)

<sup>b</sup>A-Analg = residents prescribed appropriate analgesia

<sup>c</sup>I-Analg = residents prescribed inappropriate analgesia

## 2.4.4 Anxiolytics and hypnotics

### 2.4.4.1 Prescribing of anxiolytics and hypnotics

Overall, there were a total of 141 residents (29.2%) prescribed anxiolytics and/or hypnotics. As with the prescribing of analgesics, there was considerable variations in the proportion of residents prescribed these medicines across the homes (**Table 2.24**). This ranged between 11.3% to 70.6% across the homes, with residents from NH1-6 prescribed the highest number of anxiolytics and/or hypnotics. Further analysis showed that there was only one resident from NH1-6 who was prescribed five anxiolytics and/or hypnotics during the study period.

**Table 2.24** Proportion of residents prescribed anxiolytics and hypnotics and the range in which these medicines were prescribed across the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
Residents, n	34	71	103	78	38	75	40	44	483
Residents prescribed anxiolytics and/or hypnotics, n (%)	24 (70.6)	8 (11.3)	29 (28.2)	14 (17.9)	14 (36.8)	20 (26.7)	23 (57.5)	9 (20.5)	141 (29.2)
Number of anxiolytics and/or hypnotics prescribed per resident, range	0 - 2	0 - 1	0 - 2	0 - 2	0 - 2	0 - 5	0 - 2	0 - 3	0 - 5

**Table 2.25** shows that a total of 173 anxiolytics and/or hypnotics classified as either i) benzodiazepines (long-acting), ii) benzodiazepines (short-acting), iii) Z-hypnotics, and iv) other anxiolytics and/or hypnotics (i.e. buspirone, diphenhydramine, melatonin, and

promethazine) were prescribed to 141 residents. Overall, zopiclone was the most prescribed medicine (42.8%,  $n=74$ ). Except for NH1-7 and NH1-8 whereby lorazepam and promethazine respectively accounted for the most frequently prescribed anxiolytics and/or hypnotics, zopiclone was the most prescribed preparation in the other homes accounting for 29.2% to 75.0% of the anxiolytics and/or hypnotics prescribed. Overall, the 'other anxiolytics and/or hypnotics' accounted for less than 10% of prescriptions. No residents in homes NH1-2, NH1-5, and NH1-7 were prescribed medicines that were classified under the category of 'other anxiolytics and/or hypnotics'.

**Table 2.25** *The types of anxiolytics and hypnotics prescribed across the eight nursing homes*

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
<b>Anxiolytics and hypnotics prescribed, <i>n</i></b>	34	8	34	17	16	24	26	14	173
<b>Benzodiazepines (long-acting), <i>n</i> (%)</b>									
Diazepam	4 (11.8)	0 (0.0)	5 (14.7)	2 (11.8)	0 (0.0)	3 (12.5)	0 (0.0)	0 (0.0)	14 (8.1)
Nitrazepam	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (8.3)	0 (0.0)	0 (0.0)	2 (1.2)
Oxazepam	0 (0.0)	0 (0.0)	2 (5.9)	0 (0.0)	0 (0.0)	3 (12.5)	0 (0.0)	2 (14.3)	7 (4.1)
<b>Benzodiazepines (short-acting), <i>n</i> (%)</b>									
Lorazepam	12 (35.3)	0 (0.0)	8 (23.5)	4 (23.5)	4 (25.0)	3 (12.5)	13 (50.0)	3 (21.4)	47 (27.2)
Temazepam	2 (5.9)	2 (25.0)	1 (2.9)	0 (0.0)	3 (18.8)	1 (4.2)	1 (3.8)	0 (0.0)	10 (5.8)
<b>Z-hypnotics, <i>n</i> (%)</b>									
Zopiclone	15 (44.1)	6 (75.0)	15 (44.1)	8 (47.1)	8 (50.0)	7 (29.2)	12 (46.1)	3 (21.4)	74 (42.8)
Zolpidem	0 (0.0)	0 (0.0)	2 (5.9)	0 (0.0)	1 (6.3)	1 (4.2)	0 (0.0)	0 (0.0)	4 (2.3)
<b>Others, <i>n</i> (%)</b>									
Buspirone	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.2)	0 (0.0)	0 (0.0)	1 (0.6)
Diphenhydramine	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (8.3)	0 (0.0)	0 (0.0)	2 (1.2)
Melatonin	1 (2.9)	0 (0.0)	0 (0.0)	1 (5.9)	0 (0.0)	1 (4.2)	0 (0.0)	1 (7.1)	4 (2.3)
Promethazine	0 (0.0)	0 (0.0)	1 (2.9)	2 (11.8)	0 (0.0)	0 (0.0)	0 (0.0)	5 (35.7)	8 (4.6)

#### ***2.4.4.2 The inappropriate prescribing of benzodiazepines and/or Z-hypnotics***

As most anxiolytics and/or hypnotics (91.3%,  $n=158$ ) prescribed during the study period were benzodiazepines and Z-hypnotics, only these medicines were analysed and classified for appropriateness. The criteria created by Franchi and colleagues in 2019 for identifying the prescribing of potentially inappropriate benzodiazepines and Z-hypnotics was used in this study.

A total of 134 residents were prescribed 158 benzodiazepines and/or Z-hypnotics. Of these 134 residents, 84 (62.7%) were prescribed a total of 84 benzodiazepines and/or Z-hypnotics (i.e. one per resident) that were deemed appropriate as defined by Franchi et al. (2019). The remaining 50 residents (37.3%) were exposed to inappropriate prescribing of 74 benzodiazepines and Z-hypnotics (see **Table 2.26**). The majority were classified as inappropriate because they were co-prescribed with another anxiolytic or hypnotic (50.0%,  $n=37$ ). In addition, it was found that over one-third of the benzodiazepines or Z-hypnotics that were inappropriately prescribed were zopiclone (33.9%,  $n=25$ ).

**Table 2.26** A breakdown of the benzodiazepines and Z-hypnotics that were classified as inappropriate

Benzodiazepines and Z-hypnotics prescribed that were classified as inappropriate	Number of medicines prescribed, n (%)
<b>Always inappropriate (n=8)</b>	
Long-acting benzodiazepine	
Nitrazepam	1 (1.4)
Short-acting benzodiazepine	
Temazepam	7 (9.5)
<b>Co-prescribed with at least other two additional central nervous system-active drugs (n=19)</b>	
Long-acting benzodiazepine	
Diazepam	3 (4.1)
Short-acting benzodiazepine	
Lorazepam	6 (8.1)
Z-hypnotic	
Zolpidem	1 (1.4)
Zopiclone	9 (12.2)
<b>Co-prescribed with another anxiolytic or hypnotic (n=37)</b>	
Long-acting benzodiazepine	
Diazepam	3 (4.1)
Oxazepam	2 (2.7)
Short-acting benzodiazepine	
Lorazepam	18 (24.3)
Z-hypnotic	
Zolpidem	1 (1.4)
Zopiclone	13 (17.6)
<b>Co-prescribed with at least other two additional central nervous system-active drugs AND co-prescribed with another anxiolytic or hypnotic (n=6)</b>	
Long-acting benzodiazepine	
Diazepam	1 (1.4)
Short-acting benzodiazepine	
Lorazepam	2 (2.7)
Z-hypnotic	
Zopiclone	3 (4.1)
<b>Always inappropriate AND co-prescribed with another anxiolytic or hypnotic (n=4)</b>	
Long-acting benzodiazepine	
Nitrazepam	1 (1.4)
Short-acting benzodiazepine	
Temazepam	3 (4.1)

The 134 residents who were prescribed benzodiazepines and/or Z-hypnotics in this study were separated into two groups for further analysis; i.e. those who were prescribed appropriate benzodiazepines and/or Z-hypnotics (A-BZD/Z) and those who were not (I-BZD/Z). These groups were compared by resident characteristics, specifically: i) residents with dementia (i.e. those prescribed dementia drugs, ii) residents prescribed analgesics, and iii) the total number of medicines prescribed to residents (see **Table 2.27**).



There were similar numbers ( $p$ -value=0.568) of residents with dementia in the A-BZD/Z group compared to the I-BZD/Z group (33.3%,  $n$ =28 residents vs. 28.0%,  $n$ =14 residents) (Table 2.27 and Table 2.28). Conversely, a higher proportion of residents prescribed analgesics were in the I-BZD/Z (80.0%,  $n$ =40 residents) compared to the A-BZD/Z group (48.8%,  $n$ =41 residents) (Table 2.27); Chi-square test of independence indicated this difference was statistically significant ( $p$ -value=0.001) with a medium effect size (Cramer's  $V$ =0.3) (Table 2.28).

**Table 2.27** Information relating to the characteristics of the residents regarding i) residents with dementia, and ii) residents prescribed analgesics categorised according to A-BZD/Z and I-BZD/Z

Characteristic of the residents	A-BZD/Z <sup>a</sup> ( $n$ =84)	I-BZD/Z <sup>b</sup> ( $n$ =50)
Residents with dementia, $n$ (%)	28 (33.3)	14 (28.0)
Residents prescribed analgesics, $n$ (%)	41 (48.8)	40 (80.0)

<sup>a</sup>A-BZD/Z = residents prescribed appropriate benzodiazepines and/or Z-hypnotics

<sup>b</sup>I-BZD/Z = residents prescribed inappropriate benzodiazepines and/or Z-hypnotics

**Table 2.28** Results from the Chi-square test of independence to test for the association between i) residents with dementia, and ii) residents prescribed analgesics with A-BZD/Z versus I-BZD/Z

Characteristic of the residents	df	$n$	Cramer's $V$	$p$ -value
Residents with dementia	1	134	0.056	0.568
Residents prescribed analgesics	1	134	0.309	0.001

In addition, the 84 residents who were in the A-BZD/Z group were on average prescribed a lower number of medicines ( $Md$ =8, interquartile range=6 to 11) compared to the 50 residents who were not ( $Md$ =10, interquartile range=8 to 11). Although Mann-Whitney  $U$ -test demonstrated that the difference in total medicines prescribed was statistically significant ( $p$ -value=0.03), the effect size was small ( $r$ =0.26) (see Table 2.29).

**Table 2.29** Results from the Mann-Whitney  $U$ -test to test for differences in the total number of medicines prescribed for A-BZD/Z versus I-BZD/Z

Mann-Whitney $U$ -test	Residents prescribed benzodiazepines and/or Z-hypnotics ( $n$ )	$Md$ (IQR) <sup>a</sup>	$U$	$Z$	$r$	$p$ -value
Total number of medicines prescribed per resident	A-BZD/Z <sup>a</sup> (84)	8 (6 to 11)	1450.5	-2.99	0.26	0.03
	I-BZD/Z <sup>b</sup> (50)	10 (8 to 12)				

<sup>a</sup> $Md$  (IQR) = median (interquartile range)

<sup>b</sup>A-BZD/Z = residents prescribed appropriate benzodiazepines and/or Z-hypnotics

<sup>c</sup>I-BZD/Z = residents prescribed inappropriate benzodiazepines and/or Z-hypnotics

### ***2.4.4.3 The administration patterns of benzodiazepines and/or Z-hypnotics that were prescribed to be given on a 'as required' basis***

Of the 483 residents in the present study, 54 residents (11.2%) were prescribed a total of 57 benzodiazepines and/or Z-hypnotics that were to be administered 'as required.' Almost all residents (94.4%,  $n=51/54$ ) were prescribed one 'as required' benzodiazepine or Z-hypnotic, and 3 residents (5.5%) were prescribed two 'as required' benzodiazepines and/or Z-hypnotics. In addition, 29.6% of these 54 residents were also prescribed these medicines to be administered regularly.

**Table 2.30** provides a breakdown of the 57 benzodiazepines and/or Z-hypnotics that were prescribed 'as required' during the study period. Lorazepam (47.4%,  $n=27$ ) and zopiclone (29.8%,  $n=17$ ) accounted for more than 75% of the 'as required' prescriptions.

**Table 2.30** *A breakdown of the benzodiazepines and/or Z-hypnotics that were prescribed to be given on a 'as required' basis*

<b>Benzodiazepines and/or Z-hypnotics prescribed 'as required'</b>	<b><i>n</i></b>	<b>%</b>
Lorazepam	27	47.4
Zopiclone	17	29.8
Diazepam	5	8.8
Zolpidem	4	7.0
Nitrazepam	2	3.5
Temazepam	1	1.8
Oxazepam	1	1.8

A median of 70.0% (interquartile range=29.7 to 96.7%) of doses that could be given on an 'as required' basis were administered to the 54 residents. Similar to analgesics, the most common reason (92%) recorded for non-administration was that it was 'clinically inappropriate.'

For the 54 residents prescribed 'as required' benzodiazepine and/or Z-hypnotics the percentage of doses administered per resident were compared between i) residents with and without dementia, ii) residents prescribed analgesics versus those who were not, and iii) residents prescribed appropriate versus inappropriate benzodiazepine and/or Z-hypnotics.

The 16 residents with dementia tended to be administered a lower percentage of doses of 'as required' benzodiazepine and/or Z-hypnotics ( $Md=44.3\%$ , interquartile range=5.6 to 92.9%) compared to the 38 residents without dementia ( $Md=81.1\%$ , interquartile range=33.3 to 97.5%), although a Mann-Whitney  $U$ -test showed that this difference was not statistically significant ( $p$ -value=0.125) (**Table 2.31**).

**Table 2.31** Results from the Mann-Whitney  $U$ -test to test for differences in the percentage of doses of 'as required' benzodiazepine and/or Z-hypnotics administered per resident between residents with and without dementia

Mann-Whitney $U$ -test	Residents with dementia ( $n$ )	$Md$ (IQR) <sup>a</sup>	$U$	$Z$	$r$	$p$ -value
Percentage of doses of 'as required' benzodiazepine and/or Z-hypnotics administered per resident	Yes (16)	44.2 (5.6 to 92.9)	223.50	-1.53	0.21	0.125
	No (38)	81.1 (33.3 to 97.5)				

<sup>a</sup> $Md$  (IQR) = median (interquartile range)

As shown in **Table 2.32** and **Table 2.33**, the percentage of doses of 'as required' benzodiazepine and/or Z-hypnotics that were administered to i) residents prescribed analgesics versus residents who were not, and ii) residents prescribed appropriate versus inappropriate benzodiazepine and/or Z-hypnotics were similar in both instances; Mann-Whitney  $U$ -test confirmed that there was no statistically significant differences with a  $p$ -value=0.434 in both instances.

**Table 2.32** Results from the Mann-Whitney  $U$ -test to test for differences in the percentage of doses of 'as required' benzodiazepine and/or Z-hypnotics administered per resident between residents prescribed analgesics versus those who were not

Mann-Whitney $U$ -test	Residents prescribed analgesics ( $n$ )	$Md$ (IQR) <sup>a</sup>	$U$	$Z$	$r$	$p$ -value
Percentage of doses of 'as required' benzodiazepine and/or Z-hypnotics administered per resident	Prescribed analgesics (31)	73.3 (30.0 to 100.0)	312.00	-0.78	0.11	0.434
	Not prescribed analgesics (23)	66.7 (11.1 to 95.0)				

<sup>a</sup> $Md$  (IQR) = median (interquartile range)

**Table 2.33** Results from the Mann-Whitney U-test to test for differences in the percentage of doses of 'as required' benzodiazepine and/or Z-hypnotics administered per resident between residents prescribed appropriate versus inappropriate benzodiazepine and/or Z-hypnotics

Mann-Whitney U-test	Residents prescribed benzodiazepine and/or Z-hypnotics (n)	Md (IQR) <sup>a</sup>	U	Z	r	p-value
Percentage of doses of 'as required' benzodiazepine and/or Z-hypnotics administered per resident	Potentially appropriate (27)	76.4 (30.0 to 100.0)	319.5	-0.78	0.11	0.434
	Potentially inappropriate (27)	66.7 (11.1 to 95.0)				

<sup>a</sup>Md (IQR) = median (interquartile range)

## 2.4.5 Antimicrobials

### 2.4.5.1 Prescribing and administration patterns of antimicrobials

A total of 115 residents (23.8%) were prescribed antimicrobials; for all residents, the range was between zero to six antimicrobial courses (see **Table 2.34**). Individually, the percentage of individuals prescribed antimicrobials varied from 6.8% of residents in NH1-3 to 42.7% in NH1-6. Similarly, the number of antimicrobial courses prescribed per resident varied considerably across each individual nursing home. Whilst a range between zero to one antimicrobial course was prescribed per resident in NH1-1, a considerably higher number of courses were prescribed to residents in NH1-4 (range=0 to 6 antimicrobial courses per resident). Further analysis revealed that that most residents from NH1-4 were prescribed a range between zero to four courses, whilst one resident was prescribed six courses.

**Table 2.34** Proportion of residents prescribed antimicrobials and the range in which these medicines were prescribed across the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
Residents, n	34	71	103	78	38	75	40	44	483
Residents prescribed antibiotics, n (%)	4 (11.8)	22 (31.0)	7 (6.8)	27 (34.6)	6 (15.8)	32 (42.7)	11 (27.5)	6 (13.6)	115 (23.8)
Number of antimicrobial courses prescribed per resident, range	0 - 1	0 - 3	0 - 2	0 - 6	0 - 2	0 - 4	0 - 3	0 - 2	0 - 6

A total of 158 antimicrobials were prescribed (consisting of 18 unique medicines) to these 115 residents; **Table 2.35** provides a breakdown of the antimicrobials that were prescribed. Specifically, penicillin (29.7%,  $n=47$ ), nitrofurantoin (25.9%,  $n=41$ ), and trimethoprim (17.7%,  $n=28$ ) accounted for the top three antimicrobials prescribed. Whilst quinolones are no longer recommended due to the risks associated with aortic aneurysm and dissection in older adults (European Medicines Agency 2018; Medicines and Healthcare products Regulatory Agency 2018), antimicrobials in this class were prescribed on four occasions. In addition, there was considerable variability in the types of antimicrobials prescribed in each nursing home. For example, whilst penicillin was the most prescribed antimicrobial in NH1-2, NH1-4, and NH1-7, it was not prescribed at all in NH1-1 and NH1-5.

**Table 2.35** The types of antimicrobials prescribed across the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
Antimicrobials prescribed, $n$	4	29	9	40	7	44	18	7	156
Antifungal, $n$ (%)	1 (25.0)	0 (0.0)	0 (0.0)	1 (2.5)	0 (0.0)	3 (6.8)	1 (5.6)	0 (0.0)	6 (3.8)
Cephalosporin, $n$ (%)	0 (0.0)	2 (6.9)	0 (0.0)	3 (7.5)	1 (14.0)	0 (0.0)	0 (0.0)	1 (14.3)	7 (4.4)
Macrolide, $n$ (%)	0 (0.0)	2 (6.9)	1 (11.1)	0 (0.0)	2 (29.0)	3 (6.8)	0 (0.0)	1 (14.3)	9 (5.7)
Metronidazole, $n$ (%)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.5)	0 (0.0)	0 (0.0)	2 (1.3)
Nitrofurantoin, $n$ (%)	1 (25.0)	3 (10.3)	3 (33.3)	11 (27.5)	3 (43.0)	13 (29.5)	5 (27.8)	2 (28.6)	41 (25.9)
Penicillin, $n$ (%)	0 (0.0)	9 (31.0)	2 (22.2)	17 (42.5)	0 (0.0)	12 (27.3)	6 (33.3)	1 (14.3)	47 (29.7)
Quinolone, $n$ (%)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.5)	0 (0.0)	3 (6.8)	0 (0.0)	0 (0.0)	4 (2.5)
Tetracycline, $n$ (%)	0 (0.0)	7 (24.1)	1 (11.1)	1 (2.5)	0 (0.0)	2 (4.5)	0 (0.0)	0 (0.0)	11 (7.0)
Trimethoprim, $n$ (%)	2 (50.0)	6 (20.7)	2 (22.2)	6 (15.0)	1 (14.0)	4 (9.1)	5 (27.8)	2 (28.6)	28 (17.7)
Other <sup>a</sup> , $n$ (%)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.5)	1 (5.6)	0 (0.0)	3 (1.9)

<sup>a</sup>Other antimicrobials include gentamicin, methenamine, and aciclovir

**Table 2.36** illustrates the median number of days which the antimicrobials were prescribed for and the administration patterns for these courses. Of note, the median duration antimicrobials were prescribed was 6.9 days (interquartile range=3.3 to 9.4

days). However, this varied considerably in each nursing home ranging between 3.5 days and 11.3 days. In regard to the administration patterns of these courses, a median of 95.1% of all antimicrobial doses prescribed were administered (interquartile range=84.9 to 100.0%) although there was intra- and inter- variability with respect to the homes. For example, whilst a median of 87.5% of antimicrobial doses were administered in NH1-5, the interquartile range was 20 to 100%. Again, whilst there was variability with respect to the number of antimicrobial courses that were fully completed across the homes (see **Table 2.36**), overall, 66 of the 158 antimicrobial courses (41.8%) were fully administered i.e., the course completed entirely.

**Table 2.36** The median duration (days) in which antimicrobials were prescribed for and the administration patterns of these courses across the eight nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
Duration of antimicrobials prescribed (days), median (IQR)	11.3 (5.6 - 25.5)	7.0 (2.5 - 30.0)	7.0 (2.3 - 19.0)	7.0 (3.6 - 7.9)	8.0 (3.0 - 22.5)	6.8 (3.6 - 10.1)	4.9 (2.0 - 7.7)	3.5 (2.5 - 6.0)	6.9 (3.3 - 9.4)
Percentage of doses administered per antimicrobial course prescribed, median (IQR)	80.4 (56.3 - 94.0)	96.7 (88.9 - 100.0)	100.0 (89.0 - 100.0)	96.2 (90.1 - 100.0)	87.5 (20.0 - 100.0)	91.1 (74.3 - 100.0)	95.2 (68.2 - 100.0)	100.0 (50.0 - 100.0)	95.1 (84.9 - 100.0)
Antimicrobial courses that were fully administered, n (%)	0 (0.0)	13 (44.8)	5 (55.6)	17 (42.5)	3 (42.9)	16 (36.4)	8 (44.4)	4 (57.1)	66 (41.8)

**Table 2.37** provides a breakdown of the reasons for non-administration. In total, 301 antimicrobial doses were not administered during the study period. The most documented reason for non-administration was 'no stock' (37.9%,  $n=114$ ). However, the reasons for non-administration were variable between homes. For example, except for NH1-3, 'no stock' was recorded as a reason for antimicrobials not being administered during the study but accounted for between 5.8% to 73.3% of the reasons documented across the other homes. Similarly, except for NH1-1, the percentage of administrations where a 'resident refused' an antimicrobial administration ranged between 4.5% to 92.3% of the reasons in all the other nursing homes.

**Table 2.37** A breakdown of the reasons documented for the antimicrobial doses that were not administered across the nursing homes

Nursing home code	NH1-1	NH1-2	NH1-3	NH1-4	NH1-5	NH1-6	NH1-7	NH1-8	All
Resident unavailable, n (%)	2 (13.3)	2 (7.1)	2 (33.3)	0 (0.0)	0 (0.0)	20 (16.9)	1 (2.3)	0 (0.0)	27 (9.0)
Resident refused, n (%)	0 (0.0)	3 (10.7)	1 (16.7)	2 (6.7)	48 (92.3)	30 (25.4)	2 (4.5)	5 (62.5)	91 (30.2)
No stock, n (%)	11 (73.3)	10 (35.7)	0 (0.0)	18 (60.0)	3 (5.8)	54 (45.8)	17 (38.6)	1 (12.5)	114 (37.9)
Clinically inappropriate, n (%)	2 (13.3)	13 (46.4)	3 (50.0)	10 (33.3)	1 (1.9)	13 (11.1)	22 (50.0)	2 (25.0)	66 (21.9)
Missing reviewed <sup>a</sup> , n (%)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.8)	2 (4.5)	0 (0.0)	3 (1.0)

<sup>a</sup>missing reviewed means that medicines that were retrospectively reviewed by a member of staff to indicate that it was unknown whether the administration took place

#### 2.4.5.2 Sub-analysis of residents that were prescribed more than two antimicrobials

Given that more than one-quarter (28.7%,  $n=33$  residents) of the 115 residents who were prescribed antimicrobials received at least two antimicrobial prescriptions during the one-month medicines cycle, a sub-analysis of these residents was conducted. Most of these residents (81.8%,  $n=27/33$  residents) were prescribed two antimicrobial courses during the study, whilst four were prescribed three courses (12.1%,  $n=4$  residents), one was prescribed four (3.0%,  $n=1$  resident), and one was prescribed six (3.0%,  $n=1$  resident).

The antimicrobial prescribing patterns for these 33 residents were analysed in more detail and grouped together under key themes. The three key themes that emerged were the prescribing of antimicrobials i) for the prophylaxis of UTIs, ii) for the treatment of UTIs, and as iii) repeated courses of the same antimicrobial.

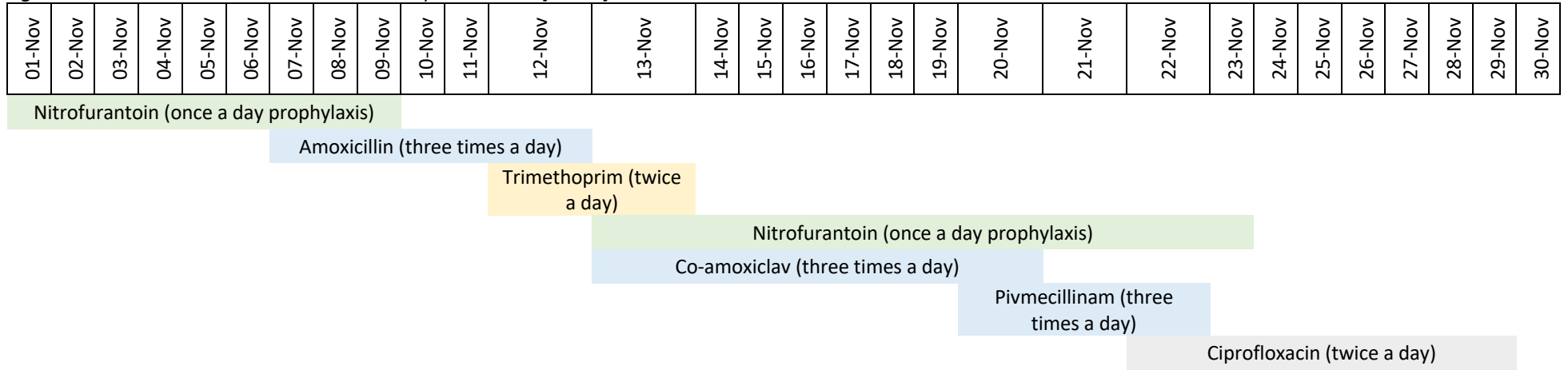
##### 2.4.5.2.1 The prescribing of antimicrobials for the prophylaxis of UTIs

A total of 11/33 residents (33.3%) were prescribed an antimicrobial for the prophylaxis of UTIs. Two residents (**Figure 2.5** and **Figure 2.6**) were re-prescribed the same antimicrobial for the prophylaxis of UTIs in between a short course of antimicrobials for the treatment of UTI. Of note, given that the resident described in **Figure 2.5** was

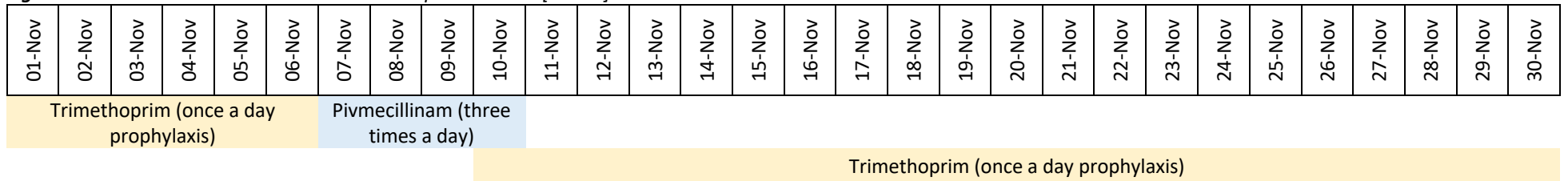
prescribed a total of six antimicrobials during the one-month study period, four of which were classified as broad-spectrum antimicrobials, it is likely that this resident will be particularly susceptible to antimicrobial resistant infections. Furthermore, whilst methenamine is considered less suitable for prescribing compared to nitrofurantoin for the prophylaxis against UTIs (National Institute for Health and Clinical Excellence 2018), one resident (**Figure 2.7**) was concomitantly prescribed both methenamine and nitrofurantoin for prophylaxis against UTIs.



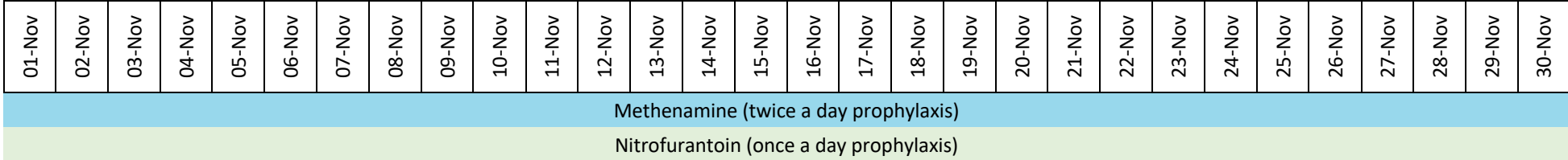
**Figure 2.5** A timeline to show the antimicrobials prescribed to [R9318]



**Figure 2.6** A timeline to show the antimicrobials prescribed to [R9340]



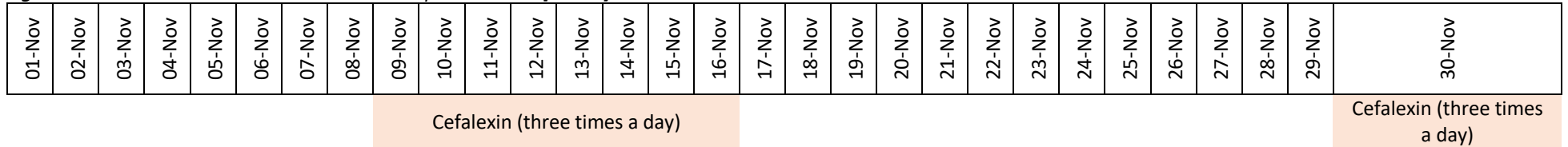
**Figure 2.7** A timeline to show the antimicrobials prescribed to [R37370]



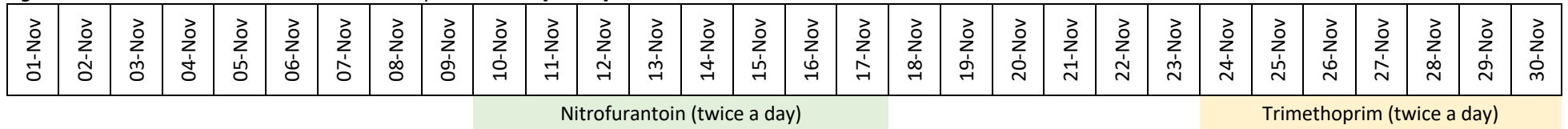
#### 2.4.5.2.2 The prescribing of antimicrobials for the treatment of UTIs

At least one short course of antimicrobials was prescribed for the treatment of UTIs to more than one-half of the residents who were the recipients of two or more antimicrobial courses during the study (63.6%,  $n=21$  residents). More specifically, six of these residents were prescribed at least two short courses of antimicrobials for the treatment of UTIs (**Figure 2.5**, and **Figure 2.8** to **Figure 2.12**). With the exception of the resident described in **Figure 2.8** who was prescribed two identical courses of antimicrobials for the treatment of UTIs, the remaining five residents (**Figure 2.5**, and **Figure 2.9** to **Figure 2.12**) were prescribed multiple different antimicrobials for the treatment of UTIs.

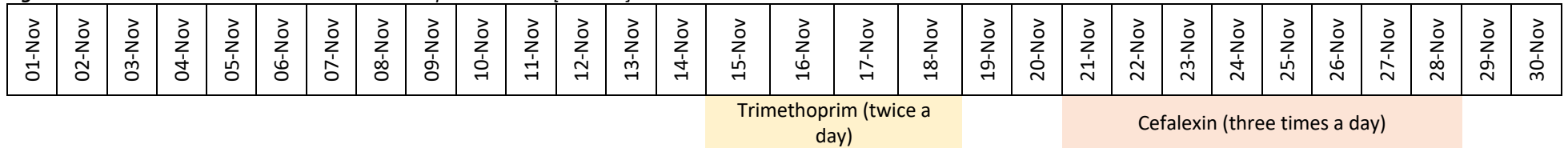
**Figure 2.8** A timeline to show the antimicrobials prescribed to [R9303]



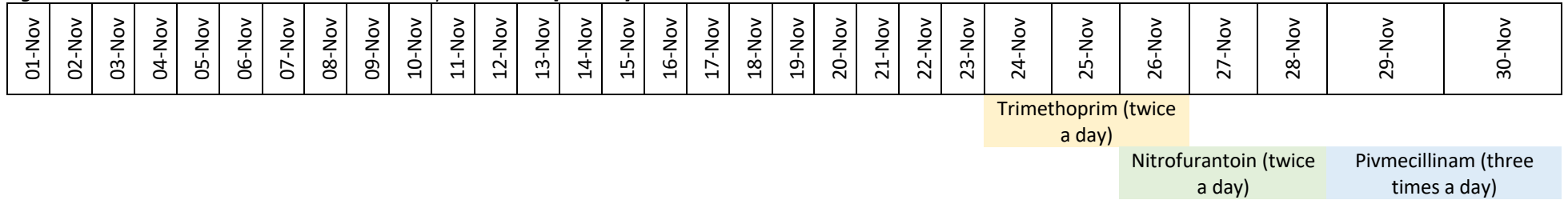
**Figure 2.9** A timeline to show the antimicrobials prescribed to [R9345]



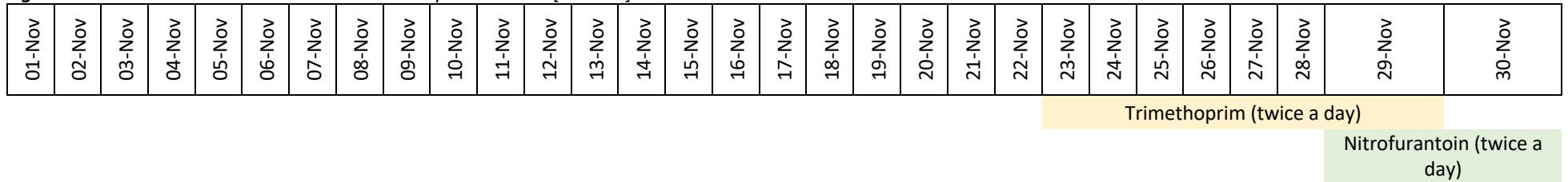
**Figure 2.10** A timeline to show the antimicrobials prescribed to [R14148]



**Figure 2.11** A timeline to show the antimicrobials prescribed to [R41000]



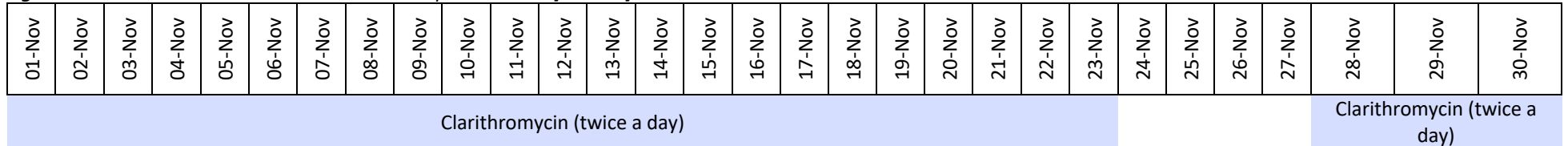
**Figure 2.12** A timeline to show the antimicrobials prescribed to [R41020]



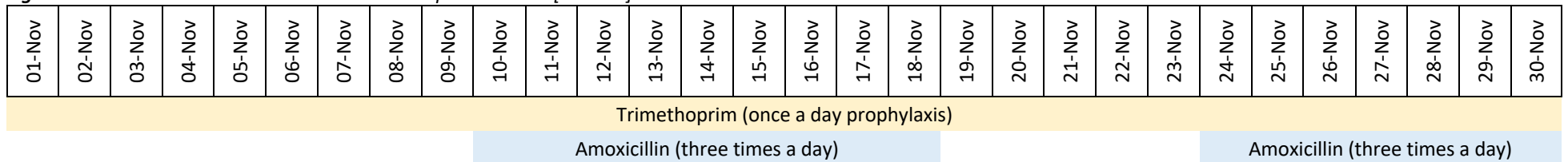
#### 2.4.5.2.3 The prescribing of repeated courses of the same antimicrobial

Two identical courses of antimicrobials were prescribed to approximately 1 in 10 residents who received at least two antimicrobials during the study period (12.1%,  $n=4$  residents) (see **Figure 2.8** and **Figure 2.13** to **Figure 2.15** illustrating the timeline of prescribing). With the exception of the resident described in **Figure 2.13** who was prescribed the same macrolide (clarithromycin) on two different occasions, the residents in **Figure 2.8**, **Figure 2.14** and **Figure 2.15** were prescribed two courses of the same broad spectrum antimicrobial (like cephalosporin or penicillin).

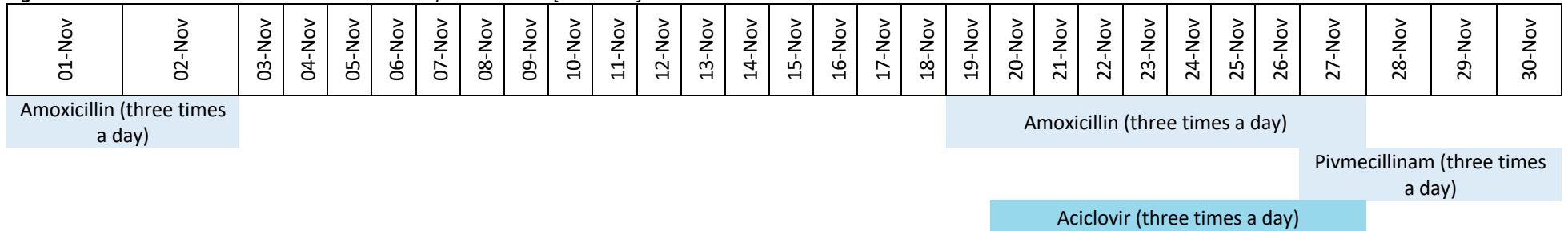
**Figure 2.13** A timeline to show the antimicrobials prescribed to [R16623]



**Figure 2.14** A timeline to show the antimicrobials prescribed to [R16789]



**Figure 2.15** A timeline to show the antimicrobials prescribed to [R190719]



### 2.4.5.3 The prescribing and administration of antimicrobials for the prophylaxis and treatment of UTIs

A total of 72/115 residents (62.6%) were prescribed antimicrobials for the prophylaxis and/or treatment of UTIs. More specifically, 22 residents (19.1%) were prescribed antimicrobials for the prophylaxis of UTIs, 44 residents (38.3%) were prescribed antimicrobials for the treatment of urinary tract infections, and 6 residents (5.2%) were prescribed antimicrobials for both the treatment and prophylaxis of UTIs.

In total, 86 antimicrobial courses were prescribed for the prophylaxis and treatment of UTIs over the one-month study period, and the most prescribed antimicrobial was nitrofurantoin (see **Table 2.38**). Most of these courses were prescribed for the treatment of UTIs (65.1%,  $n=56$ ), with the remaining 34.9% ( $n=30$ ) prescribed for prophylaxis. Except for cefalexin which was prescribed at a similar rate for both the prophylaxis and treatment of UTIs, the prescribing patterns for the treatment and prophylaxis of UTIs were notably different for other antimicrobials. For example, whilst nitrofurantoin featured as the most prescribed antimicrobial for the treatment of UTIs (57.1% of antimicrobial prescriptions for the treatment of UTIs), trimethoprim was the most prescribed for prophylaxis (56.7% of antimicrobial prescriptions for the prophylaxis of UTIs).

**Table 2.38** A breakdown of the antimicrobials prescribed for the prophylaxis and treatment of UTIs

Antimicrobial prescribed	Prophylaxis of UTIs, $n$ (%)	Treatment of UTIs, $n$ (%)	Total
Nitrofurantoin	9 (22.0)	32 (78.0)	41
Trimethoprim	17 (60.7)	11 (39.3)	28
Cefalexin	3 (42.9)	4 (57.1)	7
Methenamine	1 (100.0)	n/a	1
Pivmecillinam	n/a	9 (100.0)	9
<b>All</b>	<b>30 (34.9)</b>	<b>56 (65.1)</b>	<b>86</b>

Over 11 percent (11.3%,  $n=159$ ) of the 1,408 antimicrobial doses prescribed for the management of UTIs, were not administered to residents as intended, with a lack of stock the most documented reason for non-administration (see **Table 2.39**). The antimicrobials prescribed for the treatment of UTIs accounted for most of the antimicrobial doses that were not administered (72.3%,  $n=115$ ), with the remaining 27.7% ( $n=44$ ) of doses prescribed for the prophylaxis of UTIs. Whilst 'no stock' was the



most documented reason for antimicrobials not being administered when they were prescribed for the treatment of UTIs, 'resident unavailable' was the most commonly documented reason for non-administered doses of prophylactics.

**Table 2.39** A breakdown of the reasons for the antimicrobial doses not being administered for the prophylaxis and treatment of UTIs

Reasons documented for antimicrobial doses not being administered	Doses for the prophylaxis of UTIs, n (%)	Doses for the treatment of UTIs, n (%)	Total
No stock	15 (18.5)	66 (81.5)	81
Resident refused	7 (20.0)	28 (80.0)	35
Clinically inappropriate	4 (18.2)	18 (81.8)	22
Resident unavailable	17 (89.5)	2 (10.5)	19
Missing reviewed <sup>a</sup>	1 (50.0)	1 (50.0)	2
<b>All</b>	<b>44 (27.7)</b>	<b>115 (72.3)</b>	<b>159</b>

<sup>a</sup>missing reviewed means that medicines that were retrospectively reviewed by a member of staff to indicate that it was unknown whether the administration took place

Specifically, the percentage of doses administered for prophylaxis achieved a median of 100% (interquartile range=94.1 to 100%). Whilst this suggests that most prescriptions for the prophylaxis of UTIs were fully administered, only 18 of the 30 antimicrobial courses (60%) were administered completely. The median number of doses administered for the 56 antimicrobial courses prescribed for the treatment of UTIs was 90.3% (interquartile range=75.7 to 100%); only a third of these courses (19/56 treatment course for UTIs=33.9%) were fully completed by residents.

Further analysis using Mann-Whitney *U*-test (see **Table 2.40**) indicated a statistically significant difference in the percentage of antimicrobial doses administered for prophylaxis of UTIs compared to the treatment of UTIs ( $p$ -value=0.008), with a small effect size ( $r$ =0.29).

**Table 2.40** Results from the Mann-Whitney U-test to test for differences in the percentage of antimicrobial doses administered for antimicrobials prescribed for the prophylaxis versus treatment of UTIs

Mann-Whitney U-test	Antimicrobials prescribed for the management of UTIs (n)	Median (IQR)	U	Z	r	p-value
Percentage of antibiotic doses administered per antimicrobial course prescribed	Prophylaxis (30)	100 (94.1 - 100.0)	559.50	-2.65	0.29	0.008
	Treatment (56)	90.3 (75.7 - 100.0)				

## 2.5 Discussion

Medicines are a common therapeutic intervention in health and social care settings (Care Quality Commission 2019), and this is particularly true for older adults residing in long-term care facilities. Such individuals are often diagnosed with multiple chronic diseases which require the prescribing of complex medicine regimens for the prevention, management or treatment of illnesses (Lane et al. 2004; Shah et al. 2012; Olsen et al. 2016). There is a plethora of literature highlighting the poor quality of prescribing in long-term care facilities worldwide, especially with regards to the inappropriate prescribing of medicines which could ultimately lead to adverse outcomes that include hospitalisation and death (Lau et al. 2005; Perri et al. 2005; Ruggiero et al. 2010; Grace et al. 2014). It is estimated that almost 10% of hospital admissions in older adults are related to inappropriate medicine use (NHS 2019), and more than 40% of emergency admissions by care home residents in the UK could potentially be prevented through strategies which include medicines optimisation (Wolters et al. 2019). The prescribing of anticholinergic drugs, anxiolytics, hypnotics, analgesics and antimicrobials are often cited in the literature as key classes of medicines which are commonly associated with adverse outcomes (Gurwitz et al. 2005; van Buul et al. 2012; Welsh et al. 2018) and should therefore be routinely reviewed for clinical appropriateness when prescribed to long-term care residents. In this chapter, the prescribing and administration of i) anticholinergic drugs, ii) anxiolytics, hypnotics and analgesics, and iii) antimicrobials to older adults residing in care homes was studied. A one-month medicines cycle (November 2017) was examined through the analysis of digital medicines administration records of 483 residents from eight nursing homes.

The eight nursing homes were in a combination of urban and rural areas in the UK. The residents were fairly representative of the English nursing home population in terms of bed capacity (Grant Thornton 2018), with an average of 59 residents per home (range=36 to 87). In common with previous research that has examined the prescribing patterns of care home residents in the UK, the most commonly prescribed group of medicines were those which act on the central nervous system, cardiovascular system and gastrointestinal system (Furniss et al. 2000; Alldred et al. 2007; Shah et al. 2012). The average number of medicines prescribed to residents was also reasonably similar compared to research conducted in UK care homes (Zermansky et al. 2006; Alldred et al. 2009; Barber et al. 2009; Szczepura et al. 2011; Gadsby et al. 2012; Shah et al. 2012; Griffiths et al. 2019; Desborough et al. 2020), with a median of 7 distinct medicines (interquartile range=4 to 9) prescribed per resident. For example, a random sample of 256 residents from 55 care homes in the UK were found to be prescribed an average of 8 medicines in the seminal CHUMS study (Alldred et al. 2009). Other care home research conducted in the UK has categorised the average number of medicines prescribed per resident according to the type of care provided and this is of particular relevance to the current study. Of note, both studies by Szczepura et al. (2011) and Shah et al. (2012) found that nursing home residents were prescribed an average of 9 and 8.8 medicines respectively which is reasonably similar to the findings from the eight nursing homes in the present study.

Consistent with previous literature (Lane et al. 2004; Barnett et al. 2011; Shah et al. 2012), the residents described in this chapter were prescribed a greater number of medicines compared to older adults living in the community. For example, Shah and colleagues in 2012 found that older adults residing in the community in England and Wales were prescribed a mean of 4.9 medicines; this compares to a median of 7 medicines per resident in the nursing homes analysed in this current study. This is not limited to England and Wales, as a study in Scotland by Barnett et al. (2011) found that a sample of 4,557 care home residents were prescribed almost twice as many prescription items when compared to 65,742 older adults who lived in their own homes.

Previous studies have indicated that a nursing home admission in itself can result in increased numbers of medicines prescribed to older adults (Koopmans et al. 2003;

Maguire et al. 2013; Lundby et al. 2020). This may be partly explained by current evidence which suggests that older adults in care homes often present with multiple comorbidities and have escalating care needs as their health deteriorates. Together, this ultimately warrants complex medicine management (Lane et al. 2004; Olsen et al. 2016). An increase in the number of medicines prescribed to a care home resident may also be explained by a recent discharge from secondary care which generally sees additions to medicine regimens. Evidence from the UK indicates that care home admissions are often unplanned (Competition & Markets Authority 2017), and more than 50% of admissions are directly from hospital discharges (Bebbington et al. 2001). In a recent Danish cohort study by Lundby et al. (2020), an increase in the incidence rate of new drug treatments for a total of 5,179 residents of 94 nursing homes was observed between 2015 to 2017, and the researchers suggested that this may be due to increased hospitalisations or visits to the GP immediately prior to nursing home admission (from 21 new treatments/100 residents/month at 12 to 24 months pre-nursing home admission to 34 new treatments/100 residents/month at 6 to 9 months post-nursing home admission).

In a recent report published by the Care Quality Commission, poor communication during transfer of care between care homes and secondary care was stated as one of the key themes which often contributed towards medication errors in adult social care (Care Quality Commission 2019). A key recommendation from the landmark CHUMS study on medication errors in UK care homes was that a named individual should be responsible for the safety and quality of medicines management in care homes, and it has been subsequently suggested that this person could be a pharmacist (Alldred et al. 2009). Previous studies have demonstrated the benefits of implementing pharmacist-led medication reviews in care homes to reduce the number of inappropriate medications prescribed to residents (Furniss et al. 2000; Baqir et al. 2017; Desborough et al. 2020). However, to date, improvements in clinical outcomes (e.g. falls, mortality and hospital admissions) and the cost-effectiveness of this model remains inconclusive in the UK literature (Furniss et al. 2000; Zermansky et al. 2006; Swift 2018; Baqir et al. 2017; Alves et al. 2019; Desborough et al. 2020). More recently, a UK cluster randomised controlled trial is being conducted to compare the effectiveness of introducing a pharmaceutical service delivered by pharmacist independent prescribers in care homes

with usual care (Bond et al. 2020). A preliminary study has highlighted the feasibility and acceptability of this new model of care by the majority of stakeholders in the care homes studied (Inch et al. 2019). In addition, UK policy-makers have recognised the value of pharmacists in supporting the safety and quality of medicines management in care homes and have specifically highlighted the requirement for primary care pharmacists to prioritise structured medication reviews to care home residents as part of the new five-year GP contract agreement (Primary Care Strategy and NHS Contracts Group 2020). In particular, the identification of residents prescribed key classes of medicines associated with medication errors such as anticholinergic drugs, analgesics, anxiolytics and hypnotics has been a source of focus. This could assist in the prioritisation of medication reviews (NHS Digital and NHS Business Services Authority 2019) and the service specification also suggests that efforts should be made in primary care to improve the quality of antimicrobial prescribing (Primary Care Strategy and NHS Contracts Group 2020).

Consistent with previous studies which used a cross-sectional research design to explore the prescribing prevalence of specific classes of medicines in long-term care facilities (Teramura-Grönblad et al. 2011; Palmer et al. 2014; Hoffmann and Schmiemann 2016; Johnson et al. 2016; Thornley et al. 2019), this present study applied a similar study design to explore the prescribing patterns of anticholinergic drugs, analgesics, anxiolytics and hypnotics, and antimicrobials in nursing homes. The analysis, which was for a one-month medicines cycle, found that 49.9% of residents were prescribed anticholinergic drugs, 29.2% were prescribed hypnotics and/or anxiolytics, 48.7% were prescribed analgesics, and 23.8% were prescribed antimicrobials. Whilst the prescribing prevalence for anticholinergic drugs, anxiolytics and/or hypnotics, and analgesics were fairly consistent with previous care home research in the UK (Furniss et al. 2000; Fox et al. 2011a; Johnson et al. 2016; Griffiths et al. 2019), the prescribing of antimicrobials varied considerably compared to other UK studies (McClellan et al. 2012; Gillespie et al. 2015; Ricchizzi et al. 2018; Thornley et al. 2019). For example, a recent point-prevalence study by Thornley and colleagues in 2019 found that only 7.7% of care home residents of 644 care homes in the UK were prescribed antimicrobials. This is significantly lower than the 23.8% of residents identified in this study.

The differences in the prevalence of residents prescribed antimicrobials in the current study compared to other studies in the UK is perhaps unsurprising given differences in methodologies and time frames used for analyses. Unlike other UK studies which explored the prevalence of antimicrobial prescribing in care homes on either a single day (McClellan et al. 2012; Thornley et al. 2019) or one-year period (Gillespie et al. 2015), the current study was a cross-sectional study over a one-month medicines cycle. For example, the study by McClellan et al. 2012 found that approximately 9% of residents from 30 residential homes in Northern Ireland were prescribed antimicrobials on the day of data collection. Similarly, the recent point-prevalence study by Thornley and colleagues in 2019 found a similar prevalence where only 7.7% of nursing home residents from 644 care homes in the UK were prescribed antimicrobials on the day of data collection. On the other hand, studies which explore antimicrobial prescribing over a longer time-frame generally find a higher prevalence. For example, Gillespie et al. 2015 found that 73.7% of residents in 10 care homes in Wales were prescribed at least one antimicrobial course over the 12-month study period.

The first part of the current study looked at the prescribing of anticholinergic drugs. In recent years, there has been emerging evidence highlighting the risk of adverse outcomes associated with the prescribing of anticholinergic drugs. More specifically, previous studies have found that the use of anticholinergic drugs in older adults can lead to adverse outcomes that increase the risk of hospitalisations (Gnjidic et al. 2014), falls (Wilson et al. 2011; Landi et al. 2014), diminishing quality of life (Bosboom et al. 2012; Harrison et al. 2018), impaired physical performance (Gnjidic et al. 2009; Gnjidic et al. 2012), cognitive decline (Ancelin et al. 2006; Fox et al. 2011a), and ultimately death (Fox et al. 2011a; Gnjidic et al. 2014). Using the AEC scale to quantify anticholinergic burden, the present study identified that 17.6% of residents were at risk of clinically relevant anticholinergic cognitive effects from their medicine regimens (Bishara et al. 2016; Bishara et al. 2020). Given current evidence suggests a high prevalence of dementia in nursing homes residents (73%) (Prince et al. 2014), the findings from the present study are concerning as the cognitive decline of residents with dementia could be further exacerbated by the prescribing of anticholinergic drugs.

In common with previous studies, the prescribing of dementia drugs (i.e. donepezil, rivastigmine, galantamine and memantine) in residents in the current study was used as a proxy measure for dementia diagnosis (Boustani et al. 2008; Chatterjee et al. 2016; Richardson et al. 2018). With the exception of memantine (which can be prescribed for the management multiple sclerosis), donepezil, galantamine and rivastigmine are all licensed exclusively for dementia in the UK (Joint Formulary Committee 2019). A cohort study of 372 older adults aged over 60 years old in Southern France found that the use of anticholinergic drugs was a strong predictor of mild cognitive impairment (OR=5.12, 95% CI=1.94-13.51) (Ancelin et al. 2006). Given that there is evidence to support the association between anticholinergic drug exposure and an increased risk in cognitive decline, the findings from the current study are concerning given that almost one-third of residents who were prescribed anticholinergic drugs had dementia.

In this study, almost 10% of residents ( $n=34$ ) were prescribed anticholinergic drugs alongside cholinesterase inhibitors (i.e. donepezil, rivastigmine, and galantamine), despite this being recognised as a drug interaction that may reduce the efficacy of cholinesterase inhibitors in the management of dementia. Whilst the prescribing of anticholinergic drugs together with cholinesterase inhibitors has been reasonably well documented in previous research conducted in long-term care facilities, the prevalence of anticholinergic drugs prescribed in combination with cholinesterase inhibitors varies between 10.7% to 61% in the literature (Modi et al. 2009; Teramura-Grönblad et al. 2011; Reppas-Rindlisbacher et al. 2016). Different anticholinergic rating scales were used to identify anticholinergic drugs in these studies, and it is likely that this may have resulted in some of the variation across these studies.

This present study offers some important insights into the prescribing of anticholinergic drugs in UK nursing homes. The high anticholinergic burden identified in some residents was usually a result of the prescribing of multiple lower scoring anticholinergic drugs from the AEC scale. For example, more than 50% of the medicines which contributed towards a clinically relevant cumulative AEC score of 4 were comprised of anticholinergic drugs with an AEC score of 1. A few studies have also found that high anticholinergic drug burden is often a consequence of prescribing multiple anticholinergic drugs that usually feature as low-scoring anticholinergic drugs on various

anticholinergic rating scales (Parkinson et al. 2015; Reppas-Rindlisbacher et al. 2016). This is concerning as some studies conducted on the older adult population suggest increasing total anticholinergic burden calculated using anticholinergic rating scales is associated with adverse outcomes like falls and a reduced quality of life in older adults (Wilson et al. 2011; Harrison et al. 2018). For example, a large longitudinal study of 13,004 participants aged 65 years and older indicated that the odds of death within two years increased by 26% with every additional point scored on the ACB scale (OR=1.26, 95% CI=1.20-1.32) (Fox et al. 2011a).

The appropriateness of analgesic prescribing was also explored in the current study according to the WHO pain ladder. In contrast to concerns regarding the undertreatment of pain in older adults, longitudinal studies in both community and long-term care facilities have revealed that the prescribing of analgesics has gradually increased in recent years (Ruscitto et al. 2015; Sandvik et al. 2016). A recent systematic review by La Frenais et al. (2018) identified a positive correlation (correlation coefficient=0.94) between the prevalence of opioid prescribing and the year in which prescribing data was collected across ten studies. The authors therefore concluded that opioid prescribing have increased over time between 1997 and 2014 (La Frenais et al. 2018).

Previous research indicates that strong opioids (i.e. morphine, oxycodone, fentanyl and buprenorphine) are commonly prescribed in long-term care facilities (Lukas et al. 2013b; Jensen-Dahm et al. 2015; Tan et al. 2016; Hunnicutt et al. 2019). However, these are often prescribed inappropriately as long-acting preparations (Dosa et al. 2009; Pimentel et al. 2016). In common with previous studies, this current study found that most opioids prescribed were strong-opioids and that almost 70% of the 75 residents with inappropriate analgesic regimens were prescribed long-acting strong opioids such as buprenorphine transdermal patches.

Amongst the commonly reported opioid-induced adverse effects such as nausea, vomiting and constipation, the prescribing of opioids has been associated with adverse outcomes including delirium, falls and fractures (American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons 2009; Vestergaard



et al. 2006; Clegg and Young 2011). Of note, a systematic review by Clegg and Young (2011) found that delirium risk was increased by more than two-fold with opioid use (OR=2.5, 95% CI=1.20-5.20) and such events could ultimately contribute towards the incidence of falls and fractures (Clegg and Young 2011). It has also been suggested that long-acting strong opioids which require a prolonged period of time for elimination may have greater overdose potential than short-acting opioids when prescribed to opioid naïve older adults (Pimentel et al. 2016). Given that older adults are particularly at risk of adverse effects of inappropriate opioid use due to age-related pharmacokinetic and pharmacodynamic changes, the high prevalence of potentially inappropriate opioid use in the current study is concerning.

In addition, guidelines recommend that older adults taking opioids should be prescribed laxative therapy for the prophylaxis of opioid-induced constipation (National Institute for Health and Care Excellence 2012; British Geriatrics Society 2013; National Institute for Health and Care Excellence 2019a). However, studies in both primary care and long-term care facilities indicate that this recommendation is not always followed (Max et al. 2007; Veal et al. 2015; Bruin et al. 2019). In particular, the study by Veal and colleagues in 2015 found that a high proportion ( $n=2,195$ , 60%) of Australian older adults were not co-prescribed laxatives with opioids. In line with previous research, the results presented in this chapter demonstrate that laxatives were not prescribed for almost one-third of residents ( $n=28$ ) who received opioids.

Although the present findings show that some residents were not prescribed laxatives alongside opioids and therefore prescribing guidance was essentially not followed, anecdotal evidence in practice suggests that some residents may not require regular prescriptions for laxatives due to a history of laxative-induced diarrhoea when these medicines are prescribed. Of note, the study by Bruin and colleagues in 2019 found that almost 25% of adults ( $n=137$ ) who collected their medicines from 81 community pharmacies in the Netherlands were not prescribed laxatives with regular opioid use because the clinician and/or patient considered them to be unnecessary. More locally, a study by Baqir et al. (2017) found that laxatives accounted for the group of medicines that was most frequently deprescribed by a multidisciplinary team in 422 residents of 20 care homes in Northern England. Given that an increasing number of primary care

pharmacists conduct medication reviews for care home residents in the UK, the absence of laxative therapy for the 28 residents who were prescribed opioids in the current study could be entirely appropriate due to a lack of clinical need. Instead, it is possible that residents in the current study may have received laxatives as a 'homely remedy' within the nursing home when there was a clinical need. This is because laxatives which are general sales list (GSL) and pharmacy (P) medicines could be readily purchased without a prescription by care home staff for use as a 'homely remedy' in the acute management of residents with 'minor' ailments such as constipation in the UK (National Institute for Health and Care Excellence 2018). It is estimated that £50million worth of unused medicines is disposed by care homes every year in the UK (Trueman et al. 2010), and some care homes have started to implement a 'homely remedies' policy to reduce medicines waste (East and North Hertfordshire Clinical Commissioning Group 2019).

The prescribing of benzodiazepines and Z-hypnotics was also examined in the present study, with 37% of residents ( $n=50$ ) prescribed these medicines in a manner that was deemed potentially inappropriate. The total number of medicines received by residents who were prescribed potentially inappropriate benzodiazepines and Z-hypnotics was higher than those who were prescribed appropriately ( $Md=10$  vs. 8 respectively). Previous research has similarly shown that the prescribing of benzodiazepines and Z-hypnotics in long-term care facilities is often related to polypharmacy (Petek Šter and Cedilnik Gorup 2011; Bourgeois et al. 2012). For example, a cross-sectional study by Petek Šter and Cedilnik Gorup (2011) found that the odds of anxiolytic use amongst 2,040 residents from 12 nursing homes increased by 18% when an increasing number of medicines was prescribed (OR=1.18, 95% CI=1.15-1.25). Whilst Bourgeois and colleagues in 2012 similarly found an association between polypharmacy and benzodiazepines and Z-hypnotics, they have further established that the use of these medicines was positively associated with central nervous system drugs used for the management of pain (OR=1.58, 95% CI=1.27-1.97).

The British National Formulary recommends that underlying factors which impact on sleep must be explored and managed prior to the initiation of anxiolytics and hypnotics in patients (Joint Formulary Committee 2019). Symptoms associated with uncontrolled pain could lead to both sleeplessness and agitation in older adults, and it is likely that

clinicians may be inclined to prescribe hypnotics to aid sleep under these circumstances. In this present study, almost 35% of residents ( $n=26$ ) with potentially inappropriate pain management was prescribed anxiolytics and/or hypnotics. A pain management review for these residents could highlight areas of suboptimal pain control and resolve associated symptoms like sleeplessness and agitation. This would ultimately improve the quality of life of residents and potentially eliminate the requirement for hypnotics to be prescribed.

The potentially inappropriate prescribing of benzodiazepines and Z-hypnotics identified in the present study is particularly concerning as it places residents at an increased risk of adverse outcomes which could be avoided. More specifically, previous research has shown that the prescribing of anxiolytics and hypnotics is associated with an increased risk of adverse outcomes related to cognitive decline associated with dementia (Wu et al. 2009; Billioti de Gage et al. 2014), falls (Mustard and Mayer 1997; Ray et al. 2000) as well as dependence and withdrawal symptoms (Joint Formulary Committee 2019). Of note, a case-control study by Billioti de Gage et al. (2014) found that benzodiazepine use amongst older adults in Canada was associated with a 51% increased risk of Alzheimer's disease (OR=1.51, 95% CI=1.36-1.69). The same is true for falls, as the study by Ray and colleagues in 2000 found that benzodiazepine use amongst 2,510 residents from 53 nursing homes in the United States was associated with a 44% increased risk of falls (OR=1.44, 95% CI=1.33-1.56).

Recent literature has highlighted that analgesics, benzodiazepines and/or Z-hypnotics are often prescribed on an 'as required' basis in long-term care facilities (Westbury et al. 2019; Griffiths et al. 2019). In this current study, the number of residents prescribed these medicines were fairly similar to the most recent UK study conducted by Griffiths et al. (2019), with 33% of residents ( $n=160$ ) prescribed 'as required' analgesics and 11% ( $n=54$ ) prescribed 'as required' benzodiazepines and/or Z-hypnotics. Griffiths and colleagues in 2019 studied the prescribing and administration of 'as required' medicines which act on the central nervous system in 50 care homes in the UK and found that 35% of residents were prescribed 'as required' analgesics and 7% were prescribed benzodiazepines and/or Z-hypnotics.

More interestingly, this current study found several residents were prescribed analgesics, benzodiazepines and/or Z-hypnotics for administration at regular intervals and on an 'as required' basis. For example, 29.6% of residents ( $n=16$ ) prescribed 'as required' benzodiazepines and/or Z-hypnotics were also prescribed these medicines on a regular basis. In addition, 18.1% of residents ( $n=29$ ) prescribed 'as required' analgesics were also prescribed these medicines to be given regularly. A national cross-sectional cohort study by Westbury et al. (2019) which examined the use of psychotropics in 11,368 residents from 139 residential aged care facilities in Australia similarly found a number of residents prescribed regular doses of benzodiazepines together with the same medicines to be administered on an 'as required' basis. Of note, Westbury and colleagues identified that almost one-half of the residents prescribed 'regular' benzodiazepines ( $n=1,150$ , 47%) were also prescribed these medicines on an 'as required' basis. This is concerning as it increases the likelihood of overdose and adverse outcomes in residents where the total doses of these medicines given regularly with occasional doses administered 'as required' may exceed the recommended maximum doses.

In common with the study by Griffiths et al. (2019), this current study identified considerable variability in the administration rates of 'as required' analgesics and benzodiazepines and/or Z-hypnotics. More specifically, a median of 70.0% (interquartile range=29.7 to 96.7%) of doses of 'as required' benzodiazepines and/or Z-hypnotics, and a slightly lower median of 42.8% (interquartile range=23.3 to 61.7%) doses of 'as required' analgesics were administered to residents. Although the significant range in the rates of administration of these 'as required' medicines could be explained by individual resident needs, research often reports equivocal findings in this regard (Stokes et al. 2004; Stasinopoulos et al. 2018). For example, whilst the cross-sectional study conducted by Stasinopoulos et al. (2018) highlighted that residents with an increased level of care needs had an increased likelihood of 'as required' medicines being administered in Australian residential aged care services, a cross-sectional study by Stokes et al. (2004) reported that residents with a lower level of care needs had an increased 'as required' medicines use in Dutch nursing homes. The frequency of administration of these medicines when prescribed 'as required' ultimately impacts on

the risk of adverse outcomes to residents. Given that care home staff are responsible for administering 'as required' medicines to residents, future work should aim to understand the decision-making of staff in administering 'as required' medicines in UK care homes.

There is also emerging evidence that there has been a gradual shift towards the prescribing of psychotropics to be administered on an 'as required' basis in long-term care facilities (Westbury et al. 2019). It has been previously suggested that the shift towards the prescribing of 'as required' analgesics and benzodiazepines and/or Z-hypnotics reflects efforts made by clinicians to reduce the exposure of residents to these medicines and their risk from adverse outcomes (cf. administration of these medicines at regular dose intervals) (Stasinopoulos et al. 2018). Indeed, the same principle has been similarly applied to care home practice in the UK, with for example the delivery of a medicines optimisation service in care homes by Wigan Borough Clinical Commissioning Group (Swift 2018). Specifically, the service aimed to reduce inappropriate polypharmacy amongst 749 care home residents by reviewing medicine regimens with a view to either i) discontinue the prescription, ii) reduce daily doses, or iii) changing medicines prescribed regularly to 'as required' where appropriate (Swift 2018). However, given the finding in this current study that some residents received almost all their 'as required' doses of benzodiazepines and/or Z-hypnotics, 'as required' prescribing may be potentially inappropriate, and these residents may benefit from a medication review to determine their current needs.

The final part of this present study explored the prescribing of antimicrobials, identifying that more than one-third of the antimicrobials prescribed over the study period were broad spectrum antimicrobials including penicillins, cephalosporins, and quinolones. The choice of antimicrobials prescribed for infections in long-term care facilities have been examined in previous studies, similarly highlighting that such broad spectrum antimicrobials are the most commonly prescribed antimicrobial classes (Benoit et al. 2008; Blix et al. 2010; Heudorf et al. 2012; Daneman et al. 2015; Marquet et al. 2015; Ricchizzi et al. 2018; Selcuk et al. 2019; Thornley et al. 2019; Smith et al. 2020). This finding is concerning as organisations in the UK recommend against the use of broad spectrum antimicrobials wherever possible due to the growing evidence of antimicrobial

resistance with their use, and complications associated with *Clostridioides difficile* infection such as antimicrobial-associated diarrhoea (Public Health England 2018; All Wales Medicines Strategy Group 2019; Department of Health and Social Care 2019). For example, in a cross-sectional study conducted in four long-term care facilities in Australia, researchers found that the odds of multi-drug resistant gram-negative bacilli colonisation is increased by four-fold with prior use of broad-spectrum antimicrobials like quinolones (OR=4.27, 95% CI=1.20-15.25) (Lim et al. 2014). More locally, a 12 month cohort study across care homes in Wales found that the risk of complications associated with antimicrobial use such as antimicrobial-associated diarrhoea increased more than two-fold following the use of broad spectrum antimicrobials like co-amoxiclav (HR=2.06, 95% CI=1.18-3.66) (Gillespie et al. 2015).

Many cross-sectional studies have focussed on exploring the prescribing of antimicrobials in long-term care facilities on a single day (Blix et al. 2010; McClean et al. 2011; McClean et al. 2012; Boivin et al. 2013; Rummukainen et al. 2013; Ricchizzi et al. 2018; Thornley et al. 2019). This methodology has meant that the prescribing of repeated courses of antimicrobials to residents has been underexplored. Whilst some longitudinal studies have reported a high number of antimicrobial courses prescribed to residents over an extended time period (range=0.6 to 13.9 courses of antimicrobials per 1000 resident days) (Mylotte 1996; Loeb et al. 2001; Benoit et al. 2008; Lim et al. 2012; Sundvall et al. 2015), the types of antimicrobials prescribed to residents receiving such multiple courses remains largely unknown. This present study highlighted potential areas of inappropriate prescribing of multiple antimicrobial courses to residents of nursing homes in the UK. For example, some residents were identified to have received repeated courses of the same antimicrobial within the same one-month medicines cycle. This included the re-prescribing of the same broad-spectrum antimicrobials which is particularly concerning given their ongoing association with the emergence of antimicrobial resistance. Of note, approximately one in five residents are colonised with extended-spectrum  $\beta$ -lactamase (ESBL) producing microorganisms (Flokas et al. 2017) and the odds of methicillin-resistant *Staphylococcus aureus* (MRSA) colonisation is increased by almost four-fold with nursing home exposure (McKinnell et al. 2013), meaning that such residents will be resistant to many antimicrobials if infections are

found to be caused by these microorganisms. Given the high rates of antimicrobial resistance in long-term care facilities, it is likely that some residents in the present study may be particularly susceptible to colonisation by antimicrobial resistant organisms and therefore the clinical decision to re-prescribe the same course of broad-spectrum antimicrobials may be of dubious value, prolonging the infection whilst also placing residents at risk of the adverse effects associated with antimicrobial use.

Most residents in this current study were prescribed antimicrobials for the management of urinary tract infections ( $n=72$ , 62.6%), with a significant proportion of these prescribed short courses of antimicrobials to treat UTIs ( $n=50$ , 69.4%). This is consistent with previous research conducted within care homes in the UK (McClellan et al. 2012; Thornley et al. 2019). Current guidance states that the majority of older adults often have asymptomatic bacteriuria and the use of antimicrobials for the management of UTIs in the absence of clinical signs and symptoms are not only ineffective but may in fact predispose these individuals to harmful adverse effects (Royal College of General Practitioners 2018). In a six month cross-sectional study of four nursing homes in the United States, the researchers found that 50% of antimicrobial courses for UTIs were prescribed to residents with asymptomatic bacteriuria (Phillips et al. 2012). Similarly, in a 12-month prospective study of 25 nursing homes in the United States, the researchers found that there were 110 episodes of UTIs which presented without any clinical signs and symptoms and that 75% of these were treated unnecessarily with antimicrobials (D'Agata et al. 2013). It is therefore likely that the antimicrobials prescribed for the treatment of UTIs in this current study may similarly be of limited value whilst predisposing residents to preventable adverse effects as well as further exacerbating antimicrobial resistance in care homes.

The inappropriate prescribing of antimicrobials to manage UTIs in long-term care facilities could be explained by methods that have been historically used to source prescriptions for residents with suspected episodes of UTIs. In UK care homes, prescriptions for antimicrobials could be prescribed in person, or over the telephone without a preceding clinical examination by a clinician (Thornley et al. 2019). Whilst Public Health England advises against the prescribing of antimicrobials over the telephone (Public Health England 2018), the most recent study by Thornley and

colleagues in 2019 highlighted a significant number of prescriptions for the management of UTIs were prescribed over the telephone; this is in contrast to other infection types like infections of the respiratory-tract, skin, and eye. In a Dutch qualitative study, semi-structured interviews with doctors and nursing staff were employed to understand the factors that influenced the prescribing of antimicrobials in seven long-term care facilities (five nursing homes and two residential homes). Participants indicated that antimicrobial prescriptions which were prescribed over the telephone may be inappropriate given that nursing staff at the home are often relied on to conduct clinical examinations when doctors are off-site (Van Buul et al. 2014).

Whilst the prescribing of antimicrobials for the management of UTIs may be potentially inappropriate, this current study found that, once prescribed, most doses were administered to residents ( $Md=100\%$  doses administered for antimicrobials prescribed for the prophylaxis and  $Md=90.3\%$  doses administered for antimicrobials prescribed for treatment). This finding is in common with studies conducted in UK care homes by McClean et al. (2012) and Thornley et al. (2019). For example, Thornley et al. (2019) reported only 9.2% of residents had doses omitted and McClean et al. (2012) did not identify any incidences of omissions on MAR charts.

This present study also provided further understanding of the administration of antimicrobials prescribed for the prophylaxis and treatment of UTIs. Prescribed courses of prophylactics were more likely to be fully administered (60% of courses completed) compared to courses prescribed for the treatment of UTIs (33.3% of courses completed). The differences observed may partly be a consequence of resident characteristics. For example, residents requiring antimicrobials for the treatment of infections may be acutely unwell in terms of their physical health (cf. to those who are prescribed antimicrobials for prophylaxis purposes), and as such, staff may struggle to administer medicines to these residents. Indeed, Thornley and colleagues in 2019 similarly highlighted that several omitted antimicrobial doses were due to some residents being physically unable to take the antimicrobial.

The study presented in this chapter has four limitations to acknowledge. Firstly, the sample of nursing homes recruited in the current study was fairly small and findings may



not be generalisable to other nursing homes of the UK. However, the prescribing patterns with respect to key classes of medicines which are commonly identified as potentially inappropriate in older adults were explored in detail in a variety of nursing homes. Of note, the recruited nursing homes in the present study were from a mix of both rural and urban locations in the UK with variability in bed capacities. Secondly, only homes which used the PCS™ were recruited to this study. This limits the sample size (PCS™ users represent a small number of nursing homes compared to the total population) and it is possible that these findings may not be representative of other homes which do not use PCS™. However, the number of errors identified with respect to the key classes of medicines which are commonly identified as potentially inappropriate in older adults were consistent with other studies. Thirdly, clinical diagnostic information (e.g. patient notes, physiological readings and clinical biochemistry test results) that would have informed the study and assisted in assessing the clinical appropriateness of medicines prescribed were not available. Nevertheless, the medicines examined in the current study have often been identified as key classes of medicines which feature in explicit criteria tools such as Beers criteria and the STOPP/START criteria to identify inappropriate prescribing in older adults. National guidance in the UK has similarly highlighted that the classes of medicines studied here should be prioritised to optimise prescribing in this vulnerable population. Lastly, the classes of medicines examined in the current study were categorised according to the body systems listed in the British National Formulary, and it is therefore difficult to compare the present findings to other international research which often classify medicines according to the Anatomical Therapeutic Chemical (ATC) classification system developed by the World Health Organization (WHO). Despite this, it was appropriate to classify medicines according to the body systems categorised by the British National Formulary given that the current study was conducted in the UK.

To conclude, this chapter has provided insights into the prescribing patterns of anticholinergic drugs, analgesics, anxiolytics and hypnotics, in addition to antimicrobials amongst 483 residents from eight nursing homes in the UK over a one-month study period. The medicines administration patterns of antimicrobials and 'as required' analgesics, anxiolytics and hypnotics, were also explored. Whilst the UK has begun

implementing pharmacist-led medication reviews with a view to improve the quality of prescribing in care homes, the current study has shown that these strategies may not be sufficient, at least at this time, in optimising the use of medicines within this environment given a significant number of residents remain exposed to potentially inappropriate prescribing. Future work should prioritise policies and processes to efficiently conduct medication reviews in care homes.

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**Chapter 3 Exploring the Quality and Feasibility of a Model  
of Nurse-Delegated Medicines Administration by Senior  
Carers**

## 3.1 Chapter summary

Chapter 3 is a mixed methods study that explores the quality and feasibility of senior carers administering medicines, under the delegation of nurses, to nursing home residents using a digital medication management system (PCS™). This chapter involves research on a mix of stakeholders within nursing homes (i.e. care home managers, nurses, senior carers, carers, residents and their relatives). The chapter will begin with an introduction to the background of this research project, followed by the aims and objectives of the study, research design and methods, and then results. To conclude, the research findings and their implications for practice in nursing homes will be discussed.

## 3.2 Introduction

### 3.2.1 The development of the carers' role

Delivering health and social care in the UK is increasingly challenging not least due to a growing older adult population with complex health needs and polypharmacy, financial constraints and a health professional workforce that has not grown in line with needs (Duerden et al. 2013; Smith 2014; NHS Improvement 2016; Competition & Markets Authority 2017). In addressing the health and social care needs of older adults, a significant challenge will be in growing and upskilling the workforce to address individual needs.

As a consequence, health and social care has seen the emergence of an ancillary workforce comprised of individuals that are not healthcare professionals. A major review of this ancillary workforce was published in 2013 in the Cavendish Review. This review indicated that the ancillary workforce devote the majority of their time to delivering personal care to patients but that they are *“now doing jobs that used to be the preserve of nurses, even doctors”* (Cavendish 2013). In addition, the review provided a number of recommendations to ensure the quality of care provided by this group was of an adequate standard. These recommendations included the provision of common training standards and quality assurance for training and qualifications.

Within the literature and in the workplace, there are a variety of titles that are used to describe roles within this ancillary workforce across health and social care settings.

These titles are often used interchangeably and include: carers, health care support workers, care aides, healthcare aides, health care assistants, nursing assistants, nurse aides, unlicensed assistive personnel, home care assistants, care assistants, and unlicensed caregivers. In this study, the terms 'carer,' 'care staff,' or the term that has been used by the original researchers of studies cited in this thesis, will be used to denote this ancillary workforce trained in the provision of personal care and other tasks related to their care roles.

One setting in which the growth of care staff has been particularly significant is within care homes. In these settings, carers have historically provided varying degrees of support services related to medicines management, wound care, nutritional care, clinical observations, and sample taking within community nursing services as well as residential homes (Spilsbury et al. 2013). These activities have traditionally served to complement the role of nurses rather than replace them. However, carers are increasingly being asked to deliver services that have previously been the direct responsibility of nurses. This has been particularly driven by the growth in the number of older adults requiring residential and nursing care alongside a fall in the number of nurses entering the care home sector (Royal College of Nursing 2010).

One area in which there has been interest in deploying carers is in the administration of medicines to residents under the delegation of nurses. Indeed, medicines management is often cited as one of the tasks most frequently delegated by nurses to carers (Bystedt et al. 2011; Denton et al. 2015).

In UK residential homes, medicines administration is normally undertaken by trained carers. Conversely, the situation is different in nursing homes where the availability of nurses on site throughout the day has historically meant that nurses assume the responsibility of preparing and administering medicines. However, recent changes to guidance allows for experienced or senior carers to administer medicines to nursing home residents on completion of appropriate training and competency based assessment(s) (Department of Health 2016; Care Inspectorate 2016; Care Inspectorate Wales 2016; Spilsbury et al. 2016).

### **3.2.2 Nurse-delegation of medicines administration by senior carers in nursing homes**

Delegation is defined as the assignment of a task to another individual in a specified situation (Stonehouse 2015). In accordance with standard 11 of the Code for nurses and midwives in the UK, nurses can delegate tasks to others providing that the individual accepting the task is capable and is appropriately supervised to ensure that the task is delivered to a high standard (Royal College of Nursing 2015; Nursing and Midwifery Council 2015b). Upon delegation, the nurse accepts professional responsibility that delegation is in the best interest of the resident and the senior carer to which the task is delegated becomes accountable for their actions (Royal College of Nursing 2015).

A variety of guidance documents, legislation and professional standards for health care professionals related to medicines management emphasise the importance of training, assessment as well as the continual review of competency of care staff when undertaking medicines administration (Royal Pharmaceutical Society of Great Britain 2007; Nursing and Midwifery Council 2015a; Care Quality Commission 2015; Royal College of Nursing 2015; Department of Health 2016; Care Inspectorate 2016; Care Inspectorate Wales 2016; National Institute for Health and Care Excellence 2018; Care Quality Commission 2020a). Although health and social care regulators do not detail specific training requirements for senior carers that are administering medicines under the delegation of a nurse within nursing homes, it is recommended that senior carers should be working towards a level 3 diploma in health and social care for adults (Care Inspectorate 2016; Care Inspectorate Wales 2016). Whilst the evidence base for this approach is fairly limited, of note, one evaluation which aimed to compare the quality of care provided by nurses versus care staff in the UK found that staff who completed a level 3 diploma in health and social care for adults provided better quality of care compared to newly qualified nurses (Warr 1998).

### 3.2.3 Research on nurse-delegated medicines administration by senior carers in long-term care facilities

A variety of qualitative and quantitative research methods have been adopted to study medicines administration in long-term care facilities in the UK and internationally (Pierson et al. 2007; Alldred et al. 2009; van den Bemt et al. 2009; Barber et al. 2009; Crespín et al. 2010; Wild et al. 2011; Szczepura et al. 2011; Gilmartin-Thomas et al. 2017; Odberg et al. 2018). It is clear in the literature that medication administration errors are prevalent within care homes (see chapter 1, section 1.6.2), with for example the seminal CHUMS study highlighting that 22.3% of the residents studied were exposed to at least one administration error between 2006 to 2007 (Alldred et al. 2009). This reinforces the necessity to review the quality and feasibility of any new model of medicines administration to care home residents.

A study conducted by the Social Care Institute for Excellence in 2016 provides some relevant information regarding the safety of a model of nurse-delegated medicines administration by senior carers in care homes. Specifically, the study evaluated the impact of a development programme for senior carers within a care home group in the UK and found that the number of medication errors fell from 92 errors (between May 2014 to March 2015) to 36 errors (between May 2015 to March 2016) once senior carers were trained to undertake nursing tasks like medicines administration alongside nurses (Social Care Institute for Excellence 2016). However, the study lacks clarity in regard to the types of staff who were responsible for the errors. These details are important in determining the quality of medicines administration by different staff members.

Given that medicines administration by carers is a normal practice in other environments like residential homes in the UK, studies conducted in residential homes could provide insights into the quality of medicines administration by carers. Of note, the seminal CHUMS study found no statistically significant differences in the number of medication administration errors made by carers in residential homes compared to nurses in nursing homes ( $p$ -value=0.063) (Alldred et al. 2009). In another UK study, the researchers found that medication administration errors were 1.43 times as likely to be made by nurses in nursing homes compared to carers in residential homes ( $p$ -

value<0.001) (Szczepura et al. 2011). Although there is some evidence from the UK which suggest that medicines administration by carers in residential homes is at least as safe as administration by nurses (in terms of number of medication administration errors) (Alldred et al. 2009; Szczepura et al. 2011), it is difficult to determine if these findings are more widely generalisable to other environments where medicines are administered by senior carers (under nurse-delegation) in nursing homes. This is because there are clear differences between medicines administration by carers in residential homes versus a nurse-delegated model of medicines administration by senior carers in nursing homes. For example, unlike residential homes, in nursing homes, nurses are on-site with senior carers throughout the day. In addition, unlike residential homes, nurses delegate the medicines administration task to senior carers working in nursing homes.

Aside from care homes research in the UK, the practice of medicines administration by specific staff members like senior carers (under nurse-delegation) and nurses have been explored internationally in long-term care facilities (including nursing homes) (Spellbring and Ryan 2003; Reinhard et al. 2006; Randolph and Scott-Cawiezell 2010; Walsh et al. 2013; Gransjön Craftman et al. 2014; Denton et al. 2015; Dupler et al. 2015; Lee et al. 2015; Gransjön Craftman et al. 2016). In the main, these studies have shown that nurse-delegated medicines administration by senior carers who have undertaken relevant medicines training is a practical alternative to administration by nurses.

It should be noted however that, these studies often use a variety of titles to describe senior carers undertaking medicines administration tasks in long-term care facilities and include: medication aides, medication technicians, medication assistants in addition to other titles used to denote care staff that have been described in section 3.2.1. Where references are made about senior carers undertaking medicines administration in studies discussed in this thesis, 'senior carer' or the term that have been used by the original researchers will be used.

Although a number of studies indicate that the decision to implement nurse-delegated medicines administration by senior carers in long-term care facilities tends to be driven by attempts to reduce costs in these settings (Dupler et al. 2015; Lee et al. 2015;

Gransjön Craftman et al. 2016), there is currently a lack of evidence which confirms that administration by senior carers leads to reductions in cost. However, aside from potential financial-savings, studies do reveal other valuable outcomes. For example, studies which explored the perceptions of senior carers who were delegated the task of medicines administration found improvements to resident care as well as nurses being freed to focus their time on more complex residents or other nursing tasks (Randolph and Scott-Cawiezell 2010; Lee et al. 2015; McMullen et al. 2015). In addition, these studies also found that they enjoyed their new roles (Randolph and Scott-Cawiezell 2010; Lee et al. 2015).

Where studies have specifically investigated the safety and quality of nurse-delegated medicines administration by senior carers in nursing homes (Scott-Cawiezell et al. 2007; Randolph and Scott-Cawiezell 2010; Walsh et al. 2013), observational studies tend to dominate research in this area as these are generally considered the most accurate method for identifying errors (Allan and Barker 1990). For example, the observational study by Scott-Cawiezell et al. (2007) showed no statistically significant differences in medication administration error rates for nurses versus medication technicians (34.6% vs. 34.2%;  $p$ -value=0.82) working in nursing homes. Due to the time-consuming nature of observational methods, limited sample sizes of nurses and senior carers remains a consistent feature of such studies with, for example, Scott-Cawiezell et al. (2007) examining the largest group of staff ( $n=39$ ) from five nursing homes. Randolph and Scott-Cawiezell in 2010 mentioned that small sample sizes make it difficult to apply meaningful inferential statistics to examine the differences in medication administration errors committed by nurses and medication aides. Conversely, a longitudinal study conducted within eight states in the USA utilising self-reported staff data and data from inspection reports found that nurse-delegated administration by medication aides in skilled-nursing facilities can significantly reduce the probability of the total number of medication administration errors and unnecessary medicines use amongst residents ( $p$ -value<0.001) (Walsh et al. 2013). It should be noted however that self-reporting bias on staffing data could have inherently impacted the validity of the results. In summary, despite methodological weaknesses, international studies within long-term care appear



to suggest that senior carers commit at most the same number of medication administration errors as nurses.

More recent attention has focussed on the use of technology to support medicines management processes within long-term care facilities (Patterson et al. 2006; Scott-Cawiezell et al. 2009; Wild et al. 2011; Szczepura et al. 2011; Qian et al. 2015; Fuller et al. 2018). Whilst studies do cite benefits associated with the use of digital medication management systems to improve the safety of medicines administration (see chapter 1, section 1.6.2), a limited number of studies have raised safety concerns arguing that the benefits associated with digital systems may be impacted by attempts to 'work around' the safety features that are purposefully designed to enhance resident safety (Patterson et al. 2006; Chan 2008; Scott-Cawiezell et al. 2009). In addition, both Wild et al. (2011) and Szczepura et al. (2011) propose that the understanding of staff behaviour and digital systems should be explored further before the delegation of care staff to administer medicines in nursing homes can be recommended. More importantly, the understanding of this is particularly relevant to the UK as senior carers can now be delegated to administer medicines in nursing homes and there are current government initiatives to embed digital systems into care homes for quality improvement and medicines optimisation (NHS England 2018).

Whilst there seems to be some evidence internationally that corroborates the quality and feasibility of nurse-delegation of medicines administration by senior carers within long-term care facilities (including nursing homes), the practice remains underexplored in the UK. Due to differences in the level of training, resident characteristics, regulations and the healthcare system(s) that operate overseas, it is difficult to generalise findings to nursing homes in the UK. Given current staffing pressures in the care homes sector and recent guidance that has been released to support nurse-delegated medicines administration by senior carers, it is anticipated that an increasing number of nursing homes may potentially seek to implement this model of care (Department of Health 2016). It is important to ensure that in implementing the new guidance, medicines management remains safe and effective for both residents and staff alike, and a study addressing the quality and feasibility of the model in UK nursing homes is timely.

### **3.2.4 Aim and objectives**

This mixed methods study seeks to explore the quality and feasibility of a model of nurse-delegated medicines administration by senior carers in UK nursing homes that use a digital medication management system (PCS™). The objectives of the study are:

- i) To determine the proportion of total medicine administrations in nursing homes that are delegated to senior carers by nurses.
- ii) To compare the types of medicines that are administered by nurses and senior carers.
- iii) To compare the number and types of medication administration errors made by nurses and senior carers using the PCS™.
- iv) To explore the perceptions of care home managers, nurses, senior carers, carers, residents and their relatives before and after the implementation of a model of nurse-delegated medicines administration by senior carers.

## **3.3 Methods**

### **3.3.1 Study design**

This study represents an evaluation of the implementation of a model of nurse-delegated medicines administration by senior carers in nursing homes using a digital medication management system (PCS™). The study was divided into two parts, part 1 and part 2, and utilised a mixed methods approach to address the aim and objectives of the study.

Mixed methods research, a common methodology used in health services research, incorporates both quantitative and qualitative methods to answer a research question (Tariq and Woodman 2013). A mixed methods approach is commonly used in studies where it is believed that the research question can be answered more completely via the employment of both quantitative and qualitative methods (Creswell and Plano Clark 2011).

Quantitative research often adopts a deductive approach whereby the collection of data is typically presented in a numerical format, and statistical analysis is used to explore

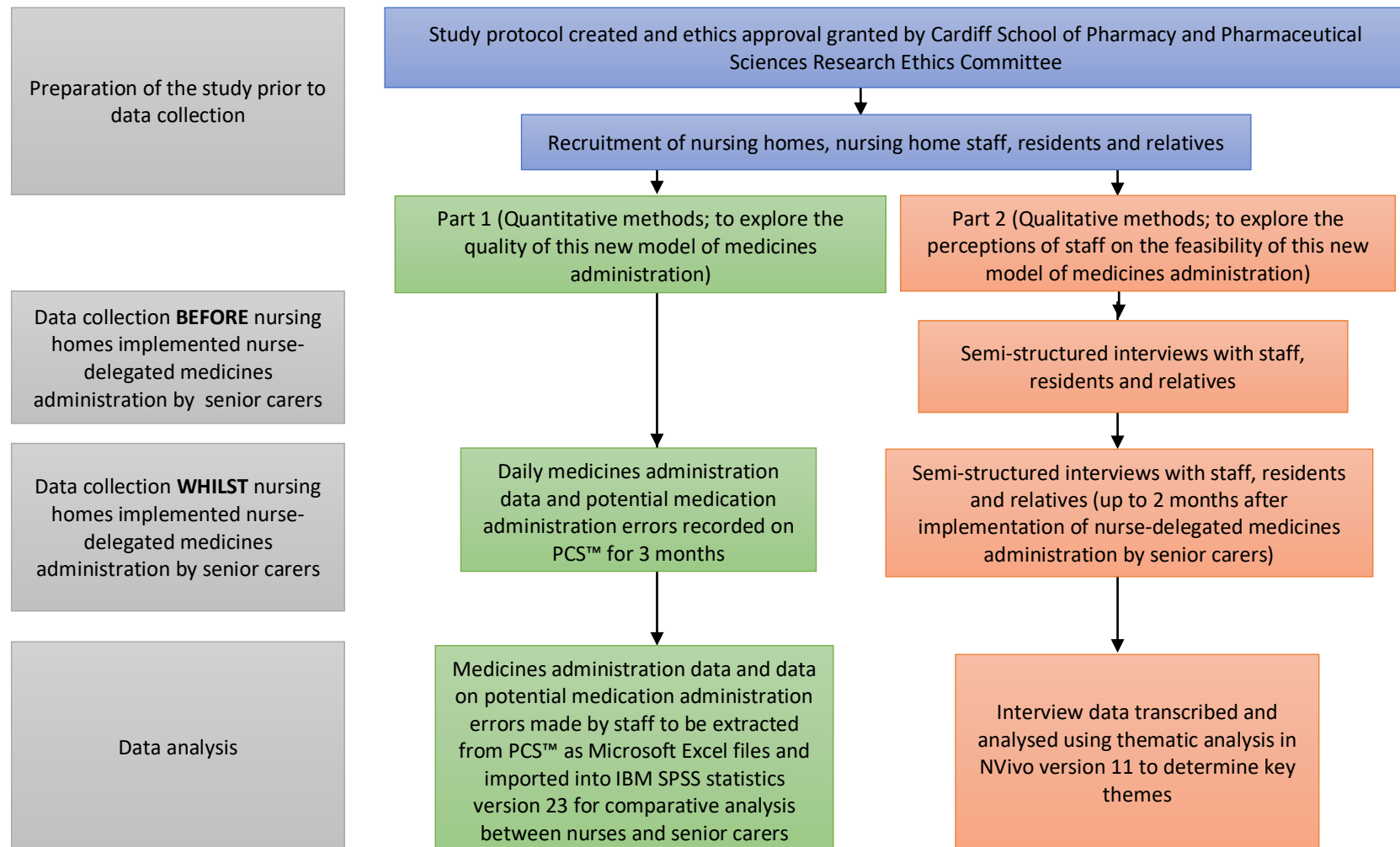
relationships and test theory (Creswell 2009). In relation to objectives i), ii), and iii) of this study, quantitative methods allow for measurement and comparison of the medicines administration practices of nurses and senior carers in nursing homes. Although quantitative research allows for efficient data collection and analysis of large datasets that tend to be more generalisable compared to qualitative research methods, it often does not provide sufficiently detailed explanation as to how or why results arise (Tariq and Woodman 2013).

To address this, qualitative methods are commonly employed. Here, an inductive approach is generally used whereby data is collected for example through focus groups or interviews with participants. The researcher then develops an interpretation of the data in order to generate a theory (Creswell 2009). Qualitative research offers rich data on participants' viewpoints and their values related to the context of the research question (Pope and Mays 1995). In this study, the perceptions of stakeholders regarding nurse-delegated medicines administration by senior carers in nursing homes was obtained through semi-structured interviews to address objective iv). One disadvantage of a qualitative approach is that results are subjective owing to any bias in the researcher (conscious or unconscious), as the interpretation of findings cannot be completely divorced from the researcher's own experiences and perspectives (Noble and Smith 2015). Also, in contrast to quantitative methods, data collection and analysis tends to be less scalable and as such smaller sample populations are studied which can impact on the generalisability of findings (Creswell 2015).

All researchers incorporate a worldview into their research – a set of beliefs that influences how a piece of research is conducted (Creswell 2015). Researchers that adopt a mixed methods research design often hold a pragmatic worldview. This is the belief that the use of a variety of quantitative and qualitative research methods allows for a more thorough and better understanding of the research problem (Creswell 2009). Likewise, the researcher in this present study felt that the use of a mixed methods approach facilitated a more holistic exploration of nurse-delegated medicines administration by senior carers in nursing homes that use a digital medication management system (PCS™). Consequently, the worldview in which the researcher in this present study has is one of a pragmatist. A mixed methods approach was therefore

adopted in this study to explore i) the quality of nurse-delegated medicines administration by senior carers (quantitative – part 1 ; section 3.3.3) and ii) perceptions of this new model of care (qualitative – part 2; section 3.3.4). A schematic diagram of this present study is illustrated in **Figure 3.1**.

**Figure 3.1** Schematic diagram of study (chapter 3)



### 3.3.2 Ethical considerations

The study was reviewed and approved by Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee prior to commencing any studies (see appendix 1).

The nursing homes that were recruited in this study utilised PCS™ to support medicines administration within their homes (see chapter 1, section 1.6.2.1 for further information about PCS™) and gave consent for their data to be used for research as part of their end-user license agreement with Invatech Health Ltd. A governance framework was also developed by Invatech Health Ltd whereby a governance board (which consisted of representatives from the participating nursing homes, Invatech Health Ltd and Cardiff University) attended weekly meetings to ensure the safety of both residents and staff and clinical effectiveness associated with this study.

The nursing homes that participated in part 1 (a quantitative study to explore the quality of a model of nurse-delegated medicines administration by senior carers) were the same group of homes that were recruited for the study in chapter 2. To maintain the confidentiality of the nursing homes recruited to this study, the nursing homes were coded. The codes allocated to the nursing homes in this study are the same codes assigned in chapter 2 (see chapter 2, section 2.3.1 for further information related to the coding used for nursing homes that were recruited).

The medicines administration data used in part 1 of the study was extracted from PCS™ by Invatech Health Ltd, and then provided to the researcher in an anonymised format. This meant that residents and staff were only identifiable by codes known to Invatech Health Ltd.

For part 2 (a qualitative study to explore the perceptions of staff on the feasibility of a model of nurse-delegated medicines administration by senior carers), potential participants were informed in writing about the study via mail. Only those that had capacity to consent were eligible to participate. In addition, potential participants who had learning or communication difficulties were excluded from the study. Participation

was voluntary and both written and verbal consent were obtained from the participants taking part in audio-recorded one-to-one semi-structured interviews.

The audio-recordings obtained from the interviews in part 2 were treated as confidential, transcribed verbatim and anonymised using a reference code in place of personal data. Participants were also informed that they were entitled to withdraw from the study at any time and if they chose to do so, their data would be removed and excluded from the study.

Again, a coding system was adopted here to protect the confidentiality of the nursing homes that participated in this part of the study. For example, the first nursing home recruited to part 2 of the study was assigned the reference code, NH2-1. Similarly, each staff member was assigned a reference code during the transcription of interviews. Staff were assigned a letter representing their professional role within the nursing home (i.e. M for care home manager, N for nurse, S for senior carer (delegated to administer medicines), and C for carer, followed by a number according to the order in which the staff members were interviewed. For example, the first care home manager that was interviewed was assigned the reference code, M1. The researcher also replaced personal data with reference codes when participants' comments had the potential to disclose the identity of others or the nursing home. These details were replaced with a reference code which comprised of the noun mentioned and a number according to the order in which the noun was mentioned during each interview. For example, when a city name was first mentioned during an interview, the name of the city was replaced with the reference code of city1. The same method of allocating reference codes for personal data was used for all interviews.

In terms of data handling for both parts of the study, all physical data (i.e. consent forms and audio-recordings) were stored in a locked filing cabinet in the School of Pharmacy and Pharmaceutical Sciences at Cardiff University. Similarly, digital data (i.e. interview transcripts and medicines administration data) was stored securely on password protected computers. Only the researchers had access to this information.

### **3.3.3 Part 1: a quantitative study to explore the quality of a model of nurse-delegated medicines administration by senior carers**

#### ***3.3.3.1 Participants and setting***

The nursing homes that took part in this study were the same homes that were recruited in the study described in chapter 2 (see chapter 2, section 2.3.2 for further information regarding the methods used to recruit these homes onto the study). Essentially, these were i) registered nursing homes where both nurses and senior carers (under delegation) were able to administer medicines, ii) medicines had previously been administered to residents using PCS™ for at least three months and iii) there was interest within the nursing home in evaluating nurse-delegated medicines administration by senior carers.

#### ***3.3.3.2 Data collection***

All the homes were provided training by Invatech Health Ltd on the use of PCS™ and had administered medicines using PCS™ for at least three months prior to data collection (see chapter 1, section 1.6.2.1 for further information about PCS™). PCS™ was used to collect data relating to medicines administration attempts made by staff during a three-month study period (1<sup>st</sup> October 2017 to 31<sup>st</sup> December 2017).

A three-month study period was chosen for exploration in line with another study that utilised the PCS™ for medicines administration in care homes within the UK (Szczepura et al. 2011). In the study by Szczepura et al. (2011), the researchers aimed to measure the incidence of medication administration errors in care homes.

Chapter 2, section 2.3.3 provides further information relating to the medicines administration data that was collected over three-months. In addition, data related to the time at which the medicines were due for administration and data on the four types of potential medication administration errors made by staff was also collected.

The definition used for a medication administration error (MAE) was, 'any deviation between the medication as prescribed and that administered' (Barber et al. 2009). It was unknown if the four types of MAEs alerted on PCS™ were actually averted or not,



therefore, the term 'potential MAEs' were used to describe the type of errors captured in this study.

The four types of potential MAEs that were recorded were as follows:

- i) attempting to give a medicine to the wrong resident,
- ii) attempting to give a medicine that had been discontinued by the prescriber,
- iii) attempting to give a medicine more than two hours early, and
- iv) attempting to give a paracetamol containing medicine within four hours of the last administered dose.

### **3.3.3.3 Data analysis**

An SPSS file contained the medicines administration data covering a three-month period (see chapter 2, section 2.3.3 for further information related to the methods used to extract this data). This was analysed using IBM SPSS statistics version 23. In addition, anonymised data on the potential MAEs that were made by staff over the corresponding three-month period was also extracted from PCS™ in the form of Microsoft Excel spreadsheets and then imported into IBM SPSS statistics version 23 as another single file for analysis.

#### **3.3.3.3.1 Preparing the data for analysis**

The data on medicine administrations and potential MAEs contained unique codes to identify individual members of staff that were responsible for either the error or an administration. The identity of the individual using these unique codes was only known to Invatech Health Ltd. Consequently, Invatech Health Ltd provided a list of the unique codes of staff classified according to their respective roles in the nursing homes i.e. either 'nurse' or 'senior carer.' This list was used to classify the staff role in the SPSS file.

In addition, all 'missing' medicines administration entries (i.e. those that were identified as 'missing (reviewed)' and 'missing (not reviewed)' as described in chapter 1, section 1.6.2.1) were filtered to allow classification of the member of staff who was responsible for the 'missing' medicines administration(s). The unique code of the member of staff

who was responsible for each 'missing' medicines administration entry, in addition to their respective roles within the nursing homes (i.e. 'nurse' or 'senior carer') were entered into the SPSS file containing the medicines administration data.

The researcher selected a 10% sample from all SPSS files (administration data and potential MAEs) to check the accuracy of staff coding and role allocation.

The researcher also obtained statistical advice from a statistician within the Doctoral Academy at Cardiff University regarding the relevant statistical tests to be used for the analysis of the data.

#### **3.3.3.3.2 Pattern of medicines administered by nurses and senior carers**

The SPSS file containing medicines administration data was used for this part of the analysis. Descriptive statistics were generated to determine the number of nurses, senior carers and residents involved during the three-month study period, in addition to the number and types of medicines due for administration. Chi-square tests were used to examine potential associations between staff role (i.e. nurses and senior carers) and the types of medicines that were due for administration. As multiple Chi-square tests were conducted, the level of statistical significance for the Chi-square tests was adjusted according to the Bonferroni correction and set at  $p$ -value < 0.01. In addition, effect size was determined using the Cramer's  $V$  value for the Chi-square tests. Specifically, a value of 0.1 was considered a small effect, whereas 0.3 was considered a medium effect, and 0.5 was a large effect (Pallant 2016).

#### **3.3.3.3.3 Pattern of potential MAEs made by nurses and senior carers**

The SPSS file which contained data on potential MAEs made by staff was used for this part of the analysis. Descriptive statistics were used to determine the number of potential MAEs made for each distinct error type, in addition to the potential MAE rates made by every individual for each distinct error type during the study period.

The potential MAE rate is essentially the number of potential MAEs made per 1000 medicines administrations. The general equation for calculating the potential MAE rate

made by an individual for each distinct error type is shown in **Equation 3.1**. The numerator is based on the total number of errors made by an individual for a given error type. The denominator is the total number of opportunities for error, for each individual. This is essentially the total number of medicines administrations that had an opportunity to trigger a safety alert on PCS™. This denominator is different according to the distinct error type that is being calculated for a given individual (see **Table 3.1**).

**Equation 3.1** General equation for calculating the potential MAE rate for each distinct error type by an individual during the study

$$\text{Potential MAE rate} = \frac{\text{Number of errors made}}{\text{Number of opportunities for error}} \times 1000$$

**Table 3.1** Calculating the denominator for the potential MAE rate

Potential MAE rate according to the distinct error type	Number of opportunities for error by an individual (i.e. denominator)
<ul style="list-style-type: none"> <li>Attempting to give a medicine to the wrong resident</li> <li>Attempting to give a medicine that had been discontinued by the prescriber</li> </ul>	All medicines which were barcode scanned by the individual
<ul style="list-style-type: none"> <li>Attempting to give a medicine more than two hours early</li> </ul>	All medicines that were documented as either 'given' or 'not given' by the individual
<ul style="list-style-type: none"> <li>Attempting to give a paracetamol containing medicine within four hours of the last administered dose</li> </ul>	All paracetamol containing medicines that were documented as either 'given' or 'not given' by the individual

Mann-Whitney *U*-tests were used to detect differences in the potential MAE rates between nurses and senior carers for each error type. The level of statistical significance was set at *p*-value < 0.05. In addition, effect size was determined using the *r* value for Mann-Whitney *U*-tests. Specifically, a value of 0.1 was considered a small effect, whereas 0.3 was considered a medium effect, and 0.5 was a large effect (Pallant 2016).

### **3.3.4 Part 2: a qualitative study to explore the perceptions of staff on the feasibility of a model of nurse-delegated medicines administration by senior carers**

#### ***3.3.4.1 Participants and setting***

This part of the study utilised qualitative research methods to determine the perceptions of staff, residents and their relatives, before (pre-implementation) and after the introduction (post-implementation) of nurse-delegated medicines administration by senior carers in nursing homes. Purposive sampling is a commonly used sampling strategy in qualitative research to efficiently select samples that are knowledgeable about an area of research area so that detailed views can be generated for interpretation (Patton 2002; Creswell and Plano Clark 2011).

Consequently, a purposive non-randomised sampling method was used to select participants for this part of the study. Nursing home staff (i.e. managers, nurses, senior carers, and carers), their residents and their relatives were identified as key stakeholders within the nursing home with respect to medicines management. Consequently, their views were considered important for evaluating the feasibility of nurse-delegated medicines administration by senior carers in nursing homes. Staff, residents and their relatives were respectively required to be working, residing or is a relative of a resident living in a nursing home that administered medicines using PCS™ and planned to implement a model of nurse-delegated medicines administration to senior carers. As a consequence, only stakeholders of nursing homes from part 1 of the study were invited to participate in part 2 of the study.

Managers of the respective nursing homes who were recruited to part 1 of the study were first contacted via mail for part 2. Information packs (which consisted of an invitation letter, information sheet, consent form, and pre-paid envelope; see appendix 3, 4 and 5) were sent to the care home managers, inviting them to participate in the study. They were given one week to decide whether they would like to distribute letters of invitation to their staff, residents and their relatives and/or participate themselves in the one-to-one semi-structured interviews.

Further information packs (which consisted of an invitation letter, information sheet, consent form, and pre-paid envelope; see appendix 6, 7, and 8) were then mailed to the care home managers of the respective nursing homes once they had provided written consent to distribute the information packs to their staff, residents and their relatives. The number of information packs issued to each nursing home was based on the total number of staff and residents at the nursing homes during the recruitment period. Care home managers distributed the information packs to individuals within the home. This excluded individuals that did not have capacity to consent and those that had learning or communication difficulties. Similar to the recruitment of care home managers into part 2 of the study, the nursing home staff, residents and their relatives were also given one week to decide whether they would like to participate.

Following receipt of completed consent forms, the researcher contacted the care home managers to arrange suitable dates where the pre-implementation interviews could take place at the respective nursing homes. The care home managers were contacted again post-implementation to arrange suitable dates for interviews at the nursing homes. Given that it usually takes one month to adapt to new models of care in care homes (i.e. learning curve) (Szczepura et al. 2011), the post- interviews were conducted up to two months post-implementation to ensure that information regarding the adaptation to the nurse-delegated medicines administration model and its impact on nursing homes could be captured within the interview data.

Although the researcher originally planned to conduct two interviews (pre- and post-implementation of nurse-delegated medicines administration) with each participant, it was difficult to arrange two suitable interview dates during the study. While interview dates were organised with care home managers beforehand, some staff were often unavailable to participate in the interviews due to the busy clinical setting of the nursing home whereby staff were primarily engaged in providing care to residents. Consequently, some participants only took part in one interview (i.e. either the pre- or post- interview).

### **3.3.4.2 Data collection**

Interviews were used to explore the perceptions of nursing home staff, residents and relatives towards a model of nurse-delegated medicines administration by senior carers in nursing homes. Interview methods in qualitative research can be broadly divided into three categories: structured, semi-structured or unstructured. One-to-one semi-structured interviews with care home managers, nurses, senior carers, carers, residents and relatives was selected as the most appropriate method for data collection. This approach was chosen for the flexibility it offers i.e., the interviewer is able to cover key questions related to their area of research but also has the opportunity to probe responses upon the discovery of interesting information or ideas which the researcher may not have previously considered (Gill et al. 2008; Clarke and Braun 2013; Zohrabi 2013). One-to-one interviews were chosen over focus groups due to concern that some participants may feel uncomfortable in openly expressing their views and opinions within a group setting particularly one in which their line manager may be present.

Each interview was conducted face-to-face with the researcher and they were all audio-recorded unless the participant declined to consent, in which case handwritten notes were taken instead. Participants who agreed to participate in the study were interviewed at the nursing home where they worked, lived, or visited. All of the interviews took place within a quiet meeting room organised by the care home manager. Staff were also asked not to enter the meeting room on the days when interviews were scheduled in order to minimise interruptions during the interviews.

A semi-structured interview guide was developed for each stakeholder group i.e. i) care home managers, ii) nurses, iii) senior carers, iv) carers, and v) residents and their relatives. Therefore, a total of five semi-structured interview guides were developed to aid collection of data (see appendix 9, 10, 11, 12, and 13). The same interview guide was used for each stakeholder group for both pre- and post- implementation interviews. In addition, the researcher used lay language during the interviews in order to ensure that the participants understood the questions without ambiguity, so that appropriate responses could be provided (Zohrabi 2013).

All five interview guides consisted of three main parts: i) an introduction to the research, ii) a series of open questions on topic areas that were related to the aim and objectives of the study (main section), and iii) a debrief section.

More specifically, the interview guides began with a brief introduction about the study and description of the interview agenda (DeJonckheere and Vaughn 2019). This was then followed by general questions relating to the background of the participant and the nursing home where they worked, lived, or visited. These questions essentially aimed to allow participants to feel at ease during the interview process, and enable the researcher to contextualise responses during data analysis (Rubin and Rubin 2012).

It is recommended that the topic areas and subsequent questions included in the main section of interview guides should be based on literature on the research area (Rubin and Rubin 2012), therefore the researcher began by reading relevant guidance and documents on nurse-delegated medicines administration by senior carers in nursing homes in the UK (Department of Health 2016; Care Inspectorate 2016; Care Inspectorate Wales 2016; Spilsbury et al. 2016). In addition, the researcher conducted an initial literature search to learn about available literature related to the area of research. However, a full literature review was not conducted as this could facilitate preconceptions around the research topic, which could ultimately limit the researcher's openness to identifying new emerging themes from the interview data during analysis (Tuckett 2005).

Following this initial literature search, the questions and topic areas included in the main section of the interview guides were related to the objectives of the study, and focused on themes that the researchers believed were important in influencing participants' opinions on this model of care. Specifically, topic areas that were covered in all five interview guides included: effectiveness, safety, facilitators and barriers. Additional topic areas were also included relevant to each stakeholder category (see appendix 9, 10, 11, 12, and 13). Open questions were designed for each topic area as it was thought that these would encourage detailed responses by participants, and prevented the researcher from using leading language which could impact on the participants' responses (Clarke and Braun 2013; DeJonckheere and Vaughn 2019). In addition,

supplemental probing questions were further used to clarify ambiguities associated with the participants' responses (Clarke and Braun 2013). The questions and topic areas that were included in the interview guides were discussed with the research team until agreement was reached.

The interview guide concluded with a debrief section. Here, participants were given the opportunity to elaborate on their previous responses in the interview, and ask questions related to the study. In addition, participants were provided with the researcher's contact details should they have any questions regarding the research after the interview.

#### **3.3.4.3 Data analysis**

NVivo version 11 was used for the management of interview data and analysis. Although the researcher originally planned to analyse the pre- and post- interviews separately, only a small number of staff were able to participate in both the pre- and post-interviews. Consequently, all interviews were analysed together (i.e. irrespective of when the interviews were conducted) as the researcher felt that similar opinions were shared in both pre- and post- interviews from stakeholders within the nursing homes.

The researcher imported the audio-recordings of each interview into NVivo version 11, then anonymised and transcribed the digital files verbatim. To ensure rigour during transcription, the researcher also re-checked the transcripts for accuracy against the original digital file.

Following transcription, the researcher analysed the interview transcripts using the six stages of thematic analysis described by Braun and Clarke via an inductive approach, and a description of this method can be found in **Table 3.2** (Braun and Clarke 2006).



**Table 3.2** Description of the process of analysis at each stage of thematic analysis adapted from Braun and Clarke (2006)

Stage	Description
1. Familiarisation of the data	Transcribing the interview data into transcripts, reading and re-reading the transcripts, and noting down initial thoughts and ideas.
2. Generating initial codes	Coding interesting features of the transcripts line-by-line in a systematic fashion and gathering data from transcripts relevant to each code.
3. Searching for themes	Organising codes into potential subthemes and themes, and gathering all data from transcripts relevant to each potential subtheme and theme.
4. Reviewing themes	Verifying if the themes and subthemes work in relation to the coded extracts and across all transcripts, generating a “thematic map” of the analysis.
5. Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each overarching theme and subthemes.
6. Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Thematic analysis is a common approach to analyse large amounts of qualitative data by recognising and understanding patterns in responses that the researcher considers important to the phenomenon under study (Clarke and Braun 2017). The method was chosen to analyse the interview transcripts since the approach is recommended for researchers who are new to qualitative research, but also because the method is capable of identifying patterns across interview transcripts of different research participants (Braun and Clarke 2006). This part of the study contained several opinions and experiences from stakeholders about nurse-delegated medicines administration by senior carers in the nursing home. It was therefore considered important that similarities and differences in their perspectives were identified.

As the researcher conducted the interviews and was responsible for the analysis of data, an inductive approach to thematic analysis was used to reduce researcher bias. The researcher acknowledged herself as an integral part of the research process, and it was therefore considered that her interpretation of the data could be influenced by her personal beliefs and interest towards a particular topic under research. Although researcher bias cannot be completely eliminated, an inductive approach to thematic

analysis meant that identified themes were driven by the data themselves and therefore strongly related to the data (Patton 2002; Braun and Clarke 2006).

#### ***3.3.4.4 Researcher bias and reflexivity in qualitative research***

Qualitative research has in the past been scrutinised for lacking scientific rigour as its findings are generally focussed around the analysis of subjective perceptions that are susceptible to researcher bias whether conscious or unconscious (Noble and Smith 2015). In addition, qualitative research usually involves the researcher being an integral part of the research, therefore their personal characteristics (i.e. age, sex, social class and profession) and preconceptions (i.e. experiences and perspectives) will have an influence at every stage of the research process and will ultimately impact on the final research findings (Sandelowski 1993; Malterud 2001; Horsburgh 2003). Consequently, Sandelowski (1993) states that because every researcher is unique with differing preconceptions and personal characteristics, varying conclusions may be drawn by different researchers for the same qualitative task.

However, as one of the aims of qualitative research, Malterud (2001) states these varying conclusions of the qualitative data are all equally valid because this allows for a more complete understanding of complex phenomena. Also, although researcher bias cannot be fully eliminated in qualitative research, Malterud (2001) argues that the notion of bias in qualitative research only becomes an issue when the researcher fails to identify that their personal characteristics and preconceptions may ultimately have an impact on their research.

Consequently, reflexivity is one of the strategies that is recommended to improve validity in the process of generating knowledge via qualitative research (Malterud 2001; Horsburgh 2003). This approach is defined as the, “active acknowledgement by the researcher that his/her own actions and decisions will inevitably impact upon the meaning and context of the experience under investigation” (Horsburgh 2003).

Malterud (2001) emphasises the importance of transparency and indicates that to adopt a reflexive approach to qualitative research, the effect of the researcher on the topic under study should be continuously assessed at every stage of the research process, and

later shared. As such, the demonstration of reflexivity in qualitative research is often evidenced via a first-person narrative whereby the researcher who conducted the study reflects upon their own personal characteristics, experiences and perspectives that could have impacted on the entire research process (i.e. from planning the study to analysis and interpretation of the results) (Horsburgh 2003). A summary of the researcher's reflective account on this present study can be found below.

#### Researcher's reflective account

I am a registered pharmacist in the UK and a PhD student interested in the research around the safe and effective management of medicines in UK care homes. I started this research project by reading around literature related to nurse-delegated medicines administration by carers in long-term care. Having been raised in the UK, I was conscious that I may selectively read research papers that were conducted in the UK as I was more familiar with the context and language used in referencing the long-term care sector (i.e. residential homes and nursing homes). Also, with no prior experience in research within the long-term care sector and therefore unfamiliar with the terms used for long-term care internationally, I was mindful that my literature search may not encompass studies that were conducted internationally. However, I ensured that I was able to access all relevant literature by firstly expanding my literature search to include international studies in the English language, and utilised the subject headings function in MEDLINE and EMBASE (via Ovid) and CINAHL (via EBSCO), to locate all research papers that was indexed specifically for long-term care.

The literature that I initially reviewed formed the basis of my knowledge on nurse-delegated medicines administration in the long-term care sector. I utilised this knowledge to formulate my interview guides for the semi-structured interviews with care home managers, nurses, carer staff and residents and their relatives. I was conscious that the interview guide questions would be driven by my knowledge on the delegation of carers to administer medicines in nursing homes. Consequently, I ensured that I mainly designed open questions followed by probing questions in order to allow the participant to elaborate on their own thoughts (rather than guided by my own), as well as left time for the participant to make additional comments at the end.

As a practising pharmacist in the UK, I anticipated that some staff, residents and their relatives may feel less inclined to inform me about issues relating to medicines management during the semi-structured interviews due to fears that I may judge their opinions or practices. Similarly, as a PhD student who is part-funded by Invatech Health Ltd, I was conscious that some participants may feel pressured to speak positively about the PCS™. However, I made efforts to reassure all participants that I would value their honest opinions as the aim of the research was to understand the factors that impact a policy of nurse-delegated medicines administration by senior carers in nursing homes in the UK. In addition, I was conscious that the way I presented myself during the interviews could impact on the way the participants perceive me and ultimately the participants' willingness to provide information. Hence, I tried to remain impartial during the interviews by ensuring that my responses and body language were neutral.

Finally, as I initially reviewed some literature which explored the factors that could influence a policy of nurse-delegated medicines administration by senior carers in long-term care facilities, I was aware that I may have already formed preconceptions about the topic and these beliefs could impact on the way I analyse and interpret the interview transcripts. I was conscious that I may be subsequently inclined to selectively identify the factors that I felt were particularly important in implementing a model of nurse-delegated medicines administration by senior carers in nursing homes. In addition, as I was the only researcher that conducted the interviews within the nursing homes, I was mindful that my experiences within the nursing homes that I have visited during this research project may influence my interpretation of the transcript data. Consequently, I opted to analyse the interview transcripts using an inductive approach to thematic analysis. This would mean that the identified themes were driven by the data themselves and therefore strongly related to the data, rather than my own beliefs (Patton 2002; Braun and Clarke 2006).

### 3.4 Results

#### 3.4.1 Part 1: a quantitative study to explore the quality of a model of nurse-delegated medicines administration by senior carers

This part of the study sought to determine the quality of a model of nurse-delegated medicines administration by senior carers in nursing homes. All nursing homes that were recruited into the study used PCS™ to administer medicines and had used the system for at least three months prior to the study. Medicines administration and potential MAEs data for a duration of three months (1<sup>st</sup> October 2017 to 31<sup>st</sup> December 2017) was extracted from PCS™ as Microsoft Excel files and imported into IBM SPSS statistics version 23 for comparative analysis between nurses and senior carers.

##### 3.4.1.1 Response and demographics

The nursing homes that were recruited into part 1 of the study were the same nursing homes ( $n=8$ ) that were studied in chapter 2. As shown in **Table 3.3**, a total of 527 residents were administered medicines by 163 nursing home staff (99 nurses and 64 senior carers), with most homes located in rural areas of the UK.

**Table 3.3** Demographics of the sample of nursing homes in part 1 of the study

Nursing home code	Location <sup>a</sup>	Beds, <i>n</i>	Residents, <i>n</i>	Nurses, <i>n</i>	Senior carers, <i>n</i>
NH1-1	U	36	39	12	10
NH1-2	R	70	76	12	7
NH1-3	R	87	117	13	3
NH1-4	R	80	84	13	8
NH1-5	U	29	37	9	2
NH1-6	R	75	82	24	11
NH1-7	U	39	42	8	11
NH1-8	R	60	50	8	12
All	n/a	476	527	99	64
Mean (range)	n/a	59.5 (29 - 87)	65.9 (39 - 117)	12.3 (8 - 25)	8.0 (2 - 12)

<sup>a</sup>classified in accordance with the 2011 Rural Urban Classification data from the Office for National Statistics; R=Rural, U=Urban

For some nursing homes, the number of beds were less than the number of residents. This is due to the movement of residents to and from the nursing homes during the study period (i.e. new residents were admitted whilst some residents were discharged from the homes)

### **3.4.1.2 Pattern of medicines administered by nurses and senior carers**

**Table 3.4** shows the data for the medicines administrations from the eight nursing homes during the study period. Except for NH1-7, nurses retained the responsibility for the administration of the majority of medicines.

Across the study period, residents were exposed to a total of 392,274 medicines administrations, with nurses retaining the responsibility for the administration of the majority of medicines ( $n=264,135$ , 67.3%) and the remainder delegated to senior carers ( $n=128,139$ , 32.7%). Each resident was scheduled a median of 624 administrations (interquartile range=340 to 1,084).

Although the majority of medicines due for administration were recorded on PCS™ as either 'given' or 'not given', a small number of administrations were recorded as a 'missing' entry (0.04%,  $n=162$ ) (**Table 3.4**). 'Missing' entries were essentially medicines whereby the staff member responsible for the administration did not indicate whether the medicine was 'given' or 'not given' at the time the medicine was scheduled. It was found that 29.3% ( $n=29$ ) of nurses and 28.1% ( $n=18$ ) of senior carers were responsible for at least one 'missing' entry during the study.

These 'missing' entries were further classified into 'missing (reviewed)' or 'missing (not reviewed)' administrations. 'Missing (reviewed)' entries were medicines that were retrospectively reviewed by a member of staff to assess whether the administration took place. Conversely, 'missing (not reviewed)' entries were not retrospectively reviewed by a member of staff to indicate whether the administration took place. Further analysis indicated that 9.3% of the 'missing' entries ( $n=15$ ) were 'missing (not reviewed).'

**Table 3.4** Medicine administrations across the eight nursing homes

Nursing home code	Median medicine administrations per resident (interquartile range)	Total number of medicines administered, <i>n</i>	Medicines administered by nurses, <i>n</i> (%)		Medicines administered by senior carers, <i>n</i> (%)	
			'Given' or 'Not given with a reason' <sup>a</sup>	Missing <sup>b</sup>	'Given' or 'Not given with a reason' <sup>a</sup>	Missing <sup>b</sup>
NH1-1	1,320 (925 - 1,595)	47,338	30,816 (65.1)	49 (0.1)	16,430 (34.7)	43 (0.1)
NH1-2	612 (385.8 - 1,020.3)	52,204	34,388 (65.9)	9 (0.0)	17,802 (34.1)	5 (0.0)
NH1-3	504 (219 - 721)	59,158	56,949 (96.3)	8 (0.0)	2,200 (3.7)	1 (0.0)
NH1-4	539 (347 - 857)	51,497	31,834 (61.8)	0 (0.0)	19,663 (38.2)	0 (0.0)
NH1-5	924 (486.5 - 1,230)	35,563	31,323 (88.1)	0 (0.0)	4,240 (11.9)	0 (0.0)
NH1-6	1,030 (441.3 - 1,390.3)	87,230	52,379 (60.1)	16 (0.0)	34,822 (39.9)	13 (0.0)
NH1-7	678.5 (494.5 - 1,184.5)	31,889	7,174 (22.5)	7 (0.0)	24,699 (77.5)	9 (0.0)
NH1-8	499.5 (240.3 - 830.3)	27,395	19,181 (70.0)	2 (0.0)	8,212 (30.0)	0 (0.0)
<b>All</b>	<b>624 (340 - 1,084)</b>	<b>392,274</b>	<b>264,044 (67.3)</b>	<b>91 (0.0)</b>	<b>128,068 (32.7)</b>	<b>71 (0.0)</b>

<sup>a</sup>Reasons that medicines were 'not given' were associated with one of three broad categories; i) stock issues, ii) absence of resident, and iii) medicine was clinically inappropriate

<sup>b</sup>Medicines that were either 'missing (reviewed)' or 'missing (not reviewed)'

**Table 3.5** illustrates the patterns of medicines administered by nurses and those that were delegated to senior carers. Across the study period, nurses were responsible for the administration of at least 70% of all controlled drug schedules. Given that additional training is usually required for the administration of dressings and/or catheters and injections, nurses also retained responsibility for the vast majority of the injections (90.1%,  $n=3,274$ ) and dressings or catheters (81.3%,  $n=501$ ) that were administered. In addition, nurses retained responsibility for the majority of medicines prescribed for the immune system and malignancy (72.5%,  $n=408$ ), and medicines that were to be administered on an 'as directed' basis (71.8%,  $n=5,431$ ). Although senior carers were delegated to administer medicines throughout the day, nurses remained responsible for administering the majority of medicines that were scheduled to be given between 22:00:00 and 01:59:59 (91.0%,  $n=1,276$ ).

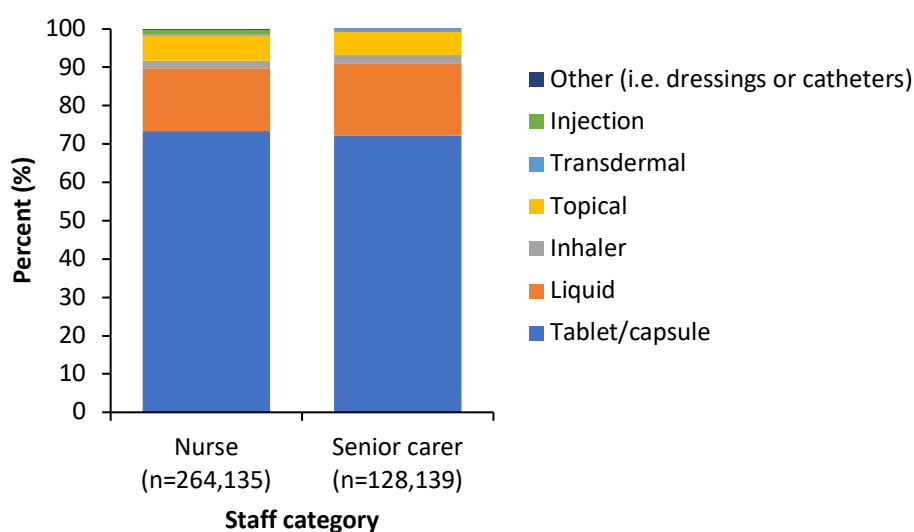


**Table 3.5** Summary of the proportion of medicine administrations administered by nurses and delegated to senior carers from all eight nursing homes

Characteristic of medicine due for administration	Total, <i>n</i>	Administered by nurses, <i>n</i> (%)	Delegated to senior carers, <i>n</i> (%)
<b>Formulation of medicine</b>			
Tablet/capsule	286,012	193,483 (67.6)	92,529 (32.4)
Liquid	67,680	43,651 (64.5)	24,029 (35.5)
Inhaler	8,107	5,188 (64.0)	2,919 (36.0)
Topical	24,544	16,872 (68.7)	7,672 (31.3)
Transdermal	1,680	1,166 (69.4)	514 (30.6)
Injection	3,635	3,274 (90.1)	361 (9.9)
Dressings or catheters (other)	616	501 (81.3)	115 (18.7)
<b>BNF drug category</b>			
Gastrointestinal system	70,004	46,177 (66.0)	23,827 (34.0)
Cardiovascular system	49,792	30,511 (61.3)	19,281 (38.7)
Respiratory system	13,577	8,853 (65.2)	4,724 (34.8)
Nervous system	163,275	115,219 (70.6)	48,056 (29.4)
Infection	8,354	5,662 (67.8)	2,692 (32.2)
Endocrine system	19,924	14,018 (70.4)	5,906 (29.6)
Genitourinary system	4,646	2,999 (64.6)	1,647 (35.4)
Immune system and malignancy	563	408 (72.5)	155 (27.5)
Blood and nutrition	33,116	20,762 (62.7)	12,354 (37.3)
Musculoskeletal system	7,915	4,619 (58.4)	3,296 (41.6)
Eye	9,869	6,956 (70.5)	2,913 (29.5)
Ear, nose and oropharynx	3,162	2,142 (67.7)	1,020 (32.3)
Skin	7,461	5,308 (71.1)	2,153 (28.9)
Dressings or catheters (other)	616	501 (81.3)	115 (18.7)
<b>Type of dosage regimen</b>			
Regular	309,126	207,744 (67.2)	101,382 (32.8)
As required	75,581	50,960 (67.4)	24,621 (32.6)
As directed	7,567	5,431 (71.8)	2,136 (28.2)
<b>Controlled drug schedule</b>			
Not controlled drug	362,418	241,606 (66.7)	120,812 (33.3)
Schedule 2	1,122	844 (75.2)	278 (24.8)
Schedule 3	2,433	1,877 (77.1)	556 (22.9)
Schedule 4	18,751	14,519 (77.4)	4,232 (22.6)
Schedule 5	7,550	5,289 (70.1)	2,261 (29.9)
<b>Time in which medicine was due</b>			
06:00:00-09:59:59	182,049	106,192 (58.3)	75,857 (41.7)
10:00:00-13:59:59	37,504	23,223 (61.9)	14,281 (38.1)
14:00:00-17:59:59	74,655	47,460 (63.6)	27,195 (36.4)
18:00:00-21:59:59	93,921	83,829 (89.3)	10,092 (10.7)
22:00:00-01:59:59	1,402	1,276 (91.0)	126 (9.0)
02:00:00-05:59:59	2,743	2,155 (78.6)	588 (21.4)
<b>Total medicine administrations</b>	<b>392,274</b>	<b>264,135 (67.3)</b>	<b>128,139 (32.7)</b>

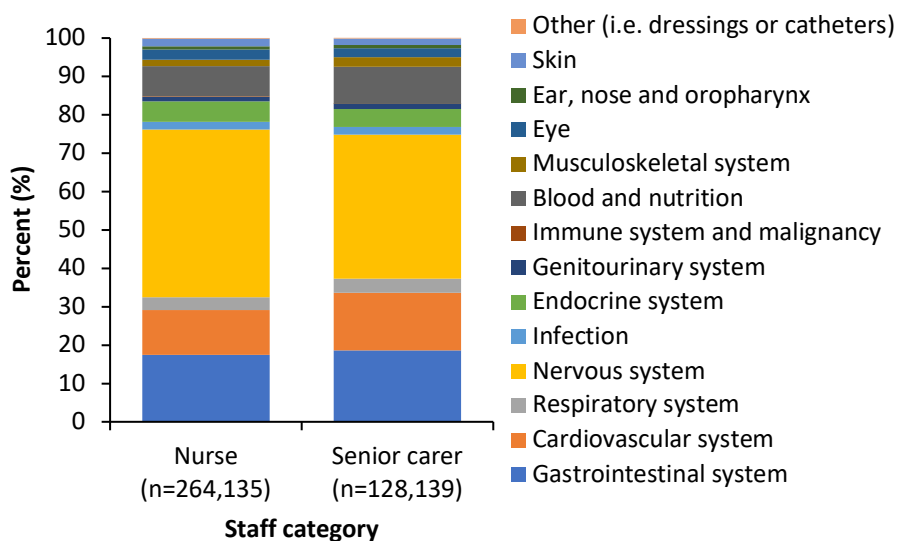
**Figure 3.2** provides a profile of the types of formulation administered by nurses and senior carers. Senior carers were less likely to be responsible for the administration of injections (0.3% of all administrations,  $n=361$ ) than nurses (1.2% of all administrations,  $n=3,274$ ). Nurses also administered a wider variety of injectable drugs (including anticoagulants, flupentixol, denosumab and goserelin) compared to those that were delegated to senior carers (limited to insulin, palliative care medicines, hydroxocobalamin and apomorphine). Conversely, senior carers were more likely to be responsible for the administration of liquids (18.8% of all administrations,  $n=24,029$ ) than were nurses (16.5% of all administrations,  $n=43,651$ ). More detailed examination of the liquid administrations revealed that senior carers administered a higher proportion of nutritional supplement drinks (5.9%,  $n=1,419$ ) compared to nurses (3.7%,  $n=1,601$ ).

**Figure 3.2** Relationship between the formulation of the medicine due for administration and staff category from all eight nursing homes



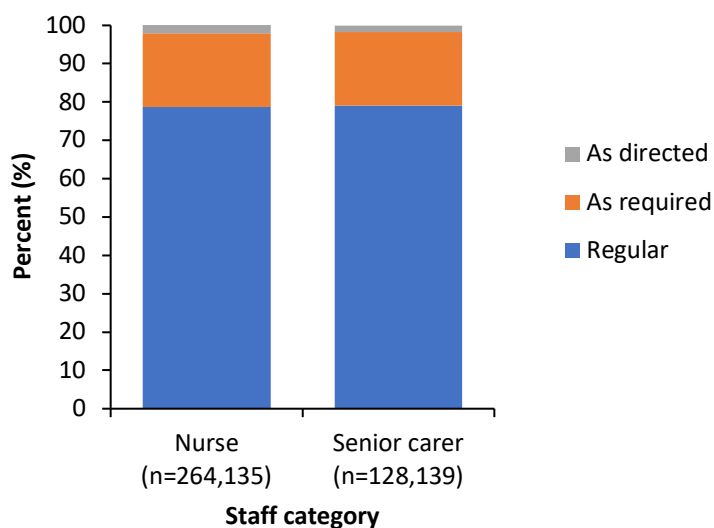
Analysis of the relationship between BNF drug category and staff category revealed that senior carers were less likely to be responsible for the administration of medicines prescribed for the nervous system (37.5%,  $n=48,056$ ) compared to nurses (43.6%,  $n=115,219$ ) (**Figure 3.3**). However, it can also be seen from **Figure 3.3** that senior carers were more likely to be responsible for the administration of medicines prescribed for blood and nutritional disorders, the cardiovascular system, and the musculoskeletal system than were nurses.

**Figure 3.3** Relationship between the BNF drug category of the medicine due for administration and staff category from all eight nursing homes



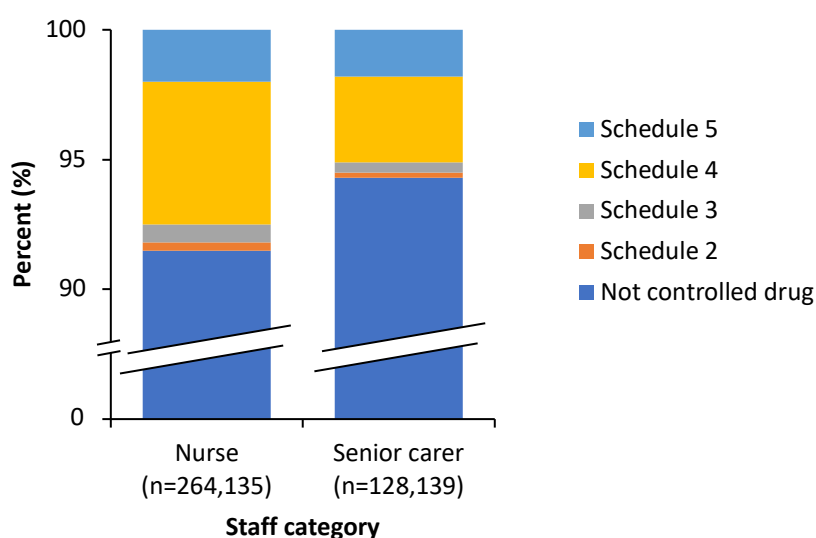
The relationship between the type of dosage regimen prescribed (i.e. 'regular,' 'as required,' or 'as directed') and staff category from all eight nursing homes was also examined (**Figure 3.4**). This revealed that senior carers were less likely to administer medicines that were prescribed 'as directed,' (1.7%,  $n=2,136$ ) than were nurses (2.1%,  $n=5,431$ ).

**Figure 3.4** Relationship between the type of dosage regimen due for administration and staff category from all eight nursing homes



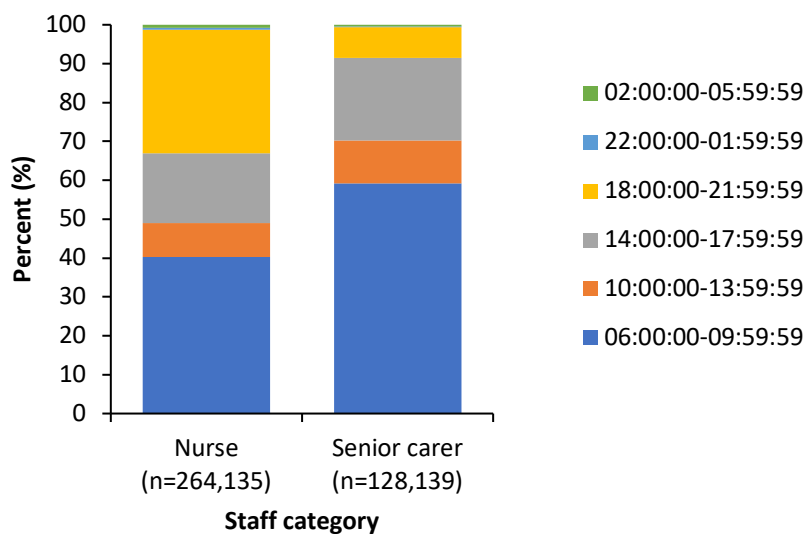
**Figure 3.5** describes the relationship between the controlled drug administration and staff category from all eight nursing homes. Controlled drugs, accounted for less than 10% of all administrations for both senior carers (non-controlled drugs administered: 94.3%,  $n=120,812$ ) and nurses (non-controlled drugs administered: 91.5%,  $n=241,606$ ). However, senior carers were less likely to be responsible for the administration of schedule 2, 3, 4 and 5 controlled drugs compared to nurses (**Figure 3.5**).

**Figure 3.5** Relationship between the controlled drug schedule due for administration and staff category from all eight nursing homes



**Figure 3.6** explores the relationship between the time at which medicines were scheduled for administration and which staff were administering them at that time. **Figure 3.6** shows that senior carers were more likely to administer medicines during daylight hours i.e. between 06:00:00 to 17:59:59 (91.6%,  $n=117,333$ ) than were nurses (67.0%,  $n=176,875$ ). Conversely, nurses were more likely to be responsible for medicines administration between 18:00:00 and 05:59:59 at night (33.0%,  $n=87,260$ ) than senior carers (8.4%,  $n=10,806$ ).

**Figure 3.6** Relationship between the time in which the medicine was due for administration and staff category from all eight nursing homes



A Chi-square test of independence indicated that there were statistically significant associations between staff category and the i) formulation of medicine administered, ii) BNF drug category of medicine administered, iii) type of dosage regimen administered, iv) administration of controlled drugs, and v) the timing of the administration ( $p$ -value<0.001) (**Table 3.6**). Although statistically significant relationships were established for these five parameters, the Cramer's  $V$  values indicate that the effect sizes were small.

**Table 3.6** Results from Chi-square test of independence to test for the association between staff category and the characteristics of the medicines due for administration from all eight nursing homes

Characteristic of medicines due for administration	df	$n$	Cramer's $V$	$p$ -value
Formulation of medicines	6	392,274	0.06	<0.001
BNF drug category	13	392,274	0.08	<0.001
Type of dosage regimen	2	392,274	0.01	<0.001
Controlled drug schedule	4	392,274	0.05	<0.001
Time in which medicines was due	5	392,274	0.27	<0.001

#### 3.4.1.3 Pattern of potential MAEs made by nurses and senior carers

Across the eight nursing homes, a total of 7,921 potential MAEs were recorded on PCS™ throughout the study period with senior carers responsible for 35.7% of these. Almost all of the residents (92.0%,  $n=485$ ) were exposed to at least one potential MAE. **Table 3.7** shows that the median and interquartile range of the number of potential MAEs

varied across the eight nursing homes. On average, each resident was exposed to a median of 7 potential MAEs (interquartile range=2 to 19).

**Table 3.7** Median and interquartile range of the number of potential MAEs per resident across the eight nursing homes

Nursing home code	Median potential MAEs per resident	Interquartile range
NH1-1	27	14 - 40
NH1-2	6	2 - 13.8
NH1-3	5	2 - 10
NH1-4	7.5	1.3 - 17.8
NH1-5	3	1 - 4.5
NH1-6	16	7 - 35
NH1-7	9.5	1 - 28
NH1-8	6	3 - 14.5
<b>All</b>	<b>7</b>	<b>2 - 19</b>

Regarding the frequency of potential MAEs for each distinct error type, the majority (50.8%,  $n=4,027$ ) recorded were associated with ‘attempting to give a medicine more than two hours early,’ and some 83.3% of residents ( $n=439$ ) were exposed to this potential MAE on at least one occasion during the study period. Of note almost one half (47.3%,  $n=1,903$ ) of these occurred during the morning medication round (06:00:00 – 09:59:59).

The next most frequently recorded type of potential MAE was ‘attempting to give a paracetamol containing medicine within four hours of the last administered dose.’ This accounted for 41.6% ( $n=3,292$ ) of all potential MAEs recorded on PCS™, with 43.6% of all residents ( $n=230$ ) exposed to the error on at least one occasion during the study. The majority of these potential MAEs occurred during the late morning (10:00:00 – 13:59:59) (35.6%,  $n=1,172$ ) and evening (18:00:00 – 21:59:59) (39.5%,  $n=1,300$ ) medication rounds. Whilst the majority of errors were associated with the use of paracetamol on its own, 16.0% ( $n=528$ ) of these potential MAEs ( $n=3,292$ ) involved paracetamol-containing combination analgesics (e.g. co-codamol).

Some 7.5% of potential MAEs ( $n=592$ ) were associated with ‘attempting to give a medicine to the wrong resident.’ This potential MAE is one of the more serious potential MAEs recorded on PCS™ and it was found that almost one half of the residents (43.5%,  $n=229$ ) were potentially administered another resident’s medicine on at least one

occasion during the study. Attempting to give a medicine to the wrong resident occurred most frequently during the morning (06:00:00 – 09:59:59) (34.5%,  $n=204$ ) and evening medication rounds (18:00:00 – 21:59:59) (27.4%,  $n=162$ ). The type of medicines that were potentially administered to the wrong resident were predominantly in the tablet or capsule form (67.1%,  $n=397$ ), however, a small number these errors were injections (2.5%,  $n=15$ ) with the misadministration of such medicines often considered more serious.

The final type of potential MAE recorded on PCS™ was ‘attempting to give a medicine that had been discontinued by the prescriber.’ Only a small proportion of all the potential MAEs (0.1%,  $n=10$ ) were associated with this type of error with 0.9% of residents ( $n=5$ ) potentially administered a medicine that was discontinued by the prescriber on at least one occasion during the study. Of note only nurses attempted to administer discontinued medicines, the majority of which were associated with the administration of antibiotics (70%,  $n=7$ ).

Following analysis of the frequency of potential MAEs which occurred during the study, the incidence rate of potential MAEs was further examined (see **Table 3.8**). ‘Attempting to give a paracetamol containing medicine within four hours of the last administered dose,’ accounted for the highest rate of potential MAEs for both nurses and carers. For nurses:  $Md=45.45$  potential MAEs per 1000 medicines administrations, interquartile range=16.79 to 115.34 and senior carers:  $Md=65.82$  potential MAEs per 1000 medicines administrations, interquartile range=19.23 to 141.45.

**Table 3.8** Incidence rate of potential MAEs by staff category from all eight nursing homes

Number of potential MAEs (N=7,921) <sup>a</sup>	Staff category (n)	Interquartile range <sup>b</sup>		
		25 <sup>th</sup> Percentile	Median	75 <sup>th</sup> Percentile
Attempting to give a medicine more than two hours early (n=4,027)	Nurse (99)	3.68	8.15	16.12
	Senior carer (64)	2.65	6.43	18.89
Attempting to give a paracetamol containing medicine within four hours of the last administered dose (n=3,292)	Nurse (97)	16.79	45.45	115.34
	Senior carer (63)	19.23	65.82	141.45
Attempting to give a medicine to the wrong resident (n=592)	Nurse (98)	0.00	1.10	2.82
	Senior carer (64)	0.00	0.68	3.32

<sup>a</sup>The total number of errors associated with 'attempting to give a medicine that had been discontinued by the prescriber' (n=10) were made by nurses only (n=5) and not included in the comparative analysis of potential MAE rate between nurses and senior carers

<sup>b</sup>Incidence rate of potential MAEs calculated as the number of potential MAEs per 1000 medicine administrations

Mann-Whitney *U*-tests were conducted for each type of potential MAE to test for differences in the incidence rate for each staff category (i.e. nurse or senior carer) from all eight nursing homes (**Table 3.9**). This revealed no statistically significant difference in the incidence rate of each type of potential MAE and the individuals administering them, i.e. nurses or senior carers (*p*-value>0.05).



**Table 3.9** Results from Mann-Whitney U-tests for each type of potential MAE to test for differences in the incidence rate of potential MAEs for staff category from all eight nursing homes

Number of potential MAEs (N=7,921) <sup>a</sup>	Staff category (n)	Median <sup>b</sup>	U	Z	r	p-value
Attempting to give a medicine more than two hours early (n=4,027)	Nurse (99)	8.15	2988.00	-0.61	0.05	0.541
	Senior carer (64)	6.43				
Attempting to give a paracetamol containing medicine within four hours of the last administered dose (n=3,292)	Nurse (97)	45.45	2819.50	-0.83	0.07	0.410
	Senior carer (63)	65.82				
Attempting to give a medicine to the wrong resident (n=592)	Nurse (98)	1.10	2850.00	-1.00	0.08	0.319
	Senior carer (64)	0.68				

<sup>a</sup>The total number of errors associated with 'attempting to give a medicine that had been discontinued by the prescriber' (n=10) were made by nurses only (n=5) and not included in the comparative analysis of potential MAE rate between nurses and senior carers

<sup>b</sup>Incidence rate of potential MAEs calculated as the number of potential MAEs per 1000 medicines administrations

### 3.4.2 Part 2: a qualitative study to explore the perceptions of staff on the feasibility of a model of nurse-delegated medicines administration by senior carers

This part of the study sought to determine the perceptions of staff, residents and their relatives, pre- and post-implementation of nurse-delegated medicines administration by senior carers using PCS™ in nursing homes. The researcher conducted one-to-one semi-structured interviews with participants who consented to participate in this study. These interviews were audio-recorded, transcribed verbatim and analysed using thematic analysis in NVivo version 11. Pre- and post- interviews were analysed irrespective of when they were conducted. This is because some participants were unable to take part in both interviews and the researcher felt that similar opinions were discussed during the pre- and post-implementation.

#### 3.4.2.1 Response and demographics

Two nursing homes in the UK, NH2-1 and NH2-2, were recruited to part 2 of the study; all staff, residents and their relatives at each nursing home were subsequently invited

to participate in the interviews. Both NH2-1 and NH2-2 are privately owned nursing homes and provide accommodation to a maximum of 36 and 39 residents respectively.

**Table 3.10** displays the demographics and response rate of the sample in part 2 of the study. All the care home managers who were interviewed were also nurses. Senior carers were identified as medicines-competent carers who were delegated to administer medicines to nursing home residents; carers were those who were not trained in medicines administration and therefore not delegated to administer medicines to nursing home residents.

A total of 12 participants and 14 participants from NH2-1 and NH2-2 respectively consented and took part in the interviews. Between 8<sup>th</sup> August 2017 and 1<sup>st</sup> November 2017, a total of 29 semi-structured interviews were conducted to explore the views of care home managers, nurses, senior carers and carers. Although residents and relatives were invited to participate in the interviews, the researcher obtained no response from either group.

Of the 29 interviews, 11 interviews were conducted before the implementation of nurse-delegated medicines administration and 18 interviews were conducted after. One care home manager and two senior carers from NH2-2 participated in both the pre- and post- interviews.

**Table 3.10** Demographics and response rate of the sample in part 2 of the study

		Manager	Nurse	Senior carer	Carer
<b>Invited</b>	<i>n</i>	4	16	21	10
<b>Interviewed</b>	<i>n</i>	4	4	15	3
<b>Response rate</b>	%	100.0	25.0	71.4	30.0
<b>Interview (hh:mm:ss)</b>	Mean (range)	00:56:13 (00:38:04-01:19:38)	00:56:09 (00:37:30-01:22:22)	00:46:50 (00:24:08-01:27:07)	00:35:09 (00:27:03-00:40:20)
<b>Gender</b>	Male	1	0	0	1
	Female	3	4	15	2
<b>Nursing home</b>	NH2-1	2	3	7	0
	NH2-2	2	1	8	3

### 3.4.2.2 Themes identified from semi-structured interviews

A total of four themes were identified using inductive analysis of semi-structured interviews with nursing home staff related to nurse-delegated medicines administration (**Table 3.11**). These were: i) perceived appropriateness of senior carers administering medicines, ii) expectations of staff, iii) challenges in senior carers administering medicines, and iv) positive outcomes from senior carers administering medicines.

**Table 3.11** Themes and associated subthemes identified from the semi-structured interviews

Themes	Subthemes
1. Perceived appropriateness of senior carers administering medicines	<ul style="list-style-type: none"> <li>• Existence of a similar medicines administration model in other settings</li> <li>• Intrinsic characteristics of carers</li> <li>• Perceived safety of the PCS™</li> <li>• Delegation as a solution for challenges in the care homes sector</li> </ul>
2. Expectations of staff	<ul style="list-style-type: none"> <li>• Respecting staff choices</li> <li>• Role of nurses</li> <li>• Provision of training for senior carers</li> </ul>
3. Challenges in senior carers administering medicines	<ul style="list-style-type: none"> <li>• Adaptation to the new medicines administration model</li> <li>• Technology failures</li> <li>• Increased workload for care staff due to inadequate staffing</li> <li>• Standard of training</li> </ul>
4. Positive outcomes from senior carers administering medicines	<ul style="list-style-type: none"> <li>• New opportunities for senior carers</li> <li>• Liberation of nurses to focus on other tasks</li> <li>• Improvements in staff morale</li> <li>• Resident-centred care</li> </ul>

#### Theme 1: Perceived appropriateness of senior carers administering medicines

The perceived appropriateness of nurses delegating medicines administration to senior carers was an important factor identified throughout the interviews. A range of views were expressed by participants that were categorised in a series of subthemes, namely: i) existence of a similar medicines administration model in other settings, ii) intrinsic characteristics of carers, iii) the perceived safety of the PCS™, and iv) delegation as a solution for challenges in the care homes sector.

### Existence of a similar medicines administration model in other settings

Almost all participants indicated that carers who work in domiciliary care and in residential homes have historically administered medicines to residents without delegation or indeed any direct nursing supervision. Participants indicated that this model of medicines administration by carers in other care settings meant that the same model could/should apply for senior carers who work in nursing homes:

*“I did work in a residential home. So, I’ve had that work, work sort of experience before with carers giving out medicines and I can see how it works quite naturally in any setting.” [N2]*

*“I mean carers in residential homes give out medicines. Erm, carers of community give out medicines, erm, so why not carers in nursing homes?” [N1]*

*“I think it’s common sense. And I think erm, totally practical because carers are giving out medicines in residential homes for years...why would I have concerns if they can give them out in residential homes and they have no nurses at all?” [M3]*

### Intrinsic characteristics of senior carers

Participants indicated that senior carers have a series of characteristics that make them suitable for administering medicines under a delegated process. The characteristics that were described by participants included: previous experience working with medicines, a keen interest in medicines, and the fact that senior carers tend to have close relationships with the residents they provide care to.

Senior carers participating in interviews indicated that previous experience made them particularly capable of administering medicines. The experience was generally related to previous employment in health and social care settings where carers were empowered to administer medicines. As such, senior carers administering medicines was not a new concept to them:

*“Well I did [give out medicines] when I worked for the council. You give out medicines. Erm they come pre-packed. So I have given medicines before.” [S8]*

*“In home care we used to give out medicines. Yeah they [residents] used to have medication packs. You just sort of take them out of the packs, put them in a pot and give them to the clients. Because I worked in home care before I started here as well. So I had an insight there.” [S11]*

Although not all senior carers had previous experience of the preparation and administration of medicines to residents, some participants indicated that senior carers working in nursing homes were often exposed to medicines-related tasks and had built up a level of competency based on observation and shadowing. Prior to the introduction of the delegated administration model described in this study, senior carers in nursing homes would on occasion administer medicines to residents but this was only when they had been prepared and assembled by nurses from the medication trolley. In the delegation model described here, senior carers were able to independently prepare and administer the medicines themselves. Essentially then, the model was said to be an extension of the limited involvement senior carers already had in medicines-related tasks:

*“Even before the senior carers used to do medication, we were always there to support the nurse anyway. In the sense of this lady that won’t take medication from a nurse. The nurse would administer the medicines, give the senior carer, myself, medicines. And stand aside to watch that medication given. But I would have to give it to the lady. Yeah, so even though it was administered by them, they will still watch the resident take it, but we will still give it.” [S4]*

It was also identified that many senior carers were keen to be involved in the proposed delegated medicines administration model. Some of the senior carers participating in the interviews indicated that they have a personal interest in the nursing role, particularly in the field of medicines management:

*“I’ve always found it [medicines] interesting. Medication is all interesting cos I like to know what the residents are having and if there’s any side effects or...it’s just something I’ve always been interested in since I’ve started here. So, it’s nice that they’ve [nursing homes] started doing it.” [S14]*

*“I’ve seen the ‘qualifieds’ [nurses] give out medicines and things before. And, erm, it’s [medicines administration] always been an interest really.” [S10]*

*“I think it’s interesting learning different tablets. It’s interesting to know erm, what tablet they’re having, why they’re having it, what’s the after effects.” [S8]*

The relationship between residents and nursing home staff was discussed during the interviews and it was generally perceived that senior carers possessed a closer bond to residents in comparison to nurses. This was said to be because senior carers worked closely with residents through the daily delivery of personal care, and it was therefore natural that close relationships between the two were formed. Participants suggested that over time, the regular contact between senior carers and residents and the “familiar face” of senior carers encourage residents to develop trust in their senior carers:

*“Because the residents have a good rapport with the care assistants. Because they know them. They trust them.” [N1]*

*“They know me, I’m a reg [regular]. Whereas some of the nurses they’re not on the unit all the time. Whereas I’m here three days a week, thirty, you know thirty six hours. They get to know you. They get to trust you.” [S10]*

Participants suggested that the unique bond between carers and residents means that senior carers could have an advantage in medicines administration activities because residents may be more likely to take their medicines due to the stronger relationship:

*“All I think is that, cos that they are familiar with the carers anyway, and they probably take it off us better than they did with the nurses?” [S13]*

*“You know, the residents trust you. It’s not a new face coming in. They know who you are, they trust you. So they probably take it off you a bit easier.” [S15]*

### Perceived safety of the PCS™

Nurse-delegated medicines administration by senior carers using PCS™ was perceived by nursing home staff as a task that could be safely undertaken by senior carers. Participants indicated that it was safe for senior carers to administer medicines as they were essentially safeguarded by features of the PCS™.

All the participants mentioned the safety aspects of administering medicines via the PCS™ on the basis that users followed the standard operating procedures associated with the use of the system. Participants favourably discussed the safety features and as a result commented that they liked using the PCS™ for medicines administration. The safety features which the participants discussed included the presence of prompts for administrations which required extra consideration or safety precautions as well as the occurrence of safety warnings that alert staff to potential errors associated with missing administrations, the timing of administrations, and the incorrect selection of medicines for administration:

*“The PCS™ does safeguard you. It’s really good. So, you know. If you do scan something in wrong, it doesn’t let you. It shows a red screen and says, you know, wrong resident or wrong medication, or whatever. So, you can’t really go wrong.” [S5]*

*“...the machine itself is very robust. Because obviously it will, it will flag up in red if there’s any missing medication, if somebody had their medication. So that is a visual clue. It’s on the machine, it’s in front of you.” [M2]*

*“You’ve got the photos on there of the residents on there, the dosages on there, it doesn’t let you administer the medicine unless that timing is there. I mean they come up different colours obviously to show that the medicine is due or the medicine is erm been attempted. So obviously you know what colours are for what. It even tells you please do not give this medicine if the resident is sleepy. So, it gives you instructions step by step. So you know, it is really good. There’s notes on the PCS™ system so you can’t go wrong. I mean there’s notes on there...you know, you click on a risperidone and it says please do not give if resident is sleepy. You know, it’s all there.” [S4]*

*“Like say if you were going to give someone paracetamol, if it’s not exactly four hours apart, it won’t let you give it. It will flash up saying, no you can’t give it, because it’s not four hours. So it’s safer that way.” [S11]*

### Delegation as a solution for challenges in the care homes sector

Many participants discussed aspects of the challenges in the care homes sector concerning the demand for health and social care services, financial cuts, and reductions in nursing staff. To mitigate the current challenges, participants said that nursing homes were driven to identify solutions that will sustain the day-to-day operation of their nursing homes. Staff perceived that the delegation of medicines administration to senior carers may help with the current financial climate and issues associated with the recruitment of nurses. As such, nurse-delegation of medicines administration by senior carers was considered to be an appropriate development:

*“I think because we were losing our nurses. Erm, a lot were retiring this year and we can’t seem to be recruiting. The nurses just weren’t coming for jobs basically. Which means we will going to have to go down on one nurse. Erm, because of that, we need help. We can’t do it, just one nurse. So something had to change. Something had to move on. I think economically we had to do it. We’ve been pushed to it in a way...this is the way nursing homes are dealing with the increase in the amount of people who are needing homes and all sorts of things...erm, the demands that they put on you [as nurses], are increasing all the time, so I think you’ve [nurses] got to delegate.” [N4]*

All care home managers and nurses taking part in the study articulated that there is a national shortages of nursing staff including nurses in care homes. The limited number of nurses in care homes meant that there were concerns that there was insufficient time for nurses to complete work tasks. Further complications associated with work pressures was mentioned by one care home manager whereby nursing staff were increasingly expected to complete more administrative duties:

*“Erm, paperwork which should take second place but every sort of inspector or assessor that comes into the building says that if it isn’t written down, it hasn’t happened. So the pressure is on to complete the paperwork. And inevitably, it’s always behind.” [M4]*



Consequently, it was perceived that upskilling senior carers to administer medicines in nursing homes could mitigate work demand and help with the current nursing recruitment crisis:

*“At the minute, there’s a shortage of nurses, and soon will be going to one nurse. And thirty six residents is a lot for a nurse to do [to administer medicines to], well we can do it but it’s very difficult. Erm, so yeah, it seems like the best idea to do it [delegate senior carers to administer medicines]” [N3]*

*“Partly cos the number of nurses are disappearing and few and fewer nurses. You can’t get enough nurses to come and work in nursing homes anymore. The NHS can’t get nurses to work in hospitals anymore. Erm, so, inevitably, you know, carers have to be trained up. We couldn’t run the nursing home single handed with one qualified nurse, without the carers being erm trained up and enabled to use the PCS™ system [to administer medicines].” [M3]*

In addition, financial cuts have meant that nursing homes are continuously seeking to maximise resources. From a financial perspective, some staff perceived that the nurse-delegation of medicines administration to senior carers may result in financial savings for the nursing home:

*“Actually. You know. As the funding becomes squeezed and all the produce becomes more expensive and staffing becomes more expensive, it means that everybody is having to look at skill base [of staff] and evidence of their time management and how to best utilise it.” [M1]*

*“Because of the funding and everything else going on, it [nurse-delegation of medicines administration by senior carers] is for the benefits of the care home...erm, it’s like anything else really. Like saving money.” [S13]*

*“Well obviously it’s [nurse-delegation of medicines administration by senior carers] going to have a positive impact because erm the costings of carers giving out medicines is less than nurses giving medicine.” [M4]*

## Theme 2: Expectations of staff

Participants indicated that staff possessed relatively distinct expectations regarding the ways in which nurse-delegated medicines administration by senior carers should be implemented within their nursing homes. Many participants considered that these expectations were important for medicines administration by senior carers to be implemented successfully. These expectations were related to three subthemes: i) respecting staff choices, ii) the role of nurses, and iii) provision of training for senior carers.

### Respecting staff choices

It was said that staff perceptions of the nurse-delegation of medicines administration to senior carers was influenced by their views on responsibility. Although there was a mix of opinions regarding the delegation model, almost all participants said that staff choices should be respected during implementation.

Senior carers said that some of their peers were more reluctant than others in administering medicines to residents because they were concerned about the personal responsibility, and the consequences of any mistakes that were made. Most senior carers expressed the view that medicines administration should only be delegated to those who were willing to volunteer themselves for the role. As such, it was said that senior carers expected nurses to only delegate to senior carers who wanted to be involved in the task of medicines administration:

*“Somebody might think, oh...I wouldn’t want to be responsible for it [medicines administration]. I suppose it’s up to the, you know, individual really. And then some may not want to do it [medicines administration]. I don’t think it’s something that they want to push carers into doing if they don’t really want to do it [medicines administration]. I wouldn’t force anybody to do it [medicines administration] if they didn’t want to do it.” [S9]*

*“I think it’s erm, personal choice whether you want to do it [medicines administration] or not. We weren’t badgered into doing it [medicines administration]. Some of them have said, you know, it’s [medicines administration] not in their job description. Their role as a carer is to care. Which I understand that and they are here to care. And if that’s what they want to do then it’s personal choice. You know, nobody has said to them [senior carers], you know, that you’ve got to do it. You know, so if they just don’t want to do it. They rather just stick to their job role, then that’s fine.” [S12]*

Participants suggested that some nurses also had concerns about responsibility upon delegation and therefore felt that they were not obliged to delegate to senior carers if they did not want to do so. Consequently, care home managers said that some nurses were unwilling to delegate the medicines administration task to senior carers and the preferences of nurses were respected as a result:

*“Only if you’ve got nurses that put up quite an offence about this is my job role and I don’t want anybody to take it. We’ve had one nurse who doesn’t agree with the system [delegation of the medicines administration task to senior carers and the digital medication management system]. She is a very good mentor and has taken up upon herself to do lots of handouts for the carers regarding all the different systems of the body, how drugs interact, erm all sorts of things. And she’s been brilliant like that. So. Erm, she still prefers to do the medicines when she’s on. Which is fine.” [M4]*

*“It depends on the qualified staff. I mean I’m here with nurse1 today who you’ve got to meet. She’s very. Erm ambivalent. She’s hostile to the erm carers giving out medicines...because she won’t. She does not want to be held responsible for a carer giving out medicines. So she will always give it out herself.” [M3]*

### Role of nurses

Participants had clear expectations regarding the role of nurses following the implementation of nurse-delegated medicines administration. Essentially, participants indicated that nurses should act as a point of support for the care staff, quality assure the process of delegated medicines administration, and continue to administer medicines deemed to have a high risk of causing resident harm. Support was said to

include the provision of guidance for senior carers and assistance of care staff with the delivery of personal care to residents during periods when senior carers were taken away to administer medicines. Quality assurance involved ensuring that senior carers were administering medicines appropriately following competency assessments and the digital monitoring of medicines administration using the PCS™.

The interviews identified that the senior carers who were delegated to administer medicines were generally supportive of the new medicines administration model provided that nurses were available to provide guidance. Senior carers indicated that they expected nurses to be available to provide guidance regarding the administration of 'as required' medicines, to answer queries, and to troubleshoot the PCS™ when there were issues. Also, nurses equally expected senior carers to ask questions or seek advice on issues that required nursing intervention. Therefore, the nurses would ensure that they were always available to provide support to senior carers:

*“But I mean, if there was anything we’re not sure of then I mean I’ll go up to the ‘qualified’ [nurse] and they’re really really good. But you know, if we have got questions, then I will be honest. And management is really good and will fill us in and you know, if we’re unsure then we’ll just say and they [the nurses] will come and take over.” [S12]*

*“Yeah, as long as they [nurses] back you up, I don’t mind [administering the medicines]. Well I don’t mean back you up. I mean that I know that when I’m doing the tablets, I can go and ask them [nurses] questions and everything and the answer is there. So you do have 100% support from them.” [S8]*

*“I expect the nurses to be there when we need them. I mean basically, they are. Well like I say, for like the PRN [‘as required’ medicines], if we need them for, erm paracetamol. Cos you know, at the end of the day, it is all drugs. Erm, if something that comes up on there [the PCS™] that I’ve never ever seen, then I’d expect them to come, and then to work with us, to find out what it is.” [S9]*

*“If they [the senior carer] you know, observe some problem with the patient, they will refer to the erm, well defer to the qualified nurse.” [M3]*

*“I’m always around, between floors and I’m circulating around when the drugs are given out. If there’s any queries, I’m there to ask.” [N4]*

Some participants raised concerns over the increased workload for carers when senior carers were involved in administering medicines. As such, a few senior carers expected nurses to either support the care staff in the delivery of personal care to residents during periods where the home was short staffed, or to only delegate medicines administration tasks when there was adequate staffing:

*“Well, if there are [nurses] on and if we’re short [staffed], I’d expect them [nurses] to sort of try muck in [provide personal care] with the girls [carers] a little bit. Even just sitting in the dining room when they’re doing their paperwork or whatever is a help. Because it just means there’s someone supervising there so we can get on to do what we are meant to be doing in the bedrooms [i.e. medicines administration].” [S1]*

*“It’s just erm, I just think. When there’s only two staff on the floor [usually there’s three including the senior carer] and a nurse is available, I feel like she [the nurse] should, she should help with personal care. Or say to us in the morning, before we start the round, “you are short staffed today, I’ll [the nurse] do the medicines.” That’s it really.” [S5]*

Although senior carers did not describe how nurses should ensure medicines were given appropriately, senior carers said they expected nurses to check that all the medicines delegated were administered properly. In addition, a few senior carers indicated that they would appreciate feedback regarding their own medicines administration practices. Interviews with care home managers further indicated that nursing staff would only delegate senior carers to administer medicines following completion of competency assessments, and care home managers were able to easily quality assure the delegation of medicines administration activity within their nursing home by monitoring the digital medication management system. Therefore, care home managers said that they were able to oversee the delegation of medicines administration daily and rectify issues as and when they arose:

*“I expect them [the nurse] to be there. I expect them [the nurse] to check that the medicine is complete, I expect them to check that PCS™ and see if any medicines are missing. I mean, if I’m in the middle of medication and say I’ve done 80% of my round, then, say there’s three or four medicines that I wasn’t able to give because, again, resident A have had an accident and needs to go to the toilet. Or you know, anything.*

*Dropped a hot cup of tea over them and they need to go over and be changed. Anything like that can happen. But then the nurses need to be coming up and checking the PCS™. To make sure all the medicines has been administered.” [S4]*

*“I think feedback [on medicines administration]. So we can see how we’re doing. If we need more training for different parts, or if there’s anything we’re doing wrong.” [S6]*

*“They’ve also been deemed competent either by myself or one of the nurse deputies here. Erm it’s a delegated task from the nurses on a daily basis. From a management perspective [in relation to quality assurance], I’ve been given access to the Beacon Med Score. Which is the analytics [used to monitor medicines administration]. And again, I try very hard, and I usually do achieve to check those on a daily basis. Erm, just to make sure. But I find it absolutely excellent. I think it is fantastic. Erm, I don’t particularly have any concerns whatsoever. If I did, I could address them straight away. Erm, because I got the evidence in front of me and via supervision. So I would send the girls back to do extra training, revisiting competencies etcetera.” [M2]*

Whilst many participants expected that the legal issues associated with controlled drugs meant that nurses should remain responsible for the administration of controlled drugs, other participants also expressed concerns that some medicines should not be delegated to senior carers due to the high risk of causing resident harm if the medicine was mismanaged. Participants said that nurses should remain responsible for the administration of anticoagulants, controlled drugs and insulin as senior carers were not originally provided with the appropriate training for the administration of these specific medicines within their nursing home. Therefore, administration of those medicines by senior carers would pose an increased safety risk to residents:

*“Well, it’s giving insulin. You have to inject it. So you know, any medication that requires injecting is a nurses job. Because once you’ve injected something. It’s irrevocable. Also, say warfarin, which is a drug that thins the blood, you’ve got interpret the amount to give. Which is variable day by day. Erm, get that wrong. They have a heart attack or stroke or whatever or bleed out.”[M3]*

*“Well I never injected somebody in my life. So unless I had training on it, I wouldn’t know where the needle would go, I wouldn’t know how deep I got to put it in. I could burst a vein. I could do anything. I could cause serious damage. So luckily we don’t have to do it and the nurses do it.” [S7]*

*“Because controlled drugs could be detrimental to somebody if a mistake was to happen. I don’t think they’ve got enough working experience or the qualifications to be able to do that. So a big no no [and nurses should therefore maintain responsibility for administration of controlled drugs].” [N3]*

#### Provision of training for senior carers

All participants indicated that the provision of training for senior carers was a prerequisite before they were allowed to administer medicines. The provision of training was discussed in two ways: the completion of training requirements and provision of refresher training on medicines administration in the future.

There was an expectation that all senior carers should be required to complete training and deemed competent by nurses prior to administering medicines. A few participants also noted that there were varying levels of digital literacy amongst care staff. Therefore, there was an expectation that the training should also include additional training for senior carers where needed. Whilst the completion of training to administer medicines was considered highly important by all participants, a few nurses also indicated that completion of training should be evidenced:

*“So we’ve done erm the PCS™ training on the computer and then we had to answer questions from the e-learning and competency assessments. Then because a lot of people, like the older ones. Like we’ve never had computers or anything like that, they’ve taught me to use the computer. I couldn’t even switch a computer on at one time. But they’ve taught me. But everything that I’ve needed for my job role, they’ve always given me the training to do it.” [S9]*

*“As long as the training [on medicines administration] and everything is provided, I mean. I don’t see that there’s an issue [with nurse-delegated medicines administration by senior carers].” [S4]*

*“Because, I feel like they [senior carers] do proper training. So they [senior carer], they got to go through the courses. They got to go through the exam [e-learning package and competency assessment]. It’s not like they can just say, oh I’m going to go and give out medication. You know, they got to go through the training.” [C1]*

*“As long as they got their medication training, the actual qualification first. Like they will need the evidence. I wouldn’t be comfortable giving them the keys [from the medication trolley] if they weren’t competent [to administer medicines]. So training them up, I went into the ins and outs of everything to make sure they were competent.”*

[N3]

*“It doesn’t matter who gives medication as long as they’re trained and competent [deemed competent by nurses].” [N2]*

In terms of the training, a few participants indicated that the training should focus on using the PCS™ to administer medicines and that the provision of medicines administration training without the PCS™ was ineffective:

*“The administration of medicines using MAR charts. There was no point in me even going on that. It was all MAR charts and obviously we moved to PCS™ systems. And the woman [training instructor] couldn’t even tell me anything about the PCS™ system. So I just thought that was a waste of time.” [S7]*



In addition, participants expected that refresher training on medicines administration would be appropriate in the future for individuals who were responsible for administering medicines. Senior carers said that they were concerned with changes to the PCS™ and that it is likely they may forget the aspects of training that they have received:

*“Erm, I’m not quite sure if we’re going to have update training [on PCS™ and medicines administration], that would be good, maybe every six months. Something like that. That would only be like a refresher course then. It’s just if things change, and like I said, if things were to change, or certain medicines, they sometimes change. It would just be good to have that refresher, if there was any changes in medication or something like that, so we know we can still do it.” [S10]*

*“So you should do this training, and have like a refresher and recap, and go through things again. I just think to go through that system again. Like we did the e-learning on it. Just go over, perhaps the first part of that again, to refresh.” [S13]*

*“You could forget things [related to medicines administration]. You need a refresher. You know, I probably wouldn’t be able to pass this assessment [medicines administration assessment] now. I forgotten half of the stuff I learnt before, I think you probably need to refresh.” [S7]*

### **Theme 3: Challenges in senior carers administering medicines**

Participants indicated that they experienced some challenges when implementing nurse-delegated medicines administration by senior carers within their nursing homes. These challenges were related to four subthemes: i) adaptation to the new medicines administration model, ii) technology failures, iii) increased workload for carers due to inadequate staffing, and iv) the standard of training.

#### Adaptation to the new medicines administration model

Participants indicated that adaptation to the medicines administration task was a challenge during implementation. This was particularly challenging when the model was

first implemented, and later when changes were introduced to the senior carers' established routines for medicines administration.

Some participants revealed that there was a sense of apprehension amongst senior carers when the new medicines administration model was first implemented. However, participants indicated that anxiety levels diminished over time once senior carers had adapted to the medicines administration task and it soon became a norm within the nursing home:

*“Before starting? It was a bit nervous at first. Because you know, you’re always nervous about doing something different. I think it’s just the thing of doing something different. It felt like I was starting a new job, sort of thing. But after the first day. You know, you still work with the same people and stuff so yeah. It was alright.” [S11]*

*“It’s [nurse-delegated medicines administration by senior carers] the same as anything new. Everybody [senior carers] says oh my goodness, we’re not going to cope. Oh my goodness, what’s going to happen. But you’re there. You have to get on with it. And actually, it soon becomes the norm.” [M4]*

Related to early anxieties, senior carers revealed that they were initially less comfortable in doing the medicines administration task and the task took them longer to complete (cf. nurses). Whilst some senior carers said that familiarisation with medicines administration tasks allowed them to adapt to the change over time, other senior carers said that it enabled them to complete the task more quickly. Familiarisation with medicines administration tasks was said to have occurred via repeated practice, which in turn facilitated the senior carers' recognition of medicines and their associated method of administration to their residents:

*“When I first started, the rounds [medication rounds] took me longer compared with when the nurses did it. But now I’ve done it a few times, I know my residents, I know how they take their medicines so it is a little quicker.” [S7]*

*“I feel a lot more comfortable now since I’ve been doing them [the administration of medicines] for a couple of months.” [S6]*

*“It’s getting better now cos you get familiar with boxes and meds. And you know, and you get familiar with boxes and meds and what they’re. You know, get a bit more familiar with what people have and at certain times. I’m getting more comfortable with it [medicines administration] now. And I suppose it’s like everything else isn’t it? Once you start doing it, it gets easier and more familiar.” [S13]*

*“Because we, the anxiety on it. Erm, and because you’re handling someone’s medication that they need, that their bodies rely on. But, I mean, I override that all the time. As I got used to giving out medication. I got used to the routine.” [S2]*

In addition, whilst senior carers suggested that familiarisation with the medicines administration task gradually facilitated their adaptation to the task, other senior carers noted that disruptions to their established routines introduced challenges to their work again. This is because participants indicated that the task became more challenging when the senior carers were required to administer medicines to unfamiliar residents:

*“If there was a new resident and you didn’t know them. You might think, erm how are they going to react, and it might be harder cos they don’t know me.” [S11]*

*“It is more difficult at times when we’ve had to move units. It’s difficult when you’re having to give to residents you don’t know.” [S4]*

### Technology failures

Technology failures were said to have been associated with the battery life of PCS™, system crashes, and issues with the internet. Participants raised concerns regarding occasions where the short battery life of some PCS™ devices may have impacted on safety and where technology failure disrupted the delegation of medicines administration to senior carers within the nursing home. Under these circumstances, participants mentioned that unsaved data on medicines administration attempts made during a medication round could be deleted and therefore irretrievable:

*“Erm with our PCS™’s, we have had a lot of teething problems. If you’re in the middle of scanning the medicine, you’ve added it all to pot, you then have to give that medicine to the resident before you actually go back and confirm the pot. We’ve had issues with batteries with ours, and, which they’ve been sent off a couple of times. But at the minute, they’re all good. But if it’s not holding charge or the PCS™ shuts off, it then wipes that clean. So it, it doesn’t then tell you what you’ve added to pot, what you haven’t given. So you go back from scratch, so then obviously, you’re going back through the medicine and trying to remember what you’ve done. Obviously like I’ve said the PCS™ is safe, I do feel it is, it is quite safe. Pretty safe. Apart from when the battery dies. But, yeah, medication is so important and nobody wants to make fault. I mean okay, yes it is reliable, and it is fool proof really. But if the battery dies on it, it’s not.” [S4]*

*“Erm the batteries are dreadful. You could go over, come back to confirm it. It’s all wiped. So you’ve just potted up, you’ve given them the medicine, and if you can’t remember what you’ve just given, you’re stuffed. Right?” [S3]*

Also, one of the care home managers indicated that there is a reliance on technology when the PCS™ is used to administer medicines. Senior carers were trained to administer medicine using PCS™ only i.e. not via paper-based MAR charts. This meant that the delegation of medicines administration to senior carers was challenging when the PCS™ failed to function. In addition, senior carers were said to have relied on nurses to resolve technology issues associated with the PCS™, and this therefore meant that nurses were sometimes taken away from their own clinical duties:

*“We are slightly, controlled by technology and the machine. If either the machine or Wi-Fi goes down then there is a lot of frustration. Lots of people running around, because sometimes the machines don’t sync and the machines are difficult. So that is still something that takes the nurses time up when the carers are trying to do the medication. So at the moment there’s still technical admin err tasks that the nurses are doing when they would much prefer to be having that time being able to be out doing clinical observations of the residents.” [M1]*

### Increased workload for care staff due to inadequate staffing

All participants discussed challenges associated with the increase in workload for carers due to inadequate staffing following the implementation of nurse-delegated medicines administration by senior carers. The carers' increased workload was said to occur when senior carers were absent during medicines administration. No extra staff were drafted to mitigate this which meant that residents' needs were not always promptly attended to. Therefore, some senior carers said that they felt guilty as they were sometimes unavailable to support their colleagues with the workload that they had left behind.

Some participants commented that following the nurse-delegation of medicines administration to senior carers, there has been a perceived increase in workload for the carers. This is because it was said that the remaining care staff who were not delegated to administer medicines were subsequently required to cover for the senior carers' care role whilst managing their own workload. It was also said that some senior carers were also affected by an increase in workload as they attempted to administer medicines and support their colleagues with the provision of personal care to residents at the same time. Also, although senior carers indicated that they were offered a pay increase to administer medicines, they felt that the minimal increase was inadequate given the increased workload that they had to cope with. Whilst most participants described the increase in workload was primarily evident during the senior carers' absence during medicines administration, one senior carer mentioned that the perceived workload is dependent on the skills mix of their care team:

*"If you got a strong team [care team] who you're working with, then the workload is fine." [S8]*

*"Well to some degree they [senior carers] may be pulled out of the caring team. You know, two other staff for instance on an area, or three staff. If you take one out [to administer medicines], then it overloads the others." [M3]*

*“You know, we’re expected to do everything with just two people with no support [i.e. no extra staff to cover for the senior carers’ role]. You know, by 7 o’clock, you’re [the carers] absolutely exhausted from it. I’m speaking for the other carers who do have to stay on the floor when the seniors have to go and do meds. So you know, you then try and be in like ten places at once, trying to help the girls [carers] with personal care, trying to do the medication. You know, you’re just running around like a headless chicken. I mean. It’s stressful. Obviously, our wages have been increased, but by pennies. Erm, personally, I don’t think it’s nowhere near enough for the amount of work we do.” [S5]*

In addition, concerns were also raised related to the continued personal care of residents during periods when senior carers were delegated to administer medicines. As such, one senior carer mentioned that the carers’ increased workload as a result of poor workforce management meant that residents who required personal care had to wait longer:

*“Erm, I do feel that erm, when we’re short staffed [carers left to cover senior carers’ workload as well as their own] erm, there’s a lot more strain. Obviously, the residents. I’m not saying the residents’ needs get missed, because they don’t. But residents have to wait longer.” [S4]*

Some participants also indicated that the increased workload for carers due to inadequate staffing was particularly challenging for the carers left to provide personal care, when the medication rounds took longer to complete. It was said that this meant that the carers ‘left behind’ to provide personal care had to cope with the inadequate staffing for a prolonged period. Participants revealed that these situations often occurred either during the morning medication round or when residents required more support with medicines administration:

*“Lunchtime and teatime meds, very effective [with regards to senior carers administering medicines]. Breakfast meds, it’s just so much to do in the mornings. Erm, that you’re taking the carer [senior carer] away, to do the meds. And it’s just, erm, it just makes the other two carers who’s on [with no staff member to replace the senior carer who have gone to administer medicines], have more work.” [S15]*

*“Erm I think it’s sort of been evolving that there was a realisation that we need to have extra members of staff on duty at specific times particularly at medication round times [due to the workload that was left behind when senior carers were taken away to administer medicines]. But then not at other times.” [N1]*

*“Obviously, certain residents are more complex. And it takes a lot more time. So, for instance, if we got our first resident up, and we’re giving them a cup of tea, and I’m going to go and administer their medication. I could be sat with the resident for 15, 20 minutes, that leaves two carers [with no additional staff member to replace themselves who have gone to administer medicines] on the floor.” [S4]*

Only a few senior carers mentioned that the increased workload for carers due to the inadequate levels of staffing meant that a sense of animosity developed amongst the senior carers and carers. This fuelled feelings of guilt by some senior carers as they felt uncomfortable leaving their colleagues to deliver personal care:

*“Erm, at the minute, I feel awful everytime I’ve got to do a round [medication round]. Like absolutely awful. And you’re off the floor, as they say, “just doing tablets” [medicines administration], you feel guilt. I feel guilty a lot of the time. I feel like, I’m getting like, I don’t know over two hours. Just walking back and forth just giving medication and they [carers] are slugging their guts out doing all of the personal care and feeds. It does make you feel quite guilty.” [S3]*

*“It’s just really really stressful. It’s not fair on the other two girls [carers] who’s have to do all the work. You know, you feel guilty about that. Sometimes, there’s bad atmosphere when we’re short staffed. The girls [carers] who’s got to stay on the floor and got to do all the work whilst the senior carers are doing the medication. There is a bit of animosity [between senior carers and carers] sometimes. And like I said, it does make you feel guilty then.” [S5]*

### Standard of training

The standard of training for medicines administration was raised by participants in two areas: i) the training provided by Invatech Health Ltd, and ii) the standard of medicines training traditionally provided to nurses compared to the level of training provided to senior carers. Participants indicated that the level of staff training was perceived to be insufficient which prevented further nurse-delegation of medicines management tasks, and created some initial concerns regarding the suitability of senior carers to be delegated medicines administration.

Many participants enjoyed the training and agreed that the provision of medicines administration training by Invatech Health Ltd was necessary since the nursing homes used PCS™ to administer medicines. However, some participants felt that the standard of training provided could be improved to better prepare staff to use the PCS™ for medicines administration. A small number of participants suggested that the standard of training could be improved by tailoring the training around the needs and preferences of staff. Whilst many participants indicated that they favoured more practical training on the PCS™, other participants indicated that smaller group demonstrations on the use of the PCS™ would facilitate better training delivery to all staff members:

*“Yeah one to one sessions [on using the PCS™]. Because I think working on a computer and answering questions [in relation to the e-learning package on the use of the PCS™]. I felt like I was doing my theory test again. Honestly, I’m a people’s person and I don’t learn anything from a computer screen. I don’t.” [S3]*



*“Erm, so, you know. If you were demonstrated. You learn by demonstration. By hands on, on the job, for the most part. You know. In practical terms, the best way, is showing somebody erm with a good teacher. What I’m saying is the training should be a real situation because the way we learnt was just a bit of, you know, playing around with the handheld, the device. But it wasn’t a practical situation. Apart from blipping the box of medication, and we very much needed practical input whilst we were having to order and process the first month or twos medication. To get it all coordinated so that the patient had 28 tablets for the month. Or whatever. And how to programme in PRN medication for instance. I think they [staff] need more. I need more hands on. I need somebody sitting there with me saying this is how you do this.” [M3]*

*“Erm, well we did the PCS™. The computer based training [e-learning package on the use of the PCS™]. Erm, which did take probably about six hours to do. And then we had a gentleman come with the actual device and we had a quick, like demonstration of the device. Erm, which I didn’t think was enough really. I wish we had a bit more training when the gentleman came in the afternoon, to show us, to show us the device, because he only had, I think he had three devices. Erm between the whole room. Erm, so it was difficult, looking over people’s shoulders to see what was actually going on.” [S15]*

In addition, the care home managers also indicated that they initially lacked a thorough understanding of the technical features available on the PCS™ due to the standard of training provided by Invatech Health Ltd. As a result, care home managers indicated that until the nurses developed more confidence in the use of the PCS™ through routine practice, they will remain reluctant to delegate further medicines management tasks to senior carers:

*“And, well, probably, if we were better trained as ‘qualifieds’ [nurses], we would cascade that information to the senior carers. So if they [senior carers] ask me how they would erm register a low stock for instance or when the tablets were running out. Erm, I would be able to demonstrate it. If I was trained properly. But I don’t think, I had the practical training. I don’t think any of us [nurses and senior carers] had sufficient practical training. That’s my criticism. With more practical training we [nurses] can teach them [senior carers] directly anything. Stock taking. Stock control. Stock disposal. But erm, we [nurses and senior carers] will learn gradually.” [M3]*

*“Because we’re only just getting to grips with it ourselves [the nurses and senior carers]. I think the nurses really need to get to grips with this system and know it inside out before we think of delegating other tasks further.” [M4]*

Senior carers also indicated that the training they were provided to administer medicines under the nurse-delegation model was significantly less than the clinical training nurses had received at university. As such, a few senior carers initially raised concerns about the extent of their medicines knowledge (cf. nurses) following training and felt this impacted negatively on their suitability for the medicines administration role:

*“We’re giving out medicines so we need to know everything. We need to know everything that the nurses know about it. Like knowing what medicines are for and things like that. Because you know, these nurses have been in uni [university] for how many years training? And we’ve had like a month. I think knowing half of it [knowledge about medicines] is just ridiculous [to be able to be delegated the medicines administration role].” [S7]*

*“I think a lot of us were [initially] a bit dubious about it [nurse-delegated medicines administration by senior carers]. I suppose it’s because the nurses have had medical training [from university and experience] and actually know what the tablets are actually for [compared to the knowledge of senior carers].” [S12]*

Despite the senior carers’ initial concerns, nurses have said that it is a challenge to learn the details of all medicines in a classroom setting, instead, their own knowledge on

medicines resulted from ongoing work experience. In relation to the subtheme regarding the challenge associated with the ‘adaptation to the new medicines administration model,’ nurses were therefore optimistic that the senior carers’ knowledge of medicines will gradually develop over time:

*“It’s not going to happen knowing it all [the medicines] at the start. It’s the same as nurse training. You don’t go onto a ward, do your first medication round knowing every drug. I didn’t know any drugs when I started my first round. I learnt over the course of my degree and training. I didn’t learn it all in one day before I started. And that’s what they’re doing. They’re learning as they go along.” [N3]*

*“They’re not going to know straight away in this week. But I think as time goes on, they will get to pair what’s wrong with that person and why they’re having that tablet. I think that’s an ongoing thing that they will learn eventually.” [N4]*

#### **Theme 4: Positive outcomes from senior carers administering medicines**

The positive outcomes identified from the semi-structured interviews were described by participants as beneficial consequences of the implementation of nurse-delegated medicines administration by senior carers in nursing homes. This theme consisted of four subthemes namely: i) new opportunities for senior carers, ii) liberation of nurses to focus on other tasks, iii) improvements in staff morale, and iv) resident-centred care.

##### New opportunities for senior carers

All staff spoke very positively about new opportunities that the implementation of nurse-delegated medicines administration brought for senior carers. Discussions were optimistic and mainly focussed on career progression for senior carers. Some staff also discussed the potential for the development of the senior carers’ role beyond medicines administration, for example in stock management and clinically oriented tasks.

The prospects of career development were discussed in all interviews. Staff revealed that the traditional role of the senior carer in nursing homes generally did not afford opportunities for career progression. There was also a common perception that senior

carers were keen to develop themselves in their area of work and try new things. Consequently, staff felt that the medicines administration role offered a good opportunity for senior carers to make advancements in their careers, either at their current place of work or elsewhere:

*“So obviously I was [a] senior carer anyway so there wasn’t really much more for me to go on to do anyway. So anything that was to progress, I would always have a go anyway.” [S10]*

*“Yeah, just to develop my skills and to learn something else. It will be a step on the ladder forward in this field. Not just to remain. Not just to necessarily remain as a carer. Just to go forward.” [C3]*

*“You know, it’s competent building. It gives you an opportunity to progress. It’s just another bow to your string isn’t it? If you do want to progress from a nursing home to somewhere else. Then you can actually say, I did this [medicines administration] in my last role. And I’m capable of doing it.” [S15]*

There were mixed opinions regarding the possibility of senior carers being delegated further tasks allied to medicines management. Stock management was frequently discussed in the interviews as a task that could potentially be delegated in the future. Some participants felt that the role of stock management should remain the nurses’ responsibility as they are required to have an awareness of stock control as part of their professional registration. Although senior carers were not currently expected to manage medicines stock, there was some understanding amongst staff that requests for interim orders was a natural task that followed on from the administration of medicines to residents. Also, it was identified that senior carers would alert nursing staff to reorder medicine during occasions when they have administered the last dose. Consequently, care home managers suggested that aspects of stock management like interim ordering may naturally become a nurse-delegated task to senior carers in the future:

*“With training and support. We are actually working towards training senior carers to order interim medicines. At the end of the day, they are the people that are giving out the medicines. If the medicines are running low. They should be able to say, “I’ve noticed that, I checked the stock, I’ve noticed that there’s no lactulose or we’re running short, I’m going to do an interim order for so and so.”” [M2]*

*“Erm, maybe further down the line, we might look at them being aware of stock level. They’re basically aware as much as they run out of a [medication] box or, they would tell us. They’ve been coming to us this week and saying, “oh there’s only two or three of this left in this box,” or whatever. So maybe further down the line, we may look at them doing the stock levels and some of the ordering.” [M4]*

Some participants perceived that the delegation of medicines administration was a first step in the future development of the senior carers’ role. It was perceived that senior carers in nursing homes will become more clinical through the delegation of other nurse-led tasks in the future. Participants revealed that aside from medicines administration, some of the senior carers were also doing or being offered the opportunity to be trained in tasks such as physiological monitoring, dressings, venepuncture and catheterisation:

*“Nurses and carers are doing catheterisations, they [senior carers] are taking bloods. You know they are doing other clinical skills of nurses. I think the whole thing [role of the senior carer] is moving forward and senior carers will be doing so much more of nursing skills.” [M1]*

*“And they have the ability to take blood pressure, pulse, breathing, sats...” [M3]*

*“And I think that it’s a different career pathway for them [the senior carers]. And I mean obviously, we’re specifically here concentrating on the medication round. But let’s not forget that this is a job role, and the senior carer job role that will be expanded. Erm, so it’s a completely different career pathway for them [the senior carers], you know, they’re doing some dressings all under the supervision of the nurse.”*

[M4]

*“We’ve done a dressings course, there’s things like catheterisation which we can go on courses for when they’re available.” [S12]*

#### Liberation of nurses to focus on other tasks

There was a general awareness amongst participants that nurses had a large amount of paperwork to complete as part of their role. Consequently, all nursing participants indicated that the delegation of medicines administration to senior carers meant that nurses were able to allocate more time for their administrative work:

*“We’ve got to look at our care plans every month, and say that we’ve looked at them and assessed them. And re-do them. I managed to do four by the time they [the senior carers] finished the medication round this morning, which is unheard of. I’m usually taking all month to do them. So, you know, the paperwork has definitely benefitted on that. Which the assessors look at when they come in.” [N4]*

*“It [the nurse-delegation of medicines administration by senior carers] releases me more to be able to do things like care plan reviews and things like that. It gives me a little more time to be able to do that. Erm, looking at the care plans. Reassessing the care plans.” [N1]*

Participants also mentioned that the previous norm of nurses administering medicines may have sometimes prevented nurses from promptly responding to unexpected events such as emergencies or unscheduled meetings with visitors whilst they were midway through a medication round. With the delegation of medicines administration to senior carers, staff anticipated that unexpected events would be managed more efficiently in the future:

*“Because the ‘qualifieds’ [nurses], when it was before. They were giving meds. If you had emergency, what was happening? They had to stop the medication. But now they [senior carers] are giving a hand. You know, if there was an emergency and someone was collapsing. They had epilepsy attack or a asthma attack, at least if something like that happened, the ‘qualifieds’ [nurses] will have free hands to do those tasks.” [C3]*

*“It frees them [nurses] up to be available to deal with any emergency in the nursing home at any given time. Erm, which is really important of course. Whereas you’re in one area giving out medicines, and there’s an emergency on another area of the nursing home. It’s not just a simple getting there. Because you have to make sure that your trolley was safe da dee da dee da. Whereas the nurse is now free to deal with an emergency or any sort of visiting healthcare professional that comes in. You know, that the nurse is free to manage those sorts of situations. So that’s really quite good, quite positive.” [M4]*

Some participants also indicated that nurses were able to utilise the time that they would have otherwise used for medicines administration to engage with the multidisciplinary team:

*“I mean we’ve had one day earlier this week, where we had two or three doctors coming in over the lunchtime period. It was great because both nurses were free to deal with that. And see the doctor and talk about the resident that the doctor had come to see. Whilst all the medications were being given out.” [M4]*

*“We’re able to work with the multidisciplinary team better cos we got more time to phone people and to get people in.” [N1]*

Similarly there was said to be more time for nurses to observe and provide personal care to residents. It was perceived that this offered an ideal opportunity for nurses to identify the changes in the behaviour and health of residents:

*“We’re out there. We’re amongst the residents in the morning, so we’re not going straight to the [medication] trolley. We’re going to the residents. We’re assessing the residents, and we’re sitting there giving breakfast. We can also identify another thing. Swallowing for example. Erm, we are now giving breakfasts. They’re coughing. Right what are we going to do about that? Cos we’ve identified that there’s something going on here. Is it just cos they’re tired and it’s the morning?” [M2]*

*“Even just sitting with them, talking with them, being able to observe their behaviour or if there’s something they need. And being able to do personal care where we find out a lot just doing personal care. The condition of their skin, their behaviour, whether they’re in pain, doing certain things. Being able to feed somebody. Basic care needs.*

*Which was a hard task before because I didn’t really have time to do it.” [N3]*

#### Improvements in staff morale

Many participants reported changes in staff morale following the implementation of nurse-delegated medicines administration. Despite the previously reported challenges associated with its implementation, there was a sense of positive staff wellbeing with increases in perceived job satisfaction, and the attitudes of staff towards the change were generally good.

Senior carers who were delegated to administer medicines reported positive job satisfaction. Participants reported that senior carers enjoyed the task of medicines administration and it was perceived that senior carers felt competent due to positive feedback from nurses and saw value in their new roles. This is because senior carers felt that they were able to support the nurses’ workload but also assist residents with the administration of medicines:

*“I think they feel that. They feel more appreciated that we respect the fact that they’re doing this for us [the nurses] and for the residents. And yeah, it’s positive. And I think they, they also feel a sense of pride in that they can do it [medicines administration], they can make this difference.” [M2]*

*“I can feel that they’re probably feeling that they’re helping the residents by giving them their medication.” [N2]*

One senior carer who was delegated to administer medicines described how she felt helpful as she noticed a need for a medication review for one of her residents, and changes were subsequently made to the resident’s medicines:



*“Like we have a lady who’s on lorazepam but she’s not written up for PRN. But she was obviously distressed on a weekend. And her partner was here and he was getting upset as well. And it’s completely not like her. So I went to see the ‘qualified’ [nurse]. And they phoned out of hours and discussed. And [the resident] got written up for PRN. It makes you feel good. I could see she was distressed. And she was crying and swearing. It was just not like her. You know. And then her partner, cos obviously she was shouting, and he was getting quite distressed. So it’s nice to know that you could do something about the situation.” [S12]*

Senior carers also felt proud that nurses trusted their ability to administer medicines. Job satisfaction was associated with senior carers’ feelings of self-pride and this was often mentioned throughout the interviews:

*“It makes you feel like they trust you. The management and the ‘qualified’ [nurse]. They’re putting a lot of trust into you. And that makes you feel good to go to work.”*

[S9]

*“[Regarding being delegated to administer medicines] it makes you feel good about yourself. That’s about it really, yeah, happy. I’m glad that they picked me to go through it.” [S11]*

There was a general perception that prior to the implementation of nurse-delegated medicines administration, nurses felt pressured to complete large volumes of daily duties in addition to medicines administration. Consequently, the work demands that were frequently placed on nursing staff were often described by nurses as “stressful.” However, when medicines were administered by senior carers, some work pressures were alleviated and nurses felt that their working environment became more relaxed as a result. This is because nurses could be assured that medicines administration was safely taking place in the nursing home and they could therefore focus their time on other duties:

*“It seems an easier way of life now, more relaxed. The residents are getting what they need. Erm, I’m at hand, to be here there and everywhere within the building, so it’s less stressful as a nurse.” [N2]*

*“Because if I’m needed, then I’m available [if senior carers delegated to administer medicines]. Whereas if I haven’t got time, and literally running here there and everywhere, got too much to do, I’m not spare. So if they need me, it’s hard to get everything done. And that can be quite stressful. So, it’s easier now that I’m able to say, “aw I’ve got something to do, can you [senior carer] go and do the medication for me thank you.” And I can just get on with it.” [N3]*

### Resident-centred care

There was a perceived shift towards a more holistic approach to resident care, and this was described as one of the positive consequences observed by many participants. The interviews also suggested that the holistic approach to care was believed to be more favourable for residents residing in nursing homes.

The extension of the senior carers’ role to administer medicines meant that care staff were able to provide both personal and medical care to residents. This was viewed positively by participants as it enabled consistency in care provision by the same senior carer. Further questioning of staff revealed the general perception that senior carers worked closely with residents on a daily basis in the provision of personal care. Therefore, senior carers were more likely to be aware of the needs, habits, likes and dislikes of residents. It was perceived that the additional task of medicines administration further supplemented the senior carers’ understanding and knowledge of the resident (i.e. medicines prescribed or medical conditions diagnosed). As a consequence, staff indicated that senior carers were empowered to provide better and more appropriate care to residents:

*“Because. They know. They really really know the residents. They know if they like orange squash. They know if they like blackcurrant. They know if they prefer to take their medicines with their porridge or their meal, or they really hate chocolate Ensure [a nutritional supplement drink]. So they are going to make sure, that they have the discussion. That that’s not dispensed in the future. I think the quality of care is, can only be better.” [M2]*

*“Obviously we spend a lot more time with them [residents] than nurses do. We know them literally like inside and out. They know our faces now as well. It’s like a lady upstairs, the night nurses give her so many laxatives she’s terrified to have medicine now. But if she sees one of us who does it [the medication round], she knows that we’re not going to give her things like laxatives to make her go to the toilet. Because she doesn’t need it. We know she doesn’t need.” [S3]*

Participants suggested that a more flexible approach to resident care was delivered within the nursing home when senior carers administered medicines, and that this approach supported resident-centred care. This generated a relaxed environment for residents residing in the nursing home and was perceived to be desirable for residents:

*“It’s homely, a homely feel. Person-centred feel to giving out medicines rather than the task-orientated with a nurse going around with a trolley and doing a round. You know. It’s person-centred. The carer recognises that a resident is awake or is in need of something and medication is due. So it should be quite a person-centred feel, a relaxed feel. Like homely. That’s an advantage to the resident.” [N2]*

*“I think the care staff have now accepted that they’re not expected to follow they saw as our example. In as much as it is now a medication round. It has become part of the residents’ person-centred holistic care so they can for example, they don’t have to. Well they don’t do it in a round. When the residents get up, they are able to pop along and get their medication and they can have it with their breakfast if that’s what they choose to do.” [M2]*

*“Again like I said, it goes off person-centred care. I’m not going to go in and wake up a resident and give them personal care just so I can go and administer medication. It’s now more person-centred. And the approach is a lot nicer. They’re not being woken up to be given tablets, they’re having it as they’re having their breakfast. Which is nicer for them.” [S4]*

One care home manager also perceived that the flexible approach to resident care was facilitated by the senior carers’ knowledge and understanding of the residents that carers routinely provided personal care to:

*“I think it’s because the carers know exactly their [the resident’s] little ways. They know very much erm what time they’re going to eat, when they’re more relaxed, when they’re going to have a drink. And it needn’t be sort of, right 7 o’clock, 7:30, that we’re going to do the medication round [like how the nurses administered medicines], they [carers] know the time that they like to rise, they know what they’re going to have for breakfast. They can give their medication at a relaxed time. Erm and the whole thing is just more erm palatable for everybody I think.” [M1]*

### **3.5 Discussion**

In the current climate of an ageing population, nurse staffing issues and an increasing number of care home closures due to financial challenges (NHS 2017; Directors of Adult Social Services 2019), care homes in the UK have sought to identify and implement strategies to sustain the required level of resident care. One approach has been to train carers to undertake tasks that have traditionally been delivered by nurses (Nelson et al. 2009; Social Care Institute for Excellence 2016). Through a formal process of delegation, such tasks may include care planning, wound management, clinical observations, and medicines administration. Activities related to medicines administration have been thought to constitute the majority (40 to 50%) of a nurse’s time working in care homes (Allred et al. 2009). In order to enable nurses to undertake clinical tasks that cannot be delegated and manage complex resident needs, nursing homes are increasingly seeking to delegate trained carers to administer medicines (Spilsbury et al. 2016). This present study was designed to explore the quality and feasibility of a model of nurse-delegated medicines administration to senior carers in UK nursing homes that uses a digital medication management system (PCS™). The quality of medicines administration by nurses and senior carers was examined by comparing the number of potential MAEs made by nurses and senior carers in eight nursing homes (see section 3.4.1). In addition, the feasibility and perceptions of this medicines administration model was explored via semi-structured interviews with nursing home staff in two nursing homes (see section 3.4.2).

In the current study, staff perceived that the administration of medicines could be appropriately and safely delegated to senior carers given the safeguarding and protocol

driven features of the digital medication management system used to support medicines administration. Specifically, staff highlighted that the technology improved the accuracy of medicines administered, ensured appropriate records were kept, reduced potential MAEs via system warnings and prompts, and allowed care home managers to monitor the quality of the entire medicines administration process. Indeed, similar reported benefits to medicines safety when using technology to support medicines administration in long-term care facilities have been previously noted in studies conducted in both the UK and internationally (Scott-Cawiezell et al. 2009; Szczepura et al. 2011; Qian et al. 2015; Alenius and Graf 2016). Of note, the research conducted by Szczepura and colleagues in 2011 investigated the incidence of potential MAEs in 13 care homes (nine residential homes and four nursing homes) in the UK using the same digital medication management system (PCS™) as in the present study. Staff in this current study indicated that the use of the PCS™ safely enabled senior carers to administer medicines in nursing homes due to the system's ability to warn users of potential MAEs and its provision of prompts to aid safe medicines administration. This is supported by findings from Szczepura et al. (2011) where the researchers highlighted the safety of the PCS™ in preventing the occurrence of at least 2,289 medicines administration errors.

Despite the perceived benefits associated with using technology to administer medicines, technology failures were said to disrupt the delegation of medicines administration to senior carers. Other studies that have similarly explored digital technologies for medicines management in long-term care facilities have cited technology failures as a drawback to their use (Tariq et al. 2014; Qian et al. 2015). For instance, Tariq et al. (2014) evaluated a digital medicines administration record system in an Australian residential aged care facility and noted challenges associated with system crashes. This resulted in staff printing paper copies of medicines administration records to continue medicines administration within the home. Qian et al. (2015) conducted an observational study to compare the use of digital medicines administration records and traditional paper-based records in an Australian residential aged care home and noted that unexpected battery outage of devices could result in safety risks associated with both dose omissions and duplications. Indeed, in this current

study, there was some evidence that individuals were working from memory during system failures. Given the risks associated with the continuation of medicines administration during events where technology used to support medicines administration fails, contingency plans must be considered by managers who wish to implement a model of nurse-delegated medicines administration by senior carers using digital technology in nursing homes.

A US study conducted by Flynn et al. (2002) indicated that there are various methods that have been adopted to investigate MAEs in both hospitals and long-term care facilities including direct-observation, review of medication incident reports, and chart review (Flynn et al. 2002). In addition, the development and utilisation of technology to support medicines administration has meant that an increasing number of researchers are beginning to either study the impact of these technologies on MAEs (Helmons et al. 2009; van den Bemt et al. 2009; Rantz et al. 2011; Wild et al. 2011; Seibert et al. 2014; Qian et al. 2015) and/or utilise the data stored within the digital technologies to analyse the incidence of MAEs (Helmons et al. 2009; van den Bemt et al. 2009; Szczepura et al. 2011; Seibert et al. 2014).

This current study used the PCS™ captured data for medicines administration over a three-month period and found that almost 8,000 potential MAEs were prevented when both nurses and senior carers administered 392,274 medicines to 527 residents at the eight recruited nursing homes; of note, these potential MAEs would not be prevented using traditional paper-based MAR charts. The high prevalence of potential MAEs is in line with previous studies in the UK which examined medication errors in care homes (Alldred et al. 2009; Barber et al. 2009; Szczepura et al. 2011; Gilmartin-Thomas et al. 2017). Such findings highlight that further medicines training is required in this sector. Previous literature has outlined a multitude of factors that may contribute towards the high prevalence of MAEs (Pierson et al. 2007; Vogelsmeier et al. 2007; Alldred et al. 2009; Barber et al. 2009; Dilles et al. 2011; Tariq et al. 2013). In particular, the seminal care homes study conducted by Alldred and colleagues in the UK classified the multiple causes of MAEs into six factors according to Reason's framework (Alldred et al. 2009). Specifically, these factors related to: the patient, the physical task of administering medicines to residents, factors related to the individual administering medicines with

for example the lack of knowledge in how specific medicines should be administered, working relationships with staff in the care home but also with other healthcare providers including GP surgeries and pharmacies, work environment factors and latent factors associated with management decisions and organisational processes (Alldred et al. 2009).

Whilst there may be many factors attributable to the high incidence of potential MAEs in the present study, the increase in number of potential MAEs captured by the PCS™ in the current study (7,921 potential MAEs amongst 527 residents) compared to the study by Szczepura et al. (2011) (2,289 potential MAEs amongst 345 residents) may be due to two main reasons. Firstly, Gilmartin-Thomas and colleagues in 2017 demonstrated that the incidence of MAEs in care homes within the UK may vary considerably from one institution to another. For example, MAE rates were found to be 2.1% in one facility, whilst it was 15.9% in another facility (Gilmartin-Thomas et al. 2017). Similarly, the current study found that the median potential MAE rate was 27 potential MAEs per resident in NH1-1, compared to 3 potential MAEs per resident in NH1-5. It is therefore unsurprising that there were differences in the number of potential MAEs captured in this present study compared with the study conducted by Szczepura et al. (2011). Secondly, the potential MAEs may have been impacted by the suboptimal staffing levels that some participants mentioned during the staff interviews. A national survey which was distributed to staff undertaking nurse-delegated medicines administration activities in the US highlighted concerns associated with MAEs during short-staffed periods (Budden 2011). Indeed, heavy workload due to staffing pressures have also been previously cited as workplace factors which may contribute towards the incidence of MAEs in long-term care facilities (Barber et al. 2009; Dilles et al. 2011; Mahmood et al. 2011; Mahmood et al. 2012). Whilst the Care Quality Commission specifies that care providers in England should employ enough suitably qualified staff (Care Quality Commission 2015), they have also recently published a report highlighting inadequate staffing to be one of the contributing factors leading to medication errors (Care Quality Commission 2019a).

Furthermore, mornings usually represent busy periods of the working day where increased staff workload and staff shortages are likely in nursing homes. This is because

most residents require assistance with personal care in the morning whilst the majority of medicines are also scheduled for administration during this time of the day (van den Bemt et al. 2009; Wild et al. 2011). Indeed, most medicines were also scheduled for administration during the morning in the current study. In a study by van den Bemt et al. (2009), the researchers found that medicines scheduled for administration during the busy morning hours (7am to 10am) were associated with a higher risk of MAEs (OR=2.10, 95% CI=1.27–3.49). Given that mornings are typically busy times of the day which have been shown to lead to staffing pressures and MAEs in nursing homes, it was therefore unsurprising that most potential MAEs also occurred during the morning in the present study.

Although heavy workload because of inadequate staffing could lead to MAEs, staff in the present study raised concerns that some residents may need to wait longer for personal care whilst senior carers were delegated to administer medicines. This finding is not unique as one study which investigated MAE rates in two long-term care facilities in Western Canada also noted high workload issues amongst care staff and raised concerns that delegating tasks like medicines administration to carers may potentially compromise resident care (Arain et al. 2016). Similarly, another Canadian study found that home-care workers were worried about having insufficient time to carry out their traditional roles once they were delegated to undertake nursing tasks, and again perceived that this would ultimately impact on the overall quality of resident care (Denton et al. 2015). Given concerns around maintaining quality resident care when senior carers are allowed to administer medicines, adequate staffing levels must be considered for those planning to implement this model of care. To do this, managers of nursing homes could consider scheduling rotas to incorporate additional care staff into care teams whilst senior carers are delegated to administer medicines.

One of the reassuring findings in the present study was that there was no evidence to suggest that senior carers made more potential MAEs compared to nurses. This finding agrees with previous international research conducted in long-term care facilities that used a variety of methods including direct-observation, review of medication incident reports, analysis of administrative databases or chart review (Scott-Cawiezell et al. 2007; Randolph and Scott-Cawiezell 2010; Zimmerman et al. 2011; Walsh et al. 2013; Arain et



al. 2016). For example, Scott-Cawiezell et al. (2007) observed 3,194 doses of medicines administered by staff in five US nursing homes and found no statistically significant differences in MAE rate by nurses, licensed practical nurses and medication aides ( $p$ -value=0.82). Similarly, a US observational study conducted by Randolph and Scott-Cawiezell in 2010 found no noticeable differences in MAEs when medication technicians were delegated to administer medicines in nursing homes within the state of Arizona. Again, similar findings could be extended to residential homes where Zimmerman et al. (2011) showed that medication aides did not make more MAEs than licensed practical nurses when observational and chart review methodologies were applied to a stratified sample of 11 residential homes in Tennessee and South Carolina in the US. Whilst most studies seem to indicate that senior carers are at least as competent as nurses in administering medicines, Walsh et al. (2013) demonstrated that medication aides in nursing homes in the US may have positive impacts on resident safety in comparison to nurses. Specifically, Walsh and colleagues analysed administrative databases and found that there was a significant reduction in medication errors within the nursing homes of eight south-eastern US states ( $p$ -value<0.001) when medication aides were delegated the medicines administration task (Walsh et al. 2013).

This current study also showed that potential dose omissions or 'missing entries' on the digital medicines administration records of residents in the eight nursing homes were relatively low (0.04% of all medicines administrations over the three-month study period). This is in contrast to published studies which indicate that dose omissions usually represents the most common error type in long-term care facilities particularly where paper-based MAR charts are in operation (Pierson et al. 2007; Barber et al. 2009; Zimmerman et al. 2011; Arain et al. 2016). The low rate of dose omissions is however consistent with the UK study by Szczepura et al. (2011) that found less than 0.1% of medicines administrations were omissions. As suggested by Szczepura and colleagues and also in line with the findings from the interviews in this present study, a possible explanation for the low number of dose omissions may be because management staff in care homes were able to monitor medicines management activities on the PCS™. This essentially makes it difficult for staff to omit doses during medicines administration as they will be notified by managers if medicines have been missed (Szczepura et al. 2011).

Similarly, the implementation of technology to support medicines administration was also perceived to decrease the risk of dose omissions in another cross-sectional study (Alenius and Graf 2016). In the study, surveys were distributed to nursing home staff in two homes in Sweden before and after the implementation of digital medicines administration records. A statistically significant decrease in the perceived risk of dose omissions 20 weeks after staff had started using technology to support medicines administration activities was found ( $p$ -value $<0.01$ ) (Alenius and Graf 2016).

Furthermore, although this current study did not set out to determine the severity of the potential MAEs made by staff, other studies have attempted to categorise this in long-term care facilities by developing ordinal scales based on expert opinion amongst research groups (Pierson et al. 2007; Young et al. 2008; Alldred et al. 2009; Barber et al. 2009; Zimmerman et al. 2011; Arain et al. 2016). For instance, the CHUMS study conducted by Alldred et al. (2009) utilised an expert panel of clinicians to classify the severity of MAEs on a case-by-case basis. Similarly, Pierson et al. (2007) used an expert panel to categorise MAEs and classified attempting to administer medicine to the 'wrong patient' with the potential to cause serious patient harm. Like Pierson and colleagues in 2007, Szczepura et al. (2011) also indicated that 'attempting to give a medicine to the wrong resident,' in addition to 'attempting to give a medicine that had been discontinued by the prescriber,' as more serious error types. It was therefore encouraging that both error types featured as the least common types of potential MAEs (less than 8% of all potential MAEs) in this present study.

Although previous research by Young et al. (2008) has highlighted that the majority of MAEs associated with timing are clinically insignificant, the CHUMS study by Alldred et al. (2009) noted that timing errors associated with some medicines (including paracetamol) could pose clinically significant adverse outcomes. In line with Alldred et al. (2009), the Care Quality Commission have also published information highlighting the importance of administering time sensitive medicines like paracetamol (i.e. leaving at least four to six hours in between paracetamol doses) (Care Quality Commission 2020b). It was therefore concerning that 'attempting to give a paracetamol containing medicine within four hours of the last administered dose' accounted for more than 40% of the potential MAEs in the present study, and also had the highest rate of potential MAEs.

Whilst NICE guidance on managing medicines in care homes indicates that it is important to ensure residents receive medicines according to the prescribers' directions, they also advise that the needs and preferences of residents during medicines administration must always be considered where possible (National Institute for Health and Care Excellence 2018). Accounting for the individual needs and preferences of residents contributes towards the provision of 'person-centred care' or 'resident-centred care' (PRIME Centre Wales and Linc Care 2018), and the adoption of this care model also features as one of the regulatory requirements set out by the regulators of health and social care in both England and Wales (Care Inspectorate Wales 2019; Care Quality Commission 2019b). In addition, whilst a variety of interventions including culture change models, person-centred dementia care, and person-centred nursing frameworks have been developed to embed resident-centred care into practice, the purpose of all these interventions predominantly aims to improve the quality of life of residents whilst also making long-term care facilities a more enjoyable place for staff to work (Li and Porock 2014). Some studies have demonstrated benefits associated with incorporating resident-centred care into practice including a reduction in agitation and the use of psychotropics in residents (Fossey et al. 2006; Chenoweth et al. 2009), and increased job satisfaction amongst staff (Moyle et al. 2011). It is encouraging therefore that the present study found that staff feel a model of nurse-delegated medicines administration by senior carers in nursing homes could facilitate enhanced resident-centred care. This is achieved by tailoring medicines administration to the preferences and habits of residents but also in allowing for a more consistent approach to care provision which is ultimately of benefit to the residents themselves. Studies which explore the effects of carers undertaking nurse-delegated tasks have similarly found enhanced resident-centred care (Nelson et al. 2009; Denton et al. 2015; Social Care Institute for Excellence 2016). For instance, Nelson et al. (2009) found that carers who had been trained and delegated to undertake nursing tasks in three residential homes in the UK perceived that the provision of resident-centred care 'fairly increased' at 18 months post implementation.

Although this present study did not specifically set out to measure it, staff did highlight increased levels of perceived job satisfaction when senior carers were empowered to

administer medicines. Consistent with findings from Randolph and Scott-Cawiezell (2010) and Lee et al. (2015), job satisfaction was reported to be related to the enjoyment and pride from undertaking the newly delegated roles amongst senior carers, in addition to a decline in stress levels amongst nurses as they were liberated to complete other nursing tasks. Reported figures in England show a high staff turnover rate in nursing homes with almost 30% of staff resigning between 2017 and 2018 (Skills for Care 2018). Studies have found that these high turnover rates are often associated with low levels of job satisfaction, and it is of concern that these factors may ultimately result in poor care quality (Castle et al. 2006; Kash et al. 2010; Kuo et al. 2014). Given the dilemma around nursing staff shortages in the UK as evidenced by approximately 36,000 vacant nursing posts in the NHS (NHS 2017), the job satisfaction reported amongst staff in nursing homes in this study could support the retention of nurses to provide quality care to residents.

Whilst nurse-delegated medicines administration to senior carers has demonstrated that staff and residents benefit from this way of working, the results of the current study indicate that training on medicines administration in addition to the availability of support and guidance from nurses when senior carers are undertaking medicines administration is important. In other studies that have explored nurse-delegated medicines administration, supervision and the provision of training was expected and valued by staff (Spellbring and Ryan 2003; Gransjön Craftman et al. 2014; Lee et al. 2015). It is possible that this may be explained by concerns that insufficient training may contribute towards the incidence of medication errors (Alldred et al. 2009; Barber et al. 2009; Zimmerman et al. 2011). Of note, Zimmerman and colleagues found that there was a two-fold increase in risk of MAEs when staff with less medicines training were delegated to administer medicines compared to medication aides and licensed practical nurses (OR=2.10, 95% CI=1.27–3.49). Another possible explanation may be because health and social care regulators in the UK require care homes with plans to develop their workforce to provide nursing supervision and relevant staff training according to the tasks that nurses wish to delegate to carers (Care Inspectorate Wales 2016; Care Inspectorate 2016). However, information regarding appropriate training timeframes and the specific elements of training and assessment is not currently detailed by

regulators in the UK. Whilst there are currently accredited learning providers that could deliver medicines training to staff in care homes in the UK, these training programmes often vary in content and delivery format. It is therefore unsurprising that concerns were identified regarding the standard of training provided to staff on medicines administration as nursing homes were responsible for organising training themselves. Similar issues have been noted in previous studies where concerns were raised about potentially inadequate training provided to staff and there have been recommendations that regulatory bodies should standardise training in order to ensure that medicines are administered safely by all staff undertaking this task (Craftman et al. 2013; Denton et al. 2015).

With regards to the research methods used in this study, the current findings are subject to four limitations which must be acknowledged. First, only a small number of nursing homes were recruited for the purposes of this study. Also, as per chapter 2, only homes which used the PCS™ were recruited to this study and it is therefore possible that these findings may not be representative of other homes which do not use PCS™. However, a mixed-methods approach was used to obtain an in-depth understanding of a model of nurse-delegated medicines administration by senior carers in nursing homes which used the PCS™. Secondly, whilst the study sought to obtain views from residents and relatives regarding this model of care throughout the study period, the researcher obtained no response from either group. Researchers planning to conduct research with residents and their relatives could consider having a physical presence at the home in order to increase recruitment (e.g. visiting the study site to recruit potential participants). Thirdly, it is possible that the introduction of the PCS™ to capture potential MAEs may have caused staff to be more cautious than usual when administering medicines throughout the study period. Whilst this may have led to an underestimation of the true incidence of MAEs, the incidence identified were high and in line with other studies including the CHUMS study (Allred et al. 2009). Lastly, whilst training was provided to staff on the use of the PCS™, the current study did not specifically examine the nature of additional training provided to staff on medicines administration. Consequently, variations in the training provided to staff across the recruited nursing homes may have potentially impacted on the potential MAE rates. Given that there is currently a paucity

of guidance on training standards for carers who wish to develop their skills in medicines management within nursing homes in the UK, future studies should investigate the quality of medicines administration training provided to staff in nursing homes with plans delegate medicines administration to senior carers.

In summary, this chapter has explored the quality and feasibility of nurse-delegated medicines administration by senior carers in UK nursing homes using a digital medication management system. Whilst senior carers appear to be as competent as nurses in administering medicines in nursing homes, there is a necessity for further medicines training in this sector given that many residents remain exposed to a high prevalence of potential MAEs. Minimising staff workload and putting measures in place to manage unexpected technology failures associated with the use of digital medication management systems would also help to prevent any unnecessary compromises to resident care. Both these factors should be considered by care home managers who wish to allow senior carers to administer medicines as a delegated task using digital technologies.

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**Chapter 4 A Survey of Staff Perceptions on a Model of  
Nurse-Delegated Medicines Administration by Senior Carers**

## 4.1 Chapter summary

Chapter 4 concerns a cross-sectional survey of UK care home managers or another representative in the nursing home with knowledge of the medicines management procedures within their homes. This study extends chapter 3 exploring the wider views of staff on a model of a nurse-delegated medicines administration by senior carers in nursing homes that use PCS™ in the UK. In contrast to chapter 3, the present study also explores the views of staff in nursing homes that do not currently delegate medicines administration to senior carers. This chapter will begin with a brief overview into the findings obtained from the study conducted in chapter 3 and how these formed the basis of the current study.

## 4.2 Introduction

The study in chapter 3 examined a sample of nursing homes to gather insights on the quality (analysis of medicines administration data from eight nursing homes) and feasibility (interviews with staff from two nursing homes) regarding a model of nurse-delegated medicines administration by senior carers in nursing homes within the UK. Part 1 of the study found that on average each resident ( $n=527$ ) was exposed to a median of 7 potential medication administration errors (interquartile range=2 to 19) over a three-month study period in 2017. However, no statistically significant differences ( $p\text{-value}>0.05$ ) were identified in the rates of potential medication administration errors made by nurses ( $n=99$ ) and senior carers ( $n=64$ ) during the study period (see chapter 3, section 3.4.1). Semi-structured interviews with care home managers, nurses and care staff were conducted in two nursing homes in part 2 of the study. A thematic analysis of these interviews found that the new medicines administration model was perceived to be an appropriate development within the nursing home sector, facilitating improvements in resident-centred care. The interviews also highlighted key expectations that were perceived to be important when delegating medicines administration to senior carers. Challenges related to staffing, the standard of training, the use of technology and adaptation to the new medicines administration task during the implementation of this new medicines administration model were also addressed (see chapter 3, section 3.4.2 for further information).

Whilst the study described in chapter 3 provided important information regarding the quality and feasibility of this new administration model, the number of nursing homes involved was small. The nursing homes recruited had varying capacity to accommodate residents and were located in different areas of the UK, however it remains unknown whether the findings from chapter 3 are transferable and could be applied to other areas of the UK. Budden (2011a) highlights that prior literature on the roles of care staff relating to medicines management in long-term care facilities tend to be limited by small sample sizes and suggests that surveys conducted nationally can instead provide more representative samples when researching this field.

A limited number of cross-sectional surveys have been conducted in both Canada and the United States to understand the role of care staff in medicines management in long-term care facilities (Mitty 2009; Budden 2011a; Budden 2011b; Dupler et al. 2015; Arain et al. 2017). More specifically, these surveys serve to both quantify and provide insights into the types of training requirements (if any), perceptions of care staff administering medicines in long-term care facilities, and the types of medicines management tasks undertaken by these individuals. These surveys were conducted nationally (Mitty 2009; Budden 2011a; Budden 2011b) or within a defined geographical area such as a state in the US (Dupler et al. 2015) or province in Canada (Arain et al. 2017).

A consistent finding in such studies has been that training requirements vary between facilities located within different areas of the same country (Barra 2011) and with the type of long-term care facility (Budden 2011a; Budden 2011b; Arain et al. 2017). The completion of a Canadian cross-sectional survey by management staff in long-term care facilities and supportive living facilities in Alberta found that not all institutions required care staff to complete training before being permitted to administer medicines to residents (Arain et al. 2017). More specifically, Arain et al. (2017) found that a significantly higher proportion of respondents from supportive living facilities (86%,  $n=43$ ) indicated that medicines training was compulsory for care staff compared to respondents from long-term care facilities (50%,  $n=24$ ) ( $p<0.01$ ) (Arain et al. 2017).

In terms of the types of medicines that could be administered by care staff, the study conducted by Budden (2011a) found that almost all care staff surveyed were permitted

to administer oral (94%,  $n=3,248$ ) and topical medicines (82%,  $n=2,833$ ) within long-term care facilities in the United States. In contrast, Budden (2011a) found that fewer care staff surveyed were permitted to administer 'as required' medicines (67%,  $n=2,315$ ) and injections (29%,  $n=1,002$ ) in the same long-term care facilities. Whilst these findings may be due to variations in training provision across long-term care facilities in the US, a study by Dupler et al. (2015) in Washington found that the types of medicines that could be administered by care staff were partly influenced by staff perceptions on medicines safety. Of note, Dupler et al. (2015) found that staff beliefs (real or perceived) on medicines which required 'nursing judgement' were perceived to be less suitable for administration by care staff as they carried a higher risk of negative resident outcomes if administered inappropriately; such medicines include controlled drugs (Dupler et al. 2015).

In summary, previous studies have shown that surveys can be used to explore the role of care staff in medicines management in long-term care facilities. For this reason, the present study employs a cross-sectional survey design to further explore the findings from the study in chapter 3 in a wider population of nursing homes in the UK.

#### **4.2.1 Aim and objectives**

Following the study conducted in chapter 3, the aim of the present study was to explore the views of nursing home staff with respect to a model of nurse-delegated medicines administration by senior carers within a wider population of UK nursing homes that currently use the PCS™. The specific objectives were to:

- i) To quantify the number of nursing homes that delegate senior carers to administer medicines to residents.
- ii) To determine whether nursing home staff hold similar or different views to the views of nursing home staff from part 2 of the study in chapter 3.
- iii) To identify whether there are differences in the nursing homes that delegate medicines administration to senior carers compared to those that do not.

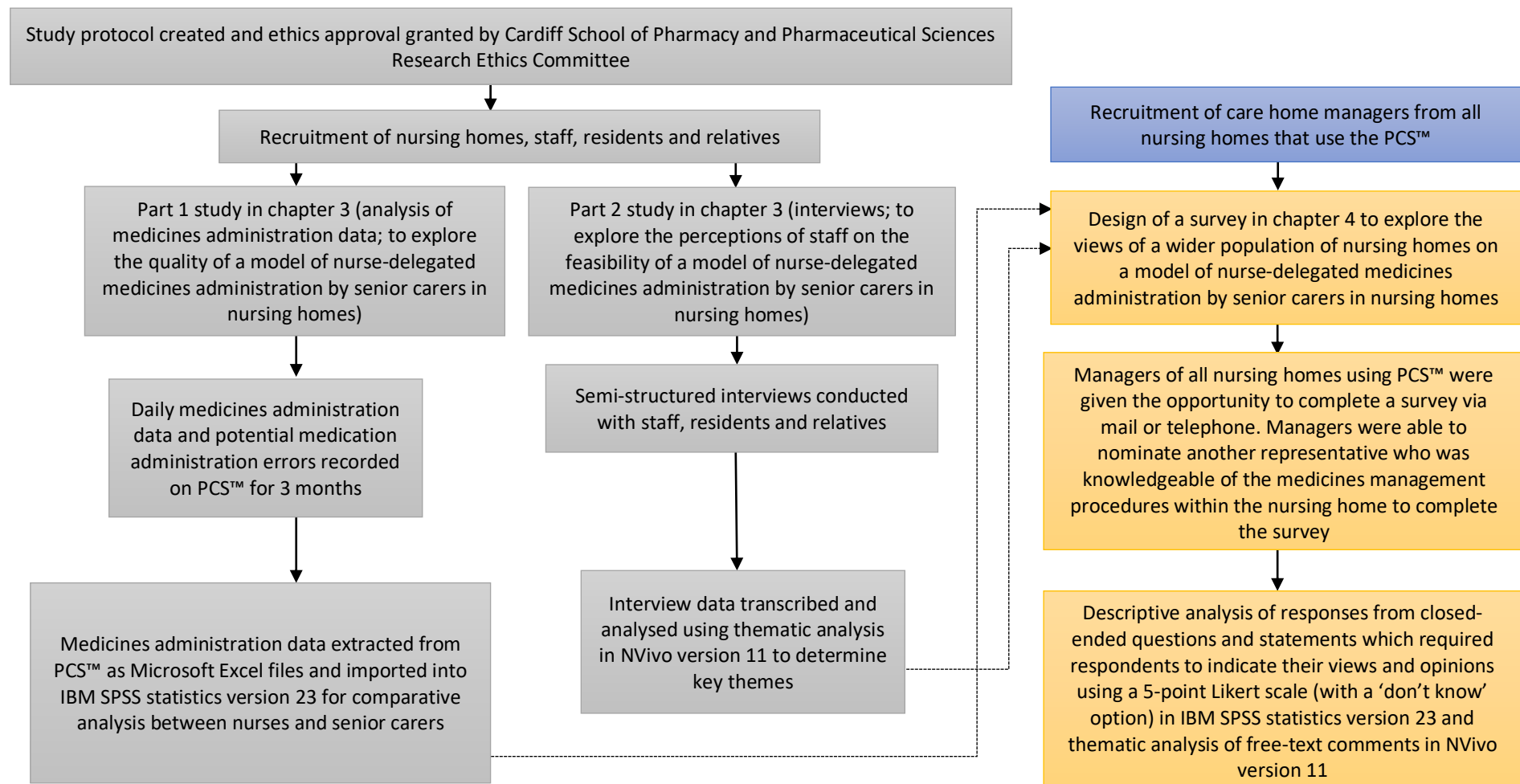
### **4.3 Methods**

#### **4.3.1 Study design**

The current study sought to explore views regarding a model of nurse-delegated medicines administration by senior carers within a wider population of nursing homes (cf. chapter 3) using a survey approach. Findings from chapter 3 were used to inform the design of the survey. The care home manager (or another member of staff) in each nursing home that used the PCS™ for medicines administration was given the opportunity to complete a survey via mail or telephone. A schematic diagram of the study can be seen in **Figure 4.1**.

**Figure 4.1** Schematic diagram of study (chapter 4)

The part of the diagram that is highlighted in grey represents the study that was conducted in chapter 3. The findings from part 1 and part 2 of the study in chapter 3 were used to inform the design of the survey in this present study.



### 4.3.2 Ethical considerations

The present study initially sought to invite the care home manager (or another member of staff) working in nursing homes to complete a self-complete paper-based survey via mail. This was submitted as an amendment to the ethics approval that was granted for the study in chapter 3. The amendment was reviewed and approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee prior to commencing any studies (see appendix 14). However, due to a low response following the mailing of the surveys, the researcher amended the method of data collection to telephone surveys. The amendment was reviewed and approved by Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee prior to conducting any telephone surveys (see appendix 15).

All nursing homes were given a unique code to maintain the confidentiality of homes that were recruited to this study, and identify non-responders so that a reminder mailing could be sent to the relevant individual. A list of the nursing homes that met the inclusion criteria for this part of the study along with their corresponding addresses was entered onto a Microsoft Excel spreadsheet, and each home was allocated a unique reference code. The nursing homes were coded as NH3 to represent a home that met the inclusion criteria for this study, followed by a number according to the order in which the home appeared on the spreadsheet. For example, the first nursing home that appeared on the spreadsheet was assigned the reference code, NH3-1.

All individuals were informed that their participation in either the mailed or telephone surveys was voluntary, any information they provide would be treated as confidential, and they could withdraw from the study at any point in which case their responses to the survey would be removed from the analysis and their survey disposed of securely.

Implied consent was assumed if a survey was mailed back to the researcher in the pre-paid envelope. Verbal consent was obtained from those who took part in the telephone surveys.

All physical data (i.e. the paper-based surveys) were stored in a locked filing cabinet in the School of Pharmacy and Pharmaceutical Sciences at Cardiff University. Digital data



(i.e. spreadsheet of the nursing home addresses with their unique reference codes and responses to the surveys used for analysis) were stored securely on a password protected computer. Only the researchers had access to this information.

### **4.3.3 Sampling**

The study purposively aimed to achieve participation from all nursing homes in the UK that used PCS™ for medicines administration. To do this, the researcher obtained a list of UK care home providers that used PCS™ from Invatech Health Ltd. The care homes were categorised into three groups according to the type of care provided by the home (i.e. nursing, residential or mixed). Given that these homes were located across three constituent nations in the UK (England, Wales and Scotland), information from the Care Quality Commission website was used to classify English care homes, whilst information from the websites of the Care Inspectorate Wales and Care Inspectorate were used to categorise Welsh and Scottish care homes respectively. A total of 107 nursing homes (excluding mixed homes) that used the PCS™ for medicines administration were identified at the time of the study. Of note, all 107 nursing homes were located in either England or Wales.

### **4.3.4 Inclusion/exclusion criteria**

A single representative from each of the included nursing homes ( $n=107$ ) was invited to the present study. This is because one of the objectives for this study was to determine the number of nursing homes in the UK that delegated the administration of medicines to senior carers using PCS™.

The inclusion criteria for this part of the study was: i) the respondent had to be a member of staff who worked at a registered nursing home in the UK where medicines were administered using PCS™, and ii) the respondent was knowledgeable of the medicines management procedures and how medicines were given to residents within the home.

The care home manager was the preferred candidate to complete the survey as they possess a general overview of the medicines management processes within their

nursing home. As such, the information packs (consisting of an invitation letter, information sheet, and a survey - see appendix 16, 17 and 18 for information packs on mailed surveys and appendix 19, 20 and 21 for information packs on telephone surveys) were addressed to the care home manager of each nursing home. However, it was acknowledged that other members of staff who are frequently involved in handling medicines daily may have been better placed to respond. Therefore, all the documents within the information packs indicated that the survey could be completed by either the manager or their designate.

#### **4.3.5 Survey design**

Findings from the studies undertaken in chapter 3 were used to inform the design and development of the survey. Both the telephone and mailed surveys had the same structure (see appendix 18 and 21). The survey began with a brief introduction about the study followed by instructions for the respondent before proceeding to the survey questions that are grouped into six different sections (see **Table 4.1**). All respondents were asked to complete section 1 (information about the role of the respondent in the nursing home), section 2 (information about the nursing home where they worked), and section 6 (further comments related to the delegation of medicines administration to senior carers). In addition, respondents were asked to complete other relevant sections of the survey (i.e. sections 3, 4, or 5) depending on whether senior carers are delegated to administer medicines in the nursing home (see **Table 4.1** for a description of the different sections used in the survey).

**Table 4.1** Description of the different sections in the survey

Section of survey	Respondents who were directed to complete this section	Description
1	All respondents	Demographic information related to the role of the respondent in the nursing home
2	All respondents	This section was used to collect demographic information about the nursing home where the respondent worked. Specifically, the information that was collected included: <ul style="list-style-type: none"> <li>i) the duration since PCS™ have been implemented at their nursing home,</li> <li>ii) the maximum number of residents in which their home can accommodate,</li> <li>iii) the number of nurses and carers employed at the home,</li> <li>iv) and whether their home allowed nurses to delegate medicines administration to senior carers</li> </ul>
3	Respondents who indicated that senior carers could be delegated to administer medicines in their nursing home	This section identified: <ul style="list-style-type: none"> <li>i) when the nursing home implemented their model of nurse-delegated medicines administration by senior carers,</li> <li>ii) the number of staff who administer medicines within the nursing home,</li> <li>iii) whether there had been changes in the number of staff working at their nursing home since implementing the medicines administration model,</li> <li>iv) qualifications and training requirements for senior carers to administer medicines,</li> <li>v) the types of medicines which nurses delegate senior carers to administer,</li> <li>vi) any challenges experienced in implementing nurse-delegated medicines administration to senior carers,</li> <li>vii) and any impact of nurse-delegated medicines administration by senior carers</li> </ul>
4	Respondents who indicated that senior carers were not delegated to administer medicines in their nursing home	This section identified whether the respondent's nursing home had previously considered or had plans to delegate administration to senior carers
5	Respondents who indicated that their nursing home have future plans to introduce a model of nurse-delegated medicines administration by senior carers	This section identified: <ul style="list-style-type: none"> <li>i) the anticipated timeframe this new medicines administration model will be introduced within the respondent's workplace,</li> <li>ii) the impact of introducing nurse-delegated medicines administration to senior carers at their nursing home</li> </ul>
6	All respondents	Further comments related to the implementation of a model of nurse-delegated medicines administration by senior carers in nursing homes

The same questions were used for the telephone and mailed surveys (see appendix 18 and 21), and the research team was consulted to check the wording and structure for all the questions. The questions within the survey were designed to be completed easily by respondents and therefore included mainly closed-ended questions using tick boxes and statements which required respondents to indicate their views and opinions using a 5-point Likert scale (with a 'don't know' option). Specifically, two 5-point Likert scales were used in the survey and these were: i) strongly disagree, disagree, neither agree nor disagree, agree, or strongly agree (used for statements which sought to determine the respondents' views on the impact of a model of nurse-delegated medicines administration by senior carers in nursing homes), and ii) never, rarely, sometimes, very often, or always (used for statements which sought to determine the respondents' views associated with the challenges encountered when implementing the model).

Space for free-text comments was also included at the end of each section, and following closed-ended questions and statements which used a 5-point Likert scale in the survey. These allowed respondents to provide further comments, and could therefore help in the clarification of views and opinions during analysis (Bowling 2014).

In addition, the researcher ensured that all mailed surveys were printed on pink coloured paper to help increase response rate (Etter et al. 2002). This is because the meta-analysis by Etter et al. (2002) found that whilst mailed surveys printed on coloured paper does not improve response rate, surveys printed on pink coloured paper increased response rate by 12%.

#### **4.3.6 Piloting**

Given that sample sizes of approximately ten participants are considered acceptable for pilot studies (Hertzog 2008), the self-complete paper-based survey was initially piloted with ten members of staff (two managers, two nurses, and six senior carers) who worked in two nursing homes that used PCS™ for medicines administration. This was to assess the accessibility of the survey (i.e. respondents understood the questions without ambiguities), and to improve the internal validity of the survey (assessing that each question delivers an adequate response and that replies can be interpreted as expected)

prior to wider dissemination across all nursing homes in the UK that used PCS™ for medicines administration.

Following feedback during the pilot phase, the researcher made some refinements to the survey. Specifically, the researcher added more space to allow respondents to provide further information or responses as free-text comments, and minor refinements were made to the tick-box options in the closed-ended questions (i.e. 'other' was added as another tick-box option to the question on qualifications, and a space was added below for respondents to provide further details). In addition, examples of controlled drugs were added to provide clarification on the question about the administration of different controlled drug schedules.

Cronbach's alpha coefficient was used to measure internal consistency and is a commonly used reliability test that could be performed on IBM SPSS statistics version 23 (Pallant 2016). The Cronbach's alpha coefficient for the statements regarding the impact of a model of nurse-delegated medicines administration by senior carers in nursing homes, and the challenges encountered when implementing a model of nurse-delegated medicines administration by senior carers in nursing homes was 0.937 and 0.946 respectively. As such, the survey was deemed reliable given that Cronbach's alpha coefficients of 0.8 or higher are generally accepted to be highly reliable with good internal consistency (Pallant 2016).

#### **4.3.7 Survey dissemination**

Although the survey could be distributed online or completed over the telephone, mail was initially selected as the distribution method for reaching eligible respondents. This is because the researcher felt that surveys distributed via mail allows individuals to complete the surveys in their own time (i.e. respondents can spend as long as they want in completing the survey), whilst telephone surveys need to be completed in a single go and may be a more time consuming task for the researcher to complete. In addition, the researcher felt that surveys distributed online could potentially result in multiple responses from the same respondent (or nursing home) and ultimately impact the validity of the results. The avoidance of multiple responses from the same nursing home

was considered important to this part of the study as one of the objectives was to determine the number of nursing homes that delegated the administration of medicines to senior carers using PCS™. Surveys distributed via mail enabled the researcher to exercise control over the number of surveys posted to each nursing home, and hence only one survey from each nursing home could be returned via the pre-paid envelope.

A unique reference code (as described in section 4.3.2) was handwritten onto both a pre-paid return envelope and self-complete paper-based survey for each nursing home. This was then mailed to the corresponding care home manager of each nursing home as part of an information pack which included an invitation letter, information sheet, and a survey, on 26<sup>th</sup> November 2018 (see appendix 16, 17, and 18). Nursing homes were given a two-week deadline to return the completed survey back to the researcher should they wish to take part in this study. The researcher was able to identify homes which had responded by checking the unique reference code on the returned pre-paid envelope. A reminder mailing was sent to non-responders after 10<sup>th</sup> December 2018 to increase response rate.

Following a low response to the mailed survey (initial and reminder mailing), non-responders were mailed information packs which consisted of an invitation letter, information sheet, and a copy of the survey questions on 26<sup>th</sup> February 2019 (see appendix 19, 20 and 21). They were then given the opportunity to complete the survey via telephone. The researcher allowed a period of seven days for individuals to read the information packs before proceeding to telephone the homes between 5<sup>th</sup> and 8<sup>th</sup> March 2019 and arrange a mutually convenient time for the telephone surveys to be conducted. All telephone surveys were conducted between 11<sup>th</sup> to 15<sup>th</sup> March 2019. The telephone call was not audio recorded, so the researcher marked down the responses and made notes onto a copy of the mailed survey instead. To verify the accuracy of the responses that were noted down, all respondents were informed of their responses to the questions at the end of the telephone survey and were asked to confirm whether these were correct. Where discrepancies were identified, the researcher amended the responses accordingly and asked the respondent to confirm their responses again for accuracy.

Although it was acknowledged that telephone surveys will be time-consuming to complete, this method of data collection was chosen because it would again allow the researcher to accurately calculate the response rate by ensuring that only one response is provided per nursing home (cf. online surveys).

#### **4.3.8 Data handling**

The survey was initially coded in preparation for data entry into IBM SPSS statistics version 23. All responses to both the mailed and telephone surveys were entered into IBM SPSS version 23 as per the codes specified in appendix 22. Free-text comments were entered into IBM SPSS statistics version 23 as string variables. The researcher also checked the accuracy of the data input once all responses were entered into IBM SPSS version 23.

#### **4.3.9 Data analysis**

##### ***4.3.9.1 Quantitative analysis***

The researcher obtained statistical advice from a statistician within the Doctoral Academy at Cardiff University regarding the relevant statistical tests to be used for the analysis of the data. Descriptive statistics was applied to the responses of the closed-ended questions and statements which required respondents to indicate their views and opinions using a 5-point Likert scale (with a 'don't know' option). Mann-Whitney *U*-tests were used to test whether a model of nurse-delegated medicines administration by senior carers in nursing homes was influenced by the number of residents or full-time staff at the home. The level of statistical significance was set at  $p$ -value $<0.05$  for the Mann-Whitney *U*-tests. In addition, effect size was determined using the *r* value for the Mann-Whitney *U*-tests. Specifically, a value of 0.1 was considered a small effect, 0.3 a medium effect, and 0.5 a large effect (Pallant 2016).

##### ***4.3.9.2 Qualitative analysis***

The string variables which contained the free-text comments from the survey were filtered on IBM SPSS statistics version 23 and then analysed thematically using NVivo version 11. The researcher familiarised herself with the data by reading and re-reading

all the free-text comments. An inductive approach was then adopted to identify the codes from the free-text comments in the survey. Similar codes were grouped together into subthemes, and these were then organised and categorised into themes (Braun and Clarke 2006).

The researcher felt that analysing the free-text comments via an inductive approach was appropriate since she had previously conducted an analysis of interview transcripts from part 2 of the study in chapter 3. Consequently, it was considered that the analysis of the free-text comments in this present survey may be influenced by the researcher's personal beliefs. Although researcher bias cannot be completely eliminated (Malterud 2001; Braun and Clarke 2006), analysing the free-text comments inductively will allow the researcher to identify new codes that may otherwise be missed if the free-text comments were analysed via a deductive approach.

#### **4.4 Results**

Following the study conducted in chapter 3, the research in this chapter aimed to explore the views of nursing home staff on a model of nurse-delegated medicines administration by senior carers in UK nursing homes that currently use PCS™ for medicines administration. The researcher initially designed a self-complete paper-based survey to be mailed to all care home managers of nursing homes that utilised the PCS™ for medicines administration. The survey was either completed by the manager or another member of staff who was knowledgeable of the medicines management and administration processes within the nursing home. Following a low response rate for the mailed surveys, the researcher offered telephone surveys as an alternative method for data collection.

##### **4.4.1 Response rate and demographics of respondents**

Of the 107 self-complete paper-based surveys mailed to nursing homes in this study, only five surveys were returned to the researcher by the date specified on the invitation letter. A reminder mail was subsequently sent to the non-responders ( $n=102$ ), and a further seven completed surveys were obtained.



The response rate after two mailings was therefore 12/107 homes (11.2%). This low response rate meant that the results would not be transferable. Therefore, the remaining 95 non-responders were offered the opportunity to complete the survey via telephone instead. It was subsequently identified that 54 of the 95 non-responders did not meet the inclusion criteria to the study. Specifically, 46 homes had stopped using PCS™ for medicines administration and another eight homes were no longer registered as a nursing home. This meant that only 41/95 of the non-responders remained eligible to participate in the telephone surveys, and 25 of these subsequently consented to take part. The overall response rate for completion of the survey via mail and telephone was 69.8% (37/53 homes). As it is generally accepted that researchers should aim for a minimum response rate of between 60% to 70% in survey research (Bowling 2014; Babbie 2015), the response rate obtained in this study provides a degree of confidence in the transferability of the results, i.e. the degree to which the results could be applied to similar settings and contexts (other nursing homes using PCS™ in the UK) (Korstjens and Moser 2018).

All respondents were asked to complete section 1 of the survey which provided data regarding the respondents' role in the nursing home. Whilst many of the respondents were care home managers (59.5%,  $n=22$ ), 13.5% were nurses ( $n=5$ ), and the remainder 27.0% classified themselves under the 'other' category ( $n=10$ ). These respondents classified themselves as service support lead ( $n=1$ ), clinical manager ( $n=4$ ) and deputy manager ( $n=5$ ).

Next, all respondents were asked to complete section 2 of the survey. Here, demographic data relating to the characteristics of the nursing home where the respondents worked were obtained (see section 4.3.5 for further information related to the type of data that was collected).

**Table 4.2** shows that all respondents had used PCS™ for at least 3 months, with almost one-half (48.6%,  $n=18$ ) indicating they had used PCS™ for '13 to 24 months' and ~84% ( $n=31$ ) having used PCS™ for 13 months or more; indeed 35.1% ( $n=13$ ) had used PCS™ for more than 2 years.

**Table 4.2** Duration since PCS™ had been implemented at the respondents' nursing home

Duration since PCS™ has been implemented	Frequency	Percentage (%)
0-2 months	0	0.0
3-6 months	2	5.4
7-12 months	4	10.8
13-24 months	18	48.6
More than 25 months	13	35.1

On average, respondents indicated that staff (i.e. nurses and carers) in their homes provided care to a median of 49 residents (interquartile range=39 to 61). Six respondents (16.2%) did not provide information on the number of staff who worked at their nursing homes. Analysis of the remaining 31 respondents showed that most staff were employed on full-time contracts. Specifically, there was a median of 7 nurses (interquartile range=5 to 11) and 30 carers (interquartile range=22 to 49) who worked on a full-time basis at each home.

As part of the final question in section 2 of the survey, most of the respondents (51.4%,  $n=19$ ) indicated that nurses at their nursing homes delegated medicines administration to senior carers. Further analysis of the responses provided by these homes will be discussed in section 4.4.2 and 4.4.3.

In addition, information regarding the nursing home related to i) country and location (i.e. rural or urban), ii) ownership, and iii) whether it is registered to provide dementia care to residents were obtained from four sources. These sources included the 2011 Rural Urban Classification data from the Office for National Statistics, information provided on the websites of the nursing homes, the Care Quality Commission website (for English nursing homes) and Care Inspectorate Wales website (for Welsh nursing homes).

**Table 4.3** shows the demographic data obtained from these sources. The homes were predominantly in England (78.4%,  $n=29$ ), with the remaining homes located in Wales (21.6%,  $n=8$ ). There was approximately an equal representation of respondents from nursing homes that were in a rural location (40.5%,  $n=15$ ) compared to an urban setting

(59.5%,  $n=22$ ). In addition, most of the nursing homes were privately owned (81.1%,  $n=30$ ) and registered to provide dementia care to residents (75.7%,  $n=28$ ).

**Table 4.3** Demographic data related to the nursing homes in this study

Demographic data about the nursing home	Frequency	Percentage (%)
<b>Country of nursing home</b>		
England	29	78.4
Wales	8	21.6
<b>Location of nursing home</b>		
Rural	15	40.5
Urban	22	59.5
<b>Ownership of nursing home</b>		
Private	30	81.1
Voluntary/Not-for-profit	7	18.9
<b>Nursing home registered to provide dementia care</b>		
No	9	24.3
Yes	28	75.7

#### 4.4.2 Differences in characteristics between nursing homes that delegate medicines administration to senior carers compared to those that do not

The 37 respondents were separated into two groups for this part of the analysis i.e. those that indicated their nurses delegated medicines administration to senior carers (MedsAdmin\_Nurses&Carers;  $n=19$ ) and those that did not (MedsAdmin\_Nurses;  $n=18$ ).

**Table 4.4** shows that most nursing homes that were located in Wales (62.5%,  $n=5$ ), in urban areas (54.5%,  $n=12$ ), that were registered to provide dementia care for residents (53.6%,  $n=15$ ), and had used PCS™ for 'more than 25 months' (61.5%,  $n=8$ ) delegate medicines administration to senior carers. Conversely, most nursing homes that were in England (51.7%,  $n=15$ ), rural areas (53.3%,  $n=8$ ), that were not registered to provide dementia care for residents (55.6%,  $n=5$ ), and had used PCS™ for less than two years (54.2%,  $n=13$ ) did not delegate medicines administration to senior carers. Ownership of the home did not appear to impact on delegation with an equal representation of private and voluntary/not-for-profit nursing homes delegating medicines administration to senior carers.

**Table 4.4** Demographic data for nursing homes that allowed nurses to delegate medicines administration to senior carers compared to those that did not

Demographic data		MedsAdmin_Nurses&Carers <sup>a</sup> , n (%)	MedsAdmin_Nurses <sup>b</sup> , n (%)
<b>Country</b>	England	14 (48.3)	15 (51.7)
	Wales	5 (62.5)	3 (37.5)
<b>Location</b>	Rural	7 (46.7)	8 (53.3)
	Urban	12 (54.5)	10 (45.5)
<b>Ownership</b>	Private	15 (50.0)	15 (50.0)
	Voluntary/Not-for-profit	4 (57.1)	3 (42.9)
<b>Registered to provide dementia care</b>	Yes	15 (53.6)	13 (46.4)
	No	4 (44.4)	5 (55.6)
<b>Duration since PCS™ implemented</b>	0-24 months	11 (45.8)	13 (54.2)
	More than 25 months	8 (61.5)	5 (38.5)

<sup>a</sup>MedsAdmin\_Nurses&Carers = nursing homes that delegate medicines administration to senior carers

<sup>b</sup>MedsAdmin\_Nurses = nursing homes that do not delegate medicines administration to senior carers

Furthermore, whether a nursing home allowed delegation of medicines administration did not appear to be influenced by the number of residents or full-time staff in the home (Table 4.5).

**Table 4.5** Number of residents and full-time staff in nursing homes that allowed nurses to delegate medicines administration to senior carers compared to those that did not

Demographic data	MedsAdmin_Nurses&Carers <sup>a</sup>		MedsAdmin_Nurses <sup>b</sup>	
	n	Md (interquartile range)	n	Md (interquartile range)
Number of residents that can be accommodated	19	50 (38 to 65)	18	49 (40 to 57)
Number of full-time nurses	17	7 (5 to 10)	14	7 (5 to 13)
Number of full-time carers	17	35 (25 to 51)	14	30 (20 to 38)

<sup>a</sup>MedsAdmin\_Nurses&Carers = nursing homes that delegate medicines administration to senior carers

<sup>b</sup>MedsAdmin\_Nurses = nursing homes that do not delegate medicines administration to senior carers

This was confirmed by Mann-Whitney *U*-tests that showed no significant differences ( $p$ -value $>0.05$ ) (**Table 4.6**).

**Table 4.6** Results from Mann-Whitney *U*-tests to test for differences in the number of residents and full-time staff in nursing homes that allowed nurses to delegate medicines administration to senior carers compared to those that did not

Demographic data	Nurse-delegation of medicines administration to senior carers	<i>n</i>	Median	<i>U</i>	<i>Z</i>	<i>r</i>	<i>p</i> -value
Number of residents that can be accommodated	Yes	19	50	163.5	-0.21	0.03	0.820
	No	18	49				
Number of full-time nurses	Yes	17	7	107.0	-0.48	0.09	0.631
	No	14	7				
Number of full-time carers	Yes	17	35	96.0	-0.92	0.17	0.360
	No	14	30				

#### 4.4.3 Nursing homes that delegate medicines administration to senior carers

Just over half of all respondents (51.4%,  $n=19$ ) indicated that medicines administration could be undertaken by senior carers in their homes; these respondents were directed to complete section 3 of the survey which sought to explore the implementation of a nurse-delegated medicines administration model in the respondent's nursing home (see section 4.3.5 for further information related to the type of data that was collected).

**Table 4.7** shows that almost one-third (31.6%,  $n=6$ ) of respondents indicated that their nursing home had operated a model of nurse-delegated medicines administration to senior carers for '13 to 24 months', and this was also identified as the most frequent category.

**Table 4.7** Duration that nurses have delegated senior carers to administer medicines at the nursing home

Duration that senior carers had been delegated to administer medicines at the nursing home	Frequency	Percentage (%)
0-2 months	1	5.3
3-6 months	2	10.5
7-12 months	5	26.3
13-24 months	6	31.6
More than 25 months	5	26.3

One respondent failed to indicate the number of nurses and senior carers that were able to administer medicines to nursing home residents. However, for the remaining 18 respondents, a median of 8 nurses (interquartile range=5 to 9) and a median of 5 senior carers (interquartile range=4 to 8) administered medicines to residents.

Only four respondents (21.1%) indicated that they had noticed changes in the staff complement at their nursing home since the introduction of nurse-delegated medicines administration. One respondent indicated that there had been an increase in care staff, whilst the remaining three respondents (15.8%) noticed a decrease in numbers of nursing staff at their workplace.

Almost all respondents (84.2%,  $n=16$ ) indicated that senior carers must hold formal qualifications to administer medicines, although three respondents (15.8%) indicated that this was not a requirement at their home. Of the respondents who indicated that formal qualifications were mandatory, the majority (93.8%,  $n=15$ ) indicated that senior carers were required to complete the level 2 diploma in health and social care for adults. The remaining respondent indicated that senior carers were required to achieve a higher level of qualification (level 4 or 5 diploma in health and social care for adults) before they were allowed to administer medicines.

Beyond completion of formal qualifications, respondents were asked to provide details of any specific training senior carers received before they were allowed to administer medicines. All respondents ( $n=19$ ) indicated that senior carers were required to complete a bespoke medicines training programme organised by their respective nursing home. This training varied across the nursing homes. Although all respondents

( $n=19$ ) indicated that senior carers were required to shadow a nurse during medication rounds as part of their training, some respondents indicated that senior carers were also required to complete assessments, e-learning/distance learning packages, and/or face-to-face medicines management training sessions (see **Table 4.8**).

**Table 4.8** *The types of training senior carers received before they were allowed to administer medicines*

Training senior carers received before they were able to administer medicines	Frequency	Percentage (%)
Shadowing a registered nurse on medicines administration	19	100.0
E-learning package provided by Invatech Health Ltd	18	94.7
Competency check assessment on medicines administration	10	52.6
Face-to-face session on using PCS™ by Invatech Health Ltd	9	47.4
External medicines management distance learning package	5	26.3
Face-to-face session with a pharmacist on medicines administration	2	10.5
Medicines calculation exam	1	5.3

Respondents were also asked to provide details on the types of medicines that could be administered by senior carers. In particular, information was requested relating to the: i) formulation of the medicine, ii) dosage regimen of the medicine (i.e. regular, 'as required,' or 'as directed'), iii) classes of controlled drugs, and iv) the time of day (medication round) when senior carers were permitted to administer medicines to residents (see **Table 4.9**).

All respondents ( $n=19$ ) indicated that senior carers could be delegated to administer medicines between 10:00:00 and 17:59:59, medicines prescribed regularly, tablets/capsules, oral liquids and creams/ointments, but senior carers were not permitted to administer injections. The administration of controlled drugs was variable between nursing homes. Whilst five respondents (26.3%) indicated that senior carers were not permitted to administer controlled drugs, other respondents indicated that senior carers could administer schedule 2 (42.1%,  $n=8$ ), schedule 3 (42.1%,  $n=8$ ), schedule 4 (68.4%,  $n=13$ ), and/or schedule 5 (63.2%,  $n=12$ ) controlled drugs.

**Table 4.9** Type of medicines that senior carers could be delegated to administer

Type of medicines in which senior carers can be delegated to administer	Frequency	Percentage (%)
<b>Formulation of medicine</b>		
Tablet/capsule	19	100.0
Oral liquid	19	100.0
Inhaler	17	89.5
Injection	0	0.0
Transdermal patch	14	73.7
Topical creams/ointments	19	100.0
<b>Dosage regimen of medicine</b>		
Regular	19	100.0
'As required' medicines	16	84.2
'As directed' medicines	14	73.7
<b>Classes of controlled drugs</b>		
No controlled drugs	5	26.3
Schedule 2	8	42.1
Schedule 3	8	42.1
Schedule 4	13	68.4
Schedule 5	12	63.2
<b>Time of day</b>		
06:00:00-09:59:59	18	94.7
10:00:00-13:59:59	19	100.0
14:00:00-17:59:59	19	100.0
18:00:00-21:59:59	14	73.7
22:00:00-01:59:59	13	68.4
02:00:00-05:59:59	10	52.6

Furthermore, a mix of responses was also obtained from the 5-point Likert statements on the challenges which respondents had experienced whilst implementing nurse-delegated medicines administration by senior carers in their homes (**Table 4.10**). The majority of respondents indicated that they had not experienced challenges associated with 'senior carers refusing to administer medicines that were delegated to them by nurses' ( $n=15$ , 78.9%), 'nurses refusing to delegate senior carers to administer medicines to residents' ( $n=12$ , 63.2%), 'resistance from family members because senior carers were administering medicines to residents (rather than nurses)' ( $n=15$ , 78.9%), and/or 'resistance from residents because senior carers were administering medicines to them (rather than nurses)' ( $n=17$ , 89.5%).



**Table 4.10** Responses to statements on the challenges associated with nurse-delegated medicines administration by senior carers in nursing homes

Statements relating to the challenges associated with nurse-delegated medicines administration by senior carers in nursing homes	Never, n (%)	Rarely, n (%)	Sometimes, n (%)	Very often, n (%)	Always, n (%)	Don't know, n (%)
Technology failures which have prevented senior carers administering medicines under nurse-delegation	8 (42.1)	3 (15.8)	4 (21.1)	3 (15.8)	1 (5.3)	0 (0.0)
Technology failures which have prevented nurses from delivering care to residents as they were needed to resolve the technology issues	5 (26.3)	7 (36.8)	5 (26.3)	1 (5.3)	1 (5.3)	0 (0.0)
Challenges in maintaining sufficient carer staffing levels whilst some senior carers are delegated to administer medicines to residents	8 (42.1)	2 (10.5)	6 (31.6)	2 (10.5)	1 (5.3)	0 (0.0)
Issues with staff adjusting to the new roles within the nursing home (i.e. nurses delegating the administration of medicines to senior carers and senior carers being delegated to administer medicines)	7 (36.8)	7 (36.8)	3 (15.8)	1 (5.3)	1 (5.3)	0 (0.0)
Senior carers refusing to administer medicines that were delegated to them by nurses	15 (78.9)	3 (15.8)	1 (5.3)	0 (0.0)	0 (0.0)	0 (0.0)
Nurses refusing to delegate senior carers to administer medicines to residents	12 (63.2)	4 (21.1)	2 (10.5)	0 (0.0)	0 (0.0)	1 (5.3)
Concerns related to the standard of training provided to senior carers to administer medicines	10 (52.6)	4 (21.1)	2 (10.5)	1 (5.3)	1 (5.3)	1 (5.3)
Resistance from family members because senior carers were administering medicines to residents (rather than nurses)	15 (78.9)	2 (10.5)	1 (5.3)	0 (0.0)	0 (0.0)	1 (5.3)
Resistance from residents because senior carers were administering medicines to them (rather than nurses)	17 (89.5)	1 (5.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.3)

Similarly, a mix of responses were obtained from the 5-point Likert statements related to the impact within the home since senior carers had been allowed to administer medicines under delegation (**Table 4.11**). However, almost all the respondents indicated 'agree' to the statements 'the workload within the nursing home is shared out more evenly amongst staff (i.e. care home managers, nurses and senior carers)' ( $n=13$ , 68.4%), and/or 'residents receive a greater consistency of care' ( $n=11$ , 57.9%).

**Table 4.11** Responses to the statements on the impact of nurse-delegated medicines administration by senior carers in nursing homes

Statements relating to the impact of nurse-delegated medicines administration by senior carers in nursing homes	Strongly disagree, n (%)	Disagree, n (%)	Neither agree nor disagree, n (%)	Agree, n (%)	Strongly agree, n (%)	Don't know, n (%)
Higher levels of staff satisfaction (i.e. care home managers, nurses and senior carers)	0 (0.0)	1 (5.3)	5 (26.3)	6 (31.6)	7 (36.8)	0 (0.0)
Medicines are administered more accurately (i.e. fewer medication incidents)	1 (5.3)	2 (10.5)	3 (15.8)	5 (26.3)	7 (36.8)	1 (5.3)
Medicines are administered in a more timely manner	1 (5.3)	2 (10.5)	2 (10.5)	8 (42.1)	5 (26.3)	1 (5.3)
Nursing home staff communicate more effectively	1 (5.3)	2 (10.5)	2 (10.5)	9 (47.4)	5 (26.3)	0 (0.0)
Residents receive a greater consistency of care	1 (5.3)	1 (5.3)	1 (5.3)	11 (57.9)	5 (26.3)	0 (0.0)
Nurses are freed up to focus their time on other nursing tasks	1 (5.3)	0 (0.0)	2 (10.5)	9 (47.4)	7 (36.8)	0 (0.0)
Residents are more satisfied with the care that is provided	0 (0.0)	0 (0.0)	5 (26.3)	9 (47.4)	4 (21.1)	1 (5.3)
The workload within the nursing home is shared out more evenly amongst staff (i.e. care home managers, nurses and senior carers)	0 (0.0)	0 (0.0)	1 (5.3)	13 (68.4)	4 (21.1)	1 (5.3)
There has been cost-savings to the nursing home as a result of delegating the administration of medicines to senior carers	0 (0.0)	3 (15.8)	4 (21.1)	6 (31.6)	4 (21.1)	2 (10.5)

#### 4.4.4 Nursing homes that do not delegate medicines administration to senior carers

Some 18 respondents (48.6%) indicated that nurses did not delegate medicines administration to senior carers within their nursing homes. These respondents were directed to complete section 4 of the survey.

Section 4 of the survey was designed to address whether the respondents' nursing home had previously considered, and/or have future plans to implement a model of nurse-delegated medicines administration. Only 4/18 respondents (22.2%) indicated that their nursing home had previously considered introducing such a model of which three (75.0%) indicated that plans are currently in place to introduce nurse-delegated administration in the future.

These three respondents were directed to complete section 5 of the survey. Section 5 was designed to address the timeframe for introducing nurse-delegated administration, and the anticipated impact of introducing such a model.

All three respondents provided differing time frames before which they anticipated introducing nurse-delegated medicines administration to senior carers ranging from '3 to 6 months' time' to 'more than 12 months' time.' A range of responses was obtained from the 5-point Likert statements on the anticipated impact of introducing such a model (**Table 4.12**). However, all respondents had selected 'neither agree nor disagree' to 'residents will receive a greater consistency of care,' and 'residents will be more satisfied with the care that is provided.' Conversely, all respondents agreed or strongly agreed that 'nurses will be freed up to focus their time on other nursing tasks,' and 'the workload within the nursing home will be shared out more evenly amongst staff (i.e. care home managers, nurses and senior carers).'

**Table 4.12** Responses to the statements on the anticipated impact of nurse-delegated medicines administration by senior carers in nursing homes

Statements relating to the anticipated impact of nurse-delegated medicines administration by senior carers in nursing homes	Strongly disagree, n (%)	Disagree, n (%)	Neither agree nor disagree, n (%)	Agree, n (%)	Strongly agree, n (%)	Don't know, n (%)
Higher levels of staff satisfaction (i.e. care home managers, nurses and senior carers)	0 (0.0)	0 (0.0)	1 (33.3)	1 (33.3)	1 (33.3)	0 (0.0)
Medicines will be administered more accurately (i.e. fewer medication incidents)	1 (33.3)	0 (0.0)	1 (33.3)	1 (33.3)	0 (0.0)	0 (0.0)
Medicines will be administered in a more timely manner	0 (0.0)	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	0 (0.0)
Nursing home staff will communicate more effectively	0 (0.0)	0 (0.0)	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)
Residents will receive a greater consistency of care	0 (0.0)	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Nurses will be freed up to focus their time on other nursing tasks	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)	2 (66.7)	0 (0.0)
Residents will be more satisfied with the care that is provided	0 (0.0)	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
The workload within the nursing home will be shared out more evenly amongst staff (i.e. care home managers, nurses and senior carers)	0 (0.0)	0 (0.0)	0 (0.0)	2 (66.7)	1 (33.3)	0 (0.0)
There will be been cost-savings to the nursing home as a result of delegating the administration of medicines to senior carers	0 (0.0)	1 (33.3)	0 (0.0)	2 (66.7)	0 (0.0)	0 (0.0)

#### 4.4.5 Staff perceptions of nurse-delegated medicines administration by senior carers in nursing homes

A total of 26 respondents (70.3%) provided additional information as free-text comments about their perceptions of a model of nurse-delegated medicines administration by senior carers. From these free text comments, themes and subthemes were identified inductively (see **Table 4.13**).

**Table 4.13** Themes and associated subthemes identified from the survey

Themes	Subthemes
1. Perceived appropriateness of senior carers administering medicines	<ul style="list-style-type: none"> <li>• Staffing shortages</li> <li>• Perceptions based on prior experiences working with medicines</li> </ul>
2. Challenges in senior carers administering medicines	<ul style="list-style-type: none"> <li>• Inadequacies in medicines administration training for senior carers</li> <li>• Increased workload for care staff due to inadequate staffing</li> <li>• Adaptation to the medicines administration task</li> <li>• Inconsistencies in opinions from different organisations</li> </ul>
3. Positive outcomes from senior carers administering medicines	<ul style="list-style-type: none"> <li>• New opportunities for senior carers</li> <li>• Liberation of nurses to focus on other tasks</li> <li>• Improvements in staff morale</li> <li>• Resident-centred care</li> <li>• Cost savings</li> </ul>

#### **Theme 1: Perceived appropriateness of senior carers administering medicines**

The perceived appropriateness of senior carers administering medicines in nursing homes was identified as an important factor which influenced the respondents' opinions on the implementation of such a model. This theme had two subthemes: i) staffing shortages, and ii) perceptions based on prior experiences working with medicines.

##### Staffing shortages

Many respondents highlighted staffing issues related to both the carer and the nurses' roles within nursing homes. Some respondents indicated that allowing senior carers to administer medicines under nurse delegation is appropriate due to a 'current crisis' of a national shortage of nurses:

*“I think it is the only way forward if nursing homes are going to thrive under the current situation of a lack of nurses.” [NH3-2]*

However, other respondents highlighted concerns that this new medicines administration model may not be appropriate in nursing homes due to concerns over existing care staff shortages. They felt this would be exacerbated if senior carers were delegated the medicines administration tasks. One respondent explained that this would mean there will be one less member of care staff delivering personal care to residents:

*“It means I have one less carer as they now are administering medicines. It takes carers off the floor so less care is being delivered.” [NH3-81]*

#### Perceptions based on prior experiences working with medicines

Some respondents indicated that their view on the appropriateness of this new medicine administration model was based on prior experiences working with medicines. These experiences were related to medicines safety and more specifically, the use of technology (PCS™) to support medicines administration.

Some respondents were supportive of the model believing that senior carers could undertake the task of medicines administration more safely compared to nurses:

*“Actually, carers are safer and better at giving out medicines than nurses because carers take more care and understand the importance. It has been very positive. I think it is a very good idea.” [NH3-70]*

Other respondents described past experiences where medication errors were made by nurses administering medicines. These incidents led them to lose confidence in the prospect of allowing senior carers to undertake medicines administration in nursing homes. Consequently, they deemed the delegation of medicines administration to senior carers to be inappropriate:

*“Personally, I don't think it's a good idea. I have seen a lot of medication errors over the years and the implications they might have. And these are with nurses giving out the medicines.” [NH3-45]*

In addition, some respondents described their experience of using PCS™ for medicines administration. Some respondents indicated that the task of medicines administration could be safely undertaken by senior carers as PCS™ alerts the user to potential medication administration errors. As one respondent indicated, PCS™ had led to fewer medication errors, explaining that delegating medicines administration to senior carers is appropriate providing they have received medicines training:

*“We use the PCS™ which is quite good - so once the carers have done the e-learning and training then they can give out the medicines to the residents. The PCS™ picks up mistakes on the system. I must say I haven't had to deal with any medication errors or incidents in the past year.” [NH3-76]*

## **Theme 2: Challenges in senior carers administering medicines**

Whilst respondents generally indicated that delegating medicines administration to senior carers may be appropriate, some respondents stated some challenges. These challenges were related to four subthemes: i) inadequacies in medicines administration training for senior carers, ii) increased workload for care staff due to inadequate staffing, iii) adaptation to the medicines administration task, and iv) inconsistencies in opinions from different organisations.

### Inadequacies in medicines administration training for senior carers

Respondents indicated that there were some inadequacies in the training provided to senior carers which created some safety concerns when implementing this new medicine administration model. These inadequacies in training were related to concerns about the senior carers' knowledge of medicines:

*“I have been concerned about the lack of understanding with carers about what they are administering.” [NH3-80]*



*“Carers are not educated enough to make decisions about medication. When to withhold or to give.” [NH3-81]*

In addition, one respondent raised concerns about the absence of a standardised training programme on medicines administration for carers in the UK. They felt this may impact on the quality of medicines administration across nursing homes:

*“There needs to be a nursing assistant programme to be developed across the board for carers especially for smaller independent care home groups. This ensures good quality.” [NH3-15]*

#### Increased workload for care staff due to inadequate staffing

Some respondents indicated that the implementation of the new medicines administration model has sometimes meant that care staff may experience an increased workload when the senior carer is administering medicines to residents:

*“The only issue is that because carers are giving out the medicines, the rest of the carers have to be delegated in different ways. So, there might be strain on the care team as one carer is taken away to give out the medicines.” [NH3-52]*

#### Adaptation to the new medicines administration model

Some respondents also indicated that the move to senior carers administering medicines to residents was initially challenging whilst staff adapted. Given that this represented a new way of working within nursing homes, most respondents indicated that challenges associated with implementation and adaptation were to be expected. Initial challenges were related to apprehension about senior carers' knowledge of medicines as well as a lack of understanding of new roles within the nursing home. However, some respondents further explained that these initial challenges disappeared over time as the staff worked alongside each other and had adapted to their new roles:

*“Nurses were initially apprehensive about this due to the knowledge of carers but once they built trust and got to know the carers a bit more by working with them then it was fine.” [NH3-15]*

*“There has been teething problems - just like normal issues with any type of change. For example, not fully understanding roles.” [NH3-43]*

#### Inconsistencies in opinions from different organisations

One respondent said that the implementation of this new medicines administration model was initially challenging due to inconsistencies in opinions from different stakeholder organisations. For example, whilst health and social care regulators supported nursing homes delegating medicines administration tasks, the local health board opposed the idea. This meant that the nursing home felt obliged to discontinue their implementation for a period of time:

*“Also, resistance from the health board as we were one of the first homes to do it, so they made us stop doing it for a while. But then we had backing from the CIW to do it - just not the health board.” [NH3-2]*

#### **Theme 3: Positive outcomes from senior carers administering medicines**

Although respondents had indicated some challenges in senior carers administering medicines within nursing homes, they also highlighted several positive outcomes. These positive outcomes were broadly categorised into five subthemes: i) new opportunities for senior carers, ii) liberation of nurses to focus on other tasks, iii) improvements in staff morale, iv) resident-centred care, and v) cost savings.

#### New opportunities for senior carers

Respondents indicated that enabling senior carers to administer medicines under delegation ultimately allowed carers to take on new roles and challenges within the nursing home:

*“It empowers the staff, and this gives them new challenges as well.” [NH3-3]*

*“There is development of staff.” [NH3-62]*

### Liberation of nurses to focus on other tasks

When senior carers are administering medicines in the nursing home, nurses were said to be freed up to focus their time on their other clinical duties as well as responding to the needs of residents:

*“It very much frees up the RN's time for more clinical tasks within the home.”* [NH3-13]

*“Senior carers giving out the medicines mean that there is a safe number of nurses available to meet the needs of residents. It is highly beneficial.”* [NH3-43]

### Improvements in staff morale

Respondents also indicated that the model facilitated improvements in staff morale within the workplace. This was described in terms of job satisfaction for senior carers and decreased levels of stress for nurses. Respondents indicated that senior carers feel appreciated when given the opportunity to administer medicines to residents and this also makes the care staff feel more positive about working in the nursing home:

*“Senior care staff are actually quite happy to take the responsibility of giving medicines since they feel valued.”* [NH3-76]

*“The carers can achieve new things, so they feel more positive working within the home.”* [NH3-3]

*“There is development of staff, less stress on RGN.”* [NH3-62]

### Resident-centred care

The respondents indicated that the delegation to allow senior carers to administer medicines supported resident-centred care which was beneficial to residents. This renewed focus on resident-centred care meant improvements in continuity (i.e. timely administration of medicines to residents) and consistency of care (i.e. residents are cared for by the same member(s) of staff):

*“I feel this improves the care continuity to the residents since they’re not waiting for their medicines. This has made it more person centred.” [NH3-39]*

*“The residents receive a greater consistency in care because we don't need to hire agency staff to come in.” [NH3-76]*

#### Cost-savings

Finally, a number of respondents indicated that senior carers administering medicines had enabled cost-savings. This is because the nursing home did not have to employ additional nursing staff, generally through an agency, as senior carers were able to administer medicines to the residents instead:

*“It’s more cost-effective not to rely on agency staff to cover night shifts.” [NH3-62]*

#### **4.5 Discussion**

Whilst UK guidance in 2016 confirmed that nurses could delegate medicines administration to trained and competent senior carers in nursing homes (Department of Health 2016), there remains a paucity of literature exploring the perceptions of nursing home staff in the UK regarding this medicines administration model. Although the study described in chapter 3 of this thesis explored the perceptions of nursing home staff regarding the feasibility of implementing such a model, these views were from two nursing homes only. To address this, in this current study, a survey was developed and distributed to managers (or another appropriate member of staff) that had implemented PCS™ to better understand the views from a wider population of nursing homes.

A total of 37 representatives from 37 nursing homes in England and Wales of different ownerships (private and voluntary/not-for-profit) completed the surveys from a total population sample of 53 nursing homes that use the PCS™; this gave a response rate of 69.8%. Of these 37 nursing homes, 19 (51.4%) indicated that they allowed senior carers to undertake medicines administration. Whilst the remaining 18 nursing homes did not permit senior carers to undertake medicines administration, three of these nursing

homes had plans to implement it in the future. To the best of the researcher's knowledge, this is the first survey which explored the views of staff working in nursing homes regarding a model of nurse-delegated medicines administration by senior carers specifically in nursing homes in the UK.

Whilst a sample of 37 nursing homes may be considered quite small compared to a similar study by Mitty et al. (2009) which explored the medicines management practices across 506 assisted living residences in the United States, the sample of nursing homes in this current study were representative of the English nursing home population in terms of bed capacity (Grant Thornton 2018) with a median of 49 residents per home (interquartile range=39 to 61). In addition, there were more nursing homes studied in the present study compared to the American study by Dupler et al. (2015) which aimed to understand the beliefs of nursing home staff from five nursing homes with plans to implement a model of nurse-delegated medicines administration by medication assistants in Washington. However, unlike the present study which only permitted the return of a single survey by one member of staff from each nursing home, conclusions from the study by Dupler et al. (2015) were drawn from a convenience sample of 218 staff from the five nursing homes. Whilst the study by Dupler et al. (2015) provided rich information from 218 staff about implementing the model, the authors focussed on the views of staff from homes that had not implemented medicines administration by medication assistants at the time of the study. A notable strength in this current study then is that it explored views from representatives of nursing homes who have already implemented the model as well as those that have not.

The response rate for the return of surveys has been reported to be variable in cross-sectional studies that have explored staff perceptions, beliefs, and understanding of medicines administration by carers in long-term care facilities (20.1% to 87.2%) (Mitty 2009; Budden 2011a; Dupler et al. 2015). Given the significant variability in response rates from previous studies, it is difficult to ascertain whether a 69.8% response rate in this present study is consistent with previous research. However, other studies have highlighted that the distribution of surveys to care homes in the UK often generates a low response rate (15.8% to 40.0%) due to difficulties in engaging care homes in research, which understandably is not a priority (Froggatt and Payne 2006; Gage et al.

2012; Backhouse et al. 2014). Barriers to engaging care homes in research in the UK have been previously described in the literature and include: studies which require care home staff to contribute a large amount of their time, high turnover of staff in care homes that means care homes that originally agreed to take part in research may potentially drop out, and care home groups not giving permission for their individual care homes to take part in research (Davies et al. 2014). Given that previous care home surveys in the UK yielded response rates of less than 40% (Froggatt and Payne 2006; Gage et al. 2012; Backhouse et al. 2014), a 69.8% response rate that was achieved in the present study could be considered quite high and provides a valuable insight into the perceptions of nursing homes regarding a model of nurse-delegated medicines administration in the UK.

The present study identified that more than one-half of the nursing homes ( $n=19$ ) who completed the surveys allowed senior carers to undertake medicines administration tasks in 2019. In line with the findings from the study in chapter 3 and consistent with evidence from previous studies, the majority of the 22 homes that have plans to implement or have already implemented a model of nurse-delegated medicines administration indicated that the model facilitated (or would facilitate) greater consistency of resident care and freed up nurses to focus their time on other nursing duties (Randolph and Scott-Cawiezell 2010; Denton et al. 2015; Lee et al. 2015).

A variety of views on the cost-effectiveness of this model of care were expressed by respondents in the present survey, and previous studies which explored the delegation of care staff to undertake medicines administration tasks in Australia also supported cost-savings (Denton et al. 2015; Lee et al. 2015). However, these are based on the opinions of staff using qualitative research methods rather than an economic analysis and therefore it remains to be elucidated to what extent (if any) this medicines administration model supports cost-savings for nursing home providers. With the ongoing financial challenges faced by the care homes sector in the UK (NHS 2017; Directors of Adult Social Services 2019), the cost-effectiveness of this medicines administration model is an important issue for future research.

There were no apparent differences between nursing homes that delegate medicines administration to senior carers compared to those that do not in terms of the number of residents that could be accommodated at the nursing homes, the number of full-time nurses, and the number of full-time carers employed. However, two key concerns which were identified in this study may have impacted on the adoption of this new model. These concerns were also elucidated in chapter 3 and relate to a perceived increase in workload for other carers when senior carers are delegated to administer medicines, and inadequacies in the training provided to carers. Given that respondents in the present study indicated that this medicines administration model is beneficial and may help address wider staffing shortages in the sector, it is important that these issues are addressed as a matter of urgency. For example, as was suggested, implementing a standard national training framework may address training issues.

Although the findings from this current study indicated that most of the nursing homes did not experience challenges in maintaining adequate carer staffing levels when senior carers were delegated to administer medicines, the analysis of the free-text comments from the survey highlighted that these concerns were held by some respondents who have plans to or have already allowed senior carers to administer medicines. Ultimately, inadequate staffing levels in nursing homes could place increased work pressures on existing staff, and previous studies including the study conducted in chapter 3 have established concerns related to inadequate staffing in nursing homes and the potential for this to compromise the quality of care provided to residents (Denton et al. 2015; Arain et al. 2016; Royal College of Nursing 2017; Royal College of Nursing 2018; Tou et al. 2020). In the UK, a cross-sectional survey distributed to nursing staff in 2017 explored their experience of staffing levels across all health and social care settings (Royal College of Nursing 2017). Of the 30,865 responses that were received, 6% ( $n=1,829$ ) were from nursing staff working in care homes (Royal College of Nursing 2017). The study found that inadequate staffing levels within the care homes sector could negatively impact on resident care, with for example more than 40% of respondents working in care homes agreeing that 'due to the lack of time, I had to leave necessary care undone' (Royal College of Nursing 2018). In addition, a recent cross-sectional study conducted by Tou et al. (2020) surveyed nursing aides from ten nursing homes in Taiwan to identify the

types and relative frequencies of missed resident care. The authors also sought to understand the reasons for this missed care. Of note, Tou reported that almost 90% of respondents ( $n=165$ ) indicated workforce shortages as one of the top three reasons for missed resident care. More specifically, other studies have established that missed resident care could lead to several adverse outcomes for residents including falls and infections (often requiring management in secondary care) (Kalisch et al. 2012; Nelson and Flynn 2015) in addition to medication administration errors (Kalisch et al. 2014; Tou et al. 2020).

In this present study, senior carers were mostly delegated medicines administration during the morning hours. At this time, both personal care and the number of medicines administered are usually at their peak (van den Bemt et al. 2009). As such, care home managers with plans to allow senior carers to administer medicines in nursing homes should ensure staff numbers are sufficient during the morning.

Consistent with findings in chapter 3 and from previous research (Gransjön Craftman et al. 2014; Lee et al. 2015; Gransjön Craftman et al. 2016), the importance of training was reinforced in this current study. All 19 respondents that allowed senior carers to administer medicines reported that senior carers were required to complete medicines training before undertaking any medicines administration tasks. However, respondents highlighted concerns that the potential for variations in medicines training provided in the UK may ultimately impact on the quality of medicines administration across different homes, a result that was distinct from chapter 3. Indeed, whilst all respondents indicated that shadowing a nurse during a medication round was a requirement before senior carers were allowed to administer medicines, only some respondents indicated that senior carers had to also complete a calculations examination or complete a face-to-face medicines training session with a pharmacist. Variations in medicines training have similarly been reported in other studies that have explored medicines-related training for 'unlicensed staff' in long-term care facilities in the United States (Budden 2011a; Barra 2011). For example, Barra (2011) found that whilst some states in the US required unlicensed staff to undertake a 100-hour medicines training course before being eligible to administer medicines in assisted-living facilities, other states only required completion of a 45 hour training course. In another US study, medication aides



were, on average, required to complete 14 hours of clinical training in long-term care facilities, compared to 20 hours for those working in nursing homes (Budden 2011a). This variability in training is unwarranted and likely the consequence of ad hoc local policies. As highlighted in the discussion section of chapter 3, future studies should investigate the quality of medicines administration training provided to staff in nursing homes that plan to implement a model of nurse-delegated medicines administration by senior carers in nursing homes within the UK.

With current UK guidance recommending that senior carers can only be delegated rights to administer medicines for which they have been trained and assessed competent, the differences in the types of medicines that could be administered by senior carers in the present study may be partly explained by variations in the medicines training provided between different nursing homes (Department of Health 2016). Another explanation for the differences in the types of medicines that could be administered by senior carers may be due to staff perceptions on medicines safety, i.e. some types of medicines may be associated with an increased risk of errors (Dupler et al. 2015). The Department of Health (2016) advise care home providers to ensure that medicines that are particularly prone to medication administration errors like inhalers should be highlighted to staff as part of a medicines training programme. In addition, a cross-sectional study which investigated the impact of medicine formulations on medication administration errors from 55 care homes in the UK found that compared with the administration of oral medicines, medicines that are administered via transdermal and injectable formulations are associated with an almost 20-fold increase in medication administration errors ( $p$ -value $<0.0001$ ), and inhalers were associated with more than a 30-fold increase in error ( $p$ -value $<0.0001$ ) (Alldred et al. 2011). It is therefore possible that some of the nursing homes in the present study have taken a cautious approach towards such formulations in prohibiting senior carers from administering them.

A number of important limitations need to be considered when interpreting the results of this current study. Firstly, the small sample of nursing homes ( $n=37$ ) studied meant that inferential statistics could not be used to determine the effects of the demographic characteristics of nursing homes on the reported impact and challenges associated with implementing a model of nurse-delegated medicines administration by senior carers.

Despite this, all nursing homes that used PCS™ for medicines administration were invited to take part in the study and a high response rate of 69.8% was achieved. Secondly, there is a possibility that only individuals working in nursing homes who considered themselves to have good medicines management procedures in place, had adequate staffing numbers to sustain the daily operation of the home, or possessed strong opinions about a model of nurse-delegated medicines administration by senior carers had volunteered to take part in the present study (Jordan et al. 2019; Jordan et al. 2021). This is known as volunteer bias (Salkind 2010), and if this occurred, it could mean that the current findings may be potentially skewed preventing the findings from being transferable to the wider nursing home sector. However, the researcher tried to ensure as many homes as possible that met the inclusion criteria for the present study were able to take part so that the widest variety of opinions could be captured. For example, the busy unpredictable nature of workload in nursing homes was acknowledged as a factor which could impact on an individual's willingness to volunteer and take part in the study. Consequently, nursing homes which met the inclusion criteria in the study were given the flexibility to complete the surveys via several mechanisms (either mail or telephone) to allow potential respondents to take part which subsequently increased the response rate. Also, to limit the burden on potential respondents, closed-ended questions were mainly used in the survey to ensure that the survey was simple and quick to complete. However, given that the current study utilises some statements which required respondents to indicate their views and opinions using a 5-point Likert scale, the final limitation relates to the possibility that respondents may have been inclined to select neutral responses like 'neither agree nor disagree' or 'sometimes.' This is commonly known as central-tendency bias where some respondents may avoid selecting extreme options on a 5-point Likert scale (i.e. 'strongly agree' or 'strongly disagree,' and 'never' or 'always'), but instead select neutral responses when they want to avoid expressing a socially undesirable response (Nadler et al. 2015). Whilst this may have potentially impacted on the results in the study, respondents were given the opportunity to elaborate on their responses through free-text comments and when completing section 6 of the survey. Indeed, most respondents in this study provided additional comments to elaborate on their survey responses.

In summary, this chapter explored the views from 37 nursing homes regarding a model of nurse-delegated medicines administration by senior carers in nursing homes in the UK who currently use PCS™ for medicines administration. The opinions expressed in this study were, in the main, aligned with those found in chapter 3, particularly with respect to concerns around the maintenance of adequate staffing levels and the need for adequate medicines training to be provided to senior carers. In addition, variability in the provision of medicines training for senior carers across nursing homes in the UK was a further factor identified in this study, an area which was not previously exposed in chapter 3. The present study further highlights the need for future studies to investigate the quality of medicines training provided to staff in nursing homes that plan to implement a model of nurse-delegated medicines administration in the UK.

## 4.6 References

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## **Chapter 5    General Discussion**



## **5.1 Chapter summary**

This final chapter draws together the findings from the research presented in chapters 2, 3 and 4 of this thesis. Specifically, it provides a discussion of the major research findings contextualised to the care homes sector in the UK, implications for practice, and recommendations for future work that can build on this area of research. A conclusion that summarises the thesis will be addressed at the end of the chapter.

## **5.2 Discussion of major research findings and implications for practice**

In recent months, the tragic impact of the COVID-19 pandemic on care homes in the UK has ultimately attracted considerable attention from the public regarding the longstanding challenges (see chapter 1, section 1.5) faced by a sector which provides accommodation to one of the most vulnerable populations in society. Specifically, statistics indicated that by 22<sup>nd</sup> May 2020, almost 30% of all UK COVID-19 related deaths occurred in those living in care homes in England and Wales (Caul 2020). Not only has the pandemic affected care home residents, but it also had a devastating impact amongst the staff working within these facilities. Of note, an analysis of COVID-19 related deaths by occupation in England and Wales showed that the mortality risk is twice as high for individuals working in adult social care compared to those working in other healthcare environments (including secondary care) (Windsor-Shellard and Kaur 2020). Despite the reported staffing shortages in care homes prior to the pandemic, the COVID-19 related deaths amongst the adult social care workforce have inevitably heightened the challenges associated with maintaining adequate staffing levels in responding to the needs of residents during this testing time. In recognition of the impact of COVID-19, the UK government has introduced an additional £2.9 billion of funding for adult social care to ensure that vulnerable older adults living in care homes continue to have access to the quality of care they need (Department of Health and Social Care 2020). Despite this injection of funding, there is a wider perspective that adult social care remains chronically underfunded. Of note, LaingBuisson was commissioned by the Association of Directors of Adult Social Services to produce an independent analysis for the Department of Health and Social Care exploring the additional financial pressures faced by the care home sector because of the COVID-19

pandemic. LaingBuisson concluded that the sector is likely to face at least £6.6 billion in extra costs mainly through the provision of personal protective equipment and sustaining safe staffing levels during the pandemic (Association of Directors of Adults Social Services 2020b).

Given that the management and administration of medicines typically features as one of the key activities in which staff support residents in care homes, one measure of quality of care is the safe and effective management of medicines. Indeed, to support quality medicines management in care homes, pharmacy professionals have been asked to support care homes with medicines supply, medication reviews, and medicines-related queries as part of the COVID-19 response (NHS England and NHS Improvement 2020a). The aim of this thesis was to explore the current complexities and challenges associated with prescribing and medicines administration within care homes in the UK, specifically addressing the prescribing of classes of medicines commonly associated with adverse outcomes in older adults and the quality of medicines administration undertaken by staff (nurses and senior carers) in care homes. The research findings shed light on areas of suboptimal medicines management which should be urgently addressed given the crisis that is currently being experienced by care homes in the UK. In addition, it explores how activities such as medicines administration might be delegated to senior carers as an intervention to improve the care of residents and address workforce challenges in the nursing home sector.

In chapter 2, the prescribing and administration of key classes of medicines that are often inappropriately prescribed to care home residents and commonly associated with adverse outcomes were explored in eight nursing homes accommodating 483 residents. These classes of medicines were: (i) anticholinergic drugs, (ii) analgesics, anxiolytics and hypnotics, and (iii) antimicrobials). The medicines administration data from the eight nursing homes was extracted from the PCS™, a digital medication management system, and was used to determine the medicines prescribed to residents over a one-month medicines cycle in November 2017. In addition, the administration practices for anxiolytics, hypnotics and analgesics that were prescribed 'as required', and the administration patterns of antimicrobials was also explored.

Whilst chapter 2 demonstrated that only 24% of residents were prescribed antimicrobials, this is higher than other age-matched populations (Shah et al. 2012). For example, Shah et al. (2012) explored the quality of prescribing in England and Wales and found that antimicrobials were more commonly prescribed to care home residents compared to older adults living in the community (RR=1.98, 95% CI=1.90-2.06), and that only 17% of community-dwelling older adults aged 65 years and older were prescribed antimicrobials during the study. Several problematic practices related to the prescribing of broad-spectrum antimicrobials, the prescribing of repeated courses of the same antimicrobial within a one-month medicines cycle, and a high prevalence of residents prescribed antimicrobials for the management of UTIs were also identified. Collectively, these prescribing practices ultimately contribute towards the global public health threat of antimicrobial resistance (World Health Organization 2015; Department of Health and Social Care 2019). For example, 62.6% of residents taking antimicrobials were prescribed these for UTIs, despite guidance advising their use is of limited value in this population (Royal College of General Practitioners 2018). Given that antimicrobial resistance is estimated to cause at least 25,000 deaths per annum and is associated with increasing healthcare expenditure of approximately €1.5 billion annually in Europe alone (European Centre for Disease Prevention and Control 2009), the UK government has previously set out the ambition to half the number of inappropriate antimicrobial prescriptions by 2021 (HM Government 2016). However, growing concerns over antimicrobial resistance have meant that regulatory measures have also been put in place in the UK to tackle this issue. As part of the code of practice relating to infection prevention set out under the Health and Social Care Act 2008, registered adult social care providers, including care homes, are required to demonstrate that antimicrobials are used appropriately and measures should be taken to reduce antimicrobial resistance (Department of Health 2015). More recently, the five-year GP contract agreement includes measures to optimise the quality of prescribing of antimicrobials in care homes (Primary Care Strategy and NHS Contracts Group 2020). However, the findings in chapter 2 have highlighted that issues related to antimicrobial prescribing still exist despite various guidance and regulations in the UK.

In line with previous research, a significant number of residents in this study were prescribed anticholinergic drugs (50%), hypnotics and/or anxiolytics (30%), and analgesics (49%) (Furniss et al. 2000; Fox et al. 2011; Johnson et al. 2016; Griffiths et al. 2019). In addition, a considerable number of residents receiving regularly scheduled analgesics, hypnotics and/or anxiolytics were also co-prescribed these medicines on an 'as required' basis. Of note, some residents were administered these 'as required' doses almost all the time, i.e. as if they were regular medicines. This increases the risk of exceeding the maximum recommended doses leading to overdose and precipitating adverse effects. It is well-documented that anticholinergic drugs, hypnotics and/or anxiolytics, and analgesics (also known as psychotropic medicines) are commonly associated with falls in care home residents (Mustard and Mayer 1997; Ray et al. 2000; Vestergaard et al. 2006; Clegg and Young 2011; Wilson et al. 2011; Landi et al. 2014). Individuals often expect that falls are an inevitable aspect of ageing, however many older adults aged 65 years and older do not usually experience falls (Department of Health 2009). Instead, it seems that the vulnerable nature of older adults living in care homes may play a role in contributing towards the incidence of falls. Of note, care home residents are predicted to be at least three times more likely to fall compared to age-matched individuals living in the community (Department of Health 2009). NICE guidance on the assessment and prevention of falls in older adults has highlighted that many factors contribute towards the incidence of falls including the prescribing of psychotropic medicines and these should be routinely reviewed and discontinued where possible to reduce falls risk (National Institute for Health and Care Excellence 2013). As described in chapter 2, residents were exposed to potentially inappropriate prescribing regarding psychotropic medicines. For example, almost a third of residents prescribed analgesics, hypnotics and/or anxiolytics were identified to have been prescribed these medicines inappropriately. Ultimately, these residents would benefit from a medication review to reduce falls risk. Addressing this is important given that at least 25% of older adults who experience falls within care homes in the UK suffer serious injuries that require hospitalisation (Care Inspectorate and NHS Scotland 2016). Approximately 4 in 10 hospital admissions occur directly following a fall in a care home (Care Inspectorate and NHS Scotland 2016), and on average, care home residents typically spend at least 8 days in hospital before being discharged back into the community (Wolters et al. 2019).

Although falls can impair mobility, affect quality of life and in more serious cases contribute towards mortality, the management of falls also has a significant impact on healthcare costs where as much as £2.3 billion of the NHS annual budget is spent on caring for individuals who fall (National Institute for Health and Care Excellence 2013). Reducing falls risk through regular medication reviews in care homes is therefore a priority to improve the health outcomes of residents but also to save valuable NHS resources that could be redistributed elsewhere.

The use of anticholinergic drugs has also garnered considerable attention over recent years in light of emerging evidence that these medicines result in an increased risk of cognitive impairment, hospital admissions and mortality in the older adult population (Ancelin et al. 2006; Fox et al. 2011; Gnjidic et al. 2014). The AEC scale was used to quantify the anticholinergic burden for each of the residents studied in chapter 2. It was found that 17.6% of all residents were at risk of clinically relevant anticholinergic cognitive effects from their medicines regimen. Given that more than two-thirds of the UK care homes population experience some form of cognitive impairment due to dementia (Alzheimer's Society 2007), the prescribing of anticholinergic drugs could exacerbate such impairment in this already vulnerable cohort. The high anticholinergic burden with the potential to cause clinically relevant anticholinergic cognitive effects was found to be related to the prescribing of multiple lower scoring anticholinergic drugs from the AEC scale (i.e. antidepressants like mirtazapine, citalopram, and sertraline) rather than a single drug with a high score. Of note, some studies have shown that the use of antidepressants in older adults living in the community is no more effective than placebo in the management of depression, and their use may ultimately predispose individuals to adverse effects such as nausea, dizziness, insomnia, and fatigue (Roose et al. 2004; Schatzberg and Roose 2006). More recently, a systematic review and meta-analysis on the use of antidepressants in older adults highlighted that there is currently an absence of studies which specifically focus on frail older adults living in care homes, even though antidepressants are known to be commonly prescribed in this setting (Mallery et al. 2019). As several residents with high anticholinergic burden were commonly prescribed low scoring anticholinergic drugs like antidepressants in the study in chapter 2, future investigations into the clinical appropriateness of

anticholinergic prescribing and particularly antidepressant prescribing in care homes is recommended.

Given that the areas of prescribing concerns identified in chapter 2 could ultimately lead to harm when administered to residents at the nursing homes, the thesis moves on to chapter 3 whereby a new model of medicines administration in nursing homes in the UK was explored. Specifically, the aim of the study was to explore the quality and feasibility of a model of nurse-delegated medicines administration by senior carers in eight nursing homes that used the PCS™ over a three-month period in 2017. The digital medicines administration records along with data on potential medication administration errors that occurred during the study period for every resident was extracted from the PCS™. This allowed for comparison of the types of medicines administered and the types of potential medication administration errors made by nurses and senior carers. Semi-structured interviews were also conducted with care home managers, nurses, and care staff in two nursing homes to explore their perceptions on the feasibility of this new model of care.

Whilst increased work pressures when senior carers were delegated to administer medicines was raised by some care staff, the model was generally found to be feasible and indeed was said to be associated with a range of benefits for residents and staff. These benefits included freeing nurses to focus on clinical tasks which specifically required their input, in addition to facilitating a more resident-centred way of working. Given that there are currently increased demands for a substantially larger workforce in adult social care to respond to the health and care needs of an ageing population alongside ongoing struggles to recruit and retain nurses in this sector (Skills for Care 2018), care home managers are inevitably placed under increasing pressure to devise strategies that optimally deploy the skillset of their staff. More recently, challenges in maintaining sufficient staffing levels have become more prominent given the COVID-19 pandemic. In particular, the UK government has predicted that at least another 20,000 workers are needed to meet the demands of the adult social care sector during the COVID-19 outbreak (Department of Health and Social Care 2020). Poor recruitment of nurses in care homes has led to considerable reliance on agency staff to deliver care to residents. A breakdown of the adult social care workforce in 2017/2018 indicated that

approximately 20% of nurses working in the care home sector are not permanent members of staff (i.e. either agency workers, bank staff or employed under temporary contracts) (Skills for Care 2018). The use of agency staff continues to raise safety concerns with respect to the quality of medicines administration and continuity of care (Royal College of Nursing 2012). Given the current challenges with nurse recruitment, a model of nurse-delegated medicines administration by senior carers could be employed to ensure that the skills of existing staff members are used effectively in nursing homes whilst the more challenging problem of recruiting nursing staff is addressed.

Whilst participants felt that the model was feasible and promoted more effective resident-centred care, it was important to quantitatively explore the safety and effectiveness of senior carers administering medicines. This demonstrated that senior carers did not produce a higher rate of potential medication administration errors compared to nurses. However, the absolute number of potential medication administration errors made was high but consistent with previous studies in the UK (Alldred et al. 2009; Barber et al. 2009; Szczepura et al. 2011; Gilmartin-Thomas et al. 2017). Over the three-month study period, residents of the eight nursing homes were collectively exposed to nearly 8,000 potential medication administration errors. Whilst it was beyond the scope of this study to determine the clinical severity of such administration errors, several errors were identified that have been categorised as 'severe' errors in previous studies (Pierson et al. 2007; Szczepura et al. 2011). These severe error types included 'attempting to give a medicine to the wrong resident,' and 'attempting to give a medicine that had been discontinued by the prescriber' (Pierson et al. 2007; Szczepura et al. 2011). Such errors have potential to cause serious patient impact. For example, in the study by Pierson and colleagues in 2007, the authors reported that these severe errors could result in either hospitalisations or the requirement for further medical intervention(s) to sustain life. In real terms, a recent report highlighted that preventable adverse drug events across all healthcare settings in the UK could result in a rise in the number of preventable hospital admissions, increased length of stay in hospitals, and ultimately costing the NHS at least £98.5million annually (Elliott et al. 2018).

To safeguard the quality of care provided to care homes, the high number of potential medication administration errors identified in this study requires urgent attention. Reasons for the incidence of such errors in long-term care facilities is multi-factorial and is well-documented in the literature (Alldred et al. 2009; Dilles et al. 2011; Szczepura et al. 2011; Wild et al. 2011; Zimmerman et al. 2011). Commonly cited reasons include work stress (Alldred et al. 2009), interruptions or distractions whilst giving out medicines (Dilles et al. 2011; Szczepura et al. 2011), level of medicines training or knowledge in regard to the administration of specific medicine formulations like inhalers (Alldred et al. 2009; Zimmerman et al. 2011), and workforce shortages (Alldred et al. 2009; Tou et al. 2020). Given that participants have highlighted the importance of medicines training in this study, and that inadequate training leading to gaps in knowledge is commonly associated with medication administration errors (Alldred et al. 2009; Dilles et al. 2011; Zimmerman et al. 2011), providing further or enhanced medicines training may improve the quality of medicines administration in care homes.

With a steady rise in the number of new medicines and differing formulations launching in the UK market each year (Ward et al. 2013), it is usual for staff in care homes to be faced with challenges in administering medicines that they may not have previously given before. This inevitably increases the risk of medication administration errors in this setting. For this reason, it is recommended that the individual delivering medicines training to staff in care homes should ideally be someone who is up to date on new medicines to market and has acquired a significant level of knowledge on medicines use (i.e. pharmacist or pharmacy technician).

The importance of medicines training was similarly expressed amongst respondents from the survey study in chapter 4 which gathered insights into the perceptions of 37 nursing homes regarding a model of nurse-delegated medicines administration by senior carers in 2019. In this study, it was found that medicines training was delivered in a variety of formats in different nursing homes. In addition, some respondents highlighted concerns that the potential variations in medicines training provided to senior carers across nursing homes in the UK may ultimately impact on the quality of medicines administration. Health and social care regulators in the UK provide autonomy for care home managers to arrange 'appropriate' medicines training. As a consequence,



care homes have traditionally operated independently within their organisations to address the training needs of their own staff. Future work in care homes should explore the quality of existing medicines administration training programmes before recommending specific training programmes to be rolled out across care homes in the UK (see section 5.3).

Patients records regarding medical history, health status and medicines prescribed and administered to residents are currently not linked for access by different individuals involved in the care of care home residents in the UK (mainly staff working in GP surgeries, pharmacies, and care homes). This lack of interoperability and poor communication across sectors provides an environment for medication errors to occur as previously highlighted in the CHUMS study (Allred et al. 2009). The fragmented nature of patient records also makes it unhelpful to conduct research and audit in monitoring the quality of medicines management within the care homes setting. For example, resident data relating to medicines prescribed, falls, hospitalisations, infections, biochemistry test results, and clinical observations (including blood pressure, pulse, temperature) is often recorded in different places both within the care home and at the GP surgery. Of further concern, this information may not be updated regularly and therefore does not reflect the true health status of residents. The accessibility of accurate resident information is fundamentally important to provide safe and effective care at the required time, and the centralisation of health data relating to the resident is needed to support a holistic approach towards resident-centred care. This centralisation would allow for the resident data to be used by the various individuals involved in the care of individuals living in care homes. The research conducted in this thesis has shown that data from digital medicines administration records from the PCS™ could be used to identify issues related to the prescribing and administration of medicines in the care homes setting. Given that it was a time-consuming task for the researcher to clean the prescribing and medicines administration data stored within the digital medicines administration records, there is a need to make this data more user-friendly for individuals in practice and future work should explore this before examining its feasibility for use by care homes and health care professionals involved in the care of residents. In order to support a holistic approach to care, developers of the PCS™ should

also consider incorporating additional features to allow other health information related to the resident to be recorded within the devices. For example, it would be useful to record falls, hospitalisations, infections, biochemistry test results and clinical observations.

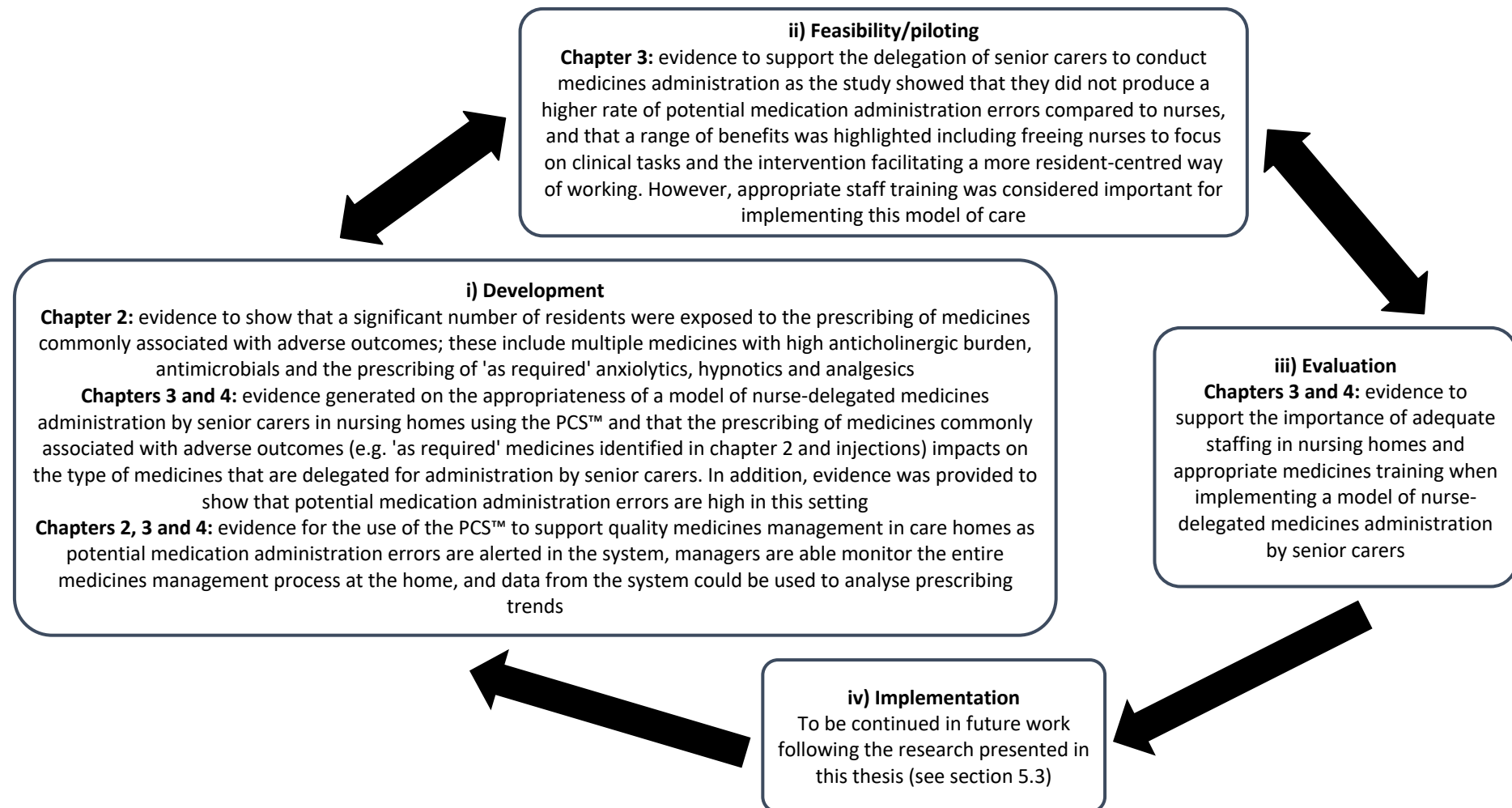
The current efforts invested to improve medicines management in care homes is likely insufficient given that this thesis has highlighted several areas of suboptimal prescribing and medicines administration within this setting in the UK. One of the main reasons for this is that individuals living in care homes in the UK are often a forgotten majority in the UK health and social care system. This has become increasingly exposed as a result of the recent COVID-19 crisis where the government's strategy in responding to the pandemic has been heavily criticised given that the major focus of attention was originally on protecting the NHS arguably at the expense of the care homes sector. For example, in order to maximise hospital bed capacity in the NHS, hospital Trusts were initially asked to 'urgently discharge all hospital inpatients who are medically fit to leave' (NHS England and NHS Improvement 2020b). This inevitably meant that some individuals were discharged into care homes without having their needs adequately assessed. Due to the rapid discharges during the early stages of the COVID-19 pandemic in the UK, a recent report highlighted that this may have resulted in the steep escalations in the number of COVID-19 related deaths in care homes (Association of Directors of Adults Social Services 2020a). Given that the care homes sector is often overlooked in the UK, the importance of quality medicines management has unsurprisingly been neglected in care homes and this has also been observed during the COVID-19 pandemic. For example, many care home pharmacists were initially redeployed to other healthcare settings during the early phases of the COVID-19 pandemic even when a rise in palliative cases was observed in care homes that would have benefited from pharmacist support (e.g. addressing medicines-related issues, appropriate prescribing and timely supply of appropriate anticipatory medicines) (Burns 2020). It was only with the sharp increase in the number of COVID-19 related deaths in care homes that the government specifically requested pharmacists to support care homes with medicines-related issues as part of the national COVID-19 response in May 2020 (NHS England and NHS Improvement 2020a). Whilst it is promising that the service specification set out

under the new five-year GP contract means that primary care pharmacists are given opportunities to have more of an input in the management of medicines within the care home setting, it must be noted that the role of pharmacists in the contract is not limited to medicines support in care homes. To ensure that care homes are maximally supported with medicines management, pharmacists will have to work together with care homes to determine areas of medicines support required.

As a whole, this thesis aligns to the early stages of the Medical Research Council's framework on developing and evaluating complex interventions (Craig et al. 2019) as shown in **Figure 5.1**. In terms of the development stage of the framework, the thesis builds evidence to show that medicines management in care homes is a complex phenomenon and challenges are present across the prescribing and medicines administration stages. Whilst chapters 2, 3 and 4 provides evidence to support the use of the PCS™ in ensuring medicines are administered appropriately in care homes and data from the system could be used to analyse prescribing trends, the chapters highlight concerns associated with the prescribing and administration of medicines in care homes. For example, chapter 2 identified areas of prescribing concerns as a significant number of residents were found to be exposed to the prescribing of medicines commonly associated with adverse outcomes. Also, a high number of potential medication administration errors were identified in chapter 3 and similarly mentioned throughout the surveys of chapter 4. Despite these areas of concern, chapters 3 and 4 developed evidence for a intervention model of nurse-delegated medicines administration by senior carers in nursing homes. Specifically, the interviews and surveys with staff generated evidence surrounding the appropriateness of such an intervention model in tackling challenges such as workforce shortages within the care homes sector. In addition, a theory was developed from chapters 3 and 4 as it was found that the prescribing of medicines commonly associated with adverse outcomes (e.g. 'as required' medicines identified in chapter 2 and injections) meant that senior carers are less likely to be delegated these medicines for administration. Moving onto the next stage of the Medical Research Council's framework, the nurse-delegated medicines administration by senior carers intervention model was tested for its feasibility in chapter 3. Here, promising results were identified as there was evidence to support this

intervention whereby senior carers were found to be at least as competent as nurses in administering medicines in nursing homes, and interviews with staff identified positive outcomes such as the provision of resident-centred care. In terms of the third stage of the Medical Research Council's framework, there are aspects of chapters 3 and 4 which evaluates the intervention and highlights important areas which support the change process. Of note, both chapters 3 and 4 builds evidence to support the importance of adequate staffing and appropriate medicines training when implementing this intervention. Whilst this thesis established a evidence base for the feasibility of a model of nurse-delegated medicines administration by senior carers in nursing homes and this may therefore be a suitable intervention for the future, the high number of medication administration errors and the perceived importance of medicines training from staff indicates that there is a need to review and optimise medicines training prior to developing this model of care.

**Figure 5.1** Schematic diagram to show the progress that have been made in developing and evaluating a model of nurse-delegated medicines administration by senior carers using the Medical Research Council's framework for developing and evaluating complex interventions



### 5.3 Recommendations for future work

In light of the present research findings, a number of next steps for future research have been identified. Specifically:

1. The development stage of the Medical Research Council's framework for developing and evaluating complex interventions (Craig et al. 2019) must be revisited to understand the medicines training programmes available to care home staff and how these impact on medication administration errors in this setting. This could be done by conducting a systematic literature review to determine the current evidence base for the different training programmes.
2. Again, the development stage should also aim to explore the views of care home staff on medicines training programmes and understand how well these prepare them for medicines administration in care homes using a mixed-methods methods approach. For example, using qualitative research methods, semi-structured interviews followed by surveys could be designed to understand more about care home staff perceptions on their experiences with different training programmes. An investigation into the incidence of medication administration errors across care homes which provide different training programmes to staff could also be conducted using quantitative research methods.
3. Based on the findings from recommendation 2, to then evaluate the feasibility of the medicines training programme which had been shown to be effective in reducing medication administration errors across a sample of care homes.
4. The Medical Research Council's guidance on developing and evaluating complex interventions (Craig et al. 2019) could then be proceeded by piloting the nurse-delegated medicines administration model of care across nursing homes where staff had undertaken the training programme that was evaluated in recommendation 3.
5. To evaluate the cost-effectiveness of the model examined in recommendation 4 by conducting an economic evaluation in order to determine that the cost of the intervention is justifiable based on the outcomes identified.

6. As per the implementation stage of the Medical Research Council's framework for developing and evaluating complex interventions (Craig et al. 2019), monitoring and long-term follow-up of the nurse-delegated medicines administration intervention model in nursing homes must be considered throughout this stage. For example, this could be done by auditing the medicines administered in nursing homes and measuring the incidence of potential medication administration errors made by different staff. In addition, distributing surveys within nursing homes that had implemented the intervention to identify long-term outcomes could also be considered.

#### **5.4 Conclusion**

To conclude, this present thesis explored the current prescribing and medicines administration practices within a sample of UK care homes. Whilst there has been a growing concern surrounding medicines use in care homes and continued efforts have been subsequently introduced to improve medicines management in the setting, this current research has highlighted that issues remain prevalent during the prescribing and administration stages of medicines management. Critically, these errors are likely to cause harm. New models of care, such as senior carers administering medicines in nursing homes may fail if the systemic issues that give rise to such issues are not addressed. The rising number of older adults in the UK will inevitably place greater demands on care homes in the future, therefore strategies to efficiently safeguard the quality of medicines management are urgently needed in this setting.

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## Appendices

**Appendix 1: ethical approval for studies in chapter 2 and 3**

SPPS Ethics Approval Notification (EAN)

8/9/14 v12

**Cardiff School of Pharmacy and Pharmaceutical Sciences,  
Research Ethics Approval**

This form has been signed by the School Research Ethics Officer as evidence that approval has been granted by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee for the following study:

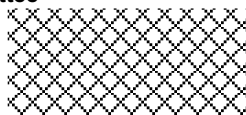
Project title:	1617-33 Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes
----------------	--

This is a/an:	Undergraduate project	<input type="checkbox"/>
	ERASMUS project	<input type="checkbox"/>
	Postgraduate project	<input checked="" type="checkbox"/>
	Staff project	<input type="checkbox"/>

Name of researcher: (PG/Staff projects only)	Vicky Cheng
Name of supervisor(s):	Mat Smith

**STATEMENT OF ETHICS APPROVAL**

**This project has been considered and has been approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee**



Signed \_\_\_\_\_ Name R Price-Davies Date 8/6/17  
(Chair, School Research Ethics Committee)



## Appendix 2: anticholinergic effect on cognition (AEC) scale adapted from Bishara et al. (2016)

Drugs with AEC score of 1	Drugs with AEC score of 2	Drugs with AEC score of 3
Amiodarone	Amantadine	Alimemazine
Aripiprazole	Chlorphenamine	Amitriptyline
Bromocriptine	Desipramine	Atropine
Carbamazepine	Dicycloverine	Benztropine
Citalopram	Dimenhydrinate	Chlorpromazine
Diazepam	Diphenhydramine	Clemastine
Domperidone	Disopyramide	Clomipramine
Fentanyl	Levomepromazine	Clozapine
Fluoxetine	Olanzapine	Cyproheptadine
Fluphenazine	Paroxetine	Dothiepin
Hydroxyzine	Pethidine	Doxepin
Iloperidone	Pimozide	Hyoscine hydrobromide
Lithium	Prochlorperazine	Imipramine
Mirtazapine	Promazine	Lofepramine
Perphenazine	Propantheline	Nortriptyline
Prednisolone	Quetiapine	Orphenadrine
Quinidine	Tolterodine	Oxybutynin
Sertindole	Trifluoperazine	Procyclidine
Sertraline		Promethazine
Solifenacin		Trihexyphenidryl
Temazepam		Trimipramine

Older adults are at risk of relevant anticholinergic cognitive effects from anticholinergic drugs listed in the AEC scale if; i) prescribed an anticholinergic drug with an individual AEC score of 2 or more, or ii) has an cumulative AEC score of 3 or more

**Appendix 3: invitation letter to care home managers from study in chapter 3**

School of Pharmacy and Pharmaceutical Sciences  
Cardiff University  
Redwood Building  
King Edward VII Avenue  
Cardiff  
CF10 3NB



Monday 25<sup>th</sup> September 2017

Dear Care Home Manager,

**RE: Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes**

My name is Vicky Cheng and I am a Ph.D. student at Cardiff University. I am running a project with Invatech Health Limited. The project aims to learn about the views of people like yourselves around carers giving out medicines to nursing residents. Because of this, I would like to invite you to take part in this project. The project has been reviewed by the university and is supervised by Dr Mat Smith.

We will ask about your views through one-to-one interviews. These will take place at your nursing home and at a time best for you. You will also invite your staff, residents and relatives onto this project by giving out letters of invitation. You may take part in the interviews but opt out in giving out the letters of invitation or vice versa. You can state this on your consent form. All information collected will be kept confidential.

More details about this project can be found in the information sheet. Please take some time to read through it then decide whether you would like to take part. If you wish to take part then please fill in the consent form and return it in the envelope by [insert date].

Your views are important in this project. They will add to what we know about the benefits and drawbacks in carers giving out medicines to nursing residents.

You may get in touch with a member of the research team if you have questions about the project. The contact details can be found below.

Thank you very much for your time and I hope to hear from you soon.

Yours Sincerely,

Vicky Cheng  
ChengV1@cardiff.ac.uk

Dr Mat Smith  
SmithMW1@cardiff.ac.uk  
+44 (0)29 2087 9286

Version 3.0, 07/06/17

## Appendix 4: information sheet to care home managers from study in chapter 3

School of Pharmacy and Pharmaceutical Sciences  
Cardiff University  
Redwood Building  
King Edward VII Avenue  
Cardiff  
CF10 3NB



### **Information about the Research for Care Home Managers**

#### **Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes**

We would like you to take part in a project. We would appreciate it if you could take the time to read the information. You can then decide whether or not you would like to take part.

Section 1 tells you the purpose of the project and what it involves for you. Section 2 gives you more details about the project.

#### **Section 1**

##### **What is the purpose of the study?**

The government (Department of Health and the Care and Social Services Inspectorate Wales) says that carers can give medicines to care home residents. This applies to carers who have been trained and assessed on giving out medicines. Nursing home residents are usually given their medicines by qualified nurses. Some nursing homes are planning for carers to give out medicines. Because of this change, it is important to get the views from those who are living or working in nursing homes and know their opinions about it.

##### **Why have I been invited?**

We aim to learn about the views of care home staff, residents and relatives around carers giving out medicines to residents in nursing homes. Because of this, it is important to get views from people like yourselves who are a major part of the nursing home.

##### **Do I have to take part?**

The success of this project relies on your views. But the decision to take part is yours. Please note that your rights will not be affected whether you choose to take part or not. Consent forms will be given at the start of the project. You have a week to fill it out and return it if you wish to take part. You can drop out of the study at any time. This means you can drop out even after signing the consent form.

##### **What will I have to do?**

There are two parts to the project that you can take part in. Part A will be the one-to-one interviews. Part B will be for you to help out in inviting your staff, residents and relatives onto this project by giving out letters of invitation. More information about what you need to do in the two parts can be found below.

##### ***Part A***

Information will be collected using one-to-one interviews with you. You will take part in two interviews. The first interview will take place just before carers start giving out medicines to residents. The second one will be two months after that. Each interview should last 30 minutes. We will ask you some questions about yourself and your views around carers giving

out medicines in nursing homes. We will record the interviews by sound. If you decide that you don't want your interviews recorded then handwritten notes will be taken instead.

### **Part B**

You will give out letters of invitation that we have made to carers, nurses, residents and their relatives at your nursing home. These letters will include an invitation letter, information sheet and consent forms. Their interviews will be like yours. Let us know if you want to see a copy of the letters of invitation before deciding to take part in part B. Please only give out letters to those who have capacity to consent and can hold a 30-minute conversation with a researcher.

You may take part in part A but opt out in part B or vice versa. Please state this on your consent form. If you wish to take part then please fill in one of the consent forms. There is an envelope to put your filled out consent form in. Please post this by [insert date]. The other consent form is yours to keep.

We will then get in touch with you to pick a time for the interviews to take place at your nursing home. If you decide to help with part B then you can also pick times for those interviews to take place. Please let your staff, residents and relatives know once you have picked some times.

### **What are the possible risks or disadvantages to taking part?**

There are no risks to you in taking part. If you feel uncomfortable during the interview then please ask the researcher to turn off the recorder and/or stop taking notes.

### **What are the possible benefits of taking part?**

We cannot promise this study will help you. But the information we get here will add to what we know about the benefits and drawbacks in carers giving out medicines to nursing residents.

## **Section 2**

### **What will happen if I don't want to carry on with the study?**

Please get in touch with us if you no longer wish to be part of this project. The same will apply even if you decide to pull out after the interviews. We will make sure that the information you have given will be disposed of securely. This information will also be taken out from the results.

### **What if there is a problem?**

You may contact any member of the research team about problems relating to the project.

### **Who can I contact to raise concerns or complaints?**

If you have any concerns or complaints, please contact the project's supervisor, Dr Mat Smith (SmithMW1@cardiff.ac.uk) who will address the issue. If you remain unhappy and wish to complain formally, you can do this by contacting the Director of Research, Cardiff School of Pharmacy and Pharmaceutical Sciences, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB.

### **Will my taking part in this study be kept confidential?**

All information will be kept confidential.

The recordings will be typed up by a member of the research team. These will be anonymised using a code in place of your personal data. This means that none of the information will be identifiable to you or to the nursing home.

The consent forms and recordings will be stored in a locked filing cabinet at Cardiff University. The typed-up interviews will be stored on password protected computers. Only the researchers will have access to this information.

All information will only be seen by the research team. The information collected will be disposed of securely once it is not needed.

**What will happen to the results of the research study?**

The results of this project will be written up and put forward in peer-reviewed journals. The information will be anonymised. This means that neither you nor any one involved will be identified in the report. Let us know if you would like to see a copy of the report.

**Who is organising and funding the research?**

The project is organised and funded by the School of Pharmacy and Pharmaceutical Sciences at Cardiff University and Invatech Health Limited.

**Who has reviewed the study?**

This study has been accepted by Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee. You will be given a copy of the consent form to keep. You may also keep this information sheet.

**Who to contact to participate or for more information?**

Please contact the supervisor Dr Mat Smith (SmithMW1@cardiff.ac.uk) or Vicky Cheng (ChengV1@cardiff.ac.uk) using the contact details given in the invitation letter. Please note that contacting us does not commit you to taking part.

Thank you for taking the time to read this information sheet.

## Appendix 5: consent form to care home managers from study in chapter 3

School of Pharmacy and Pharmaceutical Sciences  
 Cardiff University  
 Redwood Building  
 King Edward VII Avenue  
 Cardiff  
 CF10 3NB



### Consent Form for Care Home Managers

#### Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes

**Name of Researchers: Vicky Cheng and Dr Mat Smith**

Please read the following statements and initial the boxes next to the statements for which you give consent.

Please also sign and date the consent form below.

- |   |                          |
|---|--------------------------|
| 1. I have read and understood the information sheet (dated 07/06/17, version 3.0) for the above study. I have had the chance to ask questions and have had these answered satisfactorily.   | <input type="checkbox"/> |
| 2. I understand that taking part is voluntary and I can drop out at any time without giving a reason. If I decide to drop out, the information that I have given will be disposed of securely and this information will also be taken out from the results. | <input type="checkbox"/> |
| 3. I understand that by signing the form;   | <input type="checkbox"/> |
| a. I will take part in the one-to-one interviews.   | <input type="checkbox"/> |
| b. I will give out letters of invitation (i.e. invitation letters, consent forms, information sheets) to my care home staff, residents and their relatives.   | <input type="checkbox"/> |
| 4. I give consent for the interviews to be recorded by sound, otherwise I understand that handwritten notes will be taken instead.  | <input type="checkbox"/> |
| 5. I agree to be contacted by the researchers if an explanation is needed about points discussed in my interviews.  | <input type="checkbox"/> |
| 6. I understand that quotes may be used in reports and journal articles. Where they are used, the quotes will be anonymised.  | <input type="checkbox"/> |

#### **Participant Details**

Name	Role	Signature
Telephone number	E-mail	Date

#### **Researcher Details**

Name	Signature	Date
------	-----------	------

Version 3.0, 07/06/17

## Appendix 6: invitation letter to nursing home staff, residents and their relatives from study in chapter 3

School of Pharmacy and Pharmaceutical Sciences  
Cardiff University  
Redwood Building  
King Edward VII Avenue  
Cardiff  
CF10 3NB



Thursday 10<sup>th</sup> August 2017

Dear [insert stakeholder category],

**RE: Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes**

My name is Vicky Cheng and I am a Ph.D. student at Cardiff University. I am running a project with Invatech Health Limited. The project aims to learn about the views of people like yourselves around carers giving out medicines to nursing residents. Because of this, I would like to invite you to take part in this project. The project has been reviewed by the university and is supervised by Dr Mat Smith.

We will ask about your views through one-to-one interviews. These will take place at the nursing home and at a time best for you. All information collected will be kept confidential.

More details about this project can be found in the information sheet. Please take some time to read through it then decide whether you would like to take part. If you wish to take part then please fill in the consent form and return it in the envelope by [insert date].

Your views are important in this project. They will add to what we know about the benefits and drawbacks in carers giving out medicines to nursing residents.

You may get in touch with a member of the research team if you have questions about the project. The contact details can be found below.

Thank you very much for your time and I hope to hear from you soon.

Yours Sincerely,

Vicky Cheng  
ChengV1@cardiff.ac.uk

Dr Mat Smith  
SmithMW1@cardiff.ac.uk  
+44 (0)29 2087 9286

Version 3.0, 07/06/17

## Appendix 7: information sheet to nursing home staff, residents and their relatives from study in chapter 3

School of Pharmacy and Pharmaceutical Sciences  
Cardiff University  
Redwood Building  
King Edward VII Avenue  
Cardiff  
CF10 3NB



### **Information about the Research for Care Home Staff, Residents and Relatives**

#### **Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes**

We would like you to take part in a project. We would appreciate it if you could take the time to read the information. You can then decide whether or not you would like to take part.

Section 1 tells you the purpose of the project and what it involves for you. Section 2 gives you more details about the project.

#### **Section 1**

##### **What is the purpose of the study?**

The government (Department of Health and the Care and Social Services Inspectorate Wales) says that carers can give medicines to care home residents. This applies to carers who have been trained and assessed on giving out medicines. Nursing home residents are usually given their medicines by qualified nurses. Some nursing homes are planning for carers to give out medicines. Because of this change, it is important to get the views from those who are living or working in nursing homes and know their opinions about it.

##### **Why have I been invited?**

We aim to learn about the views of care home staff, residents and relatives around carers giving out medicines to residents in nursing homes. Because of this, it is important to get views from people like yourselves who are a major part of the nursing home.

##### **Do I have to take part?**

The success of this project relies on your views. But the decision to take part is yours. Please note that your rights and/or care will not be affected whether you choose to take part or not. Consent forms will be given at the start of the project. You have a week to fill it out and return it if you wish to take part. You can drop out of the study at any time. This means you can drop out even after signing the consent form.

##### **What will I have to do?**

Information will be collected using one-to-one interviews. These will be with carers, nurses, care home managers, residents and their relatives at the nursing home. Each person will take part in two interviews. The first interview will take place just before carers start giving out medicines to residents. The second one will be two months after that.

If you wish to take part then please fill in one of the consent forms. There is an envelope to put your filled out consent form in. Please post this by [insert date]. The other consent form is yours to keep.

We will then get in touch with your care home manager to pick some times for the interviews to take place. Your care home manager will let you know when these will be.



Each interview should last 30 minutes. We will ask you some questions about yourself and your views around carers giving out medicines in nursing homes.

We will record the interviews by sound. If you decide that you don't want your interviews recorded then handwritten notes will be taken instead.

**What are the possible risks or disadvantages to taking part?**

There are no risks to you in taking part. If you feel uncomfortable during the interview then please ask the researcher to turn off the recorder and/or stop taking notes.

**What are the possible benefits of taking part?**

We cannot promise this study will help you. But the information we get here will add to what we know about the benefits and drawbacks in carers giving out medicines to nursing residents.

**Section 2**

**What will happen if I don't want to carry on with the study?**

Please get in touch with us if you no longer wish to be part of this project. The same will apply even if you decide to pull out after the interviews. We will make sure that the information you have given will be disposed of securely. This information will also be taken out from the results.

**What if there is a problem?**

You may contact any member of the research team about problems relating to the project.

**Who can I contact to raise concerns or complaints?**

If you have any concerns or complaints, please contact the project's supervisor, Dr Mat Smith (SmithMW1@cardiff.ac.uk) who will address the issue. If you remain unhappy and wish to complain formally, you can do this by contacting the Director of Research, Cardiff School of Pharmacy and Pharmaceutical Sciences, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB.

**Will my taking part in this study be kept confidential?**

All information will be kept confidential.

The recordings will be typed up by a member of the research team. These will be anonymised using a code in place of your personal data. This means that none of the information will be identifiable to you or to the nursing home.

The consent forms and recordings will be stored in a locked filing cabinet at Cardiff University. The typed-up interviews will be stored on password protected computers. Only the researchers will have access to this information.

All information will only be seen by the research team. The information collected will be disposed of securely once it is not needed.

**What will happen to the results of the research study?**

The results of this project will be written up and put forward in peer-reviewed journals. The information will be anonymised. This means that neither you nor any one involved will be identified in the report. Let us know if you would like to see a copy of the report.

**Who is organising and funding the research?**

The project is organised and funded by the School of Pharmacy and Pharmaceutical Sciences at Cardiff University and Invatech Health Limited.

**Who has reviewed the study?**

This study has been accepted by Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee. You will be given a copy of the consent form to keep. You may also keep this information sheet.

**Who to contact to participate or for more information?**

Please contact the supervisor Dr Mat Smith (SmithMW1@cardiff.ac.uk) or Vicky Cheng (ChengV1@cardiff.ac.uk) using the contact details given in the invitation letter. Please note that contacting us does not commit you to taking part.

Thank you for taking the time to read this information sheet.

## Appendix 8: consent form to nursing home staff, residents and their relatives from study in chapter 3

School of Pharmacy and Pharmaceutical Sciences  
 Cardiff University  
 Redwood Building  
 King Edward VII Avenue  
 Cardiff  
 CF10 3NB



### Consent Form for Care Home Staff, Residents and Relatives

#### Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes

**Name of Researchers: Vicky Cheng and Dr Mat Smith**

Please read the following statements and initial the boxes next to the statements for which you give consent.

Please also sign and date the consent form below.

1. I have read and understood the information sheet (dated 07/06/17, version 3.0) for the above study. I have had the chance to ask questions and have had these answered satisfactorily.
2. I understand that my taking part is voluntary and I can drop out at any time without giving a reason. If I decide to drop out, the information that I have given will be disposed of securely and this information will also be taken out from the results.
3. I understand that by signing the form I will take part in the one-to-one interviews.
4. I give consent for the interviews to be recorded by sound, otherwise I understand that handwritten notes will be taken instead.
5. I agree to be contacted by the researchers if an explanation is needed about points discussed in my interviews.
6. I understand that quotes may be used in reports and journal articles. Where they are used, the quotes will be anonymised.

#### **Participant Details**

_____	_____	_____
Name	Role	Signature
_____	_____	_____
Telephone number	E-mail	Date

#### **Researcher Details**

_____	_____	_____
Name	Signature	Date

Version 3.0, 07/06/17

## Appendix 9: semi-structured interview guide for care home managers from study in chapter 3

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 Cardiff  
 CF10 3NB



### Semi-Structured Interview Topic Guide for Care Home Managers

#### Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes

Name of Researchers: Vicky Cheng and Dr Mat Smith

Topic Area	Guide Questions for Probing	Tick
1. Introduction to Research	<p><i>Hello, my name is Vicky, and I am a Ph.D student in the the School of Pharmacy and Pharmaceutical Sciences at Cardiff University. I am conducting a service evaluation in collaboration with Invatech Health Limited to explore the impact of carer-led administration of medicines on the quality of medicines administration in nursing homes.</i></p> <p><i>One of the aims of the study is to determine the perceptions of care home staff and patient/relatives regarding a policy of carer-led medicines administration in nursing homes. Another aim of the study is to determine the financial impact of using carers instead of nurses for medicines administration. We would like to hear the views of individuals who are involved in medicines management in care homes, therefore the data will be collected via recorded interviews with care home managers, nurses, carers and patients/relatives.</i></p> <p><i>Following data collection, a report of the evaluation will be written up and publications will be put forward in peer-reviewed journals. The report will also assist care home companies in reviewing their policies where only qualified nurses have traditionally administered medicines.</i></p> <p><i>Information discussed during this interview will be kept confidential and only used for the purposes of this study. Any quotes used in reports or journal articles will be anonymised.</i></p> <p><i>I have a tape-recorder here; are you happy for the interview to be audio-recorded? (if participant declines, take notes of the interview instead)</i></p> <p><i>May I also check that you have read and understood the information sheet and have posted the completed consent form back to us already? If not, please may you do this before we start?</i></p> <p><i>The total duration of this interview should last approximately 30 minutes. During this interview, I will begin with some general questions relating to your role within the nursing home followed by a few questions to explore your opinions about carers administering medications in nursing homes. Please feel free to ask if you need any of the questions clarifying.</i></p> <p><i>Do you have any questions before we begin? (answer questions as appropriate)</i></p>	

	<p><i>Are you happy to proceed with the interview? (verbal consent)</i></p> <p>----- Turn on recorder (if applicable) -----</p>	
<p>2. General questions and demographics</p>	<p><i>Firstly, could you tell me a bit about your background as a care home manager?</i></p> <ul style="list-style-type: none"> <li>a) How long have you been working in the Health and Social Care sector?</li> <li>b) How long have you worked in this nursing home?</li> <li>c) Do you have any particular qualifications that are relevant to your current role? What are they?</li> </ul> <p><i>Could you tell me a bit about your current staffing levels at your nursing home?</i></p> <ul style="list-style-type: none"> <li>a) How many full-time registered nurses do you currently employ?</li> <li>b) How many part-time registered nurses do you currently employ?</li> <li>c) How many full-time carers do you currently employ?</li> <li>d) How many part-time carers do you currently employ?</li> </ul> <p><i>Also, could you tell me a bit about how medicines are currently administered within your nursing home?</i></p> <ul style="list-style-type: none"> <li>a) What are the policies like for administering medications within your nursing home?</li> <li>b) Is technology (e.g. the Proactive Care System®) involved in administering medications to your residents? If that is the case, could you tell me a bit more about that?</li> <li>c) Are carers currently involved in administering medications to residents at your nursing home? How?</li> </ul>	
<p>3. Regulations and Quality Assurance</p>	<p><i>Now hopefully that have got you thinking about the current medicines management systems you have in place at your nursing home.</i></p> <p><i>You may already know that recent guidance developed by the Department of Health has made it clear that carers who are suitably trained and competent can administer medicines in care homes (with or without nursing).</i></p> <p><i>What tasks do you think carers could be expected to do if they are deemed competent to administer medications (e.g. supply, storage, disposal, record-keeping)?</i></p> <ul style="list-style-type: none"> <li>a) Are there any tasks you feel that only nurses should be permitted to carry out? Why?</li> </ul> <p><i>Could you describe the skills and knowledge that you feel carers will need to develop for this role?</i></p> <ul style="list-style-type: none"> <li>a) What sort of knowledge about medications do you feel that they will need to know about (e.g. side effects/monitoring/knowledge about allergies and sensitivities/giving PRN medications)? Why?</li> </ul> <p><i>What formal assessments do you think nursing homes should have to assess the competency of carers to administer medications?</i></p>	

	<ul style="list-style-type: none"> <li>a) Do you already have formal assessments for medicines administration at your nursing home? Can you tell me a bit more about that?</li> <li>b) Who do you think should conduct the assessments? Why?</li> <li>c) Could you explain what you think the assessments should contain?</li> </ul>	
<p>4. Effectiveness</p>	<p><i>How do you think implementing carer-led medicines administration would affect your nursing home?</i></p> <ul style="list-style-type: none"> <li>a) If you already have carer-led medicines administration in your nursing home, could you tell me a bit about how things have changed? What are your thoughts on the new system?</li> <li>b) What are your thoughts on the distribution of workload if carer-led medicines administration was implemented in nursing homes?</li> <li>c) What are your thoughts on the quality of care residents would receive regarding carer-led medicines administration in nursing homes?</li> </ul>	
<p>5. Safety</p>	<p><i>So, we have established your views regarding the effectiveness of carer led medicines administration in nursing homes. I would now like to learn more about your opinions on the safety of implementing carer led medicines administration in nursing homes.</i></p> <p><i>What type of training do you think carers would require to be able to safely administer medications to residents (e.g. nurse shadowing, e-learning, workshops)? Why?</i></p> <p><i>Could you explain which elements of medicines administration would you consider unsafe for carers to carry out? Why?</i></p> <ul style="list-style-type: none"> <li>a) Could you describe which types of medications (e.g. tablets/pills, liquids/solutions, creams/ointments, inhalers, insulin pens etc) would you consider unsafe for carers to administer?</li> <li>b) Why?</li> </ul> <p><i>If carers currently administer medications to residents in your nursing home, can you recall a medication incident/error that occurred in the past that involved carers?</i></p> <ul style="list-style-type: none"> <li>a) Has a similar event like this occurred in your nursing home before? Could you give a brief explanation of the incident?</li> <li>b) Why do you think the event occurred?</li> <li>c) How do you think the event can be prevented?</li> </ul>	
<p>6. Facilitators</p>	<p><i>We will now move on to discuss the potential advantages of implementing carer-led medicines administration in nursing homes.</i></p> <p><i>Can you think of any advantages for yourself or for your care home if carer-led medicines administration is implemented in your nursing home?</i></p> <ul style="list-style-type: none"> <li>a) Are these expected advantages or experienced advantages?</li> <li>b) Can you think of any reasons why you would like carers to help administer medications to residents?</li> </ul> <p><i>Can you think of any advantages for nurses if carer-led medicines administration is implemented in your nursing home?</i></p>	

	<p><i>Can you think of any advantages for the carers if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for the residents if carer-led medicines administration is implemented in your nursing home?</i></p>	
7. Barriers	<p><i>Next, I would now like to move on to talk about the potential barriers that may make implementing carer-led medicines administration in nursing homes difficult.</i></p> <p><i>Can you think of any problems that may make implementing carer-led medicines administration in nursing homes difficult? Why?</i></p> <p>a) <i>Are these expected problems or experienced problems?</i></p> <p><i>How do you think these barriers can be prevented?</i></p>	
8. Concerns	<p><i>Having discussed the barriers to carer-led medicines administration in nursing homes, I think it would now make sense to move on and talk about the concerns you may have about the proposed system.</i></p> <p><i>Can you think of any worries that you may have with regards to implementing carer-led medicines administration in nursing homes? Why?</i></p>	
9. Cost	<p><i>The final topic that I would now like to discuss is your views on the cost-effectiveness of implementing carer-led medicines administration in your nursing home.</i></p> <p><i>In order to carry out an economic evaluation of using carers instead of nurses for medicines administration, I would like to begin by asking what is the average hourly rate of carers at your nursing home? Also, what is the average hourly rate of nurses employed in your nursing home?</i></p> <p><i>Could you explain how you think implementing carer-led medicines administration would affect the costs of running your nursing home?</i></p> <p>a) <i>What are your thoughts on the any potential changes to the staff ratio of nurses to carers if carers are delegated to administer medications to nursing residents? Why do you think that is the case?</i></p> <p>b) <i>If you currently have carers who administer medications to residents, could you give an example of how the staff mix has changed?</i></p>	
10. Conclusion/Debrief	<p><i>So, I have now covered all the questions in the interview.</i></p> <p><i>Is there anything else that you would like to add to what we have covered today?</i></p> <p><i>I would like to thank you for your time and participation in this study. Again, like I have mentioned earlier, all information that we have discussed today will be kept confidential.</i></p> <p><i>A report will be written up following the analysis of all the results and you will be able to receive a copy of this, should you wish to see it.</i></p> <p><i>Do you have any further questions or comments about what we have discussed today?</i></p>	

	<p><i>Great, please feel free to contact me if you have any other questions about the study. You will be able to find my contact details included in the information sheet that was sent to you.</i></p>	
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----- Turn off recorder (if applicable) -----



## Appendix 10: semi-structured interview guide for nurses from study in chapter 3

School of Pharmacy and Pharmaceutical Sciences  
 Cardiff University  
 Redwood Building  
 King Edward VII Avenue  
 Cardiff  
 CF10 3NB



### Semi-Structured Interview Topic Guide for Nurses

#### Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes

**Name of Researchers: Vicky Cheng and Dr Mat Smith**

Topic Area	Guide Questions for Probing	Tick
1. Introduction to Research	<p><i>Hello, my name is Vicky, and I am a Ph.D student in the the School of Pharmacy and Pharmaceutical Sciences at Cardiff University. I am conducting a service evaluation in collaboration with Invatech Health Limited to explore the impact of carer-led administration of medicines on the quality of medicines administration in nursing homes.</i></p> <p><i>One of the aims of the study is to learn about the views of care home staff and patient/relatives about carers giving out medications to residents. We would like to hear the views of individuals who are a significant part of the nursing home, therefore the information will be collected via recorded interviews with care home managers, nurses, carers and patients/relatives.</i></p> <p><i>Following data collection, a report of the evaluation will be written up and publications will be put forward in peer-reviewed journals. The report will also assist care home companies in reviewing their policies where only qualified nurses have traditionally administered medicines.</i></p> <p><i>Information discussed during this interview will be kept confidential and only used for the purposes of this study. Any quotes used in reports or journal articles will be anonymised.</i></p> <p><i>I have a tape-recorder here; are you happy for the interview to be audio-recorded? (if participant declines, take notes of the interview instead)</i></p> <p><i>The total duration of this interview should last approximately 30 minutes. During this interview, I will begin with some general questions relating to your role within the nursing home followed by a few questions to explore your opinions about carers giving out medications in nursing homes. Please feel free to ask if you need any of the questions clarifying.</i></p> <p><i>Do you have any questions before we begin? (answer questions as appropriate)</i></p> <p><i>Are you happy to proceed with the interview? (verbal consent)</i></p> <p>----- Turn on recorder (if applicable) -----</p>	
2. General questions and demographics	<p><i>Firstly, could you tell me a bit about your background as a nurse?</i></p>	

	<p>a) How long have you been working in the Health and Social Care sector?</p> <p>b) How long have you worked in this nursing home?</p> <p>c) Could you tell me a bit about the type of qualifications you currently have in order to work as a nurse here?</p> <p><i>Also, could you tell me a bit about how medicines are currently administered within your nursing home?</i></p> <p>a) What are the policies like for administering medications within your nursing home?</p> <p>b) Is technology (e.g. the Proactive Care System®) involved in administering medications to your residents? If that is the case, could you tell me a bit more about that? What are your views on the use of technology in medicines administration in nursing homes?</p> <p><i>Are there any staff members other than nurses who may help you with the processes of administering medications to residents?</i></p> <p>a) Could you give me an example of what a typical scenario may look like if you have staff who assist you whilst you administer medications to residents (e.g. what was involved in the delegated task(s))?</p> <p>b) Could you describe what your role was once you have delegated the task(s)?</p> <p><i>How long did it take you to give all the medicines to the residents during your last medication round at your nursing home?</i></p> <p>a) What time of day did you conduct this medication round?</p> <p>b) Would you describe the duration as a typical medication round for that time of day? If not, why do you think this was different?</p> <p>c) Have you conducted a medication round during a different time of day? What time of day was that? How long did it take you to administer all the medications to the residents during that time? Would you describe the duration as a typical medication round for that time of day? If not, why do you think this was different?</p> <p><i>So, before we move on to the main interview topics, could you explain what are the reasons that attracted you to joining this project?</i></p>	
<p>3. Effectiveness</p>	<p><i>Now hopefully that has got you thinking about the current medicines management systems you have in place at your nursing home.</i></p> <p><i>You may already know that recent guidance developed by the Department of Health and Care and Social Services Inspectorate Wales has made it clear that carers who are suitably trained and competent can administer medicines in care homes (with or without nursing).</i></p> <p><i>How do you think implementing carer-led medicines administration would affect your nursing home?</i></p> <p>a) If you already have carer-led medicines administration in your nursing home, could you tell me a bit about how things have changed? What are your thoughts on the new system?</p>	

	<p>b) What are your thoughts on the distribution of workload if carer-led medicines administration was introduced in nursing homes?</p> <p>c) What are your thoughts on the quality of care residents would receive regarding carer-led medicines administration in nursing homes?</p>	
<p>4. Safety</p>	<p><i>So, we have established your views regarding the effectiveness of carer led medicines administration in nursing homes. I would now like to learn more about your opinions on the safety of implementing carer led medicines administration in nursing homes.</i></p> <p><i>What type of training do you think carers would require to be able to safely administer medications to residents (e.g. nurse shadowing, e-learning, workshops)? Why?</i></p> <p><i>Could you explain which elements of medicines administration would you consider unsafe for carers to carry out?</i></p> <p>a) Could you describe which types of medications (e.g. tablets/capsules, liquids/solutions, creams/ointments, inhalers, insulin pens etc) would you consider unsafe for carers to administer?</p> <p>b) Why?</p> <p>c) Could you describe some drug classes which you would consider it unsafe for carers to administer?</p> <p>d) Why?</p>	
<p>5. Facilitators</p>	<p><i>We will now move on to explore the potential advantages of implementing carer-led medicines administration in nursing homes.</i></p> <p><i>Can you think of any advantages for yourself if carer-led medicines administration is implemented in your nursing home?</i></p> <p>a) Are these expected advantages or experienced advantages?</p> <p>b) Can you think of any reasons why you would like carers to help administer medications to residents?</p> <p><i>Can you think of any advantages for carers if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for the residents if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for the care home if carer-led medicines administration is implemented in your nursing home?</i></p>	
<p>6. Barriers</p>	<p><i>Next, I would now like to move on to talk about the potential barriers that may make implementing carer-led medicines administration in nursing homes difficult.</i></p> <p><i>Can you think of any problems that may make implementing carer-led medicines administration in nursing homes difficult? Why?</i></p> <p>a) Are these expected problems or experienced problems?</p> <p><i>How do you think these barriers can be prevented?</i></p>	

<p>7. Concerns</p>	<p><i>Having discussed the barriers to carer-led medicines administration in nursing homes, I think it would now make sense to move on and talk about the concerns you may have about the proposed system.</i></p> <p><i>Can you think of any worries that you may have with regards to implementing carer-led medicines administration in nursing homes? Why?</i></p>	
<p>8. Personal Identity</p>	<p><i>The final topic I would now like to discuss about is your views on the role of the carer and yourself in administering medications to residents.</i></p> <p><i>Recent guidance has outlined that once a carer has accepted the delegated task, then they will be responsible for administering the medicine as per the prescriber's instructions. However, nurses will still have the accountability for the overall nursing care of the resident.</i></p> <p><i>Could you explain what you think your role will be if you delegate the administration of medicines to carers? How will this role change compared to your current role now?</i></p> <ul style="list-style-type: none"> <li>a) How do you think your responsibilities as a registered nurse will change if carer-led medicines administration is introduced to your nursing home?</li> <li>b) Do you think supervision will be involved in your role once carers receive appropriate training and assessment in medicines administration? Could you explain what does supervision mean to you?</li> </ul> <p><i>What tasks do you think carers could be expected to do if they are deemed competent to administer medications (e.g. supply, storage, disposal, record-keeping)?</i></p> <ul style="list-style-type: none"> <li>a) Are there any tasks you feel that only nurses should be permitted to carry out (e.g. administration of controlled drugs, injections/syringe drivers, feeding tubes, covert medication)? Why?</li> </ul> <p><i>Could you describe the skills and knowledge that you feel carers will need to develop for this role?</i></p> <ul style="list-style-type: none"> <li>a) What sort of knowledge about medications do you feel that they will need to know about (e.g. side effects/monitoring/knowledge about allergies and sensitivities/giving PRN medications/medical conditions of residents)? Why?</li> </ul> <p><i>What formal assessments do you think nursing homes should have to assess the competency of carers to administer medications?</i></p> <ul style="list-style-type: none"> <li>a) Do you already have formal assessments for medicines administration at your nursing home? Can you tell me a bit more about that?</li> <li>b) Who do you think should conduct the assessments? Why?</li> <li>c) Could you explain what you think the assessments should contain?</li> </ul> <p><i>Could you explain whether you think carer-led medicines administration seems like a natural next step for the development of the role of the carer in nursing homes? Why?</i></p>	

<p>9. Conclusion/Debrief</p>	<p><i>So, I have now covered all the questions in the interview.</i></p> <p><i>Is there anything else that you would like to add to what we have covered today?</i></p> <p><i>I would like to thank you for your time and participation in this study. Again, like I have mentioned earlier, all information that we have discussed today will be kept confidential.</i></p> <p><i>A report will be written up following the analysis of all the results and you will be able to receive a copy of this, should you wish to see it.</i></p> <p><i>Do you have any further questions or comments about what we have discussed today?</i></p> <p><i>Great, please feel free to contact me if you have any other questions about the study. You will be able to find my contact details included in the information sheet that was sent to you.</i></p> <p>----- Turn off recorder (if applicable) -----</p>
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## Appendix 11: semi-structured interview guide for senior carers from study in chapter 3

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 CF10 3NB



### Semi-Structured Interview Topic Guide for Senior Carers

#### Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes

**Name of Researchers: Vicky Cheng and Dr Mat Smith**

Topic Area	Guide Questions for Probing	Tick
1. Introduction to Research	<p><i>Hello, my name is Vicky, and I am a Ph.D student in the School of Pharmacy and Pharmaceutical Sciences at Cardiff University. I am conducting a service evaluation in collaboration with Invatech Health Limited to explore the impact of carer-led administration of medicines on the quality of medicines administration in nursing homes.</i></p> <p><i>One of the aims of the study is to determine the perceptions of care home staff and patient/relatives regarding a policy of carer-led medicines administration in nursing homes. Another aim of the study is to determine the financial impact of using carers instead of nurses for medicines administration. We would like to hear the views of individuals who are involved in medicines management in care homes, therefore the data will be collected via recorded interviews with care home managers, nurses, carers and patients/relatives.</i></p> <p><i>Following data collection, a report of the evaluation will be written up and publications will be put forward in peer-reviewed journals. The report will also assist care home companies in reviewing their policies where only qualified nurses have traditionally administered medicines.</i></p> <p><i>Information discussed during this interview will be kept confidential and only used for the purposes of this study. Any quotes used in the report or published article will be anonymised.</i></p> <p><i>I have a tape-recorder here; are you happy for the interview to be audio-recorded? (if participant declines, take notes of the interview instead)</i></p> <p><i>May I also check that you have read and understood the information sheet and have posted the completed consent form back to us already? If not, please may you do this before we start?</i></p> <p><i>The total duration of this interview should be approximately 30 minutes. During this interview, I will begin with some general questions relating to your role within the nursing home followed by a few questions to explore your opinions about carers administering medications in nursing homes. Please feel free to ask if you need any of the questions clarifying.</i></p> <p><i>Do you have any questions before we begin? (answer questions as appropriate)</i></p>	

	<p><i>Are you happy to proceed with the interview?</i> (verbal consent)</p> <p>----- Turn on recorder (if applicable) -----</p>	
<p>2. General questions and demographics</p>	<p><i>Firstly, could you tell me a bit about your background as a carer?</i></p> <ul style="list-style-type: none"> <li>a) How long have you been working in the Health and Social Care sector?</li> <li>b) How long have you worked in this nursing home?</li> <li>c) Could you tell me a bit about the type of qualifications that you currently have in order to work as a carer here?</li> <li>d) Could you tell me about the training (if any) you have had on medicines management so far in this nursing home? What was that like? Could you explain whether you think you were given sufficient training for the tasks you were asked to do?</li> </ul> <p><i>Also, could you tell me a bit about how medicines are currently administered within your nursing home?</i></p> <ul style="list-style-type: none"> <li>a) What are the policies for administering medications within your nursing home?</li> <li>b) Is any technology (e.g. the Proactive Care System®) involved in administering medications to your residents? If that is the case, could you tell me a bit more about that?</li> </ul> <p><i>You seem to know a lot about the procedures involved in giving out medicines to residents; could you give me some examples regarding how you are currently involved in these processes?</i></p> <p><i>If you administer medications to residents, how long did it take you to give all the medicines to the residents during your last medication round at your nursing home?</i></p> <ul style="list-style-type: none"> <li>a) What time of day did you conduct this medication round?</li> <li>b) Would you describe the duration as a typical medication round for that time of day? If not, why do you think this was different?</li> <li>c) Have you conducted a medication round during a different time of day? What time of day was that? How long did it take you to administer all the medications to the residents during that time? Would you describe the duration as a typical medication round for that time of day? If not, why do you think this was different?</li> </ul>	
<p>3. Effectiveness</p>	<p><i>Now hopefully that have got you thinking about the current medicines management systems you have in place at your nursing home.</i></p> <p><i>You may already know that recent guidance developed by the Department of Health has made it clear that carers who are suitably trained and competent can administer medicines in care homes (with or without nursing).</i></p> <p><i>How do you think implementing carer-led medicines administration would affect your nursing home?</i></p> <ul style="list-style-type: none"> <li>a) If you already have carer-led medicines administration in your nursing home, could you tell me a bit about how things have changed? What are your thoughts on the new system?</li> </ul>	

	<p>b) If you already administer medications to residents, have you received any feedback from colleagues or patients before? Can you tell me more about that?</p> <p>c) What are your thoughts on the distribution of workload regarding carer-led medicines administration in nursing homes?</p> <p>d) What are your thoughts on the quality of care residents would receive regarding carer-led medicines administration in nursing homes?</p>	
<p>4. Safety</p>	<p><i>So, we have established your views regarding the effectiveness of carer led medicines administration in nursing homes. I would now like to learn more about your opinions on the safety of implementing carer led medicines administration in nursing homes.</i></p> <p><i>What type of training do you think you would require to be able to safely administer medications to residents (e.g. nurse shadowing, e-learning, workshops)? Why?</i></p> <p><i>Could you explain which elements of medicines administration would you consider unsafe for carers like yourself to carry out? Why?</i></p> <p>a) Could you describe which types of medications (e.g. tablets/pills, liquids/solutions, creams/ointments, inhalers, insulin pens etc) would you consider unsafe for carers to administer?</p> <p>b) Why?</p>	
<p>5. Facilitators</p>	<p><i>We will now move on to discuss about the advantages of implementing carer-led medicines administration in nursing homes.</i></p> <p><i>Can you think of any advantages for yourself if carer-led medicines administration is implemented in your nursing home?</i></p> <p>a) Are these expected advantages or experienced advantages?</p> <p>b) Can you think of any reasons why you would like to help administer medications to residents?</p> <p><i>Can you think of any advantages for nurses if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for the residents if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for the care home if carer-led medicines administration is implemented in your nursing home?</i></p>	
<p>6. Barriers</p>	<p><i>Next, I would now like to move on to talk about the potential barriers that may make implementing carer-led medicines administration in nursing homes difficult.</i></p> <p><i>Can you think of any problems that may make implementing carer-led medicines administration in nursing homes difficult? Why?</i></p> <p>a) Are these expected problems or experienced problems?</p> <p><i>How do you think these barriers can be prevented?</i></p>	



<p>7. Concerns</p>	<p><i>Having discussed the barriers to carer-led medicines administration in nursing homes, I think it would now make sense to move on and talk about the concerns you may have about the proposed system.</i></p> <p><i>Can you think of any worries that you may have with regards to implementing carer-led medicines administration in nursing homes? Why?</i></p> <p><i>Can you think of any reasons why you may feel uncomfortable administering medicines to residents? Why?</i></p>	
<p>8. Personal Identity</p>	<p><i>The final topic I would now like to discuss about is your views on the role of the carer and yourself in administering medications to residents.</i></p> <p><i>Recent guidance has outlined that once a carer has accepted the delegated task, then they will be responsible for administering the medicine as per the prescriber's instructions. However, nurses will still have the accountability for the overall nursing care of the resident.</i></p> <p><i>What tasks do you think carers could be expected to do if they are deemed competent to administer medications (e.g. supply, storage, disposal, record-keeping)?</i></p> <p>a) <i>Are there any tasks you feel that only nurses should be permitted to carry out? Why?</i></p> <p><i>Could you describe the skills and knowledge that you feel carers will need to develop for this role?</i></p> <p>a) <i>What sort of knowledge about medications do you feel that they will need to know about (e.g. side effects/monitoring/knowledge about allergies and sensitivities/giving PRN medications)? Why?</i></p> <p><i>What formal assessments do you think nursing homes should have to assess the competency of carers to administer medications?</i></p> <p>a) <i>Do you already have formal assessments for medicines administration at your nursing home? Can you tell me a bit more about that?</i></p> <p>b) <i>Who do you think should conduct the assessments? Why?</i></p> <p>c) <i>Could you explain what you think the assessments should contain?</i></p> <p><i>Could you explain whether you think carer-led medicines administration seems like a natural next step for the development of the role of the carer in nursing homes? Why?</i></p> <p><i>Finally, following successful training and assessment of medicines administration, could you explain a bit about what type of support you would expect from nurses once you start giving medicines to residents?</i></p>	
<p>9. Conclusion/Debrief</p>	<p><i>So, I have now covered all the questions in the interview.</i></p> <p><i>Is there anything else that you would like to add to what we have covered today?</i></p> <p><i>I would like to thank you for your time and participation in this study. Again, like I have mentioned earlier, all information that we have discussed today will be kept confidential.</i></p>	

	<p><i>A report will be written up following the analysis of all the results and you will be able to receive a copy of this, should you wish to see it.</i></p> <p><i>Do you have any further questions or comments about what we have discussed today?</i></p> <p><i>Great, please feel free to contact me if you have any other questions about the study. You will be able to find my contact details included in the information sheet that was sent to you.</i></p> <p>----- Turn off recorder (if applicable) -----</p>	
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## Appendix 12: semi-structured interview guide for carers from study in chapter 3

School of Pharmacy and Pharmaceutical Sciences  
 Cardiff University  
 Redwood Building  
 King Edward VII Avenue  
 Cardiff  
 CF10 3NB



### Semi-Structured Interview Topic Guide for Carers

#### Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes

**Name of Researchers: Vicky Cheng and Dr Mat Smith**

Topic Area	Guide Questions for Probing	Tick
1. Introduction to Research	<p><i>Hello, my name is Vicky, and I am a Ph.D student in the the School of Pharmacy and Pharmaceutical Sciences at Cardiff University. I am conducting a service evaluation in collaboration with Invatech Health Limited to explore the impact of carer-led administration of medicines on the quality of medicines administration in nursing homes.</i></p> <p><i>One of the aims of the study is to learn about the views of care home staff and patient/relatives about carers giving out medications to residents. We would like to hear the views of individuals who are a significant part of the nursing home, therefore the information will be collected via recorded interviews with care home managers, nurses, carers and patients/relatives.</i></p> <p><i>Following data collection, a report of the evaluation will be written up and publications will be put forward in peer-reviewed journals. The report will also assist care home companies in reviewing their policies where only qualified nurses have traditionally administered medicines.</i></p> <p><i>Information discussed during this interview will be kept confidential and only used for the purposes of this study. Any quotes used in reports or journal articles will be anonymised.</i></p> <p><i>I have a tape-recorder here; are you happy for the interview to be audio-recorded? (if participant declines, take notes of the interview instead)</i></p> <p><i>The total duration of this interview should last approximately 30 minutes. During this interview, I will begin with some general questions relating to your role within the nursing home followed by a few questions to explore your opinions about carers giving out medications in nursing homes. Please feel free to ask if you need any of the questions clarifying.</i></p> <p><i>Do you have any questions before we begin? (answer questions as appropriate)</i></p> <p><i>Are you happy to proceed with the interview? (verbal consent)</i></p> <p>----- Turn on recorder (if applicable) -----</p>	
2. General questions and demographics	<p><i>Firstly, could you tell me a bit about your background as a carer?</i></p>	

	<p>a) How long have you been working in the Health and Social Care sector?</p> <p>b) How long have you worked in this nursing home?</p> <p>c) Could you tell me a bit about the type of qualifications that you currently have in order to work as a carer here?</p> <p><i>Also, could you tell me a bit about how medicines are currently administered within your nursing home?</i></p> <p>a) What are the policies for administering medications within your nursing home?</p> <p>b) Is any technology (e.g. the Proactive Care System®) involved in administering medications to your residents? If that is the case, could you tell me a bit more about that? What are your views on the use of technology in medicines administration in nursing homes?</p> <p>c) Are you currently involved in the administration of medicines in your nursing home? How?/Would you like to be involved in medicines administration in your nursing home and why?</p> <p>d) Could you tell me whether you were given the opportunity to undertake training in being able to give out medicines to residents? Can you describe what was the training like/why not?</p> <p><i>So, before we move on to the main interview topics, could you explain what are the reasons that attracted you to joining this project?</i></p>	
<p>3. Effectiveness</p>	<p><i>Now hopefully that have got you thinking about the current medicines management systems you have in place at your nursing home.</i></p> <p><i>You may already know that recent guidance developed by the Department of Health and the Care and Social Services Inspectorate Wales has made it clear that carers who are suitably trained and competent can administer medicines in care homes (with or without nursing).</i></p> <p><i>How do you think implementing carer-led medicines administration would affect your nursing home?</i></p> <p>a) If you already have carer-led medicines administration in your nursing home, could you tell me a bit about how things have changed? What are your thoughts on the new system?</p> <p>b) What are your thoughts on the distribution of workload if carer-led medicines administration was introduced in nursing homes?</p> <p>c) What are your thoughts on the quality of care residents would receive regarding carer-led medicines administration in nursing homes?</p>	
<p>4. Safety</p>	<p><i>So, we have established your views regarding the effectiveness of carer led medicines administration in nursing homes. I would now like to learn more about your opinions on the safety of implementing carer led medicines administration in nursing homes.</i></p> <p><i>What type of training do you think carers would require to be able to safely administer medications to residents (e.g. nurse shadowing, e-learning, workshops)? Why?</i></p>	

	<p><i>Could you explain which elements of medicines administration would you consider unsafe for carers to carry out? Why?</i></p> <p>a) Could you describe which types of medications (e.g. tablets/capsules, liquids/solutions, creams/ointments, inhalers, insulin pens etc) would you consider unsafe for carers to administer?</p> <p>b) Why?</p>	
5. Facilitators	<p><i>We will now move on to discuss about the advantages of implementing carer-led medicines administration in nursing homes.</i></p> <p><i>Can you think of any advantages for yourself if carer-led medicines administration is implemented in your nursing home?</i></p> <p>a) Are these expected advantages or experienced advantages?</p> <p>b) Can you think of any reasons why you would like to help administer medications to residents?</p> <p><i>Can you think of any advantages for senior carers/carers that are trained to give out medicines if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for nurses if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for the residents if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for the care home if carer-led medicines administration is implemented in your nursing home?</i></p>	
6. Barriers	<p><i>Next, I would now like to move on to talk about the potential barriers that may make implementing carer-led medicines administration in nursing homes difficult.</i></p> <p><i>Can you think of any problems that may make implementing carer-led medicines administration in nursing homes difficult? Why?</i></p> <p>a) Are these expected problems or experienced problems?</p> <p><i>How do you think these barriers can be prevented?</i></p>	
7. Concerns	<p><i>Having discussed the barriers to carer-led medicines administration in nursing homes, I think it would now make sense to move on and talk about the concerns you may have about the proposed system.</i></p> <p><i>Can you think of any worries that you may have with regards to implementing carer-led medicines administration in nursing homes? Why?</i></p> <p><i>Can you think of any reasons why you may feel uncomfortable administering medicines to residents? Why?</i></p>	
8. Personal Identity	<p><i>The final topic I would now like to discuss about is your views on the role of the carer and nurses in administering medications to residents.</i></p> <p><i>Recent guidance has outlined that once a carer has accepted the delegated task, then they will be responsible for administering the medicine as per the prescriber's instructions. However, nurses will still have the accountability for the overall nursing care of the resident.</i></p>	

	<p><i>What tasks do you think carers could be expected to do relating to supply, storage, disposal, record-keeping of medicines management?</i></p> <p>a) Are there any tasks you feel that only nurses should be permitted to carry out (e.g. administration of controlled drugs, injections/syringe drivers, feeding tubes, covert medication)? Why?</p> <p><i>Could you describe the skills and knowledge that you feel carers will need to develop for this role?</i></p> <p>a) What sort of knowledge about medications do you feel that they will need to know about (e.g. side effects/monitoring/knowledge about allergies and sensitivities/giving PRN medications/medical conditions of residents)? Why?</p> <p><i>What formal assessments do you think nursing homes should have to assess the competency of senior carers to administer medications?</i></p> <p>a) Do you already have formal assessments for medicines administration at your nursing home? Can you tell me a bit more about that?</p> <p>b) Who do you think should conduct the assessments? Why?</p> <p>c) Could you explain what you think the assessments should contain?</p> <p><i>What are your current responsibilities as a carer? How do you think your responsibilities as a carer will change if carer-led medicines administration is introduced to your nursing home?</i></p> <p><i>Could you explain whether you think carer-led medicines administration seems like a natural next step for the development of the role of the carer in nursing homes? Why?</i></p> <p><i>Finally, following successful training and assessment of medicines administration, could you explain a bit about what type of support you would expect from nurses once you start giving medicines to residents?</i></p>	
<p>9. Conclusion/Debrief</p>	<p><i>So, I have now covered all the questions in the interview.</i></p> <p><i>Is there anything else that you would like to add to what we have covered today?</i></p> <p><i>I would like to thank you for your time and participation in this study. Again, like I have mentioned earlier, all information that we have discussed today will be kept confidential.</i></p> <p><i>A report will be written up following the analysis of all the results and you will be able to receive a copy of this, should you wish to see it.</i></p> <p><i>Do you have any further questions or comments about what we have discussed today?</i></p> <p><i>Great, please feel free to contact me if you have any other questions about the study. You will be able to find my contact details included in the information sheet that was sent to you.</i></p> <p>----- Turn off recorder (if applicable) -----</p>	

## Appendix 13: semi-structured interview guide for residents and their relatives from study in chapter 3

School of Pharmacy and Pharmaceutical Sciences  
 Cardiff University  
 Redwood Building  
 King Edward VII Avenue  
 Cardiff  
 CF10 3NB



### Semi-Structured Interview Topic Guide for Residents or Relatives

#### Evaluation of Carer Led Administration of Medicines to Nursing Residents in Care Homes

**Name of Researchers: Vicky Cheng and Dr Mat Smith**

Topic Area	Guide Questions for Probing	Tick
1. Introduction to Research	<p><i>Hello, my name is Vicky, and I am a Ph.D student in the the School of Pharmacy and Pharmaceutical Sciences at Cardiff University. I am conducting a service evaluation in collaboration with Invatech Health Limited to explore the impact of carer-led administration of medicines on the quality of medicines administration in nursing homes.</i></p> <p><i>One of the aims of the study is to learn about the views of care home staff and patient/relatives about carers giving out medications to residents. We would like to hear the views of individuals who are a significant part of the nursing home, therefore the information will be collected via recorded interviews with care home managers, nurses, carers and patients/relatives.</i></p> <p><i>Following data collection, a report of the evaluation will be written up and publications will be put forward in peer-reviewed journals. The report will also assist care home companies in reviewing their policies where only qualified nurses have traditionally administered medicines.</i></p> <p><i>Information discussed during this interview will be kept confidential and only used for the purposes of this study. Any quotes used in reports or journal articles will be anonymised.</i></p> <p><i>I have a tape-recorder here; are you happy for the interview to be audio-recorded? (if participant declines, take notes of the interview instead)</i></p> <p><i>The total duration of this interview should last approximately 30 minutes. During this interview, I will begin with some general questions relating to your role within the nursing home followed by a few questions to explore your opinions about carers giving out medications in nursing homes. Please feel free to ask if you need any of the questions clarifying.</i></p> <p><i>Do you have any questions before we begin? (answer questions as appropriate)</i></p> <p><i>Are you happy to proceed with the interview? (verbal consent)</i></p> <p>----- Turn on recorder (if applicable) -----</p>	
2. General questions and demographics	<p><i>Firstly, how long have you/your relative been a resident at this nursing home?</i></p>	

	<p><i>How are your/their medicines currently managed at the nursing home?</i></p> <ul style="list-style-type: none"> <li>a) Do you/they take care of your/their own medications and take them yourself/themselves?</li> <li>b) Does the care home staff give your/their medications to you/them?</li> <li>c) Do you/they take care of some of your/their medications and the care home staff will give you/them the rest? Could you explain how this works?</li> </ul> <p><i>Could you explain which staff members gives most of your/their medicines (this may include; tablets/capsules, liquids/solutions, creams/ointments, injections)?</i></p> <ul style="list-style-type: none"> <li>a) What type (e.g. tablets/capsules, liquids/solutions, creams/ointments, injections) of medicines do they give you/them?</li> <li>b) Are there other staff members who may give you/their medicines?</li> <li>c) Who are they?</li> </ul> <p><i>Overall, could you explain how satisfied are you/they with the way you/they are currently given your/their medications?</i></p> <p><i>Also, before we move on to the main interview topics, could you explain what are the reasons that attracted you to joining this project?</i></p>	
<p>3. Confidence in nursing home staff</p>	<p><i>Now hopefully that have got you thinking about the current medicines management systems you have in place at your nursing home.</i></p> <p><i>You may already know that recent guidance developed by the Department of Health has made it clear that carers who are suitably trained and competent can give medicines in care homes (with or without nursing).</i></p> <p><i>With appropriate training and assessment, would you be happy for carers to administer medications to you/your relative instead/as well as registered nurses? Why?</i></p> <p><i>How important is it to you that you know whether it is a carer or nurse who is giving your/their medications? Why?</i></p>	
<p>4. Effectiveness</p>	<p><i>So we have now established your views on the roles of the carer and nurses within the nursing home. I would now like to move on and talk about your views on the effectiveness in having carers give medications.</i></p> <p><i>[If the nursing home has recently implemented carer-led medicines administration] Have you/they noticed any changes to the way your/their medicines are given recently?</i></p> <ul style="list-style-type: none"> <li>a) What changes have you/they noticed?</li> <li>b) What are your/their thoughts on the new system?</li> </ul> <p><i>How do you think implementing carer-led medicines administration would affect your/the nursing home?</i></p> <ul style="list-style-type: none"> <li>a) Have you/they received medications from carers before in the past? Could you explain your/their experience of it?</li> <li>b) What are your thoughts on the quality of care you/residents would receive regarding carer-led medicines administration in nursing homes?</li> </ul>	



<p>5. Safety</p>	<p><i>So, we have established your views regarding the effectiveness of carer-led medicines administration in nursing homes. I would now like to learn more about your opinions on the safety of implementing carer led medicines administration in nursing homes.</i></p> <p><i>Are there any aspects of medicines administration that would you consider unsafe for carers to carry out? Why?</i></p> <p>a) Could you describe which types of medications (e.g. tablets/capsules, liquids/solutions, creams/ointments, inhalers, insulin pens etc) would you consider unsafe for carers to give?</p> <p>b) Why?</p>	
<p>6. Facilitators</p>	<p><i>We will now move on to explore some of the potential advantages of implementing carer-led medicines administration in nursing homes.</i></p> <p><i>Can you think of any advantages for you/residents if carer-led medicines administration is implemented in your nursing home?</i></p> <p>a) Are these expected advantages or experienced advantages?</p> <p>b) Can you think of any reasons why it may be beneficial for carers to help administer medications to residents?</p> <p><i>Can you think of any advantages for nurses if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for the carers if carer-led medicines administration is implemented in your nursing home?</i></p> <p><i>Can you think of any advantages for the residents if carer-led medicines administration is implemented in your nursing home?</i></p>	
<p>7. Barriers</p>	<p><i>Next, I would now like to move on to talk about the potential barriers that may make implementing carer-led medicines administration in nursing homes difficult.</i></p> <p><i>Can you think of any problems that may make implementing carer-led medicines administration in nursing homes difficult? Why?</i></p> <p>a) Are these expected problems or experienced problems?</p> <p><i>How do you think these barriers can be prevented?</i></p>	
<p>8. Concerns</p>	<p><i>Having discussed the barriers to carer-led medicines administration in nursing homes, I think it would now make sense to move on and talk about the concerns you may have about the proposed system.</i></p> <p><i>Can you think of any worries that you/residents may have with regards to implementing carer-led medicines administration in nursing homes? Why?</i></p> <p><i>Can you think of any reasons why you/they may feel uncomfortable having your/their medications given by carers? Why?</i></p>	
<p>9. Conclusion/Debrief</p>	<p><i>So, I have now covered all the questions in the interview.</i></p> <p><i>Is there anything else that you would like to add to what we have covered today?</i></p> <p><i>I would like to thank you for your time and participation in this study. Again, like I have mentioned earlier, all information that we have discussed today will be kept confidential.</i></p>	

	<p><i>A report will be written up following the analysis of all the results and you will be able to receive a copy of this, should you wish to see it.</i></p> <p><i>Do you have any further questions or comments about what we have discussed today?</i></p> <p><i>Great, please feel free to contact me if you have any other questions about the study. You will be able to find my contact details included in the information sheet that was sent to you.</i></p> <p>----- Turn off recorder (if applicable) -----</p>	
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**Appendix 14: ethical approval for study in chapter 4**

SPPS Amendment Approval Notification (AAN)

11/10/14 v1

**Cardiff School of Pharmacy and Pharmaceutical Sciences,  
Research Ethics Approval**

**AMENDMENT APPROVAL**

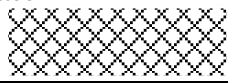
This form has been signed by the School Research Ethics Officer as evidence that approval has been granted by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee for amendment(s) to the following study:

Project ref and title:	1617-33 Nurse-delegated medicines administration to carers in nursing homes
------------------------	---

Name of researcher: (PG/Staff projects only)	Vicky Cheng
Name of supervisor(s):	Mat Smith

The amendment(s) dated 4 Nov 2018 have been reviewed and approved.

Any further amendments will require approval.

<b>STATEMENT OF ETHICS APPROVAL</b>	
<p><b>The proposed amendment(s) have been considered and approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee</b></p>	
	
Signed	Name <u>R Deslandes</u> Date <u>22/11/18</u>
(Chair, School Research Ethics Committee)	

**Appendix 15: ethical approval for study in chapter 4 (amendment)**

SPPS Amendment Approval Notification (AAN)

11/10/14 v1

**Cardiff School of Pharmacy and Pharmaceutical Sciences,  
Research Ethics Approval**

**AMENDMENT APPROVAL**


This form has been signed by the School Research Ethics Officer as evidence that approval has been granted by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee for amendment(s) to the following study:

Project ref and title:	1617-33: Nurse-delegated medicines administration to carers in nursing homes
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Name of researcher: (PG/Staff projects only)	Vicky Cheng
Name of supervisor(s):	Dr Mat Smith

The amendment(s) dated 18 Dec 2018 have been reviewed and approved.

Any further amendments will require approval.

<b>STATEMENT OF ETHICS APPROVAL</b>	
<b>This project has been considered and has been approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee</b>	
Signed	
(Deputy Chair, School Research Ethics Committee)	Name <u>M Ivory</u> Date <u>26/02/19</u>

**Appendix 16: invitation letter to care home managers from study in chapter 4**

School of Pharmacy and Pharmaceutical Sciences  
Cardiff University  
Redwood Building  
King Edward VII Avenue  
Cardiff  
CF10 3NB



Friday 16<sup>th</sup> November 2018

Dear Care Home Manager,

**RE: Evaluation of Nurse-Delegated Medicines Administration to Carers in Nursing Homes**

My name is Vicky Cheng and I am a PhD student at Cardiff University. I have recently completed a project which explored the views of staff in two nursing homes on the delegation of medicines administration to carers using the Proactive Care System™. I would now like to find out whether other nursing homes have similar or different views. This aim of this phase of the project is to find out the number of nursing homes that are currently delegating the administration of medicines to carers using the Proactive Care System™ and the views more generally of staff on nurse-delegated medicines administration to carers in nursing homes. Because of this, I would like to invite you to take part in this project. The project is supervised by Dr Mat Smith, the Director of Learning and Teaching at Cardiff School of Pharmacy and Pharmaceutical Sciences.

Using a short survey, we will ask about you about how medicines are currently given within the nursing home you manage and your views more generally on nurse-delegated medicines administration to carers in nursing homes. The survey may be completed by yourself or if more appropriate another member of staff who is knowledgeable of the medicines management procedures within the nursing home and how medicines are given to residents.

More details about this project can be found in the information sheet. Please take some time to read through it before deciding whether you would like to take part. If you wish to take part then please complete the survey and return it back in the pre-paid envelope by [insert date].

Your responses will be completely **confidential**. The code number specified on each pre-paid envelope is to allow me to send a reminder to those nursing homes who have not responded. A reminder will be sent after two weeks. Information identifying the respondent will not be disclosed under any circumstances. The survey should take about 20 to 30 minutes to complete.

Your views are important in this project. They will add to what we know about the benefits and drawbacks in carers giving out medicines to residents in nursing homes.

You may get in touch with a member of the research team if you have questions about the project. The contact details can be found below.

Thank you very much for your time and I hope to hear from you soon.

Yours faithfully,

Vicky Cheng  
ChengV1@cardiff.ac.uk

Dr Mat Smith  
SmithMW1@cardiff.ac.uk  
+44 (0)29 2087 9286

Covering letter v2.0 16/11/2018

## Appendix 17: information sheet to care home managers from study in chapter 4

School of Pharmacy and Pharmaceutical Sciences  
Cardiff University  
Redwood Building  
King Edward VII Avenue  
Cardiff  
CF10 3NB



### **Information about the Research**

#### **Evaluation of Nurse-Delegated Medicines Administration to Carers in Nursing Homes**

We would like you to take part in a project. We would appreciate it if you could take the time to read the information. You can then decide whether or not you would like to take part.

Section 1 tells you the purpose of the project and what it involves for you. Section 2 gives you more details about the project.

#### **Section 1**

##### **What is the purpose of the study?**

The government (Department of Health) has indicated that with appropriate safeguards it is appropriate for carers to administer medicines to nursing home residents. This applies to carers who have been trained and assessed on giving out medicines. Nursing home residents are usually given their medicines by qualified nurses. Some nursing homes are planning for their carers to administer medicines. Because of this change, it is important to get the views from those who are working in nursing homes and to explore their opinions on this change to practice.

We have recently completed a project which explored the views of staff in two nursing homes on carers administering medicines under the delegation of nurses using the Proactive Care System™. We would now like to find out whether other nursing homes have similar or different views.

##### **Why have I been invited?**

We aim to explore the views of nursing home staff related to carers giving out medicines to residents in nursing homes using the Proactive Care System™. Because of this, it is important to get views from people like yourselves who work in nursing homes.

##### **Do I have to take part?**

No, it is your choice to decide whether or not you would like to take part. By completing the survey, it means that you consent to taking part in this project. You can still drop out of the study at any time. You do not have to give a reason.

##### **What will I have to do?**

Please answer all the questions in the survey. The survey may be completed by either yourself or another member of staff that is knowledgeable of the medicines management procedures within the nursing home and how medicines are given to residents. If you decide that another member of staff should complete this survey, then please allow them to read this information sheet before they decide whether or not to take part.

The survey should take no longer than 20 to 30 minutes to complete. Once you have completed the survey, please return the survey in the pre-paid envelope by [insert date].

**What are the possible risks or disadvantages to taking part?**

There are no risks or disadvantages to you in taking part in this project.

**What are the possible benefits of taking part?**

We cannot promise this study will help you. But the information we get here will add to what we know about the benefits and drawbacks in carers giving out medicines to residents in nursing homes.

**Section 2**

**What will happen if I don't want to carry on with the study?**

Please get in touch with us if you no longer wish to be part of this project. We will make sure that the information you have given will be disposed of securely. This information will also be taken out from the results.

**What if there is a problem?**

You may contact any member of the research team about problems relating to the project.

**Who can I contact to raise concerns or complaints?**

If you have any concerns or complaints during the course of this research project, please contact Dr Mat Smith (SmithMW1@cardiff.ac.uk) who will address the issue. If you remain unhappy and wish to complain formally, you can do this by contacting the Director of Research, Cardiff School of Pharmacy and Pharmaceutical Sciences, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB, phrmyresoffice@cardiff.ac.uk.

**Will my taking part in this study be kept confidential?**

All information will be kept strictly confidential. You will not be able to be identified or identifiable in any reports or publications. Your nursing home will also not be identified or identifiable.

Your completed survey will be stored in a locked filing cabinet at Cardiff University. Your responses to the survey will be typed up onto password protected computers for data analysis.

All information will only be seen by the research team. The information collected will be disposed of securely once it is not needed. It is anticipated that this will be no longer than two years.

Cardiff University is the Data Controller and is committed to respecting and protecting your personal data in accordance with your expectations and Data Protection legislation. The University has a Data Protection Officer who can be contacted at inforequest@cardiff.ac.uk. Further information about Data Protection, including your rights and details about how to contact the Information Commissioner's Office should you wish to complain, can be found at the following: <https://www.cardiff.ac.uk/public-information/policies-and-procedures/data-protection>.

Under data protection law we have to specify the legal basis that we are relying on to process your personal data. In providing your personal data for this research we will process it on the basis that doing so is necessary for our public task for scientific and historical research purposes in accordance with the necessary safeguards, and is in the public interest. The University is a public research institution established by royal charter to advance knowledge and education through its teaching and research activities. Our charter can be found on the Cardiff University website.

**What will happen to the results of the research study?**

The results of this project will be written up and put forward in peer-reviewed journals. The information will be anonymised. This means that neither you nor anyone involved will be identified in the report. Let us know if you would like to see a copy of the report.

**Who is organising and funding the research?**

The project is organised and funded by the School of Pharmacy and Pharmaceutical Sciences at Cardiff University and Invatech Health Limited.

**Who has reviewed the study?**

This project has been accepted by Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee. You may also keep this information sheet.

**Who to contact to participate or for more information?**

Please contact the supervisor Dr Mat Smith ([SmithMW1@cardiff.ac.uk](mailto:SmithMW1@cardiff.ac.uk)) or Vicky Cheng ([ChengV1@cardiff.ac.uk](mailto:ChengV1@cardiff.ac.uk)) using the contact details given in the invitation letter. Please note that contacting us does not commit you to taking part.

Thank you for taking the time to read this information sheet.



## Appendix 18: mailed survey to care home managers from study in chapter 4

School of Pharmacy and Pharmaceutical Sciences  
 Cardiff University  
 Redwood Building  
 King Edward VII Avenue  
 Cardiff  
 CF10 3NB



### Evaluation of Nurse-Delegated Medicines Administration to Carers in Nursing Homes

This is a survey about nurse-delegated medicines administration by carers in nursing homes that currently use the Proactive Care System™ for medicines management. The study aims to find out the number of nursing homes that are currently delegating the administration of medicines to carers and the views of staff on carers administering medicines in nursing homes. This study has been approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee and is being conducted by a PhD student (ChengV1@cardiff.ac.uk) at the Cardiff School of Pharmacy and Pharmaceutical Sciences.

Please take some time to read through the information sheet that accompanies this survey before deciding whether you would like to take part. If you would like to take part in the survey, please ensure that you complete this survey fully and return the completed survey with the pre-paid envelope provided by [insert date]. All responses provided by you in this survey will be kept strictly confidential. The survey should take no longer than 20 to 30 minutes to complete.

### SECTION 1: About you

1. Please indicate your role within the nursing home.

Care home manager

Registered nurse

Carer

Other

If you selected other, please specify your role within the nursing home in the space below:

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**SECTION 2: About your nursing home**

1. Approximately how long has your nursing home been using the Proactive Care System™?

- 0-2 months       3-6 months       7-12 months   
 13-24 months       More than 25 months

2. Please indicate the maximum number **residents** that can be registered at your nursing home below:

\_\_\_\_\_ nursing home residents

3. Please indicate the number of **registered nurses** that work at your nursing home below. *(If there are some nurses that work on a part-time basis, please specify this below).*

\_\_\_\_\_ full-time registered nurses

\_\_\_\_\_ part-time registered nurses

4. Please indicate the number of **carers** that work at your nursing home below. *(If there are some carers that work on a part-time basis, please specify this below).*

\_\_\_\_\_ full-time carers

\_\_\_\_\_ part-time carers

5. Do nurses currently delegate medicines administration to carers within your nursing home? *(If yes, please complete section 3 on pages 2 to 9. If no, please skip section 3 and complete section 4 on page 10).*

- Yes       No

**SECTION 3: Nursing homes that currently delegate carers to administer medicines to residents**

1. Approximately how long have nurses been delegating the administration of medicines to carers within your nursing home?

- 0-2 months       3-6 months       7-12 months   
 13-24 months       More than 25 months

2. In your nursing home, what are the formal qualifications required by carers in order for them to administer medicines under the delegation of nurses? Please tick all that apply.

No formal qualifications

Level 2 Diploma in Health and Social Care (Adults)

Level 3 Diploma in Health and Social Care (Adults)

Other

If you selected other, please specify in the space below:

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3i. Were carers given training on medicines administration before being delegated to administer medicines to residents? *(If yes, please answer question 3ii on page 3 and then continue completing section 3 on pages 4 to 9. If no, please skip question 3ii and continue completing section 3 from pages 4 to 9).*

Yes  No

3ii. If you selected yes to 3i, please tick the type of training that carers were given before being delegated to administer medicines to residents. Please tick all that apply.

Completion of the e-learning package provided by Invatech Health Ltd

Attendance of a face-to-face session on using the Proactive Care System™ by Invatech Health Ltd

Shadowing a registered nurse during medicines administration

Other

If you selected other, please specify in the space below:

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4. Please indicate the total number of **registered nurses that administer medicines** to residents in your nursing home below:

\_\_\_\_\_ registered nurses that administer medicines

5. Please indicate the total number of **carers that can be delegated to administer medicines** to residents in your nursing home below:

\_\_\_\_\_ carers that can be delegated to administer medicines

6. What time of the day do carers administer medicines to residents within your nursing home? Please tick all that apply.

06:00:00 – 09:59:59       10:00:00 – 13:59:59       14:00:00 – 17:59:59

18:00:00 – 21:59:59       22:00:00 – 01:59:59       02:00:00 – 05:59:59

7i. Have you noticed a change in the number of staff members (i.e. nurses or carers) working within your nursing home during periods when nurses delegated the administration of medicines to carers? *(If yes, please answer question 7ii on page 4 and then continue completing section 3 on pages 4 to 9. If no, please skip question 7ii and continue completing section 3 from pages 4 to 9).*

Yes       No

7ii. If you selected yes to 7i, please indicate the changes in the number of staff members (i.e. nurses or carers) that you have noticed during periods when nurses delegated the administration of medicines to carers. Please tick all that apply.

More nurses       Less nurses       More carers       Less carers

8. Which type of medicine formulations are carers delegated to administer to residents within your nursing home? Please tick all that apply.

Oral tablet/capsule       Oral liquid

Inhaler       Transdermal patch

Injection       Topical (i.e. creams and ointments)

9. Which type of medicine doses are carers delegated to give to residents within your nursing home? Please tick all that apply.

Medicines prescribed at a specific time (i.e. regular medicines)

Medicines prescribed 'when required' (i.e. PRN medicines)

Medicines prescribed 'as directed'

10. Which type of controlled drugs can carers be delegated to administer to residents within your nursing home? Please tick all that apply.

Schedule 2 controlled drugs (e.g. medicines like morphine, oxycodone, fentanyl, diamorphine)

Schedule 3 controlled drugs (e.g. medicines like tramadol, buprenorphine, temazepam, midazolam)

Schedule 4 controlled drugs (e.g. medicines like zopiclone, diazepam, lorazepam)

Schedule 5 controlled drugs (e.g. medicines like oral morphine 10mg/5ml solution, co-codamol)

11i. Are there any other medicines that carers **cannot** be delegated to administer to residents within your nursing home that have not been covered? *(If yes, please answer question 11ii on page 5 and then continue completing section 3 on pages 6 to 9. If no, please skip question 11ii and continue completing section 3 from pages 6 to 9).*

Yes  No

11ii. If you have selected yes to 11i, please specify in the space below the other medicines that carers **cannot** be delegated to administer to residents within your nursing home:

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12. On a scale of 1 to 5 (where 1 is 'never' and 5 is 'always'), please indicate the extent to which you have experienced the following challenges when carers were delegated to administer medicines to residents (please tick **one** box per statement):

i. Technology failures which have prevented carers administering medicines under nurse-delegation

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ii. Technology failures which have prevented nurses from delivering care to residents as they were needed to resolve the technology issues

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

iii. Challenges in maintaining sufficient carer staffing levels whilst some carers are delegated to administer medicines to residents

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

iv. Issues with staff adjusting to the new roles within the nursing home (i.e. nurses delegating the administration of medicines to carers and carers being delegated to administer medicines)

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

v. Carers refusing to administer medicines that were delegated to them by nurses

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

vi. Nurses refusing to delegate carers to administer medicines to residents

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

vii. Concerns related to the standard of training provided to carers to administer medicines

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

viii. Resistance from family members because carers were administering medicines to residents (rather than nurses)

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ix. Resistance from residents because carers were administering medicines to them (rather than nurses)

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

x. Please use the space below to make any further comments about your thoughts on challenges experienced by your nursing home in delegating the administration of medicines to carers:

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13. On a scale of 1 to 5 (where 1 is 'strongly disagree' and 5 is 'strongly agree'), please indicate the extent to which you think carers administering medicines under the delegation of nurses has impacted your nursing home (please tick **one** box per statement):

i. Higher levels of staff satisfaction (i.e. care home managers, registered nurses and carers)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ii. Medicines are administered more accurately (i.e. fewer medication incidents)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

iii. Medicines are administered in a more timely manner

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

iv. Nursing home staff communicate more effectively

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

v. Residents receive a greater consistency of care

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

vi. Registered nurses are freed up to focus their time on other nursing tasks

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



vii. Residents are more satisfied with the care that is provided

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

viii. The workload within the nursing home is shared out more evenly amongst staff (i.e. care home managers, registered nurses and carers)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ix. There has been cost-savings to the nursing home as a result of delegating the administration of medicines to carers

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

x. Please use the space below to make any further comments about your thoughts on the ways in which delegating the administration of medicines to carers have impacted your nursing home:

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*Please skip sections 4 to 5 and complete section 6 on page 12*

**SECTION 4: Nursing homes that currently do not delegate carers to administer medicines to residents**

1. Has your nursing home considered introducing nurse-delegated medicines administration to carers? (If yes, please answer question 2 in section 4 (page 10). If no, please skip question 2 and complete section 6 on page 12).

Yes  No

2. Does your nursing home have plans to introduce nurse-delegated medicines administration to carers? (If yes, please complete section 5 on pages 10 to 12. If no, please skip section 5 and complete section 6 on page 12).

Yes  No

**SECTION 5: Nursing homes that have plans to introduce nurse-delegated medicines administration to carers**

1. When is your nursing home planning to introduce nurse-delegated medicines administration to carers?

Within the next 2 months  Within 3-6 months' time

Within 7-12 months' time  More than 12 months' time

2. On a scale of 1 to 5 (where 1 is 'strongly disagree' and 5 is 'strongly agree'), please indicate the extent to which you think carers administering medicines under the delegation of nurses will impact your nursing home (please tick **one** box per statement):

i. Higher levels of staff satisfaction (i.e. care home managers, registered nurses and carers)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ii. Medicines will be administered more accurately (i.e. fewer medication incidents)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

iii. Medicines will be administered more timely

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

iv. Nursing home staff communicate more effectively

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

v. Residents will receive a greater consistency of care

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

vi. Registered nurses are freed up to focus their time on other nursing tasks

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

vii. Residents will be more satisfied with the care that is provided

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

viii. The workload within the nursing home will be shared out more evenly amongst staff (i.e. care home managers, registered nurses and carers)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	Don't know
1	2	3	4	5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Please turn over for the next statement*

ix. There will be cost-savings for the nursing home as a result of delegating carers to administer medicines

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	
1	2	3	4	5	Don't know
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

x. Please use the space below to make any further comments about your thoughts on the ways in which delegating the administration of medicines to carers will impact your nursing home:

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*Please complete section 6 on page 12*

**SECTION 6: Completion of survey**

1. Please use the space below to make any further comments about your thoughts on nurse-delegated medicines administration to carers in nursing homes:

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*You have now completed all the questions. Thank you for taking the time to complete this survey. Please return this survey in the pre-paid envelope provided by [insert date].*

## Appendix 19: invitation letter to care home manager from study in chapter 4 following amendments

School of Pharmacy and Pharmaceutical Sciences  
Cardiff University  
Redwood Building  
King Edward VII Avenue  
Cardiff  
CF10 3NB



Thursday 21<sup>st</sup> February 2019

Dear Care Home Manager,

**RE: Evaluation of Nurse-Delegated Medicines Administration to Carers in Nursing Homes**

You were recently invited on two occasions to take part in a survey to find out the number of nursing homes that are currently delegating the administration of medicines to carers using the Proactive Care System™ and the views more generally of staff on nurse-delegated medicines administration to carers in nursing homes.

We noticed that you have not yet responded. We understand that it may have been a busy time for you to complete the survey, but we would really appreciate your views in this project. Because of this, we are writing to offer you the opportunity to answer the questions to the survey over the telephone instead.

We will contact you by the telephone number of your nursing home to check if you may be interested in taking part in the project.

The telephone call may be taken by yourself or if more appropriate another member of staff who is knowledgeable of the medicines management procedures within the nursing home and how medicines are given to residents. If you decide that another member of staff should answer the questions to this survey, then please allow them to read the information sheet.

You may answer the questions to the survey during this call, or we can arrange a time that may be more convenient for you. A copy of the survey questions that will be asked during the telephone call is also attached for reference.

As before, all your responses will be completely **confidential**.

You may get in touch with a member of the research team if you have questions about the project. The contact details can be found below.

Thank you very much for your time.

Yours faithfully,

Vicky Cheng  
ChengV1@cardiff.ac.uk

Dr Mat Smith  
SmithMW1@cardiff.ac.uk  
+44 (0)29 2087 9286

Covering letter v1.0 21/02/2019

## Appendix 20: information sheet to care home managers from study in chapter 4 following amendments

School of Pharmacy and Pharmaceutical Sciences  
Cardiff University  
Redwood Building  
King Edward VII Avenue  
Cardiff  
CF10 3NB



### **Information about the Research**

#### **Evaluation of Nurse-Delegated Medicines Administration to Carers in Nursing Homes**

We would like you to take part in a project. We would appreciate it if you could take the time to read the information. You can then decide whether or not you would like to take part.

Section 1 tells you the purpose of the project and what it involves for you. Section 2 gives you more details about the project.

#### **Section 1**

##### **What is the purpose of the study?**

The government (Department of Health) has indicated that with appropriate safeguards it is appropriate for carers to administer medicines to nursing home residents. This applies to carers who have been trained and assessed on giving out medicines. Nursing home residents are usually given their medicines by qualified nurses. Some nursing homes are planning for their carers to administer medicines. Because of this change, it is important to get the views from those who are working in nursing homes and to explore their opinions on this change to practice.

We have recently completed a project which explored the views of staff in two nursing homes on carers administering medicines under the delegation of nurses using the Proactive Care System™. We would now like to find out whether other nursing homes have similar or different views.

##### **Why have I been invited?**

We aim to explore the views of nursing home staff related to carers giving out medicines to residents in nursing homes using the Proactive Care System™. Because of this, it is important to get views from people like yourselves who work in nursing homes.

##### **Do I have to take part?**

No, it is your choice to decide whether or not you would like to take part. By answering the questions to the survey over the telephone call, it means that you consent to taking part in this project. You can still drop out of the study at any time. You do not have to give a reason.

##### **What will I have to do?**

We will contact you by the telephone number of your nursing home to check if you may be interested in answering the questions to the survey over the telephone. A copy of the survey questions that will be asked during the telephone call is attached for reference. If we are unable to get through to you by telephone on this occasion, the researcher will leave her contact details for you and we will try calling back at another time. If we are unable to get through to you by calling on two occasions, we will assume that you are not interested in taking part in the project.

The telephone call may be taken by yourself or if more appropriate another member of staff who is knowledgeable of the medicines management procedures within the nursing home and how medicines are given to residents. If you decide that another member of staff should answer the questions to this survey, then please allow them to read this information sheet.

If you confirm that you have read the information about this project during the telephone call and would like to take part, then you may answer the questions to the survey during this call or we can arrange another time that may be more convenient for you.

If you have not had time to read through the information sheet during the telephone call, then we will call back again in one week's time to check whether you may be interested in taking part. If you would like to take part in this project, you may answer the questions to the survey over the telephone when we call back or we can arrange another time that may be more convenient for you.

The telephone call should take no longer than 20 to 30 minutes to complete.

**What are the possible risks or disadvantages to taking part?**

There are no risks or disadvantages to you in taking part in this project.

**What are the possible benefits of taking part?**

We cannot promise this study will help you. But the information we get here will add to what we know about the benefits and drawbacks in carers giving out medicines to residents in nursing homes.

**Section 2**

**What will happen if I don't want to carry on with the study?**

Please get in touch with us if you no longer wish to be part of this project. We will make sure that the information you have given will be disposed of securely. This information will also be taken out from the results.

**What if there is a problem?**

You may contact any member of the research team about problems relating to the project.

**Who can I contact to raise concerns or complaints?**

If you have any concerns or complaints during the course of this research project, please contact Dr Mat Smith (SmithMW1@cardiff.ac.uk) who will address the issue. If you remain unhappy and wish to complain formally, you can do this by contacting the Director of Research, Cardiff School of Pharmacy and Pharmaceutical Sciences, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB, phrmyresoffice@cardiff.ac.uk.

**Will my taking part in this study be kept confidential?**

All information will be kept strictly confidential. You will not be able to be identified or identifiable in any reports or publications. Your nursing home will also not be identified or identifiable.

Your responses to the questions asked over the telephone call will be stored in a locked filing cabinet at Cardiff University. The telephone call conversation will not be audio-recorded. The researcher will make a note of your responses on a blank copy of the survey (a copy of the survey questions that will be asked during the telephone call is also attached for your reference). Your responses to the survey will be typed up onto password protected computers for data analysis.

All information will only be seen by the research team. The information collected will be disposed of securely once it is not needed. It is anticipated that this will be no longer than two years.

Cardiff University is the Data Controller and is committed to respecting and protecting your personal data in accordance with your expectations and Data Protection legislation. The University has a Data Protection Officer who can be contacted at [inforequest@cardiff.ac.uk](mailto:inforequest@cardiff.ac.uk). Further information about Data Protection, including your rights and details about how to contact the Information Commissioner's Office should you wish to complain, can be found at the following: <https://www.cardiff.ac.uk/public-information/policies-and-procedures/data-protection>.

Under data protection law we have to specify the legal basis that we are relying on to process your personal data. In providing your personal data for this research we will process it on the basis that doing so is necessary for our public task for scientific and historical research purposes in accordance with the necessary safeguards, and is in the public interest. The University is a public research institution established by royal charter to advance knowledge and education through its teaching and research activities. Our charter can be found on the Cardiff University website.

**What will happen to the results of the research study?**

The results of this project will be written up and put forward in peer-reviewed journals. The information will be anonymised. This means that neither you nor anyone involved will be identified in the report. Let us know if you would like to see a copy of the report.

**Who is organising and funding the research?**

The project is organised and funded by the School of Pharmacy and Pharmaceutical Sciences at Cardiff University and Invatech Health Limited.

**Who has reviewed the study?**

This project has been accepted by Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee. You may also keep this information sheet.

**Who to contact to participate or for more information?**

Please contact the supervisor Dr Mat Smith ([SmithMW1@cardiff.ac.uk](mailto:SmithMW1@cardiff.ac.uk)) or Vicky Cheng ([ChengV1@cardiff.ac.uk](mailto:ChengV1@cardiff.ac.uk)) using the contact details given in the invitation letter. Please note that contacting us does not commit you to taking part.

Thank you for taking the time to read this information sheet.



## Appendix 21: copy of survey questions to care home managers from study in chapter 4

### SECTION 1: About you

1. Please indicate your role within the nursing home.

Care home manager

Registered nurse

Carer

Other

If you selected other, please specify your role within the nursing home in the space below:

\_\_\_\_\_

### SECTION 2: About your nursing home

1. Approximately how long has your nursing home been using the Proactive Care System™?

0-2 months       3-6 months       7-12 months

13-24 months       More than 25 months

2. Please indicate the maximum number **residents** that can be registered at your nursing home below:

\_\_\_\_\_ nursing home residents

3. Please indicate the number of **registered nurses** that work at your nursing home below. *(If there are some nurses that work on a part-time basis, please specify this below).*

\_\_\_\_\_ full-time registered nurses

\_\_\_\_\_ part-time registered nurses

4. Please indicate the number of **carers** that work at your nursing home below. *(If there are some carers that work on a part-time basis, please specify this below).*

\_\_\_\_\_ full-time carers

\_\_\_\_\_ part-time carers

5. Do nurses currently delegate medicines administration to carers within your nursing home? *(If yes, please complete section 3. If no, please skip section 3 and complete section 4).*

Yes  No

**SECTION 3: Nursing homes that currently delegate carers to administer medicines to residents**

1. Approximately how long have nurses been delegating the administration of medicines to carers within your nursing home?

0-2 months  3-6 months  7-12 months   
 13-24 months  More than 25 months

2. In your nursing home, what are the formal qualifications required by carers in order for them to administer medicines under the delegation of nurses? Please tick all that apply.

- No formal qualifications
- Level 2 Diploma in Health and Social Care (Adults)
- Level 3 Diploma in Health and Social Care (Adults)
- Other

If you selected other, please specify in the space below:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

3i. Were carers given training on medicines administration before being delegated to administer medicines to residents? *(If yes, please answer question 3ii then continue completing section 3. If no, please skip question 3ii and continue completing section 3).*

Yes  No

3ii. If you selected yes to 3i, please tick the type of training that carers were given before being delegated to administer medicines to residents. Please tick all that apply.

Completion of the e-learning package provided by Invatech Health Ltd

Attendance of a face-to-face session on using the Proactive Care System™ by Invatech Health Ltd

Shadowing a registered nurse during medicines administration

Other

If you selected other, please specify in the space below:

\_\_\_\_\_

\_\_\_\_\_

4. Please indicate the total number of **registered nurses that administer medicines** to residents in your nursing home below:

\_\_\_\_\_ registered nurses that administer medicines

5. Please indicate the total number of **carers that can be delegated to administer medicines** to residents in your nursing home below:

\_\_\_\_\_ carers that can be delegated to administer medicines

6. What time of the day do carers administer medicines to residents within your nursing home? Please tick all that apply.

06:00:00 – 09:59:59  10:00:00 – 13:59:59  14:00:00 – 17:59:59

18:00:00 – 21:59:59  22:00:00 – 01:59:59  02:00:00 – 05:59:59

7i. Have you noticed a change in the number of staff members (i.e. nurses or carers) working within your nursing home during periods when nurses delegated the administration of medicines to carers? *(If yes, please answer question 7ii and then continue completing section 3. If no, please skip question 7ii and continue completing section 3).*

Yes  No

7ii. If you selected yes to 7i, please indicate the changes in the number of staff members (i.e. nurses or carers) that you have noticed during periods when nurses delegated the administration of medicines to carers. Please tick all that apply.

More nurses  Less nurses  More carers  Less carers

8. Which type of medicine formulations are carers delegated to administer to residents within your nursing home? Please tick all that apply.

Oral tablet/capsule  Oral liquid

Inhaler  Transdermal patch

Injection  Topical (i.e. creams and ointments)

9. Which type of medicine doses are carers delegated to give to residents within your nursing home? Please tick all that apply.

Medicines prescribed at a specific time (i.e. regular medicines)

Medicines prescribed 'when required' (i.e. PRN medicines)

Medicines prescribed 'as directed'

10. Which type of controlled drugs can carers be delegated to administer to residents within your nursing home? Please tick all that apply.

Schedule 2 controlled drugs (e.g. medicines like morphine, oxycodone, fentanyl, diamorphine)

Schedule 3 controlled drugs (e.g. medicines like tramadol, buprenorphine, temazepam, midazolam)

Nurse-delegated medicines administration to carers in nursing homes survey v1.0 21/02/2019

4

Schedule 4 controlled drugs (e.g. medicines like zopiclone, diazepam, lorazepam)

Schedule 5 controlled drugs (e.g. medicines like oral morphine 10mg/5ml solution, co-codamol)

11i. Are there any other medicines that carers **cannot** be delegated to administer to residents within your nursing home that have not been covered? *(If yes, please answer question 11ii. If no, please skip 11ii).*

Yes  No

11ii. If you have selected yes to 11i, please specify in the space below the other medicines that carers **cannot** be delegated to administer to residents within your nursing home:

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12. On a scale of 1 to 5 (where 1 is 'never' and 5 is 'always'), please indicate the extent to which you have experienced the following challenges when carers were delegated to administer medicines to residents (please tick **one** box per statement):

	Never	Rarely	Some times	Very often	Always	Don't know
i. Technology failures which have prevented carers administering medicines under nurse-delegation						
ii. Technology failures which have prevented nurses from delivering care to residents as they were needed to resolve the technology issues						
iii. Challenges in maintaining sufficient carer staffing levels whilst some carers are delegated to administer medicines to residents						
iv. Issues with staff adjusting to the new roles within the nursing home (i.e. nurses delegating the administration of medicines to carers and carers being delegated to administer medicines)						
v. Carers refusing to administer medicines that were delegated to them by nurses						
vi. Nurses refusing to delegate carers to administer medicines to residents						
vii. Concerns related to the standard of training provided to carers to administer medicines						

viii. Resistance from family members because carers were administering medicines to residents (rather than nurses)						
ix. Resistance from residents because carers were administering medicines to them (rather than nurses)						

x. Please use the space below to make any further comments about your thoughts on challenges experienced by your nursing home in delegating the administration of medicines to carers:

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13. On a scale of 1 to 5 (where 1 is 'strongly disagree' and 5 is 'strongly agree'), please indicate the extent to which you think carers administering medicines under the delegation of nurses has impacted your nursing home (please tick **one** box per statement):

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
i. Higher levels of staff satisfaction (i.e. care home managers, registered nurses and carers)						
ii. Medicines are administered more accurately (i.e. fewer medication incidents)						
iii. Medicines are administered in a more timely manner						
iv. Nursing home staff communicate more effectively						
v. Residents receive a greater consistency of care						
vi. Registered nurses are freed up to focus their time on other nursing tasks						
vii. Residents are more satisfied with the care that is provided						
viii. The workload within the nursing home is shared out more evenly amongst staff (i.e. care home managers, registered nurses and carers)						
ix. There has been cost-savings to the nursing home as a result of delegating the administration of medicines to carers						

x. Please use the space below to make any further comments about your thoughts on the ways in which delegating the administration of medicines to carers have impacted your nursing home:

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**SECTION 4: Nursing homes that currently do not delegate carers to administer medicines to residents**

1. Has your nursing home considered introducing nurse-delegated medicines administration to carers? *(If yes, please answer question 2. If no, please skip question 2 and complete section 6).*

Yes  No

2. Does your nursing home have plans to introduce nurse-delegated medicines administration to carers? *(If yes, please complete section 5. If no, please skip section 5 and complete section 6).*

Yes  No

**SECTION 5: Nursing homes that have plans to introduce nurse-delegated medicines administration to carers**

1. When is your nursing home planning to introduce nurse-delegated medicines administration to carers?

Within the next 2 months  Within 3-6 months' time

Within 7-12 months' time  More than 12 months' time

2. On a scale of 1 to 5 (where 1 is 'strongly disagree' and 5 is 'strongly agree'), please indicate the extent to which you think carers administering medicines under the delegation of nurses will impact your nursing home (please tick **one** box per statement):

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
i. Higher levels of staff satisfaction (i.e. care home managers, registered nurses and carers)						
ii. Medicines will be administered more accurately (i.e. fewer medication incidents)						
iii. Medicines will be administered more timely						
iv. Nursing home staff communicate more effectively						
v. Residents will receive a greater consistency of care						
vi. Registered nurses are freed up to focus their time on other nursing tasks						
vii. Residents will be more satisfied with the care that is provided						
viii. The workload within the nursing home will be shared out more evenly amongst staff (i.e. care home managers, registered nurses and carers)						
ix. There will be cost-savings for the nursing home as a result of delegating carers to administer medicines						

x. Please use the space below to make any further comments about your thoughts on the ways in which delegating the administration of medicines to carers will impact your nursing home:

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## Appendix 22: coded version of survey to be used for analysis on IBM SPSS statistics version 23 from study in chapter 4

School of Pharmacy and Pharmaceutical Sciences  
 Cardiff University  
 Redwood Building  
 King Edward VII Avenue  
 Cardiff  
 CF10 3NB



**ID (according to unique reference code from returned envelope)**

### Evaluation of Nurse-Delegated Medicines Administration to Carers in Nursing Homes

This is a survey about nurse-delegated medicines administration by carers in nursing homes that currently use the Proactive Care System™ for medicines management. The study aims to find out the number of nursing homes that are currently delegating the administration of medicines to carers and the views of staff on carers administering medicines in nursing homes. This study has been approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee and is being conducted by a PhD student (ChengV1@cardiff.ac.uk) at the Cardiff School of Pharmacy and Pharmaceutical Sciences.

Please take some time to read through the information sheet that accompanies this survey before deciding whether you would like to take part. If you would like to take part in the survey, please ensure that you complete this survey fully and return the completed survey with the pre-paid envelope provided by [insert date]. All responses provided by you in this survey will be kept strictly confidential. The survey should take no longer than 20 to 30 minutes to complete.

### SECTION 1: About you

**[S1\_1]** 1. Please indicate your role within the nursing home.

- Care home manager  **1**
- Registered nurse  **2**
- Carer  **3**
- Other

If you selected other, please specify your role within the nursing home in the space below:

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**SECTION 2: About your nursing home**

**[S2\_1]** 1. Approximately how long has your nursing home been using the Proactive Care System™?

- 0-2 months       **1**      3-6 months       **2**      7-12 months       **3**
- 13-24 months       **4**      More than 25 months       **5**

**[S2\_2]** 2. Please indicate the maximum number **residents** that can be registered at your nursing home below:

\_\_\_\_\_ nursing home residents **numeric**

3. Please indicate the number of **registered nurses** that work at your nursing home below. *(If there are some nurses that work on a part-time basis, please specify this below).*

**[S2\_3nurseft]** \_\_\_\_\_ full-time registered nurses **numeric**

**[S2\_3nursept]** \_\_\_\_\_ part-time registered nurses **numeric**

4. Please indicate the number of **carers** that work at your nursing home below. *(If there are some carers that work on a part-time basis, please specify this below).*

**[S2\_4carerft]** \_\_\_\_\_ full-time carers

**[S2\_4carerpt]** \_\_\_\_\_ part-time carers

**[S2\_5]** 5. Do nurses currently delegate medicines administration to carers within your nursing home? *(If yes, please complete section 3 on pages 2 to 9. If no, please skip section 3 and complete section 4 on page 10).*

- Yes     **1**      No     **2**

**SECTION 3: Nursing homes that currently delegate carers to administer medicines to residents**

**[S3\_1]** 1. Approximately how long have nurses been delegating the administration of medicines to carers within your nursing home?

- 0-2 months       **1**      3-6 months       **2**      7-12 months       **3**
- 13-24 months       **4**      More than 25 months       **5**

2. In your nursing home, what are the formal qualifications required by carers in order for them to administer medicines under the delegation of nurses? Please tick all that apply.

**[S3\_2noquali]** No formal qualifications  **1=y 2=n**

**[S3\_2level2dip]** Level 2 Diploma in Health and Social Care (Adults)  **1=y 2=n**

**[S3\_2level3dip]** Level 3 Diploma in Health and Social Care (Adults)  **1=y 2=n**

Other

If you selected other, please specify in the space below:

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3i. Were carers given training on medicines administration before being delegated to administer medicines to residents? *(If yes, please answer question 3ii on page 3 and then continue completing section 3 on pages 4 to 9. If no, please skip question 3ii and continue completing section 3 from pages 4 to 9).*

**[S3\_3training]** Yes  **1** No  **2**

3ii. If you selected yes to 3i, please tick the type of training that carers were given before being delegated to administer medicines to residents. Please tick all that apply.

**[S3\_3elearning]** Completion of the e-learning package provided by Invatech Health Ltd  **1=y 2=n**

**[S3\_3facetofacesession]** Attendance of a face-to-face session....  **1=y 2=n**

**[S3\_3nursesshadowing]** Shadowing a registered nurse during medicines administration  **1=y 2=n**

Other

If you selected other, please specify in the space below:

---

**[S3\_4]** 4. Please indicate the total number of **registered nurses that administer medicines** to residents in your nursing home below:

\_\_\_\_\_ registered nurses that administer medicines **numeric**

**[S3\_5]** 5. Please indicate the total number of **carers that can be delegated to administer medicines** to residents in your nursing home below:

\_\_\_\_\_ carers that can....administer medicines **numeric**

6. What time of the day do carers administer medicines to residents within your nursing home? Please tick all that apply.

**[S3\_6\_610]** 06:00:00 – 09:59:59  **1=y 2=n** **[S3\_6\_1014]** 10:00:00 – 13:59:59  **1=y 2=n**

**[S3\_6\_1418]** 14:00:00 – 17:59:59  **1=y 2=n** **[S3\_6\_1822]** 18:00:00 – 21:59:59  **1=y 2=n**

**[S3\_6\_222]** 22:00:00 – 01:59:59  **1=y 2=n** **[S3\_6\_26]** 02:00:00 – 05:59:59  **1=y 2=n**

7i. Have you noticed a change in the number of staff members (i.e. nurses or carers) working within your nursing home during periods when nurses delegated the administration of medicines to carers? *(If yes, please answer question 7ii on page 4 and then continue completing section 3 on pages 4 to 9. If no, please skip question 7ii and continue completing section 3 from pages 4 to 9).*

**[S3\_7changeinnoofstaff]** Yes  **1** No  **2**

7ii. If you selected yes to 7i, please indicate the changes in the number of staff members (i.e. nurses or carers) that you have noticed during periods when nurses delegated the administration of medicines to carers. Please tick all that apply.

**[S3\_7morenurses]** More nurses  **1=y 2=n** **[S3\_7lessnurses]** Less nurses  **1=y 2=n**

**[S3\_7morecarers]** More carers  **1=y 2=n** **[S3\_7lesscarers]** Less carers  **1=y 2=n**

8. Which type of medicine formulations are carers delegated to administer to residents within your nursing home? Please tick all that apply.

**[S3\_8tabcap]** Oral tablet/capsule  **1=y 2=n** **[S3\_8liquid]** Oral liquid  **1=y 2=n**

[S3\_8inhaler] Inhaler  1=y 2=n [S3\_8tranpatch] Transdermal patch  1=y 2=n

[S3\_8injection] Injection  1=y 2=n [S3\_8topical] Topical  1=y 2=n

9. Which type of medicine doses are carers delegated to give to residents within your nursing home? Please tick all that apply.

[S3\_9reg] Medicines prescribed at a specific time (i.e. regular medicines)  1=y 2=n

[S3\_9prn] Medicines prescribed 'when required' (i.e. PRN medicines)  1=y 2=n

[S3\_9mdu] Medicines prescribed 'as directed'  1=y 2=n

10. Which type of controlled drugs can carers be delegated to administer to residents within your nursing home? Please tick all that apply.

[S3\_10nocd] 1=y 2=n

[S3\_10cd2] Schedule 2 controlled drugs  1=y 2=n

[S3\_10cd3] Schedule 3 controlled drugs  1=y 2=n

[S3\_10cd4] Schedule 4 controlled drugs  1=y 2=n

[S3\_10cd5] Schedule 5 controlled drugs  1=y 2=n

11i. Are there any other medicines that carers **cannot** be delegated to administer to residents within your nursing home that have not been covered? *(If yes, please answer question 11ii on page 5 and then continue completing section 3 on pages 6 to 9. If no, please skip question 11ii and continue completing section 3 from pages 6 to 9).*

[S3\_11] Yes  1 No  2

11ii. If you have selected yes to 11i, please specify in the space below the other medicines that carers **cannot** be delegated to administer to residents within your nursing home:

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---



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12. On a scale of 1 to 5 (where 1 is 'never' and 5 is 'always'), please indicate the extent to which you have experienced the following challenges when carers were delegated to administer medicines to residents (please tick **one** box per statement):

**[S3\_12i]** i. Technology failures which have prevented carers administering medicines under nurse-delegation

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_12ii]** ii. Technology failures which have prevented nurses from delivering care to residents as they were needed to resolve the technology issues

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_12iii]** iii. Challenges in maintaining sufficient carer staffing levels whilst some carers are delegated to administer medicines to residents

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_12iv]** iv. Issues with staff adjusting to the new roles within the nursing home (i.e. nurses delegating the administration of medicines to carers and carers being delegated to administer medicines)

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_12v]** v. Carers refusing to administer medicines that were delegated to them by nurses

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_12vi]** vi. Nurses refusing to delegate carers to administer medicines to residents

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_12vii]** vii. Concerns related to the standard of training provided to carers to administer medicines

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_12viii]** viii. Resistance from family members because carers were administering medicines to residents (rather than nurses)

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_12ix]** ix. Resistance from residents because carers were administering medicines to them (rather than nurses)

<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Very often</i>	<i>Always</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_12x]** x. Please use the space below to make any further comments about your thoughts on challenges experienced by your nursing home in delegating the administration of medicines to carers: **string**

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13. On a scale of 1 to 5 (where 1 is 'strongly disagree' and 5 is 'strongly agree'), please indicate the extent to which you think carers administering medicines under the delegation of nurses has impacted your nursing home (please tick **one** box per statement):

**[S3\_13i]** i. Higher levels of staff satisfaction (i.e. care home managers, registered nurses and carers)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_13ii]** ii. Medicines are administered more accurately (i.e. fewer medication incidents)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_13iii]** iii. Medicines are administered in a more timely manner

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_13iv]** iv. Nursing home staff communicate more effectively

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_13v]** v. Residents receive a greater consistency of care

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_13vi]** vi. Registered nurses are freed up to focus their time on other nursing tasks

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_13vii]** vii. Residents are more satisfied with the care that is provided

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_13viii]** viii. The workload within the nursing home is shared out more evenly amongst staff (i.e. care home managers, registered nurses and carers)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_13ix]** ix. There has been cost-savings to the nursing home as a result of delegating the administration of medicines to carers

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S3\_13x]** x. Please use the space below to make any further comments about your thoughts on the ways in which delegating the administration of medicines to carers have impacted your nursing home: **string**

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*Please skip sections 4 to 5 and complete section 6 on page 12*

**SECTION 4: Nursing homes that currently do not delegate carers to administer medicines to residents**

**[S4\_1]** 1. Has your nursing home considered introducing nurse-delegated medicines administration to carers? (If yes, please answer question 2 in section 4 (page 10). If no, please skip question 2 and complete section 6 on page 12).

Yes  **1**      No  **2**

**[S4\_2]** 2. Does your nursing home have plans to introduce nurse-delegated medicines administration to carers? (If yes, please complete section 5 on pages 10 to 12. If no, please skip section 5 and complete section 6 on page 12).

Yes  **1**      No  **2**

**SECTION 5: Nursing homes that have plans to introduce nurse-delegated medicines administration to carers**

**[S5\_1]** 1. When is your nursing home planning to introduce nurse-delegated medicines administration to carers?

Within the next 2 months  **1**      Within 3-6 months' time  **2**  
 Within 7-12 months' time  **3**      More than 12 months' time  **4**

2. On a scale of 1 to 5 (where 1 is 'strongly disagree' and 5 is 'strongly agree'), please indicate the extent to which you think carers administering medicines under the delegation of nurses will impact your nursing home (please tick **one** box per statement):

**[S5\_2i]** i. Higher levels of staff satisfaction (i.e. care home managers, registered nurses and carers)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S5\_2ii]** ii. Medicines will be administered more accurately (i.e. fewer medication incidents)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S5\_2iii]** iii. Medicines will be administered more timely

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S5\_2iv]** iv. Nursing home staff communicate more effectively

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S5\_2v]** v. Residents will receive a greater consistency of care

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S5\_2vi]** vi. Registered nurses are freed up to focus their time on other nursing tasks

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S5\_2vii]** vii. Residents will be more satisfied with the care that is provided

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S5\_2viii]** viii. The workload within the nursing home will be shared out more evenly amongst staff (i.e. care home managers, registered nurses and carers)

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S5\_2ix]** ix. There will be cost-savings for the nursing home as a result of delegating carers to administer medicines

<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Don't know</i>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**[S5\_2x]**x. Please use the space below to make any further comments about your thoughts on the ways in which delegating the administration of medicines to carers will impact your nursing home: **string**

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*Please complete section 6 below*

**SECTION 6: Completion of survey**

**[S6\_1]**1. Please use the space below to make any further comments about your thoughts on nurse-delegated medicines administration to carers in nursing homes: **string**

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*You have now completed all the questions. Thank you for taking the time to complete this survey. Please return this survey in the pre-paid envelope provided by [insert date].*